Recovery Reimagined: Regenerative Intervention in the Upper Stillaguamish River Valley

Kami Lemke

A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Architecture

University of Washington

2015

Committee:

Brian McLaren

Nina Franey

Program Authorized to Offer Degree:

Architecture

University of Washington

Abstract

Recovery Reimagined: Regenerative Intervention in the Upper Stillaguamish River Valley

Kami Lemke

Co-Chairs of Supervisory Committee:
Department Chair, Associate Professor, Brian L. McLaren, PhD
Lecturer, Nina Franey
Architecture

The landslide that occurred in March 2014 in the Upper Stillaguamish River Valley caused a great loss of life and property and prompted a rebuilding of the valley's infrastructure. This thesis seeks to enhance that recovery through regenerative architecture interventions which integrate human reclamation efforts with respect for the natural wild. Instead of being known as a place of disaster, the valley, centered on the river and the White Horse Trail, will be known for its natural beauty. Architecture interventions along the existing trail seek to boost the collective spirit of the valley by providing sites that the community can be proud of as well as drawing attention to the forces of nature.

Two trailhead facilities and a viewing tower, along with trail markers, are proposed in designs that are sensitive to the surrounding natural flows of wildlife and geology. Through these built interventions, an experience of the place is curated and views of nature which may otherwise be missed are framed and highlighted. This redefinition of the natural experience cultivates pride in one's community and an atmosphere of healing and enhanced recovery that is deeply rooted in and responsive to the place.

Recovery Reimagined:

regenerative intervention
in the upper stillaguamish river valley

Thank you
to all of the inspiring and patient teachers I have had in my life
who have contributed to my love of learning.
Lateley, Brian McLaren, Nina Franey, and Louisa Iarocci.

Table of Contents

1 Introduction 8

In the wake of natural disaster..... 10
Answers in design.....11
The issue of recovery.....13
Position: enhancing recovery.....14

2 Defining the Approach 16

How to enhance recovery.....18
Regenerative approach.....23
Human reclamation.....31

3 Design Methods 36

The site.....38
Natural disaster: landslide.....42
The river.....48
The forest.....49
Climate.....52
Human presence.....52
Narrowing the focus.....56

4 Design Proposal 60

Trail vision.....62
Specific interventions.....66
Darrington.....68
Fortson.....76
Hazel.....82
Design summary.....96

5 Conclusion 98

References

Figure List.....104
Bibliography.....108

Appendix

Model photographs.....110

chapter 1: introduction

In the wake of natural disaster

The first response to a natural disaster is obviously the most crucial in terms of immediately saving human lives. Trained responders arrive, assess the event, ensure safety for those involved, and perform rescues, among many other tasks. Displaced people find shelter and the cleanup begins.

But the subsequent responses to a natural disaster-stricken area, the treatment of the land and community, can have enduring effects on generations to follow. The relationship between humans and nature changes following a natural disaster. Humans typically believe they have the power to control and manipulate nature into producing food or energy. Through a natural disaster, however, the power that humans thought they had is taken back by the natural world. It is as if nature is reminding us that it, rather than humans, is the most powerful force.

Given this power shift, how is the change in the relationship between the human world and the natural world addressed by the survivors? Do we accept nature's assertion of ultimate power? If so, how do we grapple with the identity

Figure 1: Rescue workers in Oso, Washington

of a place that has just shown its darkest side? How can the collective spirit of the community continue despite a tragedy? How can humans inhabit a place that has just turned against them?

Answers in design

It is this thesis' position that the answers to these questions lie in the recovery response subsequent to the initial emergency response. By combining the traditional recovery practice of rebuilding, such as that of infrastructure, with design that addresses the psychosocial welfare of a place, a sense of local identity beyond tragedy is cultivated. A nuanced treatment of how components of infrastructure and community are rebuilt in tandem is crucial to the continued mental wellness of those effected. It is important that the hearts and minds of those effected are rebuilt just as strongly as the local bridges and roads if efforts are to be successful.

The aforementioned nuanced treatment involves the inclusion of natural processes and flows when rebuilding

decisions are made. In the atmosphere following a natural disaster, the need for reverence toward nature and its forces is abundantly apparent. The memories are freshest and the reminders remain of the tragic effects that natural forces can have on the human realm. It is essential, then, that nature be addressed in the recovery following such an event.

Thus, this thesis proposes an enhanced recovery following natural disaster through regenerative architecture interventions which integrate human reclamation efforts with respect for the natural wild. Through sensitive, nature-based architecture interventions, existing infrastructure within the community can be elevated and celebrated in a way that replaces the memory of tragedy with a sense of pride and unified identity.

Figure 2: Blanco River flood, Texas, 2015

The Issue of Recovery

Following a large-scale disruption of a site's natural flows, there is a challenge to restore and recover the landscape for continued successful human occupancy. Disruptions include natural disasters, such as earthquakes, floods, wildfires, landslides, tsunamis, droughts, or tornadoes, and occasions of significant resource depletion within the industries of mining, logging, farming, fishing, and drilling.

Such a site, which has been inhabited and utilized by people in the immediate past, will continue to be inhabited after a major disruption due to the prior establishment of communities and ownership of property within the site boundaries. In the current age, humankind has a resiliency and stubbornness to stand one's ground that exists because of the option and ability to rebuild, but also the lack of available land and inflexibility of property. Past civilizations would either be eliminated by a natural disruption to the inhabited land or they would move away from the effected site altogether.

Imagine an inhabited waterway that experiences a

two-hundred year flood. Once waters subside, there are great efforts to return the landscape to its previous form – to rebuild structures and infrastructures that were lost, to clear debris and sediment obstructions, to uncover the features that were hidden by the inundation.

Position: Enhancing Recovery

This thesis operates with the understanding that attempts to recover and rebuild following a disruption of landscape are common and expected. It is human nature to replace what is lost and return one's habitat to a familiar, comfortable, inhabitable form. The goal of this thesis is to demonstrate an enhanced recovery, one of positive human reclamation beyond what is typical. It seeks to build upon an existing spirit of revitalization and improvement in order to benefit the local and regional communities. This thesis takes the position that through appropriate intervention, the focus of a place may shift from tragedy to pride. Instead of being known for a natural disaster, the place will be known for other assets, like the strong forces of nature present. The

goal is to celebrate what a place has through telling its story. This position emphasizes the role of natural flows pertaining to an intervention, striving to harness and highlight them rather than ignore them.

A less positive reclamation effort may go so far as to enact firm control over natural flows following a disruption; to counter the destructive forces of nature with the power of human intervention. This argument acknowledges that some control of nature is necessary for architectural intervention, but it aims to allow flows which do not present a hazard to remain unrestrained.

How to Enhance Recovery

The framework of this thesis involves multiple dimensions including recovery efforts following natural disaster, regenerative architecture, and human reclamation of landscape. Traditional natural disaster recovery, or that outlined by the Recovery Continuum put forth by the Federal Emergency Management Agency (FEMA), includes the expected and necessary activities of response and recovery spread across phases. The activities are mass care/sheltering/housing; debris/infrastructure; business; emotional/psychological; public health and health care; and mitigation.[1] These occur in the short term of days, the intermediate term of weeks/months, and the long term of months/years. While the continuum mentions emotional and psychological needs, this activity is directed more at individuals than the effected community as a whole.[2] Traditional recovery methods are

1 Federal Emergency Management Agency, "National Disaster Recovery Framework" (United States Department of Homeland Security, September 2011), http://www.fema.gov/media-library-data/20130726-1820-25045-5325/508_ndrf.pdf.

2 Community considerations are outlined by FEMA, but they make no suggestions about addressing the psychosocial welfare of the community in the short or long term. The considerations are concerned with issues of accessibility to services, the inclusion of all members in recovery activities, and pointing out potential unmet needs. Rural and urban recovery needs are highlighted as unique from one another, but not addressed in depth.

effective, but they could do more to address the collective spirit of a place in the wake of disaster.

The long-term vision of recovery efforts following a huge landslide in the Philippines is a bright example of a type of enhanced recovery. In 2006, the village of Guinsaugon in Southern Leyte was buried and destroyed by a landslide, killing 1,126 people and displacing 19,000.[3] In addition to the great loss of life, the resources and livelihoods that belonged to the villagers was destroyed. The recovery included resettling the displaced people, ensuring new livelihoods, systems of education and health, rebuilding infrastructure, and notably the psychosocial recovery of the community.

This last effort, the psychosocial recovery, was prompted by the extreme trauma of the landslide event which left children orphaned and wiped out entire families.[4] The community as a whole was traumatized. Because community religious ritual is a large part of the Filipino culture,

3 Emmanuel M. Luna et al., "Center for Disaster Preparedness," accessed December 12, 2015, http://www.preventionweb.net/files/26098_26098recoverystatusreportleytemarch.pdf.
4 Ibid

collective remembrance and memorial masses became an annual event for the survivors. The villagers found a reason to unify which aided in their process of mourning.

Psychosocial recovery involves more than memorials, as the report from Southern Leyte highlights. "The challenge for the recovery process is the capacity for an agency to provide programs that will facilitate a sense of community recovery and a united effort towards rebuilding."[5] In this recovery, special attention was paid to the establishment of empowering livelihood projects for men and women, supporting their sense of purpose as well as contributing to their economic welfare.

Another notion that the report from Southern Leyte highlights is the need for place-specific responses. For the Filipino villagers, faith and religion is a large part of everyday life, so unifying through collective spirituality is an appropriate way to respond. Responses in other locations utilize different, appropriate methods. A sensitivity to the identity of a place is important for a successful, enhanced recovery, one which rebuilds infrastructure as well as spirit.

5 Ibid

Figure 3: Former village of Guinsaugon after landslide

Figure 4: Recovery vision posted in resettlement community

Learning from the traditional and non-traditional methods of recovery, this thesis proposes a reimagined method. This method of recovery seeks to add layers which address the recuperation of collective spirit to existing efforts of rebuilding infrastructure. The idea is that the physical rebuilding is a foundation for further rebuilding that addresses the community wellbeing. For example, the rebuilding of a highway following a natural disaster includes some secondary program to engage the sense of place or allows the community to become involved. If the surviving community can share in the construction or use of a rebuilding project, regardless of the context, the process of recovery can be easier.

Regenerative Approach

As a research area

At the time of writing, regenerative architecture is largely a field of research and variations on the concept appear in articles which use the terms "ecological design"[6] and "the geographical project of architecture"[7] to expand on the topic. Much of the literature related to a regenerative architecture approach discusses the broader concepts of the methodology without offering concrete examples of the built form. That includes a 2012 issue of Building Research & Information dedicated to the topic, including papers by Raymond J. Cole, Chrisna du Plessis, and Pamela Mang & Bill Reed, which all position the regenerative approach in relation to green and sustainable methods, suggesting that sustainability and green building policy are limited, pushing for a more ecological worldview within the building design process. Raymond J. Cole discusses the difference between green building design and regenerative building

6 Chrisna du Plessis, "Towards a Regenerative Paradigm for the Built Environment," Building Research & Information 40, no. 1 (January 1, 2012): 7–22, doi:10.1080/09613218.2012.628548.

7 Mason White et al., Pamphlet Architecture 30: Coupling: Strategies for Infrastructural Opportunism (New York: Princeton Architectural Press, 2011).

design by pointing out that the former is concerned with the performance of the building and the latter strives to "understand how building design, construction and use positively influence the social, ecological and economic health of the places they exist within."[8] He stresses that human and non-human life are equal partners within regenerative development, evolving together in a complex relationship.[9]

Precedents

At the forefront of the regenerative discussion is The Adam Joseph Lewis Center for Environmental Studies at Oberlin College which is widely cited and celebrated for its design principles. Designed by William McDonough + Partners and completed in 2001, the building adheres to sustainable design standards such as daylighting strategies, optimized orientation, solar energy harvesting, and cradle-to-cradle products.[10] But innovation lies in the integration of

8 Raymond J. Cole, "Transitioning from Green to Regenerative Design," Building Research & Information 40, no. 1 (January 1, 2012): 39–53, doi:10.1080/09613218.2011.610608.

9 Ibid

10 "Zero Energy Buildings Database: Overview - Oberlin College Lewis Center," accessed May 28, 2015, http://zeb.buildinggreen.com/overview.cfm?projectid=18.

Figure 5: Adam Joseph Lewis Center for Environmental Studies, pond and south wing

the building with its site. A planted berm on the north side protects and insulates the building. A "Living Machine" is housed in one wing where waste water is treated and purified for reuse using an organic purification system in tandem with the adjacent pond, which stores water. The building does not rely on the sewer system or outside sources of water and it is energy positive, releasing excess energy it has generated into the grid.[11] The building is strongly rooted in and reliant on its site. Design decisions are based on how best to utilize what the site offers in order to achieve the end goal.

Another regenerative architecture project which is similarly rooted in its site is the VanDusen Botanical Garden Visitor Centre in Vancouver, British Columbia. The building, designed by Perkins+Will and completed in 2011, utilizes the site for its operational needs. This includes generating energy from the sun through photovoltaics as well as the earth through geothermal boreholes. The building collects rainwater and treats all of its blackwater on site.[12] And in an

11 "Adam Joseph Lewis Center for Environmental Studies--Oberlin College | Buildings Database," accessed May 28, 2015, https://buildingdata.energy.gov/project/adam-joseph-lewis-center-environmental-studies-oberlin-college.

12 "Home | Global," accessed December 12, 2015, http://perkinswill.com/work/vandusen-botanical-garden-visitor-centre.html.

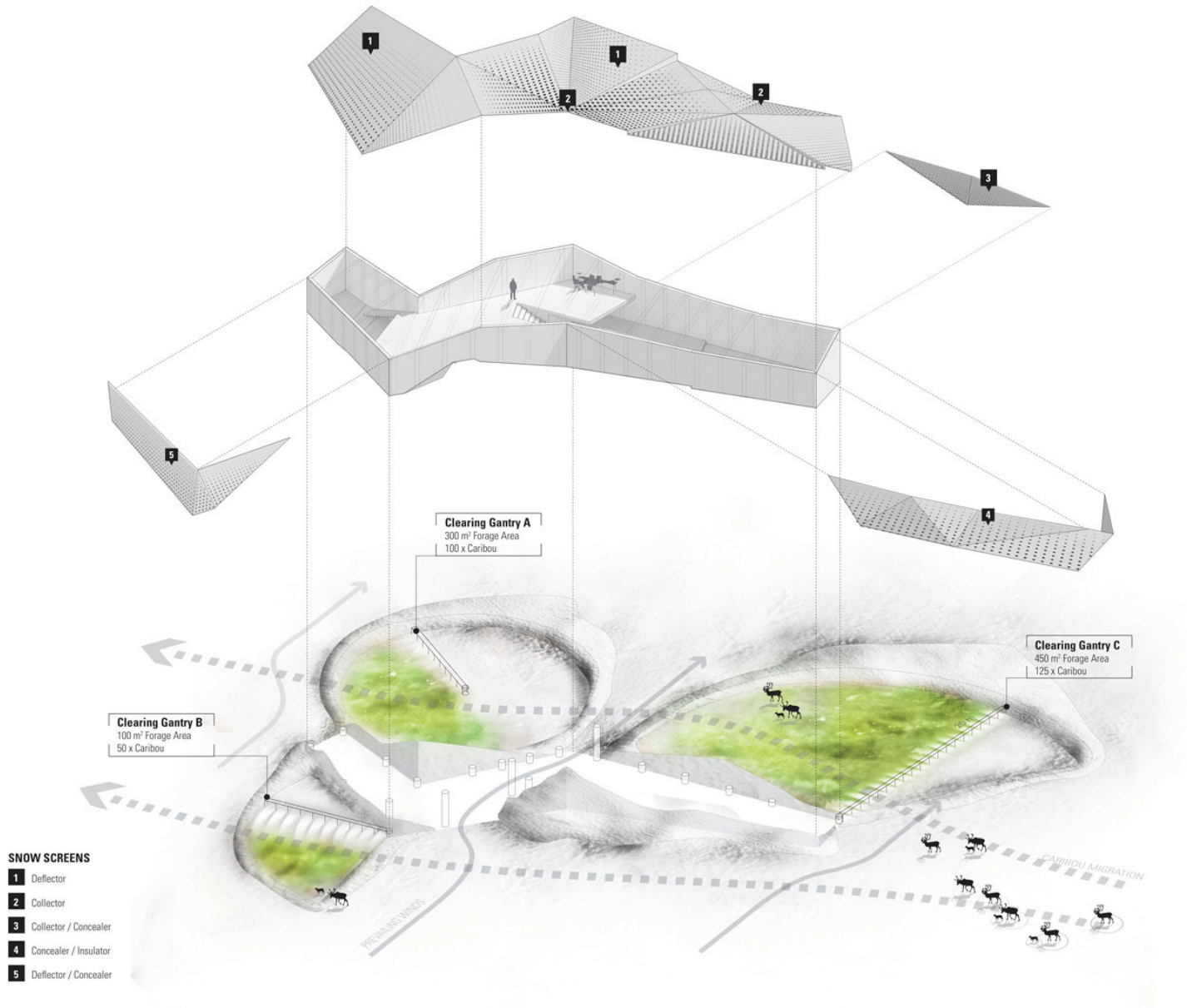
Figure 6: VanDusen Botanical Garden Visitor Centre, roof habitat

especially admirable gesture to the surrounding landscape, the roof is treated as a habitat for flora and fauna, replacing what was lost by the building's footprint.[13]

This interaction between landscape and building is taken a step further in the unbuilt project Caribou Pivot Stations designed for the Pamphlet Architecture edition entitled *Coupling: Strategies for Infrastructural Opportunism*.[14] Research stations and their infrastructure are placed within the caribou migration path in order to provide foraging microclimates for the deteriorating caribou population. Through the deflection and clearing of snow, the landscape is managed through architecture and restores the habitat needed by the caribou. The project effectively combines a human program with landscape and wildlife concerns. The identity of the site as a place for caribou and humans is maintained.

