Building Out of Place

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Abstract

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The Skagit River Delta is defined by agrarian culture and farming's relationship to the land. However, history shows the recurrence of extreme flooding, and campaigns of consolidation have embedded a pattern of separation: the river has become the prisoner in the myth of absolute protection. At both the territorial and human scale, this thesis explores a new logic for the delta that is based on adaptation. This new pattern proposes to reactivate the natural processes linked to the river and engage them as the origin of materials in the design of a Grange.

Acknowledgments

To Elizabeth, Jake and Kimo

A thousand thanks for all your support, enthusiasm,and guidance! All students should have an opportunity to learn from such wonderful and engaging architects.

To Jesce

for your endless love and understanding.

Building Out of Place

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Figure 1. The Skagit River

Introduction

As I move into practice, this thesis is viewed as an opportunity to investigate an ecologically sound design method. My hope is that this method can become a lens which can be applied to any site and place, and help me develop building practices that emerge from, and contribute to the health of, a specific local context.

The place for testing this method is the Skagit River Valley, Washington. Located roughly half-way between Vancouver and Seattle, Mount Vernon, the seat of Skagit County, has projected population growth percentages equal to Seattle over the next decade.[1] Additionally, the Skagit River Delta is a major provider of food to Seattle and is one of the most agriculturally productive regions in the nation. Upland resource extraction, such as limestone for cement, is helping construct housing in Seattle while the Skagit River headwaters, originating in British Columbia, provide energy to Seattle City Light users via three dams: Ross, Diablo, and Gorge.

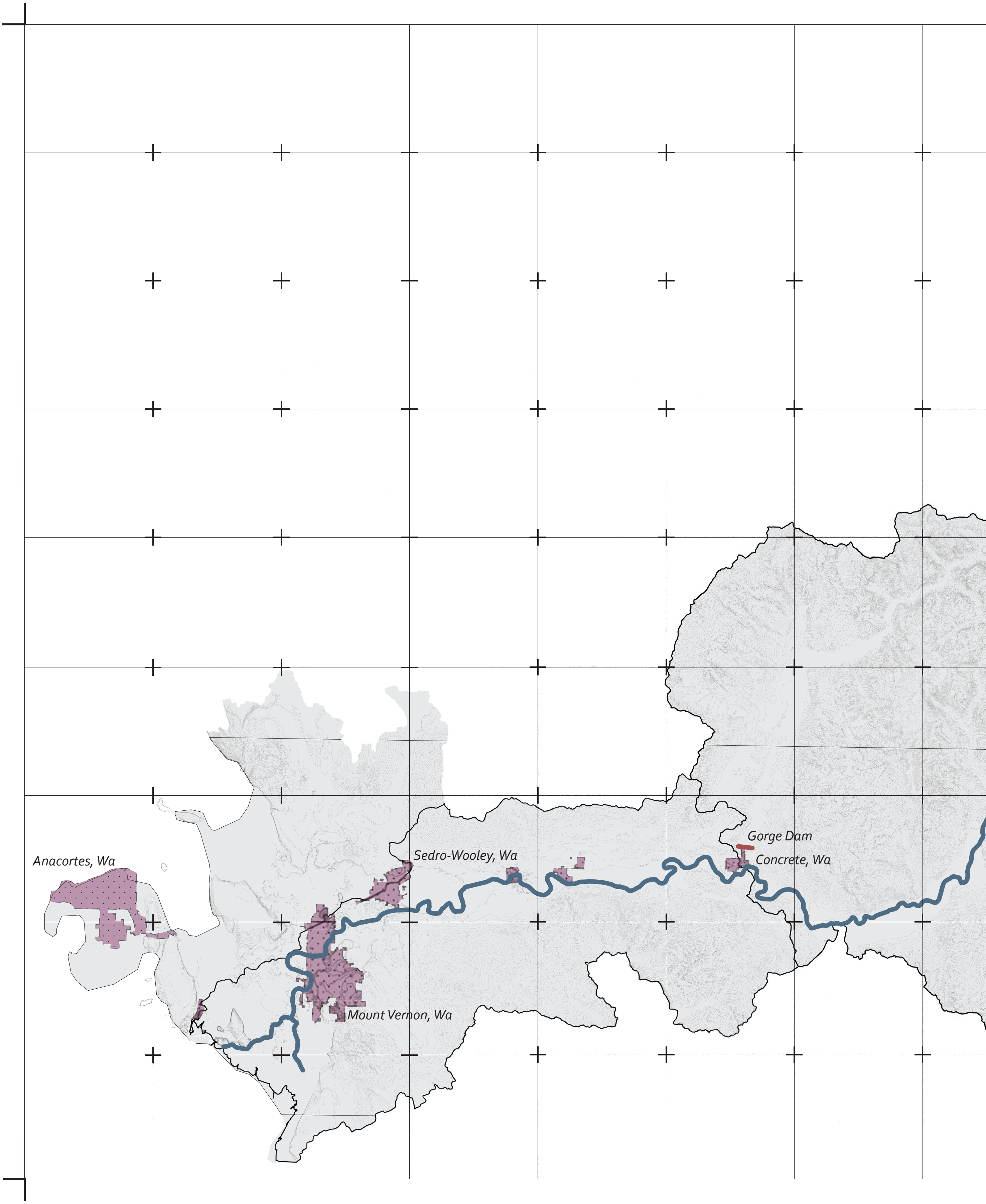
The structure of agricultural land in the Skagit River Delta is illustrative of conventional land-planning practices: broad distances separate houses, European Poplar fence-lines serve as wind-breaks, new construction is in-line with codified 'stick-built' methods, and levees protect arable land from the Skagit River. Although drained more than a century ago, looking deeper one can still find the traces of a pulsing floodplain in this seemingly flat terrain.

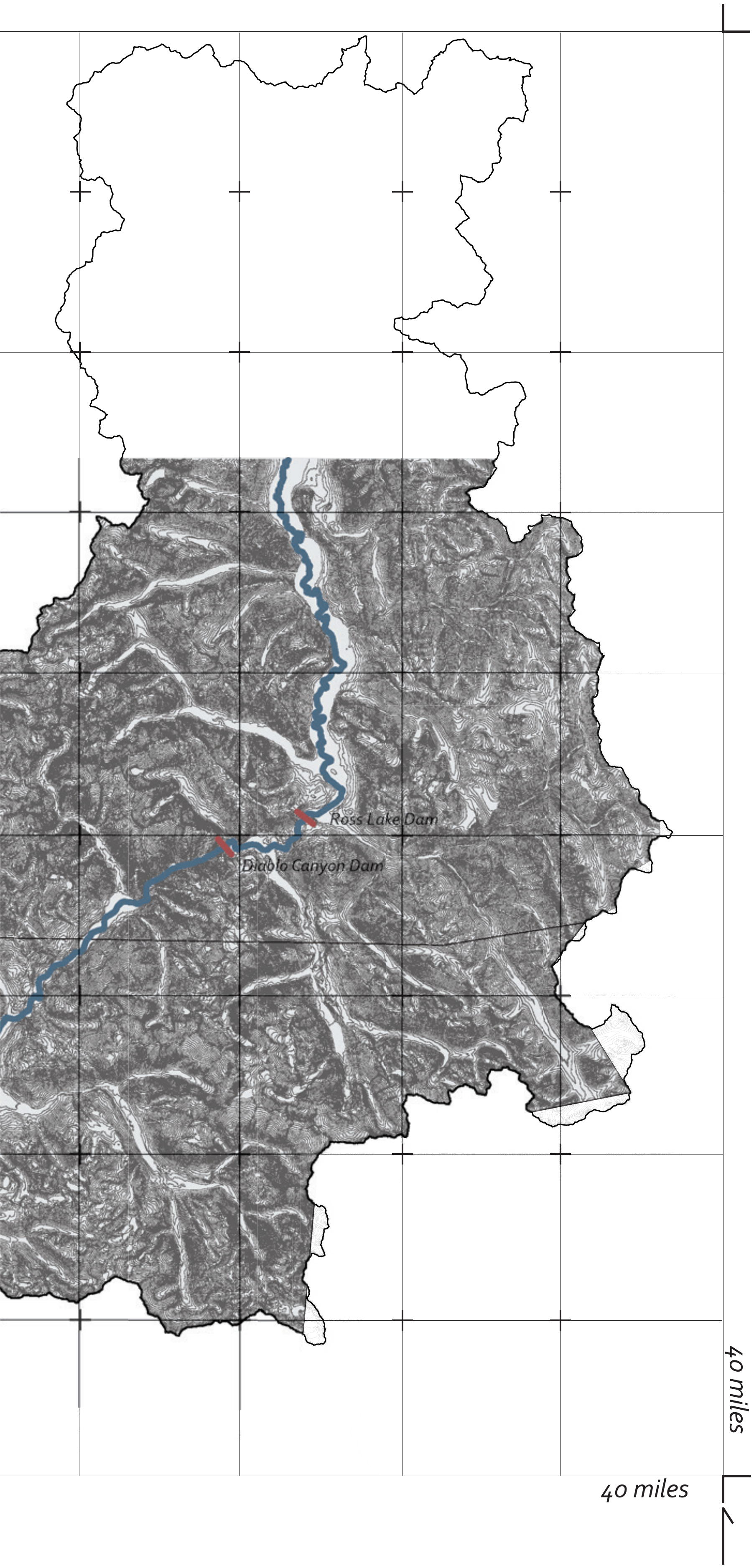
Much of what is now tilled soil was marsh-land, home to a thriving beaver population and log-jams the size of small neighborhoods. In fact, the Skagit had historically large log jams that hosted trees more than 30' tall and which took more than two solid years of company work to remove. The terraces are still there; massive shelf-like landforms generated by the deposition and erosion of soils over thousands of years, their forms solidified by the roots of established wetland forests. Nearly the entire Skagit River Delta was once a working forest: Spruce, Balsam Poplar, Black Cottonwood, Red and Black Alder, Willow, Vine Maple, Hemlock, Cedar and others worked in concert to filter water and buffer the

Figure 2. Barn at sunset

region from cycles of snow melt, rain, and tide. Now, with the levees and dikes constricting the river channel, floods are increasing in frequency and duration, and the region is without its protective natural forest buffer.

This thesis advocates an initiative in architecture to consider the impacts of design and construction upon local ecological patterns, and innovate constructional processes that support ecological restoration. In the case of the Skagit River Delta, there is reason to investigate the potential for regenerated wetland forest; through restoring its ecological function, this forest can reduce risk associated with erosion and flooding. Addressing this concern also presents an opportunity to re-think utilization of materials that have long been considered trash or pulp timber. This holds promise to innovate systems of construction which develop new spatial relationships and cultivate an ecological understanding of architecture. Through direct experimentation with site-sourced materials, this thesis proposes construction assemblies from within this knowledge-base and tests them in the design of a new Grange building for farmers.


Gorge Dam
Anacortes, Wa
Sedro-Wooley, Wa
Concrete, Wa
Mount Vernon, Wa



Skagit River Watershed

Figure 3.

Developing an Approach

In general, the approach to design investigated in this thesis explores local culture, people and their motives, and ecological processes to establish a toolkit and body of knowledge to address larger questions in design, like: What is this landscape trying to become? What opportunities exist to promote the long-term care of the place? And, how might these relate to design?

In our age, it is nearly impossible to respond to an architectural task without considering its ecological impacts. In past decades, a wide array of architectural responses to environmental crises have emerged. Rachel Carson's *Silent Spring* is now in its 55th year of publishing, and Ian McHarg's *Design with Nature* in its 48th. In response to the tangible environmental and human health concerns of this era, such as air pollution, resource depletion, and challenges meeting energy demands.[2] For instance, GZ Brown and Mark DeKay published *Sun, Wind and Light*, a visual compendium relating environmental conditions to empirical building methods.

A form-based response is only the entry-point to addressing todays environmental conditions, and recent focus in North America has been directed towards product-oriented solutions and better performance metrics. Meanwhile, scientific understanding of local ecology, restoration, and biodiversity has increased. However, designers experimenting with production technologies are often working in separate sectors from those engaging with ecological restoration.

In *Towards an Ecology of Tectonics, the need for rethinking construction in architecture*, architects Anne Beim and Ulrik Madsen note, "today's construction industry has developed into a paradox of autonomous interdependent systems largely ruled by global trends and economies."[3] The complex relationships involved in an architectural project require a holistic approach, yet as a result of these silo-ed systems, such an approach can be difficult to maintain. There is an opportunity to address this gap by developing models that place architecture within local ecological processes.

This thesis advocates for an understanding of "technique", the collective processing of materials, as a key in the development of such models. Rooted in the richness of the Skagit River Valley's ecological processes, local craft-based industries, and advancements in production technologies, this thesis explores "technique" as a way to draw connections between the way a material is processed and the place where it comes from.

Karl Christiansen's 1995 diagrammatic model of tectonic relationships advocates for "form, technique, and material" as essential elements of architecture that work together to precisely define one another.[4] (Figure 4) This thesis builds on the work of Christiansen, Beim, Leatherbarrow, and others, interpreting "technique" as a key, yet often overlooked, aspect of ecological design.

In tandem with an investigation of "technique," this thesis proposes a praxis that focuses on the study and translation of traditional knowledge of materials from craft-based industries, while exploring ways to hybridize these with existing and developing methods of construction. This approach lends an opportunity to 'leapfrog' conventional processes that are reluctant to change, such as clear-cutting forestry practices, and develop place-based approaches, such as mobile milling operations, all the while contributing to a larger conversation about the role of architecture within its greater ecological context.