13 "VanDusen Botanical Garden Visitor Centre / Perkins+Will | ArchDaily," accessed December 12, 2015, http://www.archdaily.com/215855/vandusen-botanical-garden-visitor-centre-perkinswill.
14 White et al., Pamphlet Architecture 30.

Figure 7: Caribou Pivot Stations, site and building components


1
1
2
2
3
5
4
Clearing Gantry A
300 m² Forage Area
100 x Caribou
Clearing Gantry B
100 m² Forage Area
50 x Caribou
Clearing Gantry C
450 m² Forage Area
125 x Caribou
CARIBOU MIGRATION
FREEZING HANDS
SNOW SCREENS
1 Deflector
2 Collector
3 Collector / Concealer
4 Concealer / Insulator
5 Deflector / Concealer


AUG
Avg Temp
Rainfall
Snowfall
Snow Depth
02 // 22 // 13 // 01
° mm cm cm
WIND
Gust : 20 km/h E
Steady : 10km/h SE
OCT
-15 // 01 // 16 // 15
° mm cm cm
DEC
-29 // 00 // 06 // 21
° mm cm cm
FEB
-33 // 00 // 04 // 23
° mm cm cm
APR
-23 // 00 // 07 // 25
° mm cm cm

Defining Regenerative Principles

Because regenerative architecture is still evolving through research and projects, specific principles are defined here and inform the design proposal to follow.

As exemplified in the precedents studies, a building's close relationship to its site is critical. The site analysis must act as a basis for design. An understanding of both human and natural elements present in a site is inherent in this principle and aid in design decision-making.

A key regenerative principle for this thesis is the experience of place as a tool for increasing awareness and understanding of the surrounding natural processes. Regenerative architecture tells a story about a site, highlighting the natural elements that define a place. The architecture guides users through the experience of a place, narrating to them the importance of the landscape and the educating them about nature.

Figure 8: Terrace farms in the Philippines

Figure 9: Roman aqueduct in southern France

Human Reclamation

To a certain degree, civilized humankind has a desire to control its natural surroundings, to make them inhabitable and alter them for improved use. The ancient Romans built aqueducts to reroute water for its use in building cities and establishing farms.[15] The terracing of hills in East Asia transformed steep slopes into farmable fields thousands of years ago.[16] Civilization tends to claim land and leave its mark.

At times, the alteration of landscape to extract resources or allow for industry reaches a destructive level. The land is polluted or stripped of its natural qualities. Efforts are made to reclaim the landscape that once existed or to restore some semblance of the natural world that has been erased.

Traces of an industrial landscape are often replaced

15 "Valley Crossings and Flood Management for Ancient Roman Aqueduct Bridges: EBSCOhost," accessed December 15, 2015, http://eds.a.ebscohost.com.offcampus.lib.washington.edu/ehost/detail/detail?sid=84c83554-dc6c-46d0-919f-5910bbde4174%40sessionmgr4004&vid=0&hid=4102&bdata=JnNpdGU9ZWhvc-3QtbGl2ZQ%3d%3d#AN=70338945&db=a9h.

16 "Evidence for Prehistoric Dryland Farming in Mainland Southeast Asia: Results of Regional Survey in Lopburi Province, Thailand on JSTOR," accessed December 15, 2015, http://www.jstor.org.offcampus.lib.washington.edu/stable/42928361?sid=primo&seq=2#page_scan_tab_contents.

with recreational areas. The current site of Gas Works Park in Seattle is a well-known example. The obsolete gas plant and brownfield site was converted to a 20 acre public park in the 1970's, preserving the industrial structures while cleaning the polluted soils through bio-remediation.[17] After human use of the land for industrial means stripped it of its natural identity, further human effort seeks to restore what was lost while providing a place for recreation.

A similar reclamation effort of industrial land for recreational use is done by the Rails-To-Trails Conservancy. Since the 1960's, the group has supported the conversion of obsolete railroad tracks to recreational trails. With over 21,000 miles of converted trail, the conservancy is successful in transforming an industrial landscape into a more natural one, exercising the power that humans have to reclaim what is lost.[18]

17 "Seattle Parks and Recreation," accessed December 14, 2015, http://www.seattle.gov/parks/park_detail.asp?id=293.

18 This tendency is challenged following a natural disaster. The claim that humankind made is refuted by nature and the traces of that claim are erased: buildings and infrastructure are destroyed by natural movements of water, earth, fire, etc. The power of humans to control land is usurped by natural forces. In order to reconcile this shift, humans rebuild what was lost, attempting to return to the normalcy prior to a natural disaster. Reassertion of humankind's ability to control land is a way of healing and moving forward.

Figure 10: Gas plant before reclamation, Seattle, WA, 1951

Figure 11: Gas Works Park after reclamation

The reinsertion of human activity and simply the illusion of control in a landscape can be a powerful tool for healing and recovery. This thesis takes the position that such a reclamation effort is a part of the solution to the problem of enhancing recovery. The rebuilding of infrastructure after a natural disaster is a type of reinsertion of human activity. When combined with a regenerative architecture approach, one that is respectful of nature and place, an enhanced recovery is possible

chapter 3: design methods

In order to test the position taken in this thesis, that a recovery following a natural disaster can be enhanced for the benefit of the psychosocial welfare of the community through regenerative architecture interventions, a design project within a specific site is proposed as a study. The site is one characterized by natural disaster with an effected community adjacent.

The Site

The implementation takes place in the North Fork (or Upper) Stillaguamish River Valley in Snohomish County, Washington. The valley is located between the North Cascades mountain range and Puget Sound with the river draining into the sound. The wide valley is surrounded by mountain peaks on three sides and Highway 530 provides the only east/west thoroughfare, connecting Arlington in the west to Darrington in the east.

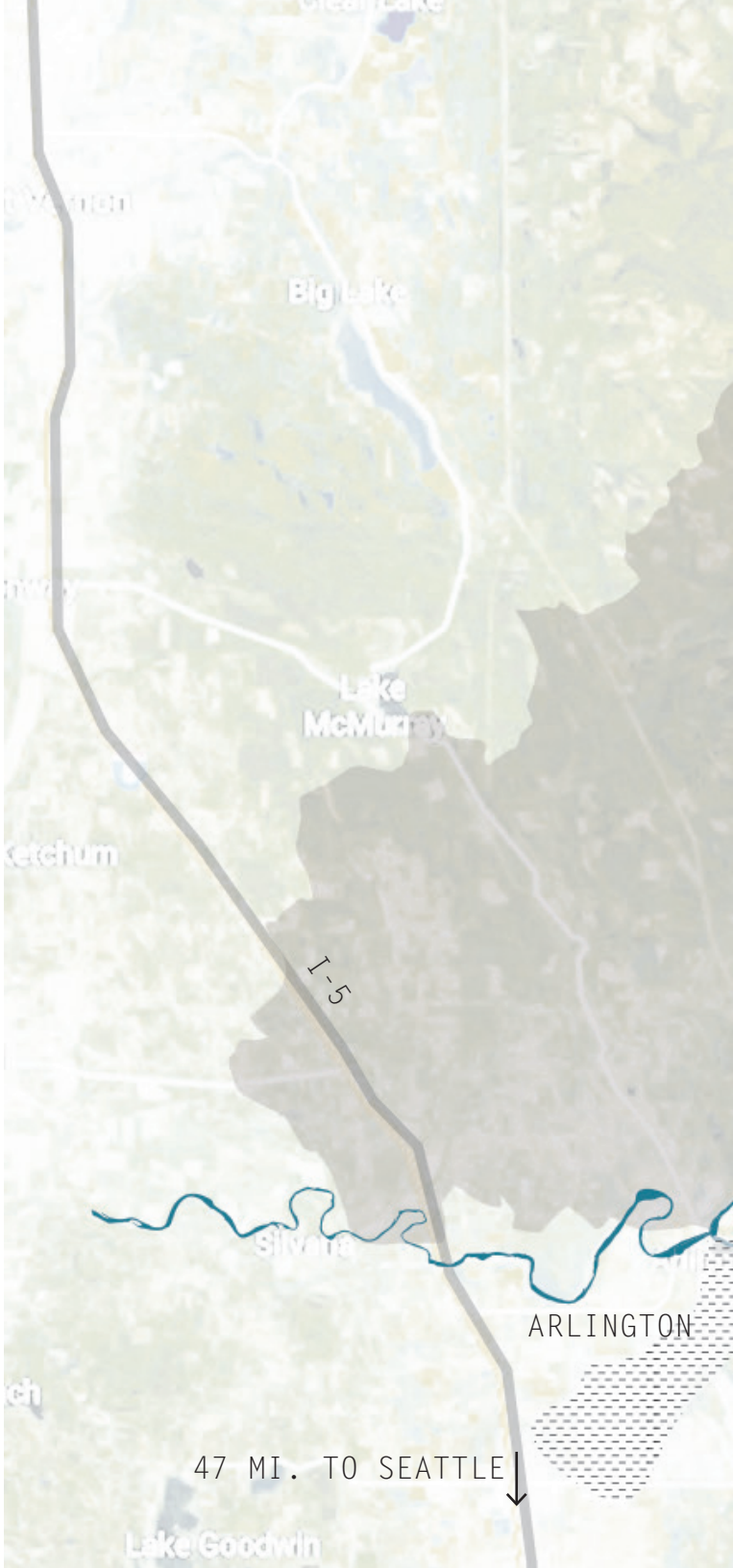
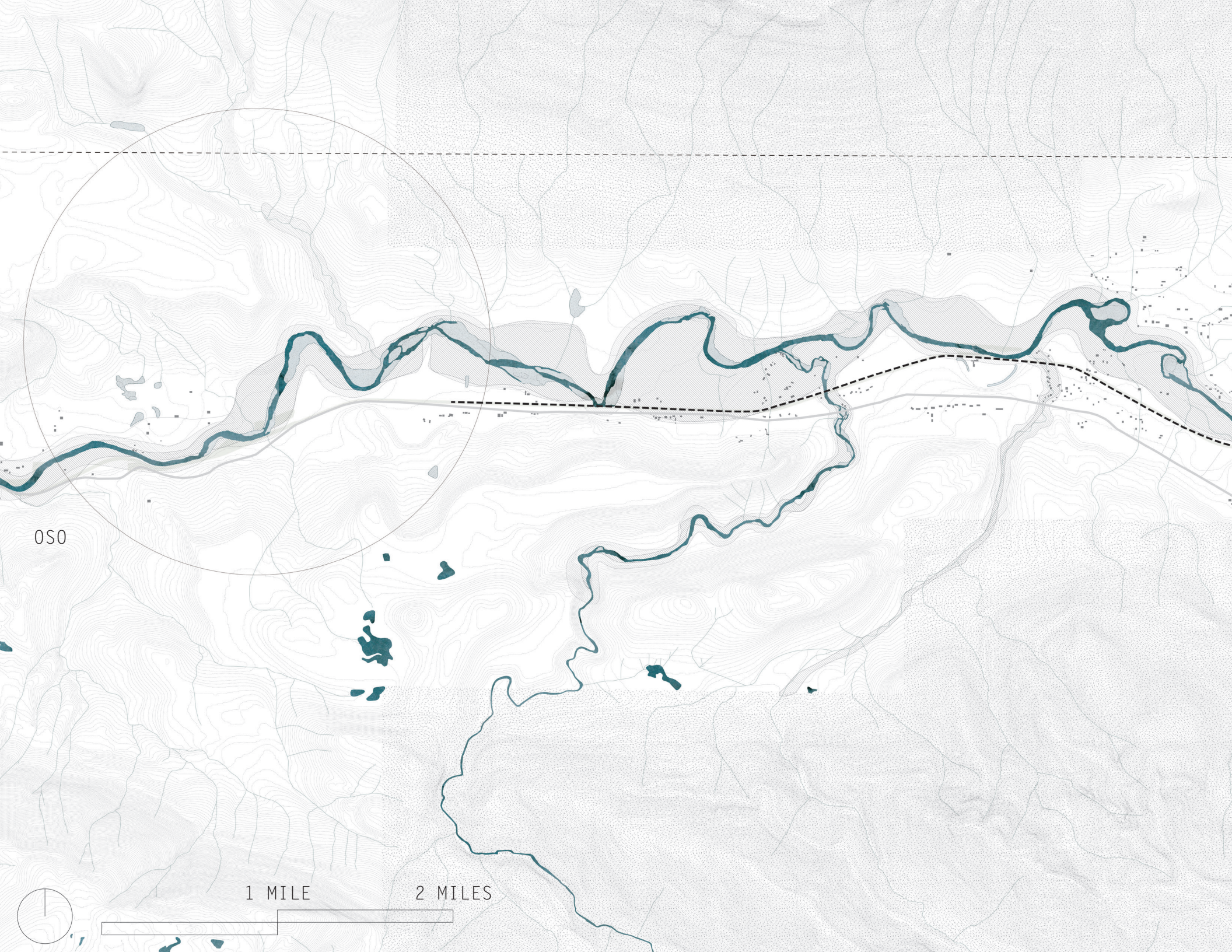
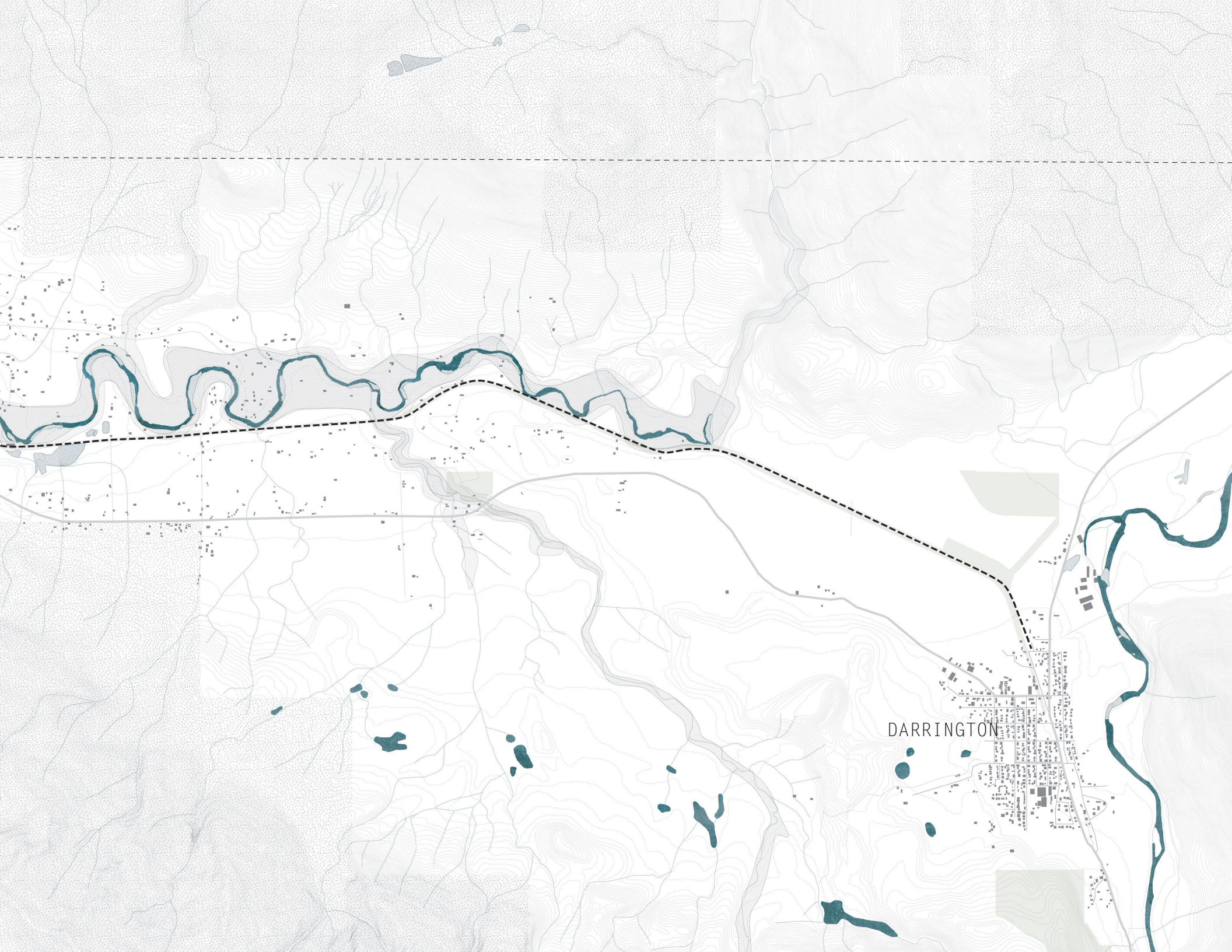


Figure 12: North Fork Stillaguamish Watershed


Lake
Cavanaugh
OSO
DARRINGTON
WA-530
24 MI. TO
GLACIER
PEAK


OSO
1 MILE
2 MILES


DARRINGTON

Natural Disaster: Landslide

The valley is a place of historical natural disaster. The hillsides along the river have experienced landslides of varying magnitudes for thousands of years and the evidence of these slides is visible through LIDAR remote sensing.[1]

Figure 13 (previous page): Valley map centered on river 50' contours

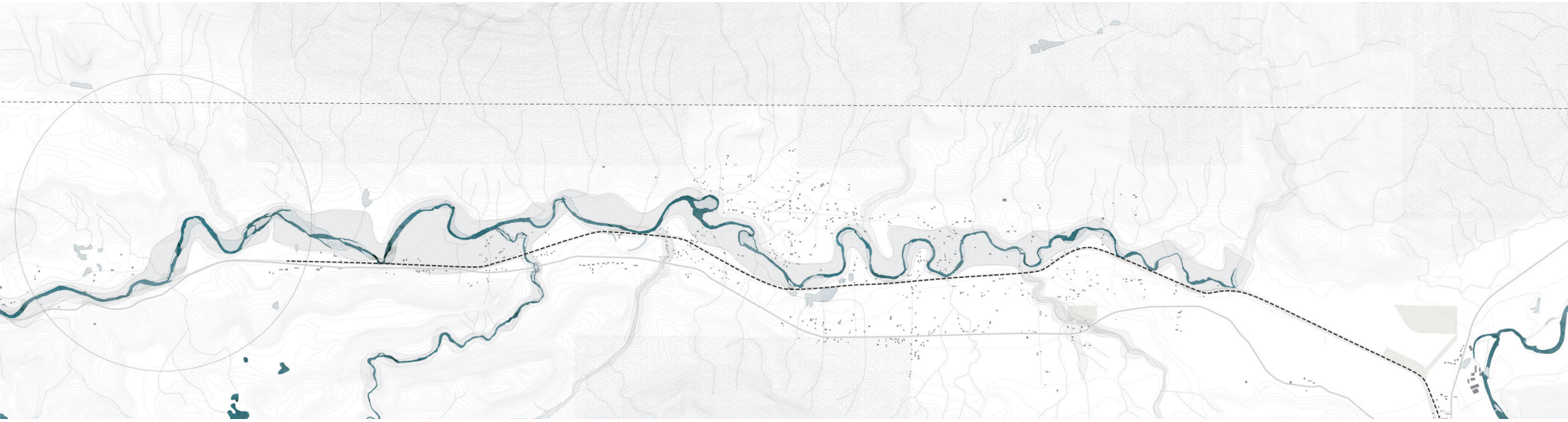


Figure 14: Key map showing zoom area for Figure 15

1 "USGS Open-File Report 2014–1065: Preliminary Interpretation of Pre-2014 Landslide Deposits in the Vicinity of Oso, Washington," accessed June 15, 2015, http://pubs.usgs.gov/of/2014/1065/.