In this thesis, ecological systems are the basis for material resource, and the building is a place of experimental constructions. Architecturally, this implies an iterative process where ideas are developed through material studies, large-scale mock-ups, sketching and drawing. Results provide successful outcomes or suggest variables in need of adjustment, and propose value-added alternatives to existing human-ecological relationships. Conceptually, physical experiments with site-derived materials can lead to a deep understanding of these materials, their processing, and the way they can be incorporated in the design of a building. A resultant design may inspire ecological awareness through the narrative embedded in its built form.

The value of technique and praxis are evidenced in the following section of this document, "A Constructional Craft," which examines the work of four contemporary architecture practices. Each practice's work exemplifies place-specific technical responses that stem from specific views of ecology.

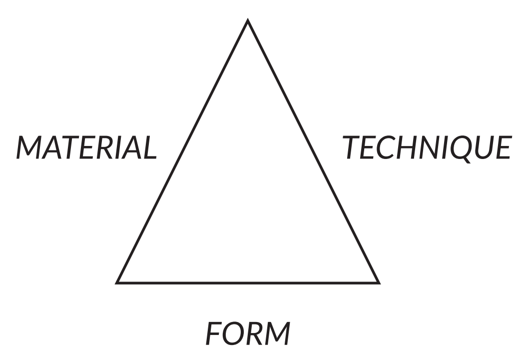


Figure 4.

When we try to pick out anything by itself, we find it hitched to everything else in the Universe.

- John Muir, 1911

A Constructional Craft

This section provides an overview of architects working towards developing a local architecture from the materials at hand. For many, architecture emerges from a position of frugality, choosing to work with what is specifically on-hand and available. More specifically, it is the way these practice's define 'ecological' and use it to provide context for approaching design.

This analysis narrows the focus of the approach discussed above, and provides examples for how one might conceive of an 'ecologically sound design methodology.'

Helen & Hard

A Constructional Craft

Norwegian architects Siv Helene Stangeland and Reinhard Kropf, Helen & Hard, challenge notions of contemporary architectural practice through engaging in what they call 'relational design.'[5] For Helen & Hard, relational design is a way to frame their investigations into a co-dependent arising of space, material, and organizational patterns; these patterns emerge from, and extend into adjacent environments, and hinge on identifying their relationships to design. Much of Helen & Hard's approach to relational design references Christian Norberg-Schultz' writings on the character of place, to include both abstract and physical relationships. This notion of place might include, for instance, the physical flow of soils on a site, the physical and abstract impacts of cultural activities, and the creation of a process of learning for the parties involved.

For instance, In the case of Pulpit Rock Mountain Lodge (Figure 5), analysis revealed how important forest diversity is to the people that visit the site. To maintain this diversity, the project to organized constructions that enhance the relationships of forest ecology; which was also in line with the existing log-construction heritage of the region. Building upon this heritage, massive timber panels were developed, which used multiple local timbers. Scots Pine lumber was combined with Birch dowels to craft the dowel-laminated panels. An intent to reveal the anisotropic properties of timber led to an undulating form, and as such, the internal form developed a gem-like atmosphere that also relates directly to the site.

Experimentation and material poverty also play a big role in the work of the Helen & Hard. During early stages of project formation, the firm researches the performance and structural possibilities of a material, analyzing it for potential of geometrical translation before overlaying digital and analogue processing, production, and mounting (detailing). In the case of Ratatosk (figure 6), a 1:1 exhibit constructed for an exhibition at the V&A in London, a stand of trees was mapped, digitized, analyzed for form

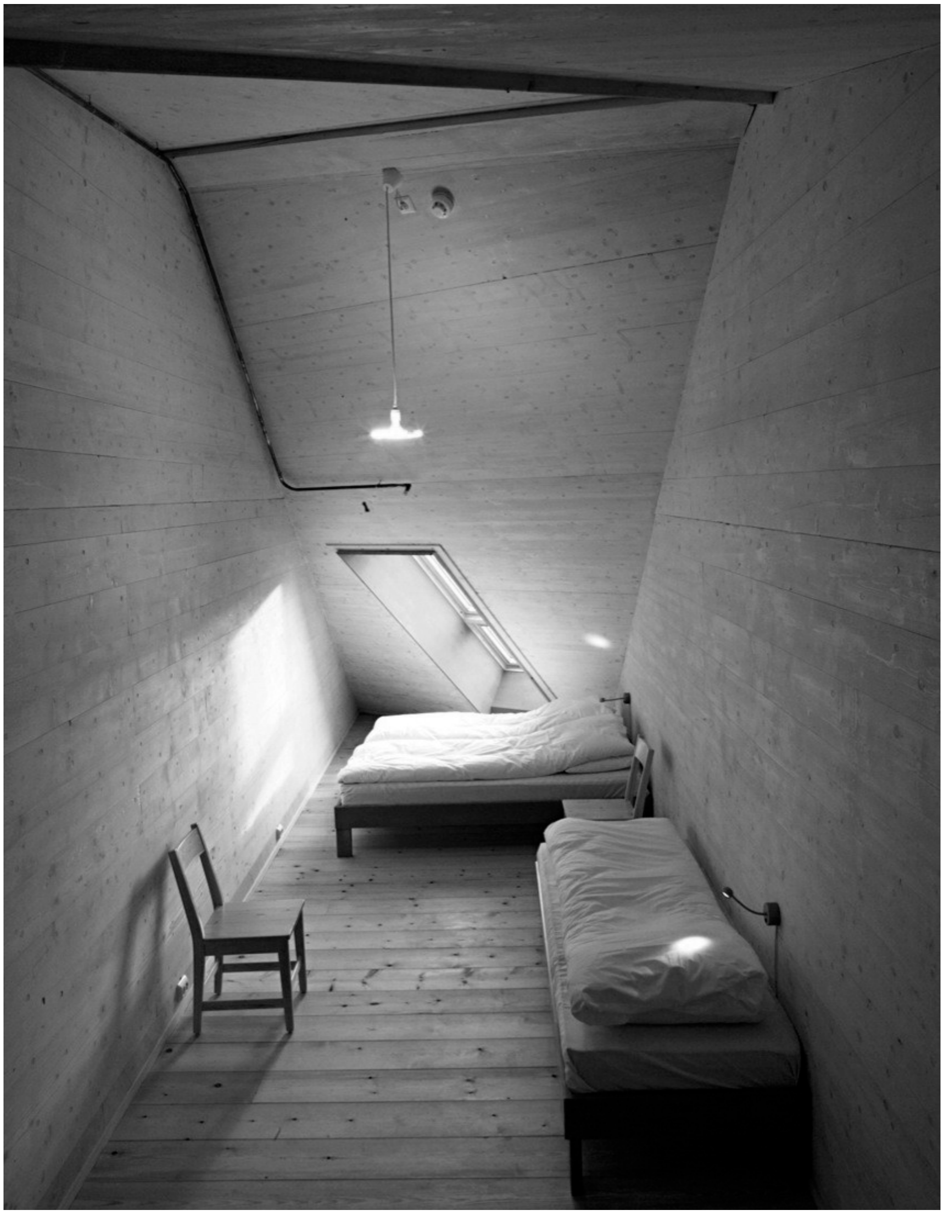


Figure 5. Pulpit Rock Lodge

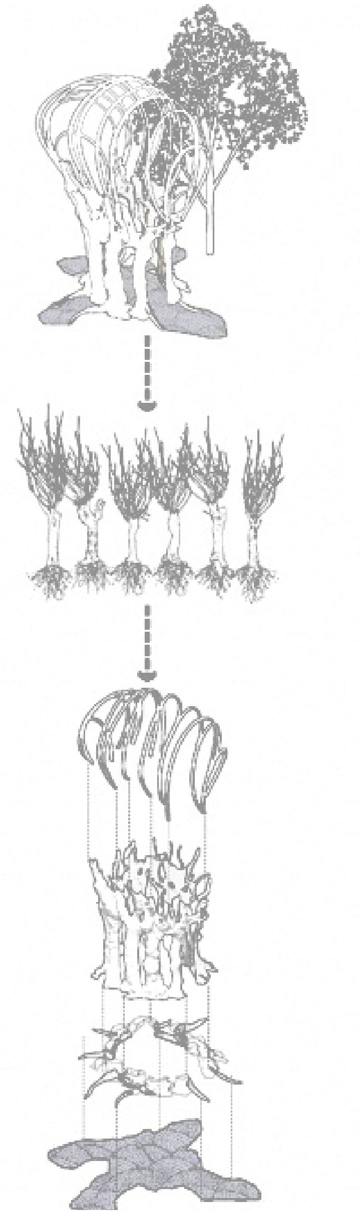


*Figure 6.*Ratatosk

generation, and utilized a fully digital process of milling raw material for assembly. This process influenced the method of analysis and assembly in the Pulpit Rock Mountain Lodge as well

Although Helen & Hard engage in dialogs of vernacular architecture, their work maintains a contemporary Nordic identity that is playful and refined. It is through their direct engagement with materials and technique that their projects hold this identifying form. Additionally 'relational design' as a methodology has proven to be a successful approach for the firm as it holds space for intention and innovation to develop alongside external disciplines.

This approach keeps architecture firmly rooted in the cultural activities of place, while developing unique solutions to place specific problems and challenging perceptions of coherence that include external processes.

Jensen | Skodvin Arkitektur

A Constructional Craft

Jensen Skodvin Arkitektur (Jensen Skodvin) advocate an understanding of the 'profound ways in which the process of construction can alter built form.' Rather than viewing architecture as a representation achievable only in the mode of drawing and model-making, JSA embrace the ability of altercations to add complexity and realness to a project. Their work displays a values-driven approach to site, material, and processes of construction.

Jensen Skodvin view the site as a 'physical manifestation of natural processes that should be highlighted, or muted, through architecture.'[6] In the Mortensrud Church (figure 7), Jensen Skodvin describes the site as a "beautiful, narrow hill-crest covered with pine trees and some exposed rock. It was the kind of place where you might think it a pity to place a building." Placing a method of values upon conservation of the site led to a discontinuous building form. In the Juvet Landscape Hotel as well, site conservation was a driving factor for building form as the intent was to construct in a way that deconstruction would leave the site as though it was never touched; this resulted in pre-fabricated, massivwood assemblies, erected upon steel pilings embedded into the rock.

Jensen Skodvin's work is built to reflect the context of industry and landscape in Norway; the harsh Norwegian environment is often inspiration for the use of raw materials. In the Mortensrud Church, stacked stone was used without mortar to build semi-transparent walls; the pieces are waste from a quarry nearby. Supporting the open stone wall is a standard steel structure with steel straps that are carried across the stone wall. The sheer weight of the stones pressing down upon the straps provides additional lateral stability.[7] Additionally, the desire to avoid conventional proprietary framing systems led to the simple, but efficient, use of the primary structure to support windows.

Jensen Skodvin often emphasize detailing of the primary structural system to allow this system to remain as the finished layer;

Figure 7. Mortensrud Church, Oslo, Norway

this value reduces cost and construction time, and allows for traceable reading of the system. In the Monastery at Tautra, the structural system of timber provides both the spatial and structural module for the building. Utilizing a refined primary structure, again, helped to reduce overall costs by not having to address specific assemblies and methods for corners, as the corners are taken up by the column. Wall infill is treated like a rubberized section, which is able to create, or take-up, slack where needed.

Jensen Skodvin's work strives to communicate the buildings assembly, while exhibiting clear commitment to tectonic endeavor. Their working method values the complexities involved in working directly with materials and methods, and takes a conservationist approach to dealing with site.

Rintala | Eggertsson Arkitektur

A Constructional Craft

The work of Rintala|Eggertsson is inspired by the unique cultural activities of the Nordic North. Sami Rintala, who traces his lineage to the reindeer herding Sami groups who inhabit the Lapland region of Norway, Sweden, Finland, and Russia, still organizes his daily activities around those which are culturally important, like smoking meat and taking a sauna. The work of Rintala|Eggertsson is characterized by an interest in the activation and cultivation of a collective 'memory bank' of atmospheres, and advocates for an architecture that ties into them.

The work of Rintala|Eggertsson emerges from within a questioning of industrialized systems, arguing that contemporary economics tends to 'turn the landscape into a mechanized system of production, traffic and information, simultaneously losing control of it.'[8] Their questioning is firmly rooted in a working tradition unfamiliar with concepts of contemporary capitalism. Rintala|Eggertsson have developed a focus on topics related to religion, ritual, and local customs. For instance, a series of lookout points in Seljord, Norway, were formed around a sea serpent myth unique to the region. (Figure 9) The myth has translated into contemporary times and become an integral part of how people who live in Telemark conceive of the surrounding landscape. The projects are conceived of as a series of resting places between the landscapes of known and unknown, and feature an elevated viewpoint, sauna, and fish-camp.

Rintala|Eggertsson's projects embody a characteristic clarity of structure that links a primitive Nordic approach with minimalist values. Milu, for instance, constructed for the Nordic Pavilion at the 11th Venice Biennale, invokes Finnish wooden pile structures that were traditionally built to produce tar. The simple notion of stacking, combined with a clear spatial module, defines the form of the building; structural elements simultaneously serve as finished material and furniture. But Rintala|Eggertsson's work is unconditionally regional in professional understanding. This work results through Rintala|Eggertsson's interest in engaging with