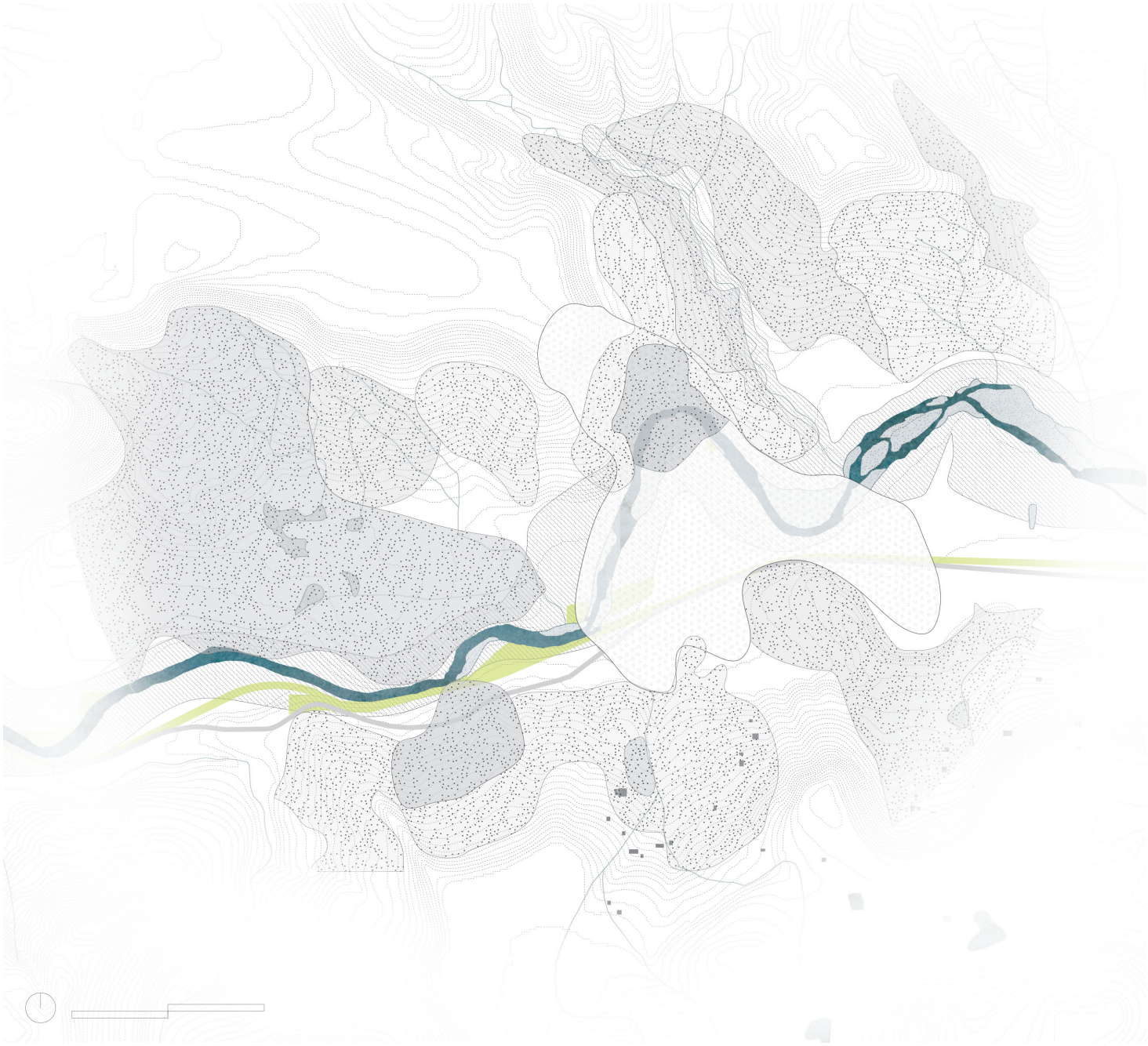


Figure 15: LIDAR evidence of past slides, redrawn after Haugerud, 2014 slide in white

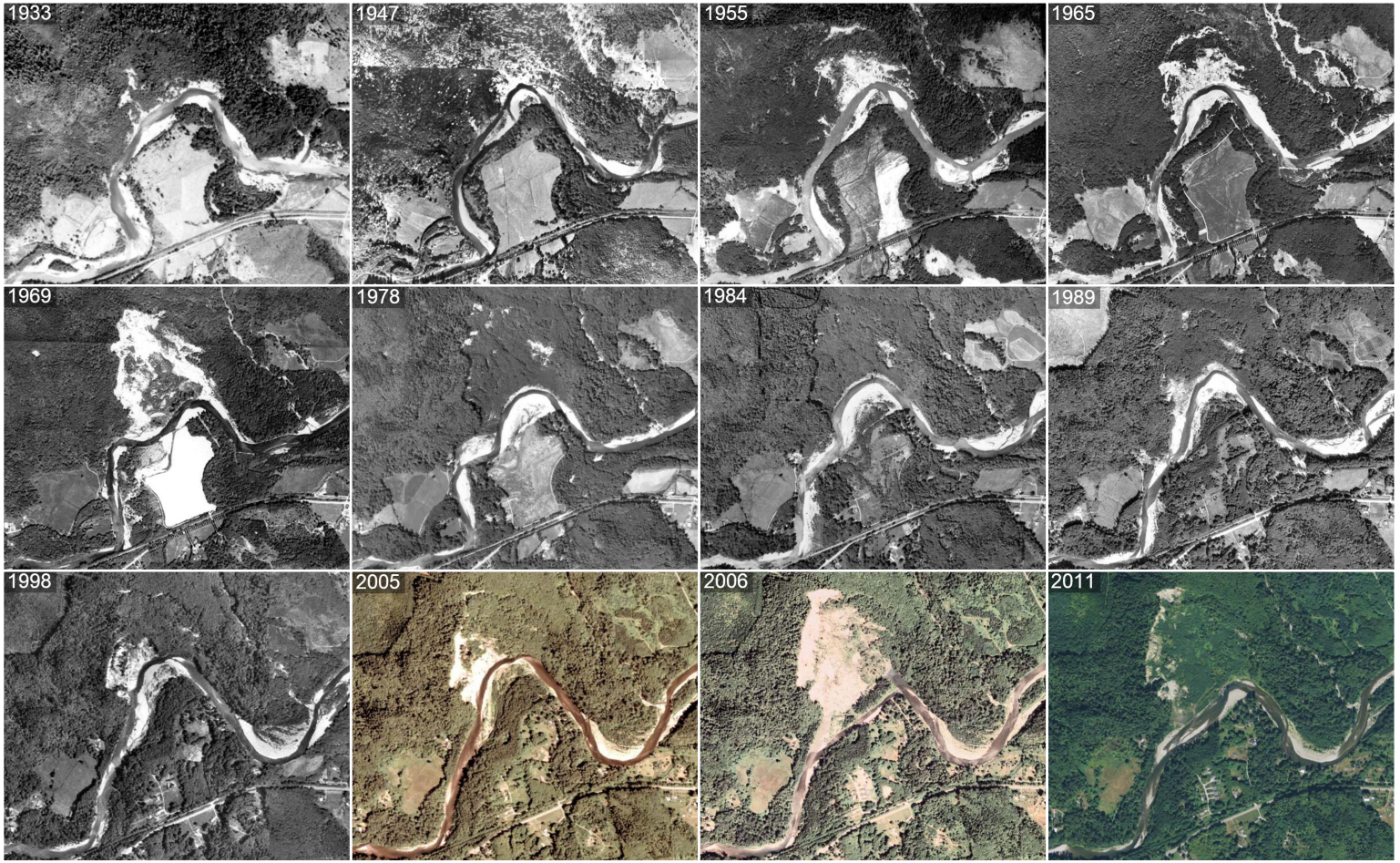


Figure 16: Aerial photos spanning 78 years showing a history of slides at Hazel

Figure 17: Aerial photo showing 2014 slide

While there have been slides throughout the valley, one area has garnered significant attention due to its history of slides and the effects they have had on human life. Just east of Oso, a river bend called Hazel has experienced six landslides since 1951. The soft soil of the hillside is carved away by the river below until a slide event occurs, typically prompted by a loosening of the soil either by heavy rainfall or human intervention such as logging.[2] Despite the hazards, a neighborhood was established in this river bend in the 1950's and by 2014 more than 30 homes were built. All of these home were destroyed on March 22, 2014 when "Slide Hill" gave way and spread 10 million cubic yards of soil, killing 43 people.[3]

2 Mike Baker and Justin Mayo, "Logging OK'd in 2004 May Have Exceeded Approved Boundary," The Seattle Times, accessed May 22, 2015, http://old.seattletimes.com/html/localnews/2023235343_mudslideovercutxml.html.

3 Winters, Chris. "HeraldNet.com - Finding Cause of Oso Mudslide Will Take Time and Science." The Daily Herald. Accessed May 21, 2015. http://www.heraldnet.com/article/20140511/NEWS01/140519850

Figure 18: Steelhead Haven neighborhood, destroyed in 2014

Figure 19: March 2014 landslide aftermath, former neighborhood

Figure 20: View north of 2014 landslide

Figure 21: Rescue workers surveying slide

The River

The central feature of the valley's natural character is the river. It is the backbone from which the valley's ecosystems and landforms develop. The river ecosystem supports a multitude of species. The presence of salmonid species in the river and its streams is especially notable and has prompted the Washington Department of Fish and Wildlife to designate the river as a priority habitat. This results in increased conservation and management efforts by the state to ensure a healthy habitat for the threatened salmon.

The Stillaguamish Tribe (formerly the Stoluckwamish) retains fishing rights to the river although the entire Stillaguamish watershed salmon habitat has suffered and the population of the Chinook salmon in particular is a major concern. Fine sediments washed into river water by industry or landslides cause major disruptions to the natural flows of the fish. Since 1994, the tribe has been involved in restoring the salmon population and it operates a fish hatchery outside of Arlington. Sediment studies are conducted by

Figure 22 Fall chinook salmon spawning

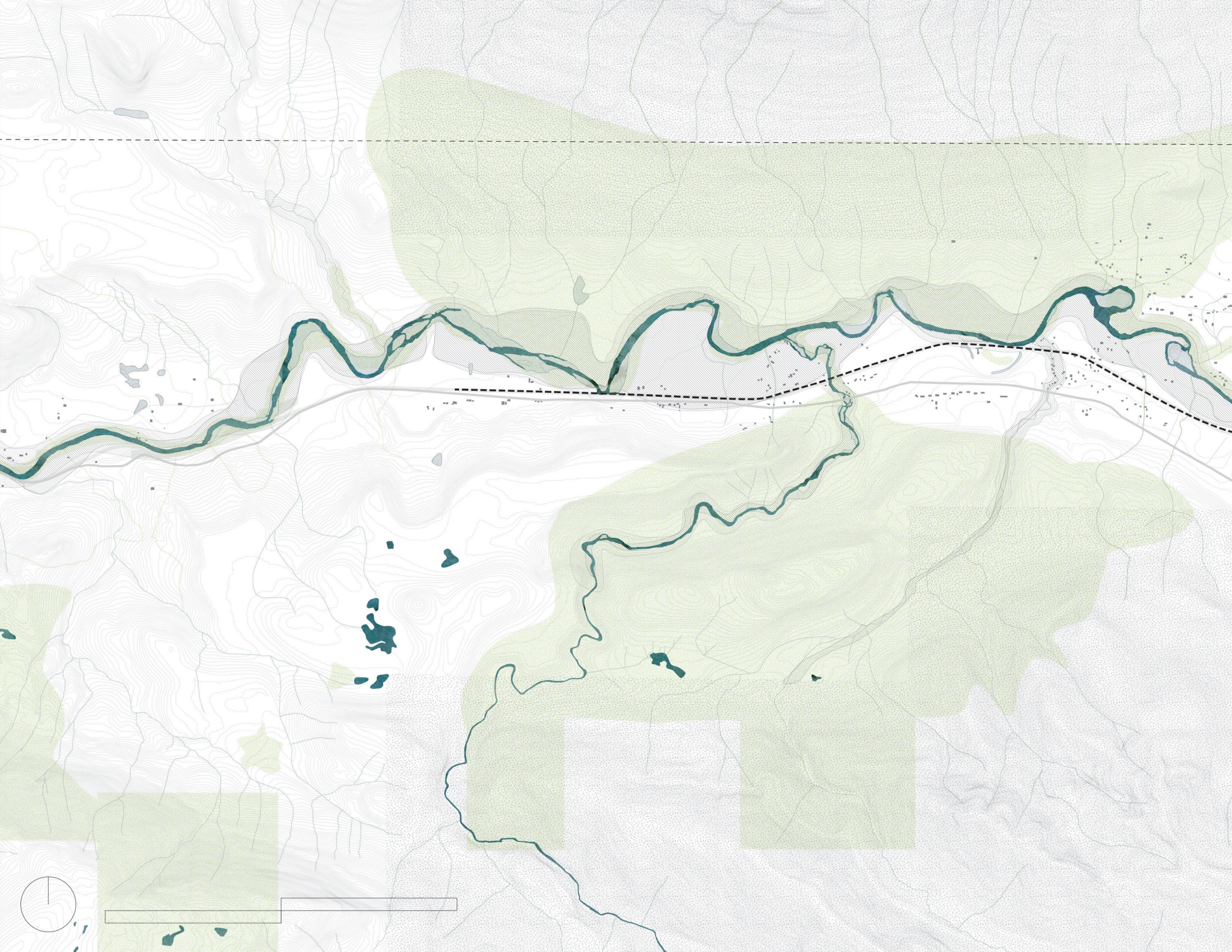
Figure 23: Stillaguamish Tribe performing a study of sediments and artificial redds

the tribe to monitor the salmon habitats and the creation of artificial redds (salmon nests) was started to improve the nesting grounds.[4] An extensive Chinook restoration plan was prepared in 2005 for the Stillaguamish watershed area, though it is unknown what improvements have been made or are successful.

The Forest

The forest ecosystem which surrounds the river and climbs up the nearby mountains is a priority habitat for the northern spotted owl and the brown bat.[5] The population of the threatened northern spotted owl has been significantly affected by industrial logging, especially of old growth forests.

4 "Stillaguamish Tribe of Indians - Artificial Redd Study," accessed June 12, 2015, http://stillaguamish.com/artificialreddstudy.asp.
5 "Priority Habitats and Species (PHS) | Washington Department of Fish & Wildlife," accessed December 14, 2015, http://wdfw.wa.gov/conservation/phs/maps_data/.