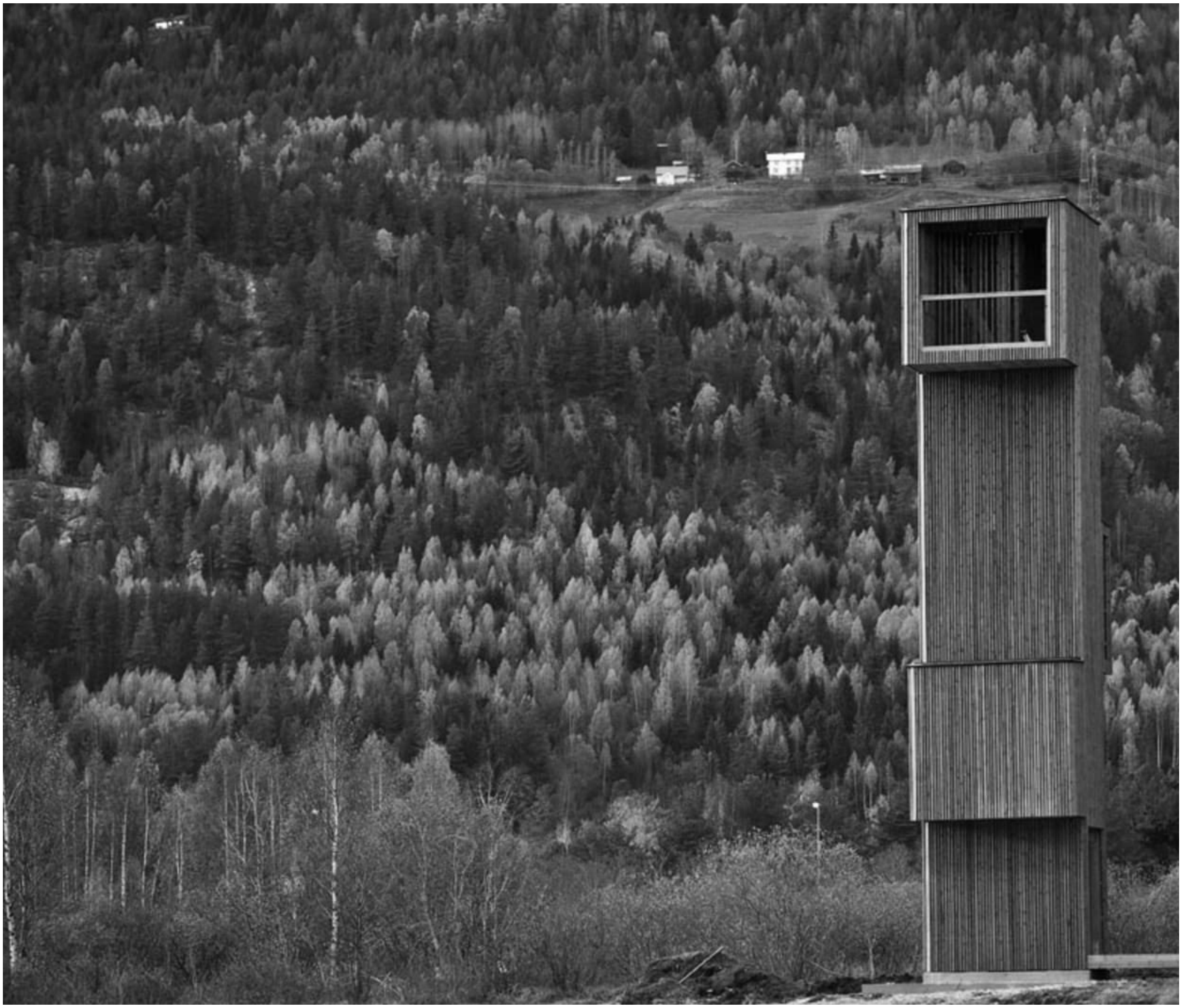


Figure 8. Seljord lookout tower

local knowledge in craft and production.[9] Their work articulates an interest in translating tradition in contemporary construction while maintaining a decidedly minimal aesthetic. Rintala|Eggertsson define their efforts as creating a 'collage of the existing,' seemingly more focused on issues of local customs and life, including themes of ritual and religion, than architectural form, leading to a search for new ways to understand particularities of place.

Bernardo Bader Architekten

A Constructional Craft

Working near Vorarlberg, the Westernmost region of Austria, Bernardo Bader's work translates the timber heritage characteristic of the region through engaging contemporary design methods with traditional material knowledge. Bader is one of many Vorarlberg craftspeople and designers working towards a collective conscience in resource usage and design aesthetic.

The region of Vorarlberg is unique in that it has the second-smallest population in Austria, yet is the most productive in terms of exported textiles and goods; the region is also well-known for its timber heritage. Just a few hundred years ago in Vorarlberg, you'd find that the person building your house was also the one who designed it, milled the trees, dried the trees, felled the trees, and managed the forest from which they were harvested. This process remains embedded in the collective craft of the region. Bader's work reflects the use of this accumulated knowledge by engaging the learnings of traditional construction and combining them with contemporary tools and materials.

Like Helen & Hard, Bader works from a position of material poverty, approaching a site and seemingly asking: what can we do with the materials that are here? In the Haus am Moor (Figure 11), for example, Bader and his team determined exactly how many board feet of material was needed for construction, and felled, dried, and milled the trees themselves. Building on deep ecological and material wisdom, Bader felled the trees during the Winter full moon, following centuries of tried-and-true methods for ensuring the durability and stability of wood.[10] Maximum use of material was ensured through coordinating the need for larger and smaller building elements, and identifying them in trunks and branches prior to processing. This is a method that wooden boat builders have used for generations, and translates well to building construction. During excavation for the construction of the foundation, rich clay was found and testing ensued to determine what could be done with it; it resulted in a series of

Figure 9. Haus am Moor

plates which make up the sub-floor, and provide radiant heat through the inclusion of plumbing.

Much of Bader's work builds upon the tradition of Alpine construction methods, which often employ solid timber elements surrounding a massive masonry or concrete core. Bader's work utilizes the structural core as a scaffold for the timber elements, which frees the timber elements from a system with different expansion and contraction ratios. The result is often walls that seems to float above the landscape, while consolidating services and enhancing a sense of safety for inhabitants.

Bernardo Bader's work exemplifies an approach that is embedded in place and emerges from deep ecological wisdom. Working in this way, the buildings are much more than places or space, they are a part of the pattern of living which is specific to Vorarlberg.

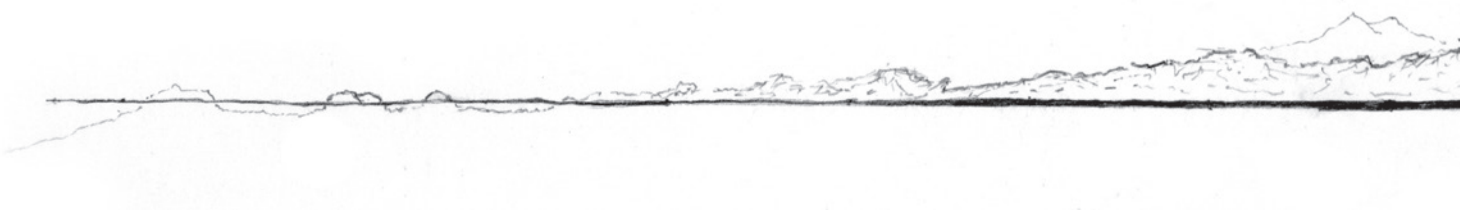
Come this way Mr. Traveler
and never be afraid
The floods have all subsided
we no longer have to wade
Trout are in the river
we catch them at our ease
The weather's moderated
no danger of a freeze
The winds are blowing milder
we feel a sort of charm
And the waters which were raging
have ceased from doing harm

Come out here Mr. Eastern man
and settle down with us
Land's so poor back yonder
you can scarcely raise a fuss
But here's the land of plenty
the land of perfect ease
And the milk and honey's flowing
from the cows and honey bees.