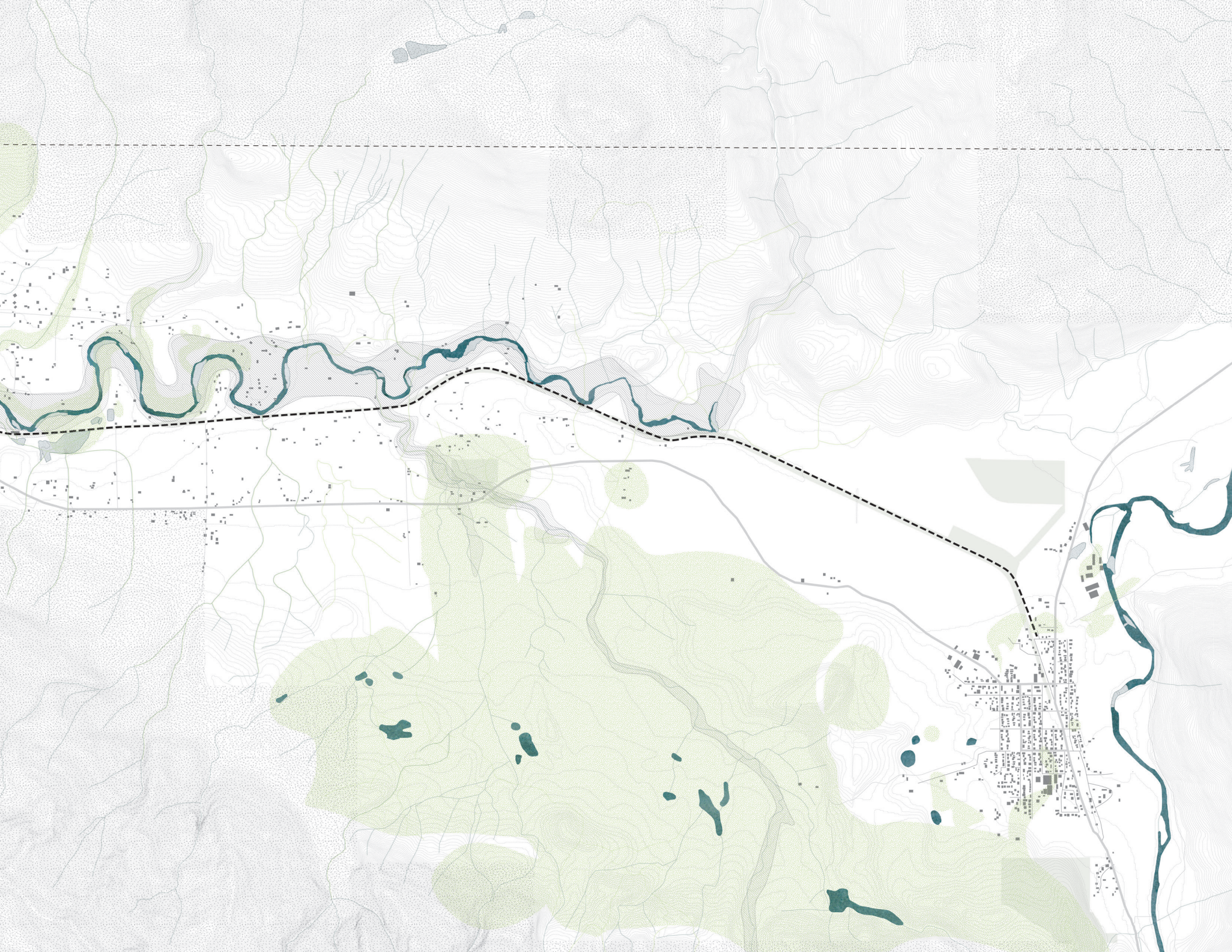


Figure 24 (previous page): Washington Department of Fish and Wildlife Priority Species Habitat areas in green

Climate

The valley experiences a range of seasons, with warm, sunny summers and cold, snowy winters. During autumn, winter, and spring, the valley sees a great deal of precipitation, which contributes to the risk of landslide. Of the six landslides in the Oso area since 1951, at least five have occurred in the rainy months.[6]

Human Presence

The Stoluckwamish (river people) tribe were the first known people to settle in the Stillaguamish River area, hunting and fishing in the valley until Europeans arrived in the mid-1800s.[7] With the signing of the Treaty of Point Elliott in 1855, the tribe surrendered their land to the Europeans and many members moved to the Tulalip Reservation.

6 "Building toward Disaster," The Seattle Times, accessed April 30, 2015, http://projects.seattletimes.com/2014/building-toward-disaster.

7 "Stillaguamish Indian Tribe," accessed June 12, 2015, http://www.u-s-history.com/pages/h1574.html.

Figure 25:
Spring average high/low is 39°/61° F

Figure 26:
Summer average high/low is 52°/76° F

Figure 27:
Winter average high/low is 30°/44° F

Figure 28:
Fall average high/low is 50°/61° F

In 1870, mining in the area brought pioneers to camp in the valley and the railroad's eventual arrival in 1901 allowed for Darrington to grow into a permanent town. Following mining and the railroad, logging became a booming industry in the valley.

Today the valley remains rural, with a population of less than 3,000 within 136 square miles. Darrington is the second largest town in the valley, with a population of 1,405, after Arlington, which is situated where the North and South Forks of the Stillaguamish rivers meet and is beyond the scope of this analysis.[8]

The permanent population is generally farmers and timber industry workers, living off of the resources of the valley. This is in contrast to the temporary population which uses the valley for recreation (hiking, biking, fishing, rafting, and camping) and as an access point to the North Cascade wilderness. There are mountain trails throughout the valley and the Mountain Loop Highway begins south of Darrington, which is a popular scenic route for adventure-seekers.

8 "Town of Darrington," accessed June 15, 2015, http://town.darrington.wa.us/.

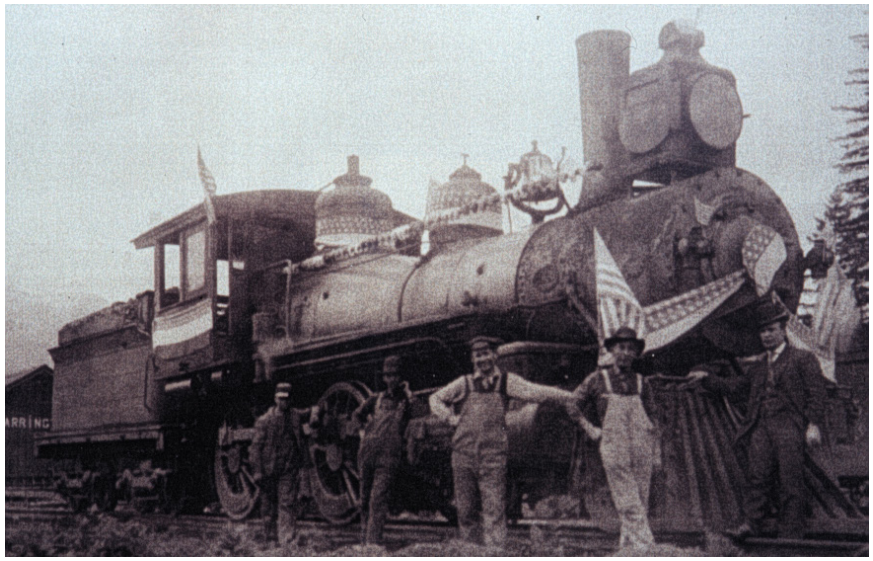


Figure 29: The first train to Darrington, 1901

Figure 30: Old Fortson Mill

Narrowing the Focus

With consideration of the valley's character as a place of industry, recreation, great beauty, and a volatile river, the White Horse Trail became a focus area for design intervention. Before being converted to a trail, the railroad operated along this path for decades, connecting the mining and logging industries of the valley with shipping channels in the west along the sound. As a Rails-to-Trails project, the path became an opportunity for recreation, allowing for hiking, biking, and horseback riding for 10 miles along the valley floor. The trail parallels Highway 530 and the Stillaguamish River as it extends from Darrington to Oso. It is a wide and flat path due to the prior needs of the railroad. The river meanders back and forth, at times intersecting the trail and at times disappearing completely. Like the highway, the trail acts as a datum across the valley against which the changing river can be measured.

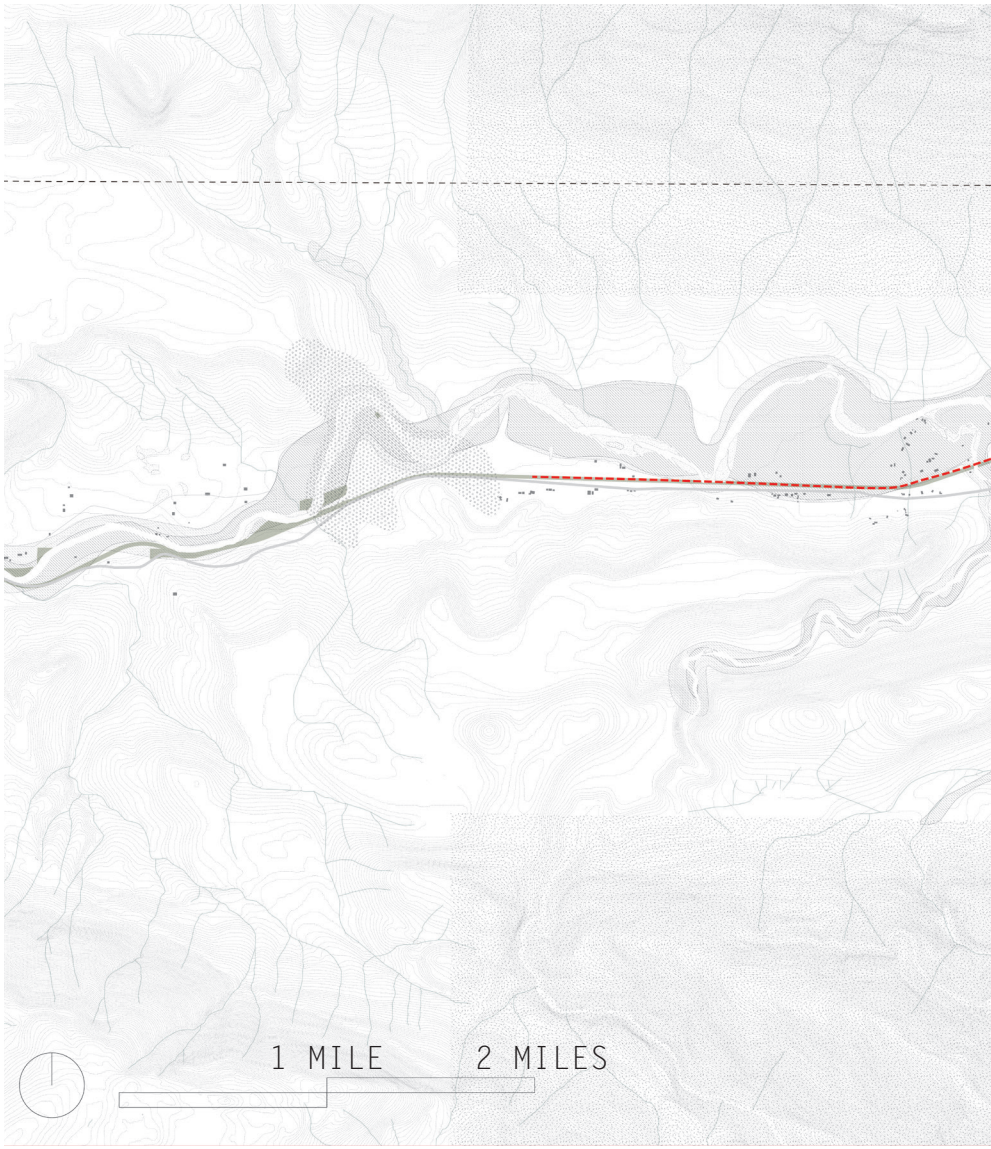
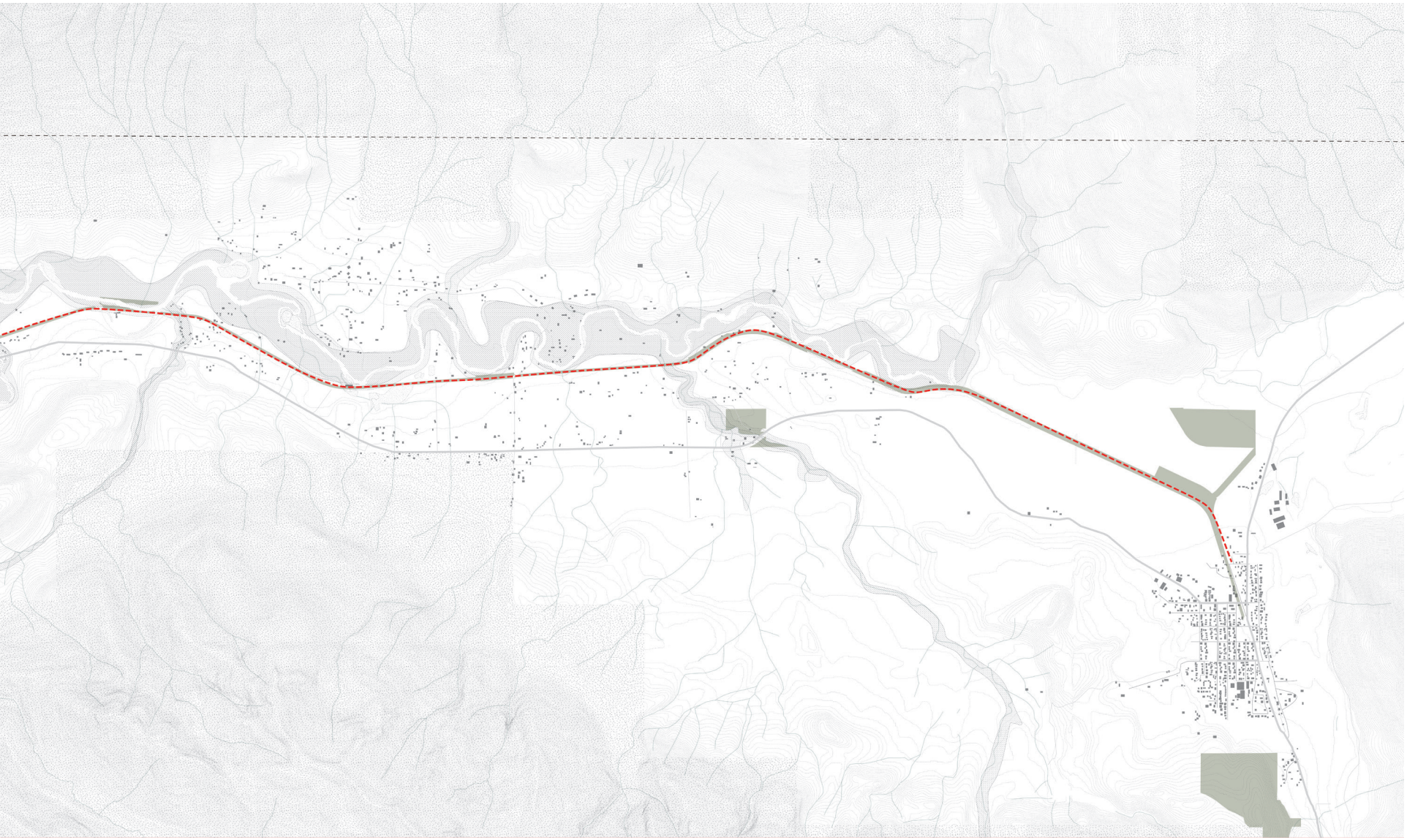


Figure 31: Valley map showing White Horse Trail in red



Before the 2014 landslide, the trail had become overgrown and was inaccessible in some places due to lack of use and maintenance. The landslide destroyed a large portion of the highway and the parallel trail and the subsequent rebuilding of the road prompted a desire within the community to improve the trail. Now it is cleared of obstructing undergrowth and the railroad bridges have been retrofitted with guardrails. It is this spirit of revitalization in the wake of disaster that is so beneficial to the future welfare of the community.

Figure 32: Trail before clearing

Figure 33: Trail (and highway) destroyed in 2014 landslide

Figure 34: Bridge with guardrails

Figure 35: After clearing efforts

chapter 4: design proposal

Trail Vision

Because White Horse Trail spans such a great distance in the valley, connecting many people and their properties together, it is viewed as a shared asset of the community. As a centralized link which is already seeing improvement efforts, the trail is in ideal piece of infrastructure which can be enhanced through design in order to ensure a successful psychosocial recovery of the area. Sensitive interventions along the trail seek to celebrate the natural qualities of the river and valley. In this way, the trail becomes the focus of the area and the landslide event becomes secondary. The valley's identity is defined not by a tragedy, but by a beautiful trail which links Puget Sound to the North Cascades.

Since the river is the dominating natural force within the valley, an overall trail intervention seeks to make its presence visible even when the river itself is out of view. At every half mile, a marker is installed which is multi-functional. In addition to indicating the distance traveled along the trail, its two arms point in the direction of the nearest riverbank. One arm remains stationary while the other

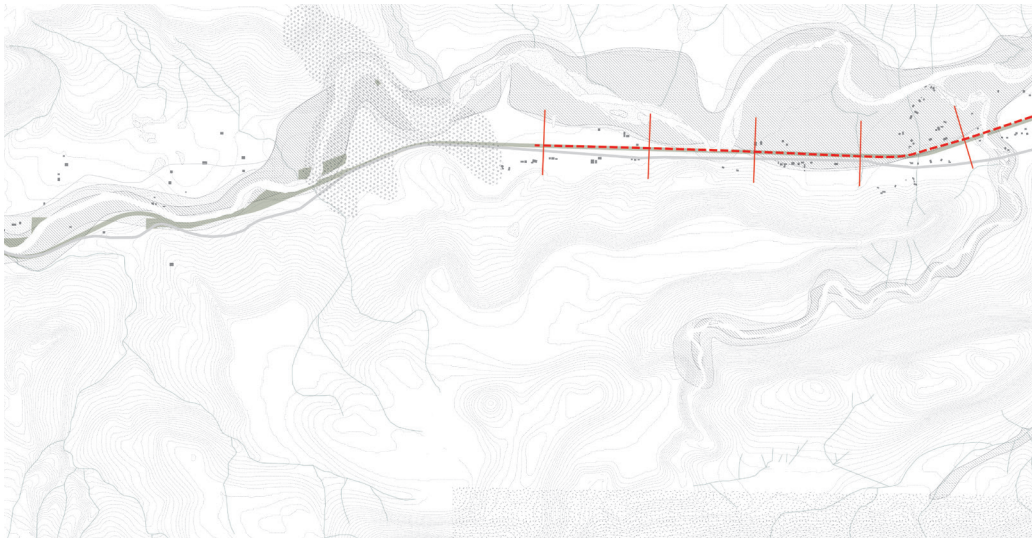


Figure 36: Valley map showing trail and half mile marker spacing

Figure 37: Stationary river, no arm movement

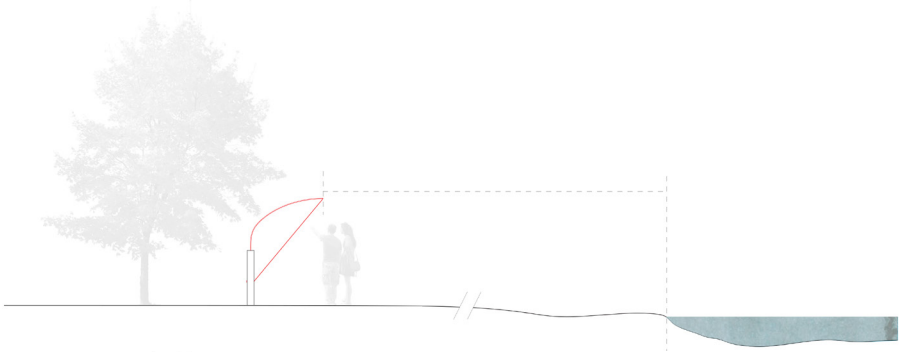


Figure 38: Approaching river, arm moves down

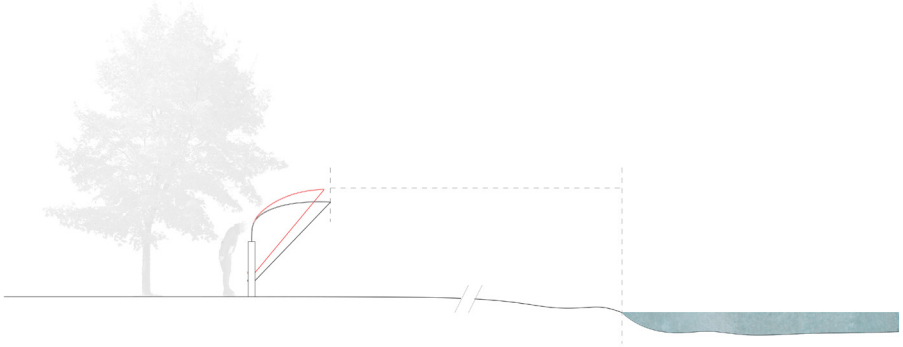


Figure 39: Receding river, arm moves up

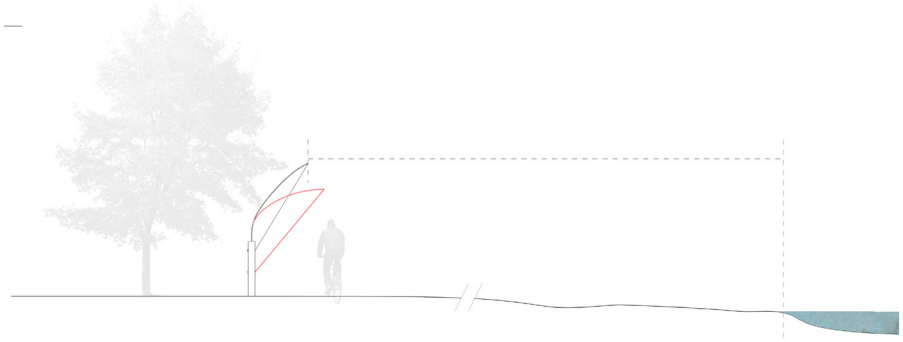


Figure 40: Marker along the trail, signaling an approaching river

is movable. It is moved when the riverbank edges closer or farther from the starting point datum, which is established on the date of installation. The markers indicate where the river is in relation to their specific points along the trail and record the shifting of the riverbank over time. A visitor will most likely observe these shifts on a long time scale, as they typically occur quite slowly. However, shifts can occur quickly, as in the case of a landslide or when portions of riverbank fall away due to erosion or weathering.

Specific Intervention

In order to implement an architectural proposal as a means of enhanced recovery, three focused areas of intervention along the trail are chosen based on their potential for program, context, character, and distance from one another along the trail. The first is the easternmost site located at the edge of Darrington. The second is six miles west at the site of an abandoned mill town. The third is four miles further west at a bend in the river where the river, trail, and highway meet and is near the Oso landslide.

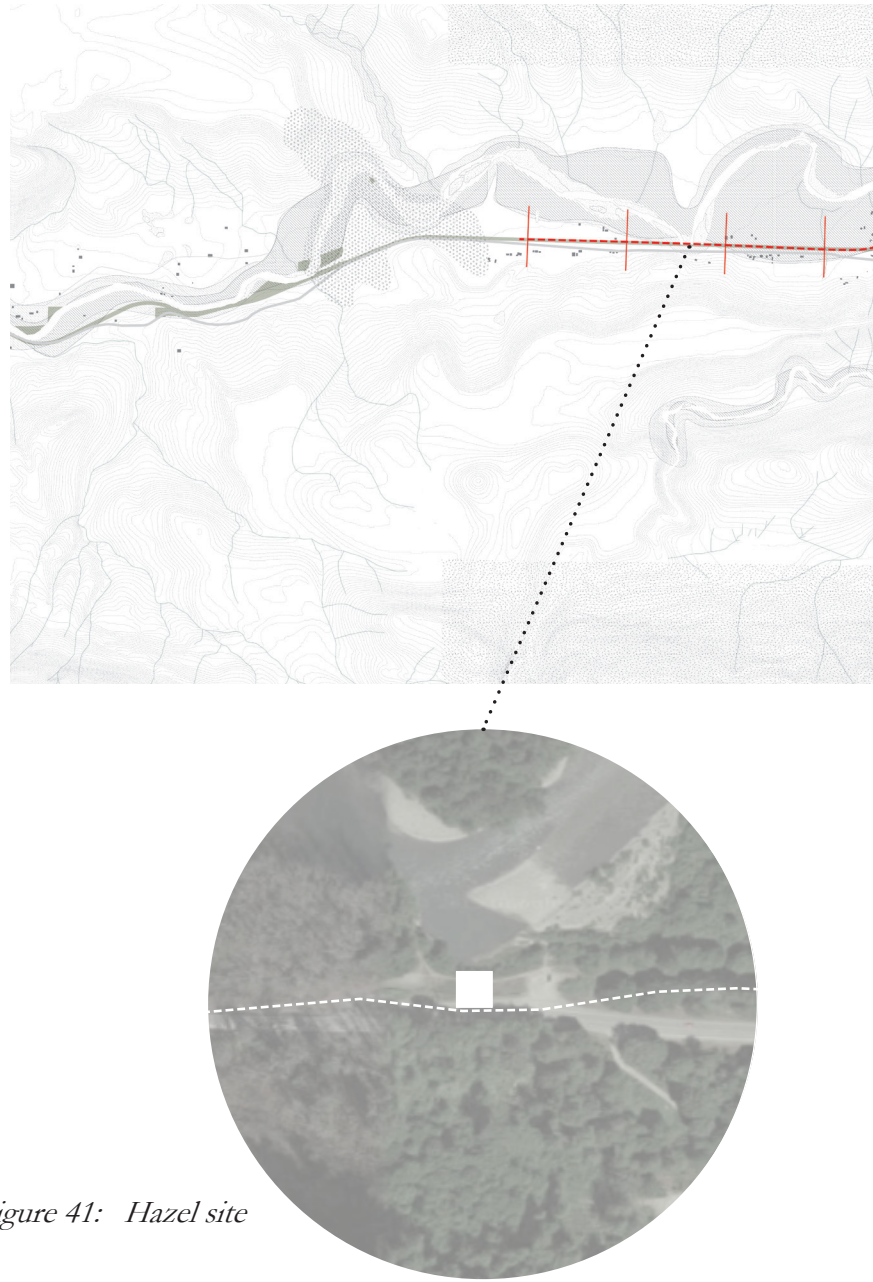
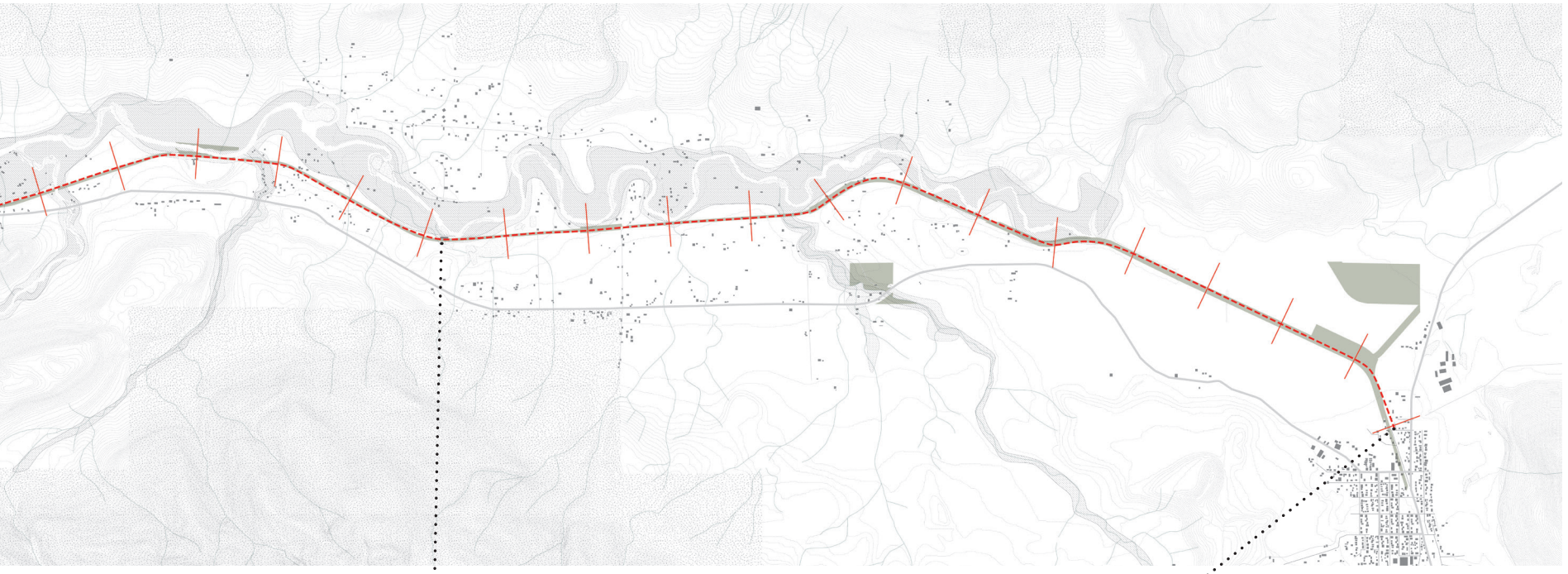


Figure 41: Hazel site



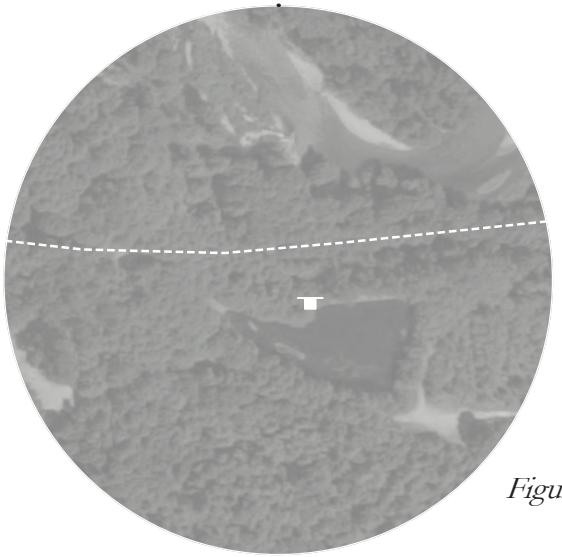


Figure 42: Fortson site

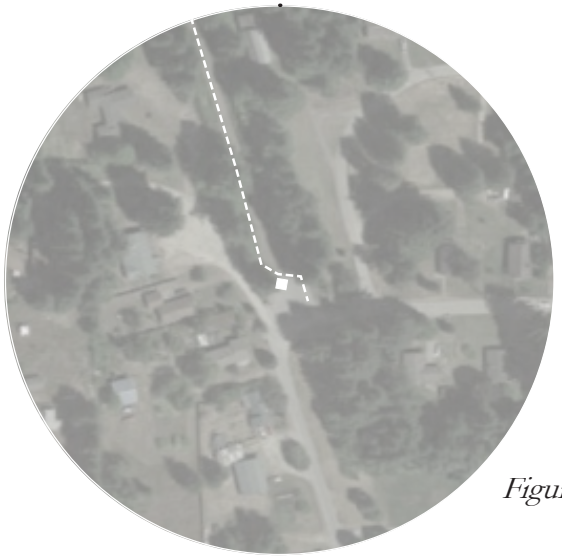


Figure 43: Darrington site

Darrington

The Darrington intervention site is the clearest start/ end point of White Horse Trail. The edge of town dissolves into trees and the trail emerges past a small parking area between houses. To the north of the trail entrance is a large lumber mill which is also visible from a portion of the trail.

A structured trailhead is proposed for this site, one which provides water for people and their animals, a composting toilet, and some parking.

This site's position as a threshold between trail and town is an inspiration for the siting of the built elements. Denial of a view of the trail, which stretches in a straight line for the first quarter mile, creates a sense of entrance into a clearly defined trail realm. The hut and wall mark a division between the town edge and the trail and enclose and direct the visitor onward.

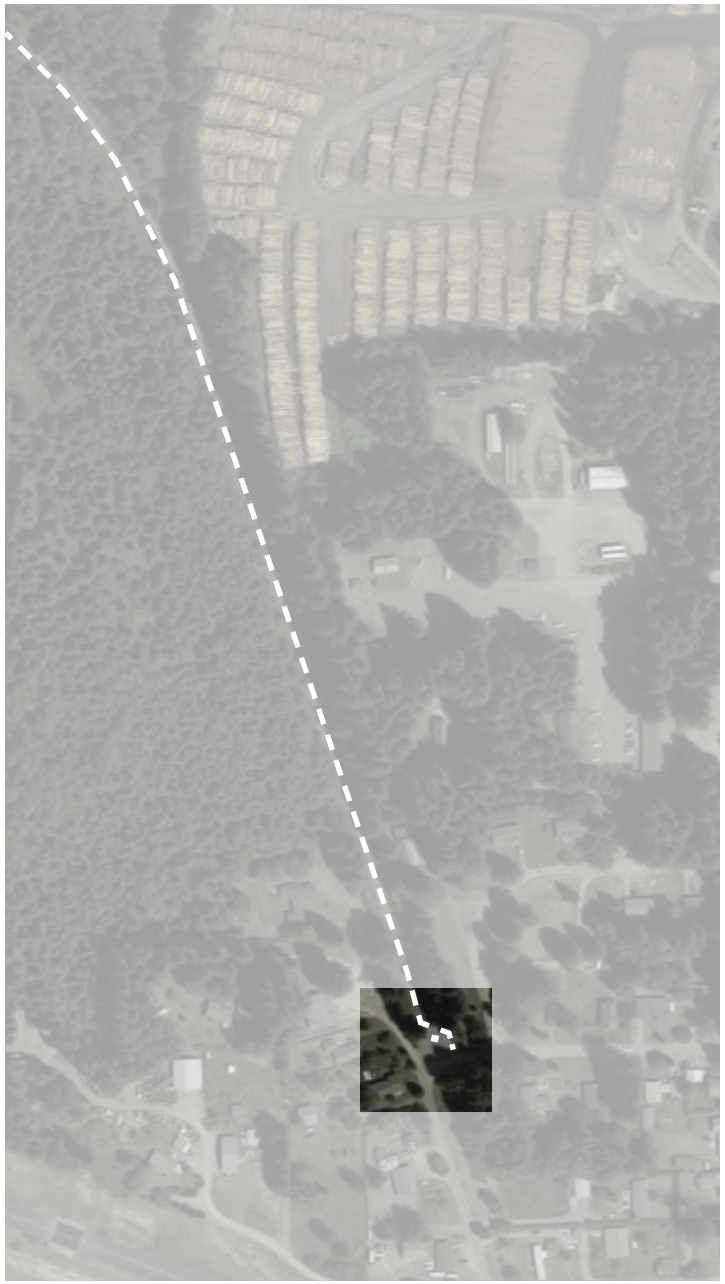


Figure 44: Darrington site and surroundings

Figure 45: Darrington site plan

Movement through the site is ordered in three segments: approach, needs, and reflection. This ordering prepares a visitor to enter the trail, both physically and mentally. As mentioned, the Approach denies a view of the trail and instead directs the visitor to pass between the two built elements of wall and hut.