- Charlie Grant, 1906

The Skagit

The Skagit River is one of the most powerful rivers on the West Coast of the United States. The scenario for this thesis is the Skagit River Delta, the lowland area well-known for its agrarian landscape. Using the approach and analysis discussed earlier, the following chapter investigates settlement patterns and ecological relationships in the Skagit to uncover how design strategies might engage the place.



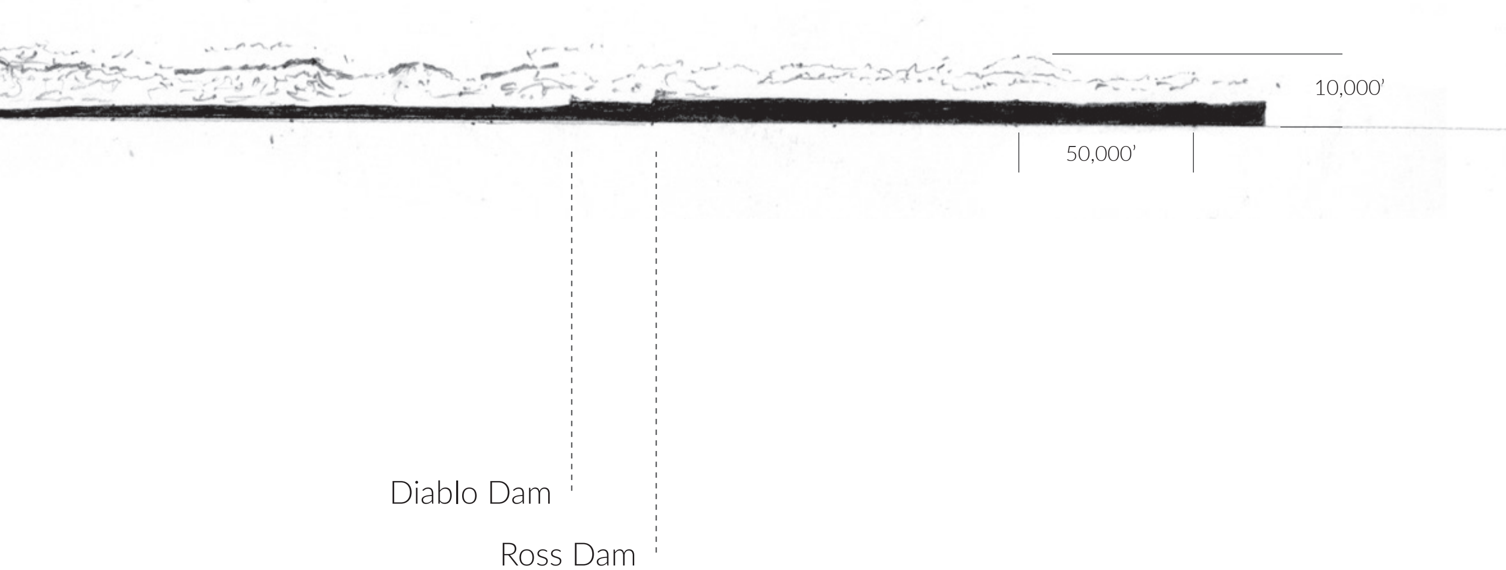
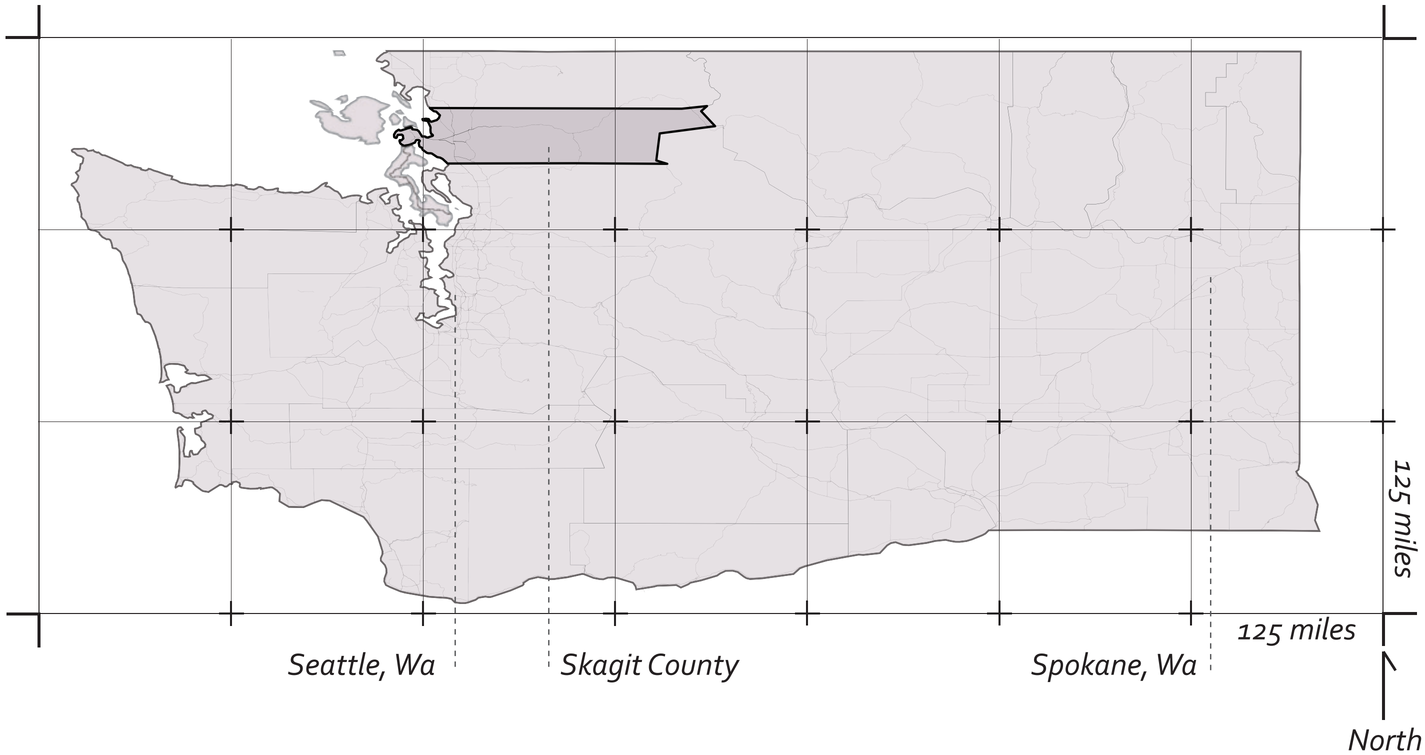
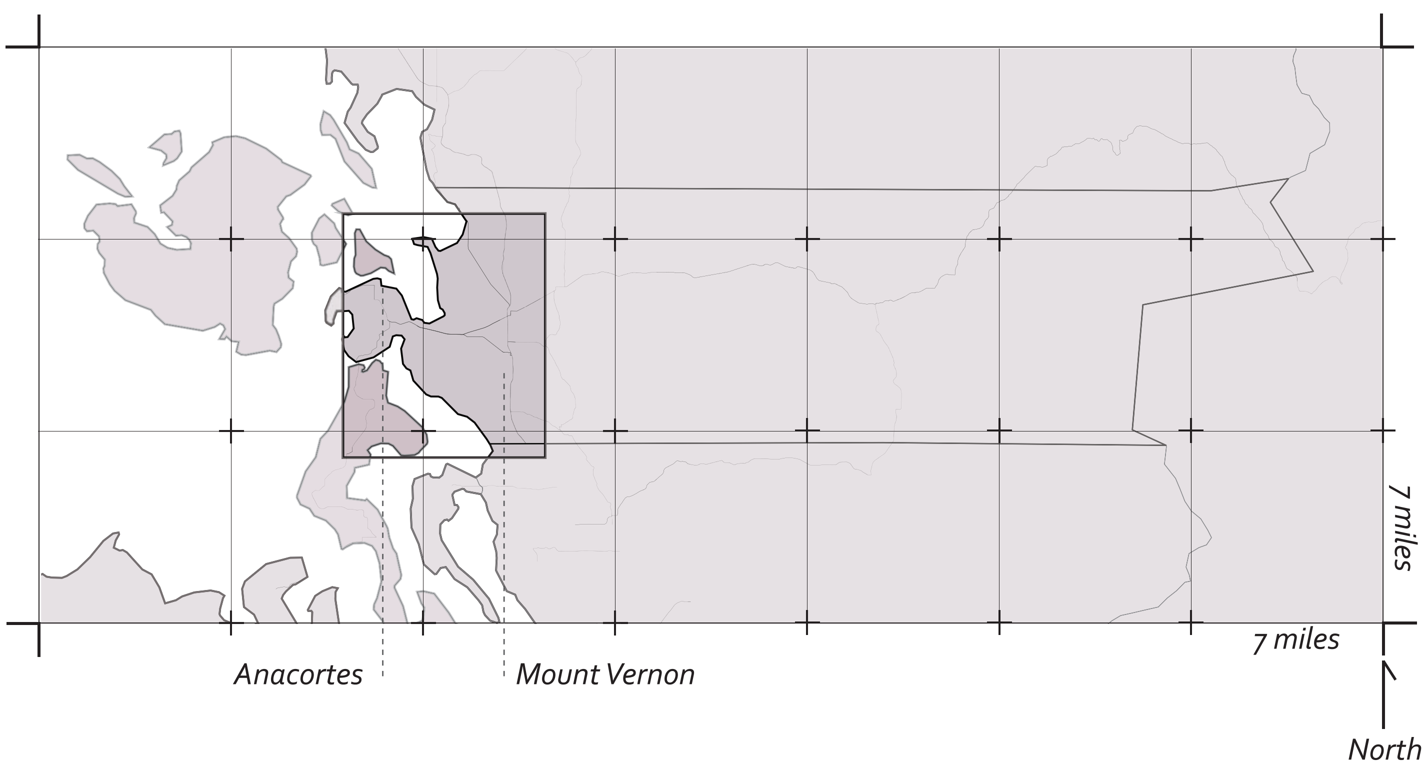