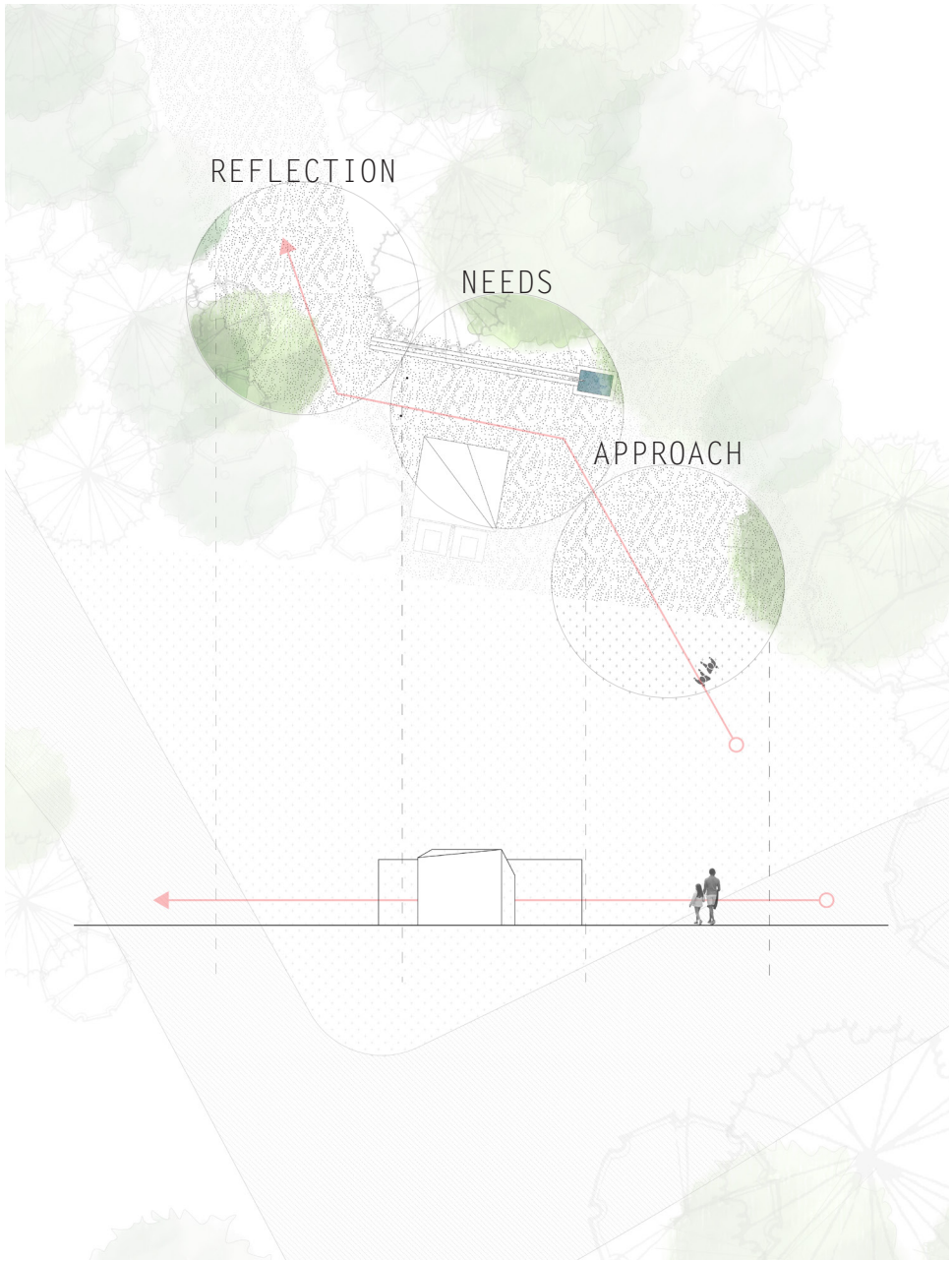


Figure 46: Darrington site organization

Figure 47: Darrington Approach

Figure 48: Darrington Needs

The Needs segment is geared toward the physical requirements of visitors and their animals, most likely dogs and horses. A water trough for animals and fountains for people are tied into the municipal water system. A simple hut with a composting toilet is a standard feature at trailheads and serves practical needs in preparation for a hike or ride.

The Reflection segment occurs when the visitor has turned the corner of the water wall and is given a view of the trail for the first time. The long open stretch of trail is defined by tall trees on either side, with a hint of mountains beyond.

The materials of the board-formed concrete wall and the wood slat hut recall the historical and contemporary context of lumber production. Angles are carved into the hut as a nod to the jagged peaks which lie to the north, east, and south.

Regenerative priorities for this site and the surrounding area center on revealing nature and providing habitat. A narrative of the place is told through the movement designed into the intervention. The separation

between town and trail is made distinct in order to highlight the transition from built realm to natural realm. The experience of moving from the confines of a car, to the space between two built forms, to the space between trees is important for cultivating a better understanding of nature.

The habitat portion of the regenerative approach for this site emanates from the trailhead along the trail. Bat houses are positioned at one mile increments in order to support the existing struggling bat population. Their presence is crucial for maintaining a healthy ecological cycle involving insects, soils, and plant growth. The visibility of the houses along the trail calls attention to the area's status as a priority habitat for the species, continuing the story of the place that began at the Darrington trailhead.

Figure 49: Darrington Reflection

Figure 50: Bat house along trail

Fortson

This intervention site is located midway along the trail as it moves from Darrington to Oso. Until the 1950's, a small town and lumber mill occupied the site, most of which was moved after the lumber industry moved to Darrington. What remains are the steam plant's concrete ruins and the mill ponds. The North Fork Stillaguamish River is directly adjacent to the north and salmon use the creek's fish ladder to reach the lower pond where they spawn.

Like Darrington, Fortson is a primary entrance and exit point for trail users. For this reason, the program and organization of the program are similar: a toilet hut and the same three segments of movement are proposed.

Because the intervention does not define a separation between built realm and natural realm, the movement through the site takes on a different significance. In this case, movement mirrors the natural cycle of the journey of

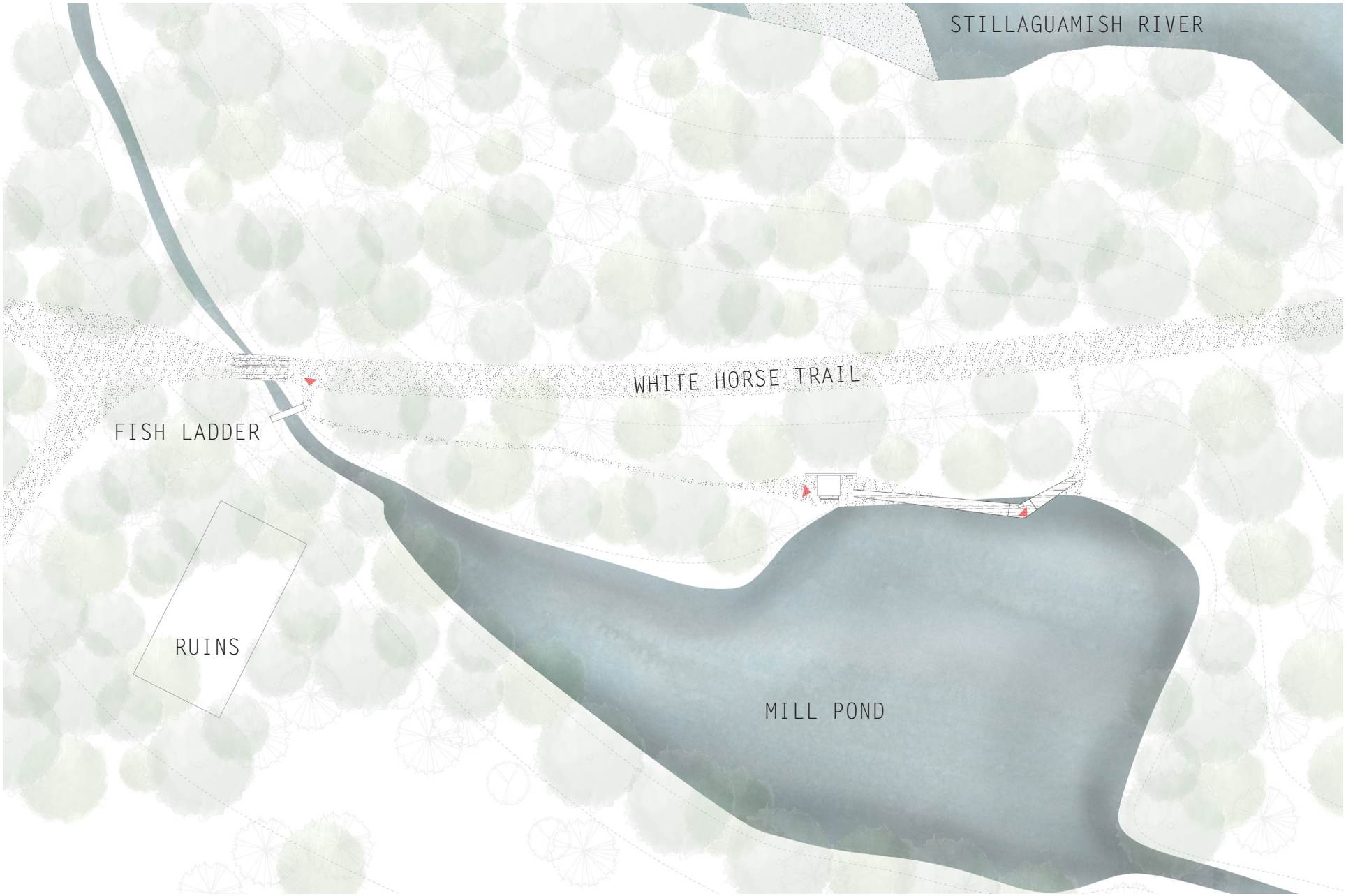


Figure 51: Fortson site plan

salmon. The Approach to the intervention is from the west at the fish ladder, which spawning salmon climb in order to reach the pond. The visitor follows a narrow trail through the trees a short distance where the hut emerges at the edge of the pond. This Needs portion parallels the salmon's own need of the pond for spawning. Whether passing through the hut or under its canopy, the visitor follows the path onward toward a wooden walkway jutting out over the water's edge. From the walkway, there is a view of a glacial mountain peak and the visitor is closest to the water. This is the moment of Reflection and while salmon die and return to the ecosystem within the pond, the visitor continues along the path, which returns them to main trail.

Again, the regenerative priority is enforcing the notion of place and the revealing of nature. Through subtle direction along the path, aspects of the landscape are exposed to the visitor. The natural elements of water and wildlife are made visible and accessible. The story of this landscape as a salmon habitat is revealed and in doing so, visitors are made more aware of the processes around them.

Figure 52: Fortson site organization


NEEDS
REFLECTION

Figure 53: Fortson Approach at fish ladder

Figure 54: Fortson Needs

Figure 55: Fortson Reflection at mill pond

Hazel

The Hazel site is a place of confluence between humans and nature. The human-made trail and highway abut the bending river in an instance of intersection. Fly fishing is popular year-round and swimmers use the water to cool off in summer.

The program for this site shifts due to its proximity to the landslide area. A viewing tower is proposed in order to grant visitors a new perspective of the valley, another

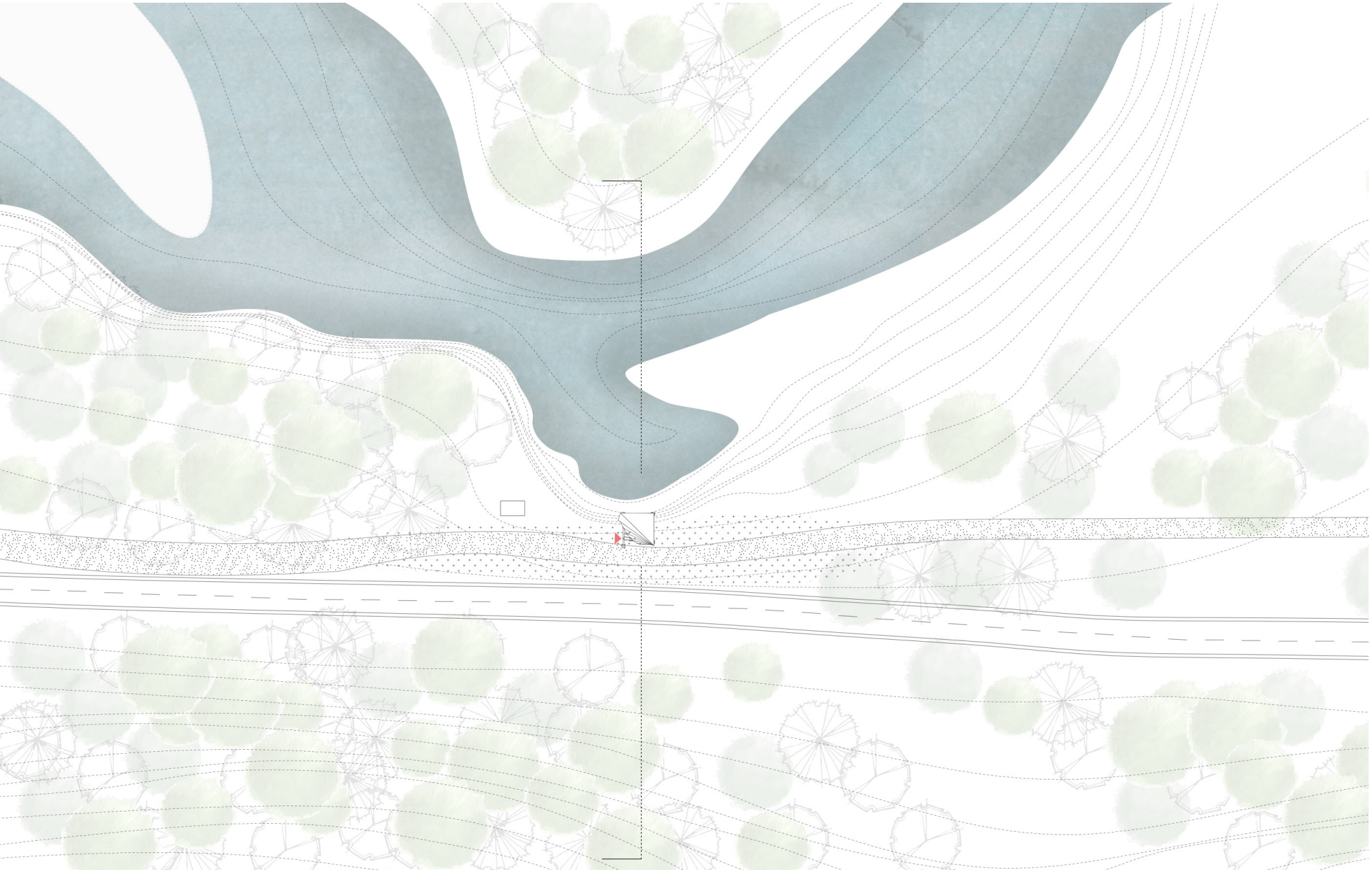


Figure 56: Hazel site plan

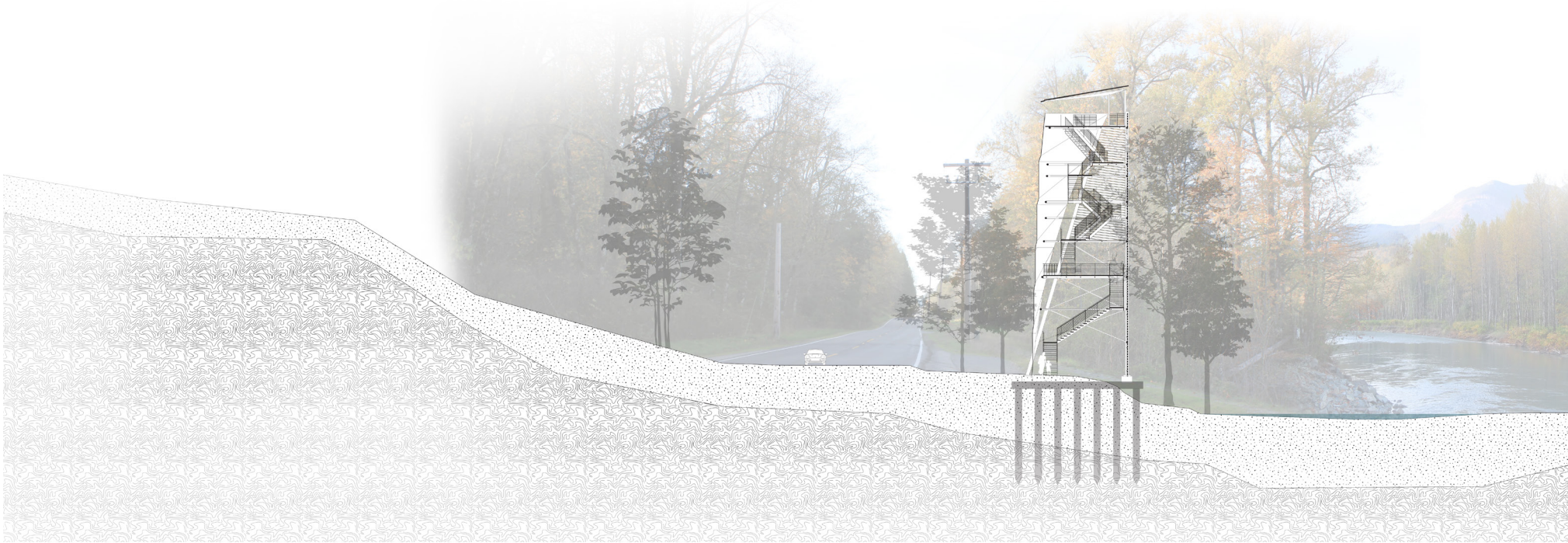
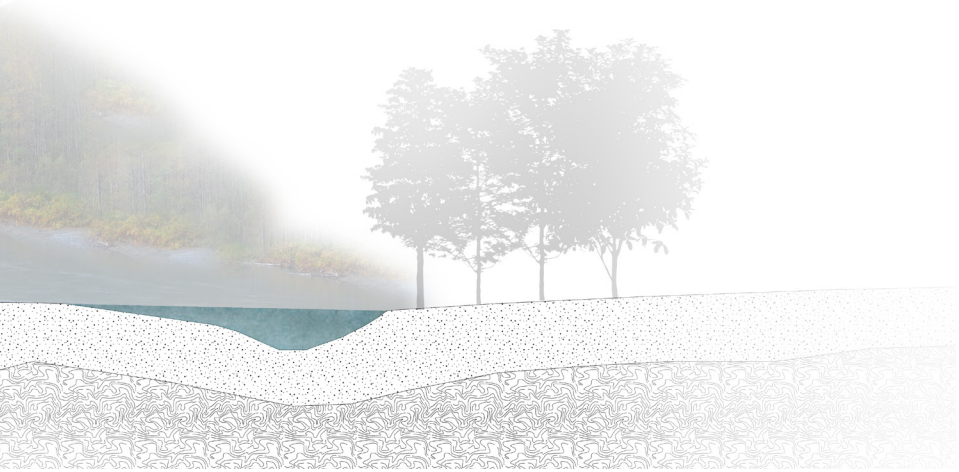


Figure 57: Hazel site section



method of revealing nature. Due to the shifting nature of the river and the height of the tower, a sturdy system of friction piles is engineered for the foundation. In a regenerative effort, these piles act to support the tower as well as stabilize the fine soil in which they sit, slowing but not completely stopping the natural erosion of the riverbank.

Like the other two sites, the tower intervention provides another series of curated moments within the larger trail context. It is composed of four portions which organize the circulation and the varied faces.

The first portion is the ground plane which provides access to the tower stairs. The tower faces are open in the direction of the trail to the east and west. Enough height is given between the ground and the structural supports in order to allow a person on horseback to pass underneath the tower. The ground plane of the tower is treated as a continuation of the trail and draws attention to the relationship between the three intersecting channels - river, trail, and highway. It is seen as a place of everyday encounter, experience, and views.

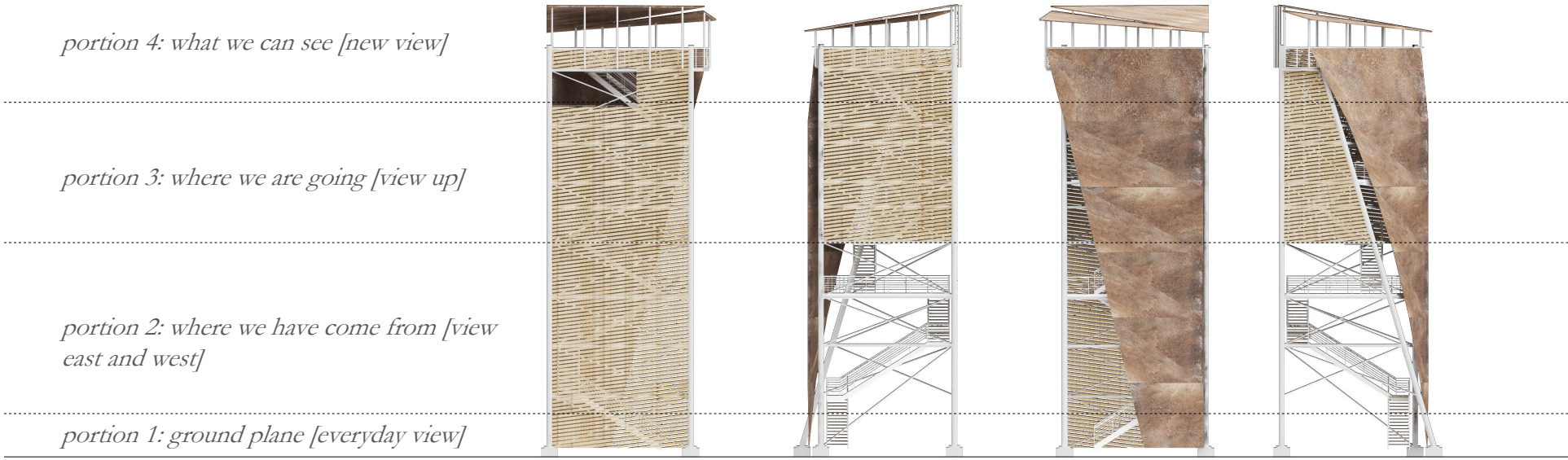


Figure 58: Hazel elevations

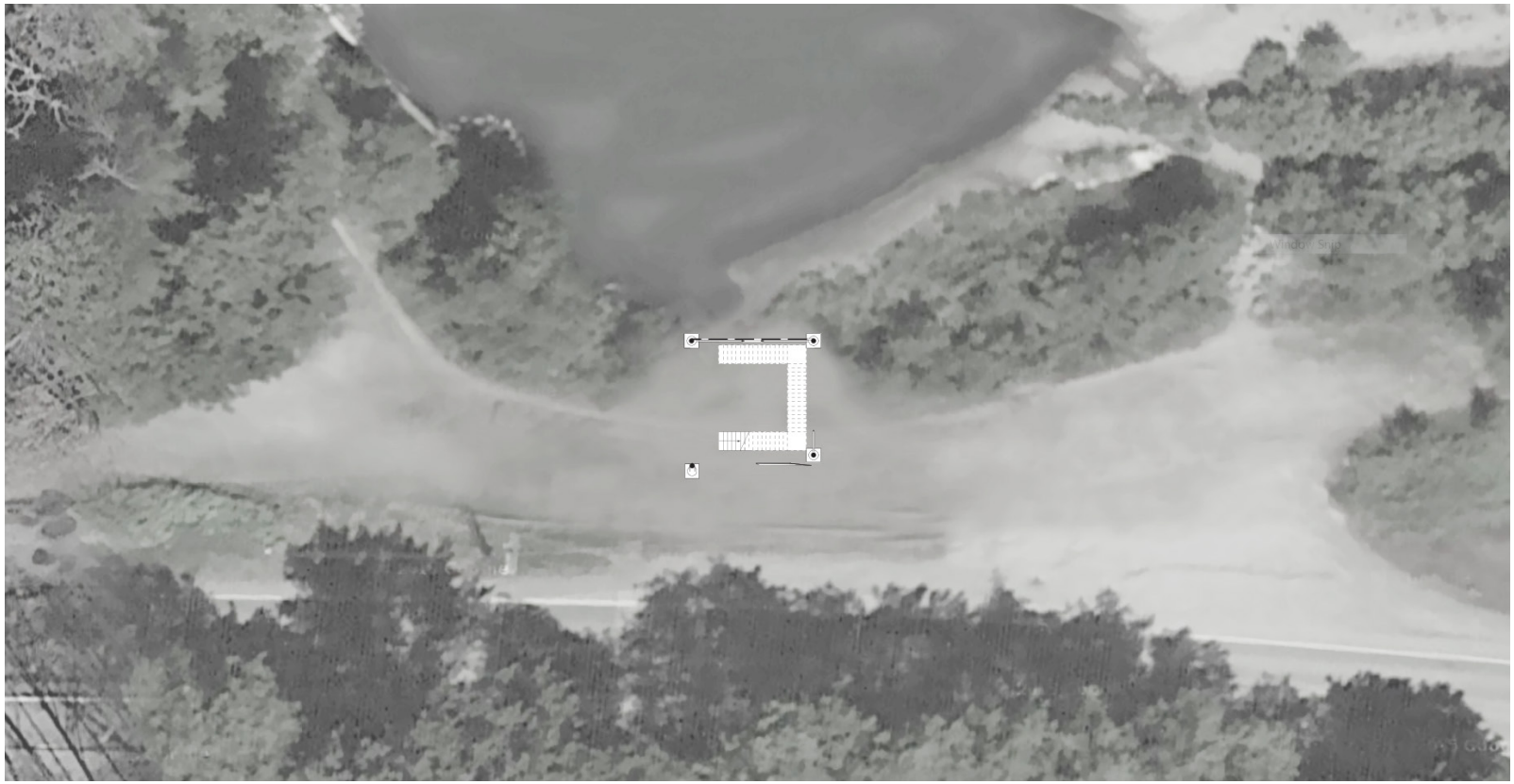


Figure 59: Ground plan within context [portion one]

Figure 60: View of tower from ground plane

The second portion occurs within the tower as one climbs the stairs and arrives at the first large landing platform. While climbing and while on the platform, the viewer is directed to look down from this slight elevation onto where they have just come from. The faces open up to the east and west to allow for this.

Figure 61: First platform

Portion three is focused on an upward movement and view. The faces are closed to views outside of the tower and the gaze is drawn upwards towards the twisting stairs and the platform above.

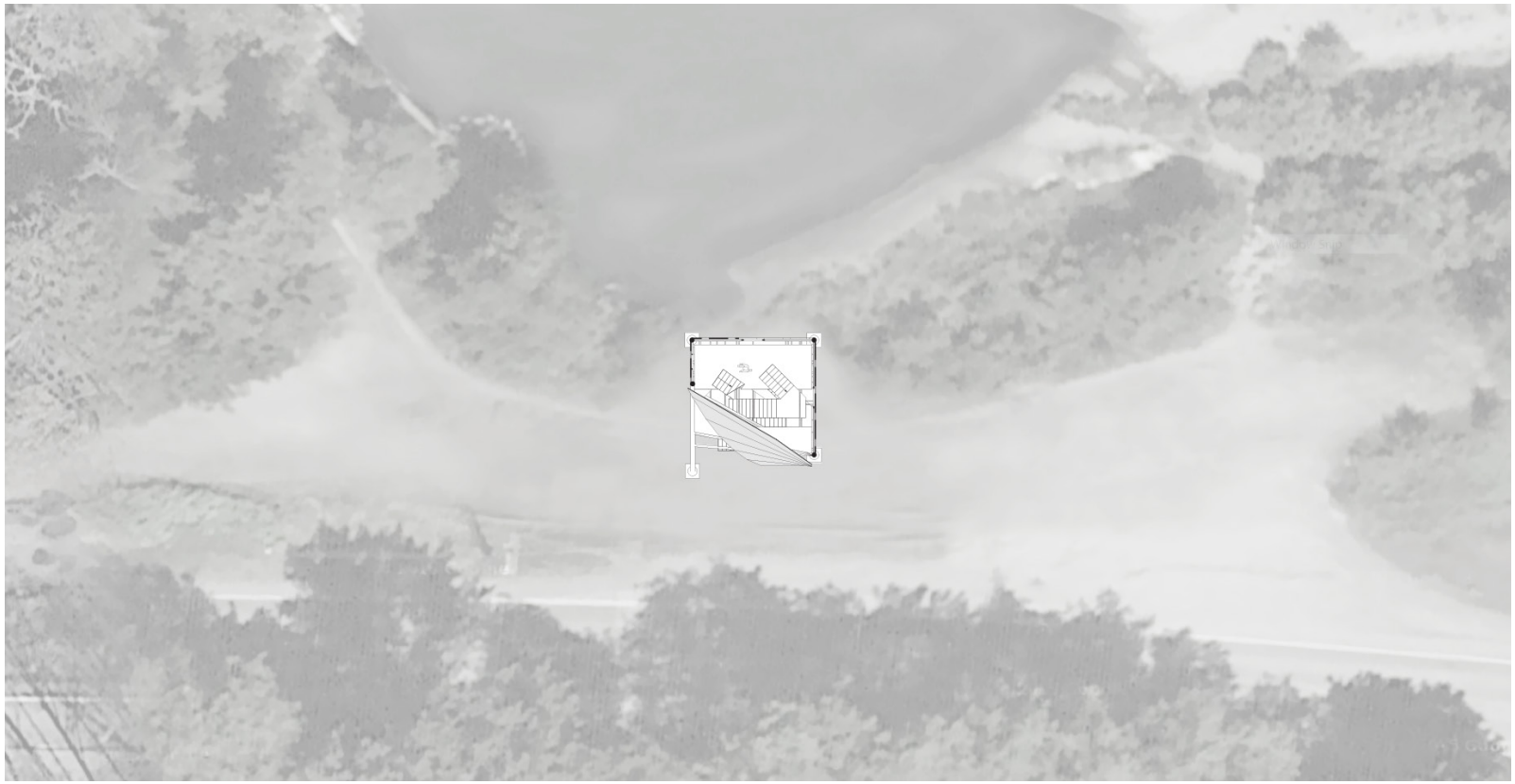


Figure 62: Second platform

Figure 63: View up from first platform

The fourth portion returns to views of the surrounding landscape, asking the visitor to reflect on how the view has changed from a great height. The first platform in this portion grants a view only to the north, focusing the gaze on the river and calling out its dominant role within this landscape. The second platform is the uppermost level of the tower and offers views in all directions. Although the views are democratic, the platform is oriented toward the northwest, narrowing in the direction of the landslide site. A private corner, wide enough for two standing bodies, juts in this direction in order to allow for a quieter reflective moment as one sees the scarred hillside from this height.

The south side cladding is asymmetrical and shifts as the tower rises in order to act as a wayfinding device within the tower. This side is clad in Corten steel, as opposed to wood, so that it may stand out from the other three sides and clearly indicate its direction in order to orient the visitor. The material continues to fold and unfold as it forms the roof pavilion over the top platform.

Figure 64: Third and uppermost platform

Figure 65: View west toward landslide from uppermost platform

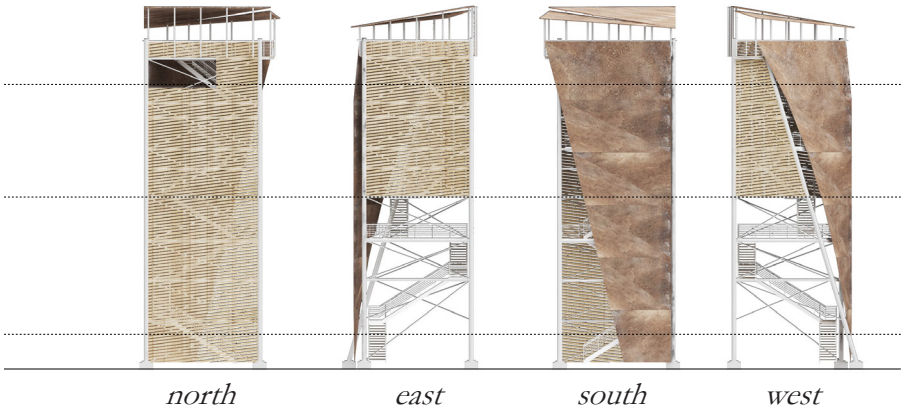


Figure 66: Tower elevations, materials

The materials chosen for the cladding of the tower are specified for several reasons. First, both the wood slats and the Corten steel have the potential to weather, wear, and show their age. This thesis acknowledges that such a riverfront structure is at the mercy of the elements. Showing that vulnerability in the non-structural building components is an act of transparency and shows awareness of the natural processes. In contrast to the cladding materials, the steel structural pieces are designed to remain sturdy and strong until the river has completely inundated the area and access to the tower is cut off. The integrity of the tower structure in steel is to remain intact until the tower can no longer be reached. At that moment, the need for the tower to continue standing is lost and it can surrender to the natural forces of the river.

Design Summary

Through these built interventions, views and experience of nature which may otherwise be missed are framed are highlighted. The slower pace of movement on the trail in contrast to the speedy one of the highway it parallels calls for pause and reflection on the landscape in flux. Curated moments along the trail allow for these pauses. The crescendo of the tower provides a new perspective from which to view the fragility of the natural world.

The improved trail is a result of enhanced recovery and the addition of layers of service onto existing recovery efforts. Public focus shifts from the devastation of a natural disaster to the community spirit and natural beauty which surround the reimagined trail.

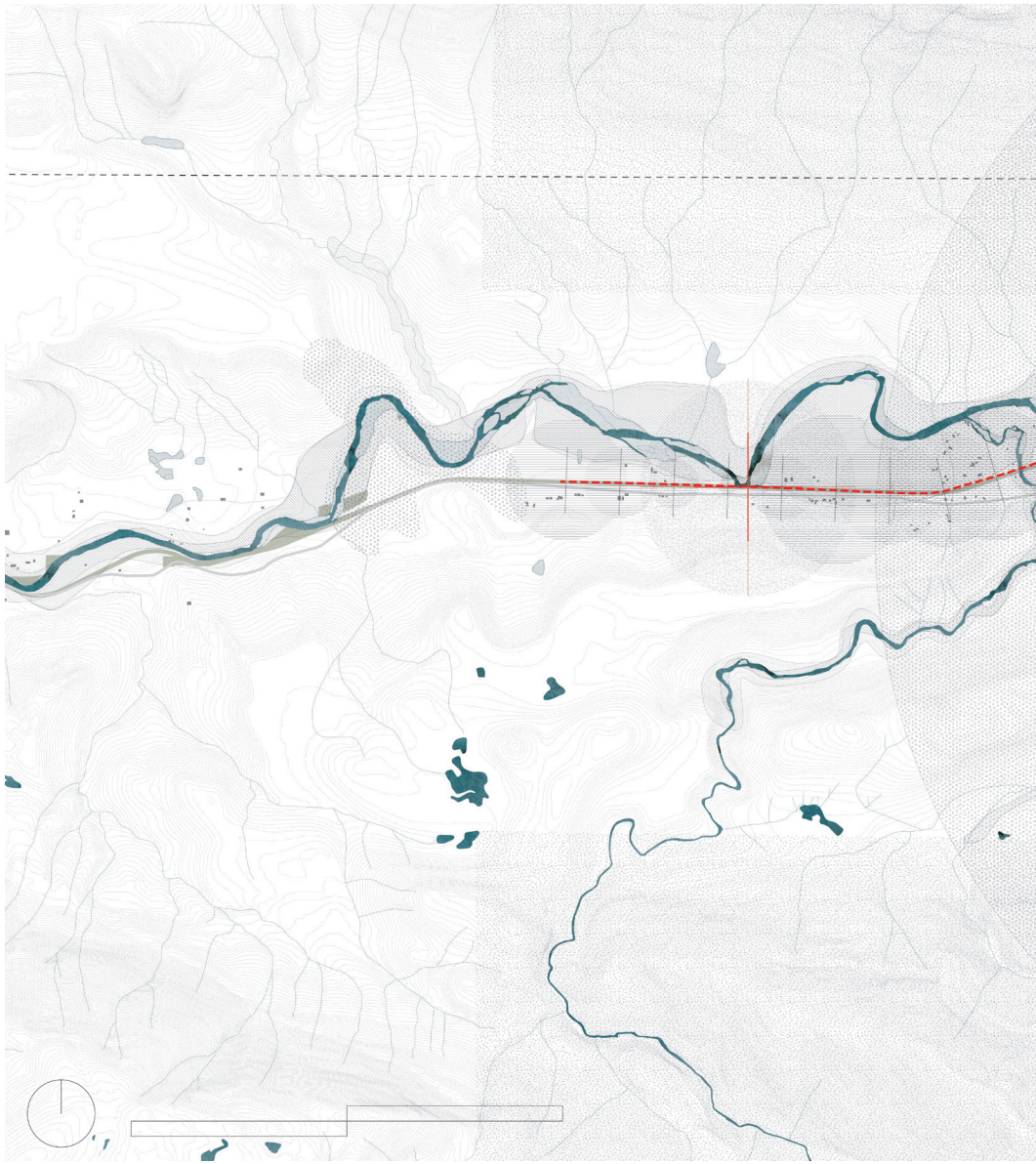
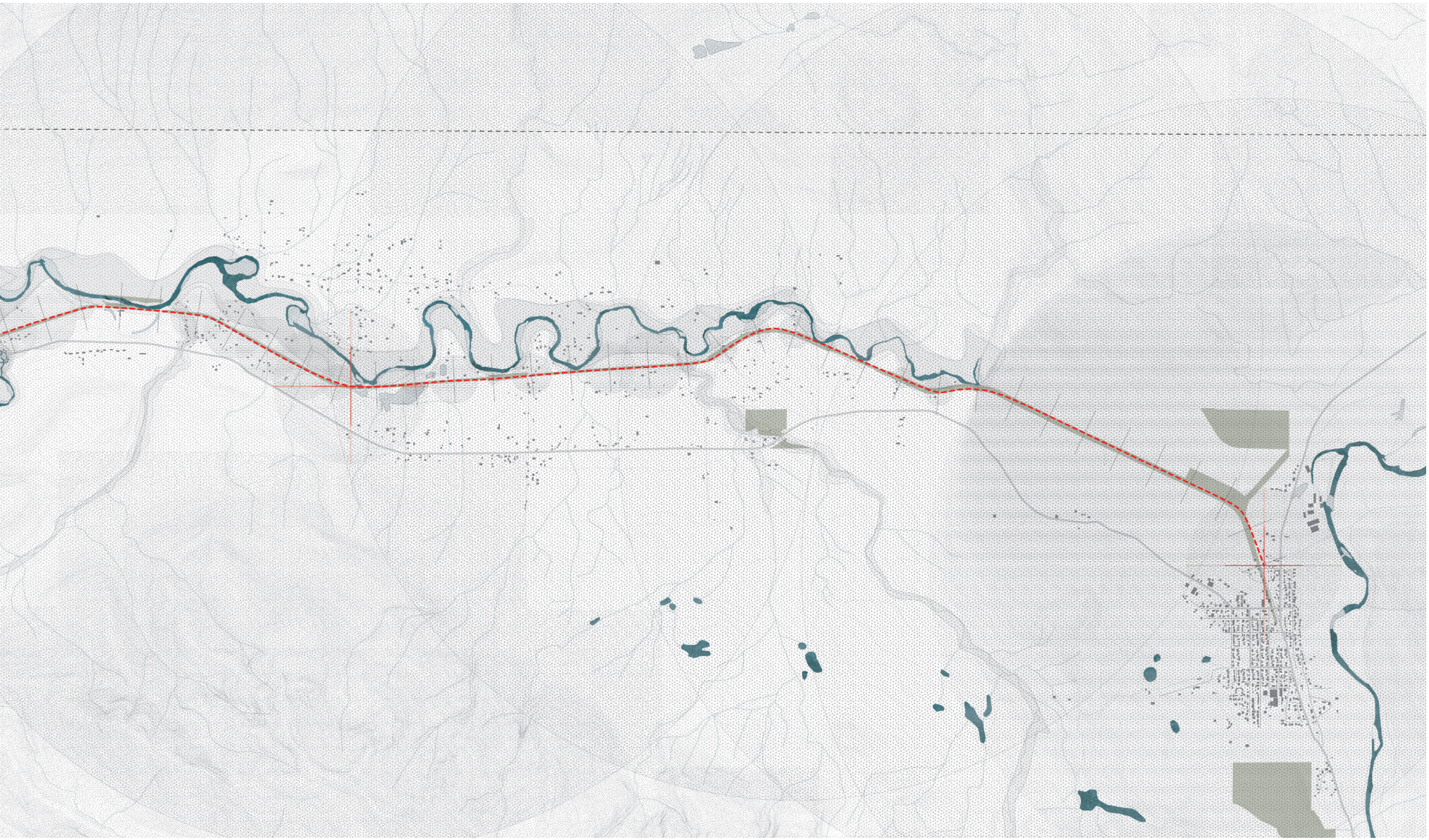


Figure 67: Valley map, showing river markers and intervention sites along the trail



chapter 5: conclusion

The problem of community recovery and the psychosocial welfare of a place following a natural disaster is not a formal concern of traditional recovery frameworks.[1] The healing of a community is something of an emerging practice and cases like the response in Southern Leyte, The Philippines provide an important example.[2] The site-specificity of a successful response is essential. The Southern Leyte example uses local cultural practices combined with a shared community project in order to facilitate successful healing.

This thesis posits that an enhanced recovery addresses the healing of the community as a whole following a natural disaster. It is incorporated within the existing recovery efforts, such as the rebuilding of infrastructure. By combining those efforts with a broader community project, a sense of shared purpose is cultivated. This community component of the rebuilding has value as a way for humans to reassert even a small amount of control on the natural landscape. But this control is tempered by the regenerative

1 Federal Emergency Management Agency, "National Disaster Recovery Framework."
2 Luna et al., "Center for Disaster Preparedness."

architecture approach, which calls for a respect for nature as volatile and dangerous.

The landslide that occurred in March 2014 in the North Fork Stillaguamish River Valley caused a great loss of life and property and prompted a rebuilding of the valley's infrastructure. This thesis seeks to enhance that recovery through regenerative architecture interventions which integrate human reclamation efforts with respect for the natural wild. Rather than being known as a place of disaster, the valley, centered on its river and the White Horse Trail, will be known also for its natural beauty. Architecture interventions along the existing trail seek to boost the collective spirit of the valley by providing sites that the community can be proud of as well as drawing attention to the forces of nature.

Two trailhead facilities and a viewing tower, along with trail markers tracking the path of the river, are proposed in designs that are sensitive to the surrounding natural flows of wildlife and geology. Where appropriate, stabilization of soils is introduced as a method of human reclamation. But

the position of this thesis is that even those efforts may be undone by natural forces one day.

The three interventions are designed as a series of moments within the larger trail context. Each intervention site is a stop along the trail and nested within each intervention are multiple stops along a smaller path.

The implementation of the design proposal at this site may be seen as a case study following in the model of the Southern Leyte recovery efforts. It is site-based and responds to the community character and natural context in order to address the recovery of the collective spirit.

The trail markers and interventions serve to celebrate and enrich the existing trail, shifting the valley's identity from a place affected by natural disaster, to a place where nature is revealed. The regenerative components of the interventions seek to tell the story of each site as well as the valley as a whole. Through this curated experiential narrative, visitors become more aware of nature and its forces. With this overall shift in valley identity, the community has a project through

which to unify. The redefinition allows for an atmosphere of healing and enhanced recovery, one that is deeply rooted in the place.

Some alternative approaches to the problem at this site might involve less of an architectural response. The treatment of the trail and the framing of natural elements along its ten miles could also serve as a solution. Perhaps the toilet facilities could be eliminated in order to promote a stronger sense of discovery along the trail. Without the practical program, knowledge of the intervention sites might be less widespread and more of a surprise as they are found. In this case, the solution might be strengthened by more path-based interventions situated where they highlight a wide range of natural qualities. Some would identify with the beauty of the site and others would point to potentially dangerous places within the landscape.

References

List of Figures

1. Rescue workers in Oso, Washington. http://old.seattletimes.com/flatpages/local/oso-mudslide-coverage.html.
2. Blanco River Flood, Texas, 2015. http://smmercury.com/wp-content/uploads/2015/05/blanco-river-flooding-wimberley-p1B-659x352.jpg.
3. Former village of Guinsaugon after landslide. Southern Leyte Landslide 2006, Recovery Status Report.
4. Recovery vision posted in resettlement community. Southern Leyte Landslide 2006, Recovery Status Report.
5. Adam Joseph Lewis Center for Environmental Studies, pond and south wing. http://zeb.buildinggreen.com/images.cfm?ProjectID=18.
6. VanDusen Botanical Garden Visitor Centre, roof habitat. http://www.archdaily.com/215855/vandusen-botanical-garden-visitor-centre-perkinswill.
7. Caribou Pivot Stations, site and building components. http://lateraloffice.com/filter/Work/CARIBOU-PIVOT-STATIONS-2010.
8. Terrace farms in the Philippines. http://worldheritage.routes.travel/world-heritage-site/rice-terraces-of-the-philippine-cordilleras.
9. Roman aqueduct in southern France. Valley Crossings and Flood Management for Ancient Roman Aqueduct Bridges.

10. Gas plant before reclamation, Seattle, WA, 1951. http://www.lakeunionhistory.org/Gasworks_History.html.
11. Gas Works Park after reclamation. http://www.lakeunionhistory.org/Gasworks_History.html.
12. North Fork Stillaguamish Watershed Map.
13. Valley Map.
14. Key Map, showing zoom area.
15. LIDAR evidence of past slides, after Haugerud. http://pubs.usgs.gov/of/2014/1065/pdf/ofr2014-1065.pdf.
16. Aerial photos of past Hazel slides. http://projects.seattletimes.com/2014/building-toward-disaster.
17. Aerial photo of 2014 slide. http://projects.seattletimes.com/2014/building-toward-disaster.
18. Steelhead Haven neighborhood prior to March 2014. http://www.nbcnews.com/news/investigations/how-politics-buries-science-landslide-mapping-n73256.
19. March 2014 landslide aftermath. http://www.nbcnews.com/news/investigations/how-politics-buries-science-landslide-mapping-n73256.
20. View north of 2014 landslide. http://www.cnn.com/2014/03/23/us/washington-landslide.
21. Rescue workers surveying slide. http://nwnewsnetwork.org/post/oso-landslide-could-be-deadliest-disaster-washington-state-history.
22. Fall chinook salmon spawning. http://rogueriverkeeper.org/who-we-are/watershed/species/chinook.
23. Building artificial redds. http://www.stillaguamish.nsn.us/sediment%20study.htm.
24. Map showing Washington Department of Fish and Wildlife Priority Species Habitat areas. http://wdfw.wa.gov/conservation/phs/maps_data.
25. North Fork Stillaguamish River in summer. http://rockhoundblog.com/page/7.
26. White Horse Trail.
27. Fortson Ruins. https://www.flickr.com/photos/25843928@N07/albums/72157613562797426.
28. North Fork Stillaguamish River in fall.
29. The first train to Darrington, 1901. http://www.darringtonwatourism.com/darrington-history/looking-at-the-town-history.
30. Old Fortson Mill. http://www.ghosttownsofwashington.com/fortson-mill.html.
31. Valley Map, White Horse Trail highlighted.
32. Trail before clearing.
33. Trail (and highway) destroyed in 2014 landslide. http://www.nbcnews.com/storyline/deadly-mudslide/really-cut-mudslide-neighbors-struggle-highway-closure-n69086.
34. Bridge with guardrails.

35. After clearing efforts. http://hogehomestead.blogspot.com/2013/10/fall-on-whitehorse-trail.html.
36. Valley map showing trail and half mile marker spacing.
37. Stationary river, no arm movement.
38. Approaching river, arm moves down.
39. Receding river, arm moves up.
40. Marker along the trail, signaling an approaching river.
41. Hazel site.
42. Fortson site.
43. Darrington site.
44. Darrington site and surroundings.
45. Darrington site plan.
46. Darrington site organization.
47. Darrington Approach.
48. Darrington Needs
49. Darrington Reflection.
50. Bat houses along trail.
51. Fortson site plan.
52. Fortson site organization.
53. Fortson Approach at fish ladder.
54. Fortson Needs.
55. Fortson Reflection at mill pond.
56. Hazel site plan.
57. Hazel site section.
58. Hazel elevations
59. Ground plan within context.
60. View of tower from ground plane.
61. First platform.
62. Second platform.
63. View up from first platform.
64. Third and uppermost platform.
65. View west toward landslide from uppermost platform.
66. Tower elevations, materials.
67. Valley map, showing river markers and intervention sites along the trail.

Bibliography

"Adam Joseph Lewis Center for Environmental Studies--Oberlin College | Buildings Database." Accessed May 28, 2015. https://buildingdata.energy.gov/project/adam-joseph-lewis-center-environmental-studies-oberlin-college.

Baker, Mike, and Justin Mayo. "Logging OK'd in 2004 May Have Exceeded Approved Boundary." The Seattle Times. Accessed May 22, 2015. http://old.seattletimes.com/html/localnews/2023235343_mudslideovercutxml.html.

"Building toward Disaster." The Seattle Times. Accessed April 30, 2015. http://projects.seattletimes.com/2014/building-toward-disaster.

Cole, Raymond J. "Transitioning from Green to Regenerative Design." Building Research & Information 40, no. 1 (January 1, 2012): 39–53. doi:10.1080/09613218.2011.610608.

"Evidence for Prehistoric Dryland Farming in Mainland Southeast Asia: Results of Regional Survey in Lopburi Province, Thailand on JSTOR." Accessed December 15, 2015. http://www.jstor.org.offcampus.lib.washington.edu/stable/42928361?sid=primo&seq=2#page_scan_tab_contents.

Federal Emergency Management Agency. "National Disaster Recovery Framework." United States Department of Homeland Security, September 2011. http://www.fema.gov/media-library-data/20130726-1820-25045-5325/508_ndrf.pdf.

"Home | Global." Accessed December 12, 2015. http://perkinswill.com/work/vandusen-botanical-garden-visitor-centre.html.

Luna, Emmanuel M., Gisela DA Luna, Jesusa Grace J. Molina, Fatima Gay J. Molina, Sanjaya Bhatia, Yasao Kawawaki, Senior Recovery Expert, Gerald E. Potutan, and Recovery Expert. "Center for Disaster Preparedness." Accessed December 12, 2015. http://www.preventionweb.net/files/26098_26098recoverystatusreportleytemarch.pdf.

Plessis, Chrisna du. "Towards a Regenerative Paradigm for the Built Environment." Building Research & Information 40, no. 1 (January 1, 2012): 7–22. doi:10.1080/09613218.2012.628548.

"Priority Habitats and Species (PHS) | Washington Department of Fish & Wildlife." Accessed December 14, 2015. http://wdfw.wa.gov/conservation/phs/maps_data.

"Seattle Parks and Recreation." Accessed December 14, 2015. http://www.seattle.gov/parks/park_detail.asp?id=293.

"Stillaguamish Indian Tribe." Accessed June 12, 2015. http://www.u-s-history.com/pages/h1574.html.

"Stillaguamish Tribe of Indians - Artificial Redd Study." Accessed June 12, 2015. http://stillaguamish.com/artificialreddstudy.asp.

"Town of Darrington." Accessed June 15, 2015. http://town.darrington.wa.us.

"Valley Crossings and Flood Management for Ancient Roman Aqueduct Bridges: EBSCOhost." Accessed December 15, 2015. http://eds.a.ebscohost.com.offcampus.lib.washington.edu/ehost/detail/detail?sid=84c83554-dc6c-46d0-919f-5910bbde4174%40sessionmgr4004&vid=0&hid=4102&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=70338945&db=a9h.

"USGS Open-File Report 2014–1065: Preliminary Interpretation of Pre-2014 Landslide Deposits in the Vicinity of Oso, Washington." Accessed June 15, 2015. http://pubs.usgs.gov/of/2014/1065/.

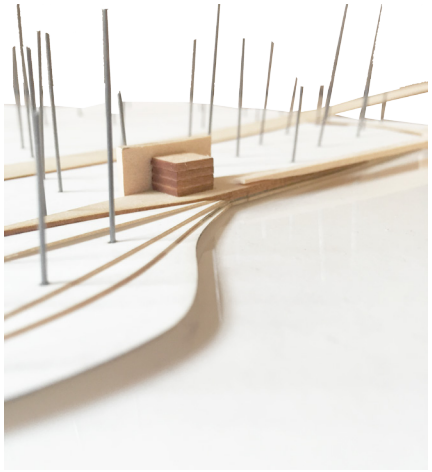
"VanDusen Botanical Garden Visitor Centre / Perkins+Will | ArchDaily." Accessed December 12, 2015. http://www.archdaily.com/215855/vandusen-botanical-garden-visitor-centre-perkinswill.

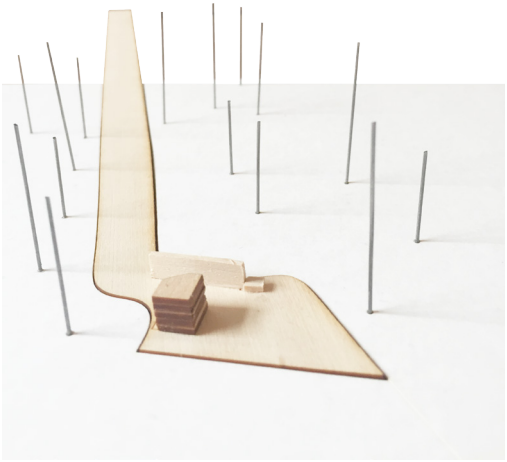
White, Mason, Lola Sheppard, Neeraj Bhatia, and Maya Przybylski. Pamphlet Architecture 30: Coupling: Strategies for Infrastructural Opportunism. New York: Princeton Architectural Press, 2011.

"Zero Energy Buildings Database: Overview - Oberlin College Lewis Center." Accessed May 28, 2015. http://zeb.buildinggreen.com/overview.cfm?projectid=18.

Hazel

Fortson





Darrington

In memory of those who lost their lives
along the North Fork Stillaguamish River
on March 23, 2014.