Figure 10. Section drawing of Skagit River

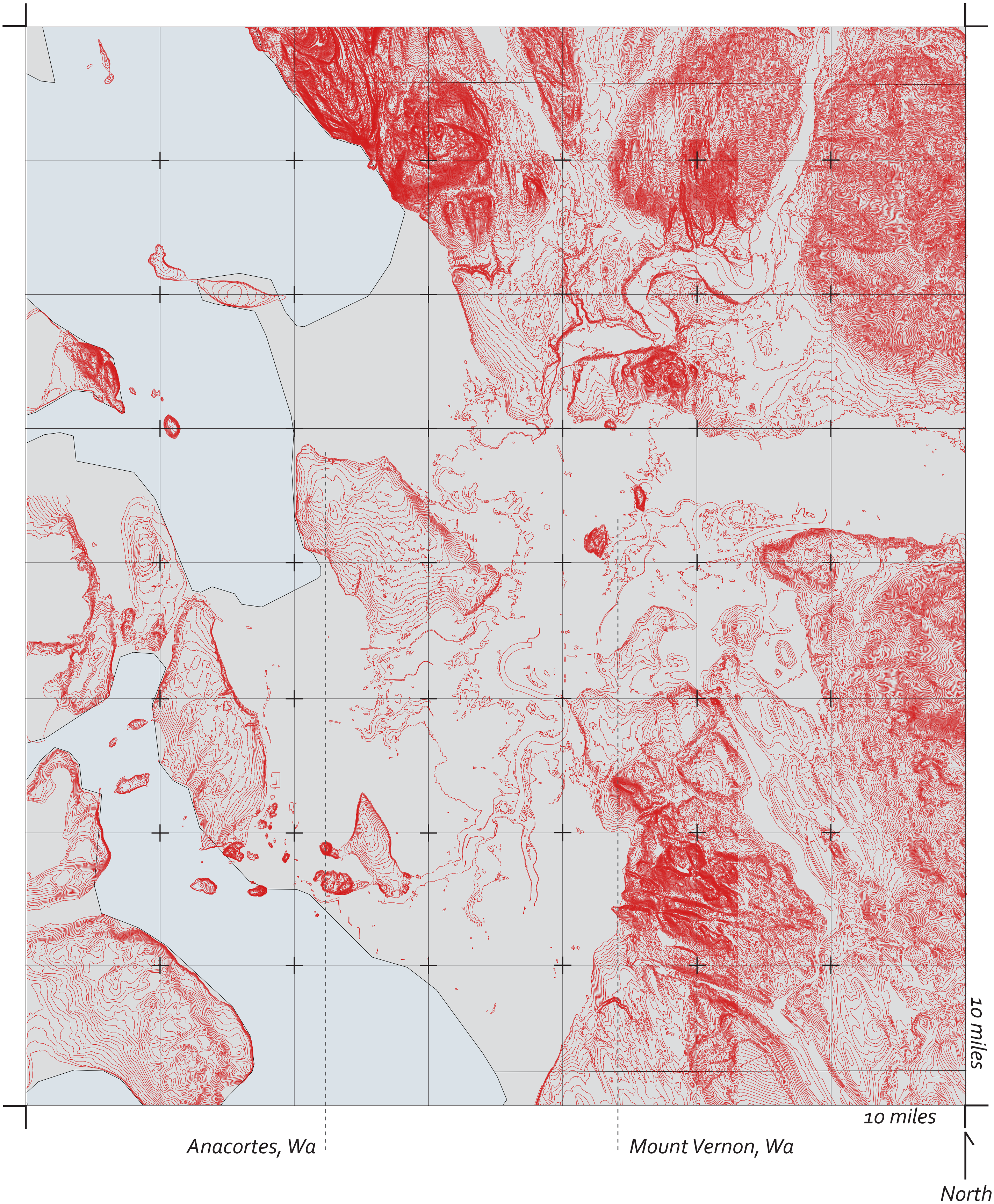


Skagit County in Washington State



The Skagit River Delta

Figure 11. Location of the Skagit River Delta



Skagit River Delta Topography

An agrarian identity

The Skagit

For many underprivileged European immigrants, the nineteenth century fulfilled the common dream of North America: to own land -- and to work it with their own labor and benefit from this production without exploitation. The first plow in the Skagit struck ground on March Point in 1853[11] , laying bare the fertility of the soil. The work of oxen soon redefined the region's landscape, and settlers swarmed upon the land, extracting its stored wealth. Their intentions were honest, tectonic even, they simply wanted to farm, to raise a family and provide a life that was better than they had been offered. Like much of North America, these agrarian acts forged the image of the Skagit River Valley we know today: emblematic virtues of thrift, authenticity, self-sufficiency, and integrity. This image has become more and more difficult to retain; urbanization and an ageing population compound risks associated with climate change, and large corporations are replacing local-ownership.

Today the fields of Skagit are mixed with architectural relics of earlier agricultural times and contemporary, stick-framed suburban developments. Contemporary farmers continually balance the values of a way of life that extends beyond the motivations of capital growth with the reality of a development-hungry society.

Timber beginnings

Like many places in North America, European pioneers discovered a nation full of healthy forests because First Nations Peoples practiced management principles that were in-line with ecological processes.[12] Early European forestry practices in the Skagit River Valley focused on clear-cutting and slash-and-burn methods to reveal arable land and process valuable timber products, such as cedar shingles and Douglas-fir lumber.[13] During this time, trees were cut by hand and large sections of timber were carried out on skid-roads by teams of oxen. Since the most valuable trees were removed first, small-diameter and more diverse species of timber were left to provide habitat for animals

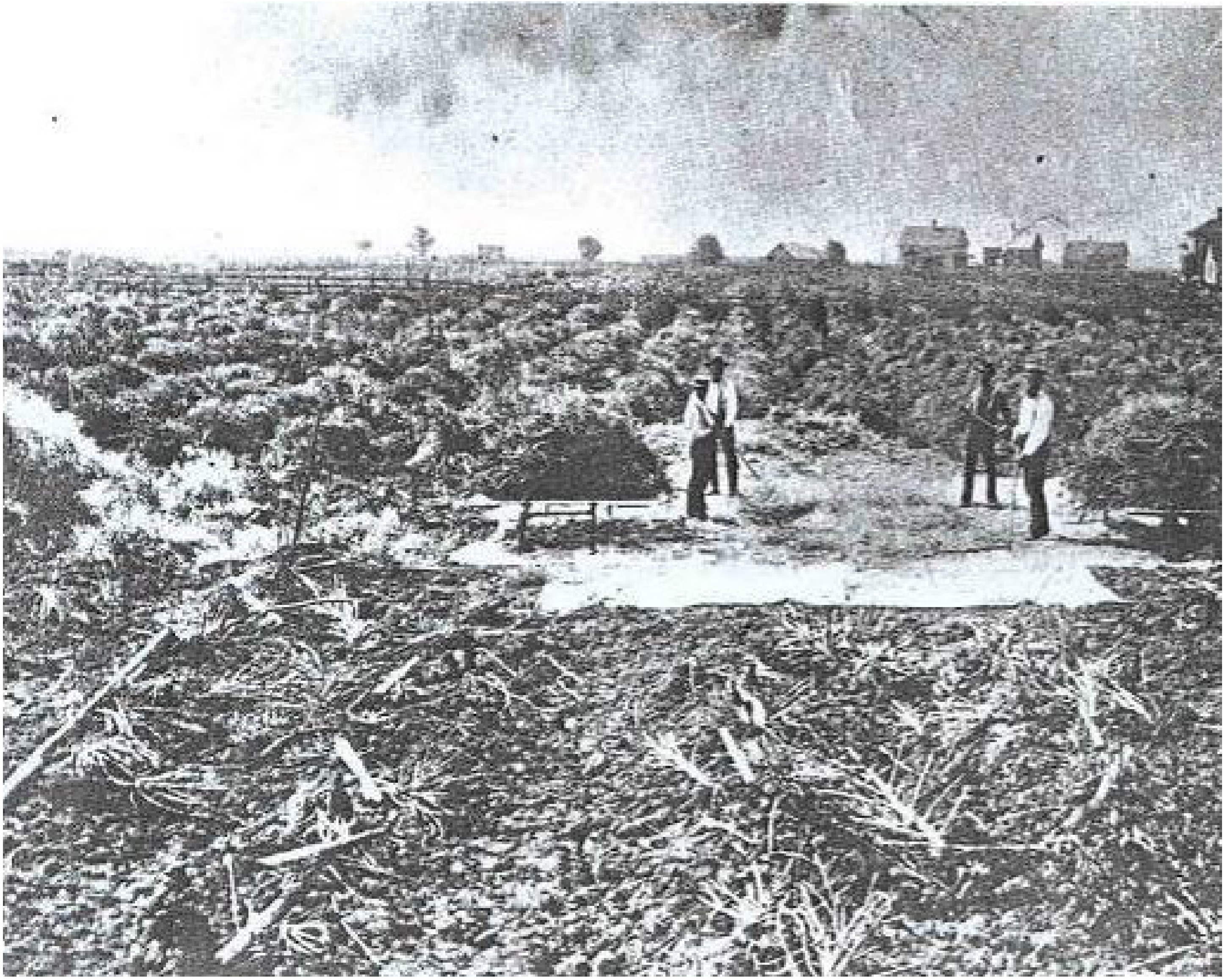


Figure 13. Early farming in the Skagit

and serve as 'forest food' for young seedlings. This worked well in the uplands, but by 1906 the once forested floodplain of the Skagit River had been completely logged, diked and drained, and was becoming one of the nations most agriculturally productive regions.[14]

When this wetland forest was logged, there were no plans for regeneration. In fact, a quick visit to the region reveals more European Poplar, which suffers from fungal disease in humid environments, than the native Balsam Poplar, and is indicative of the innocent, yet destructive, mindset that shaped this region.

Subsistence Agriculture

The seeds of this ecological conflict were not sown by farmers riding diesel tractors and wielding fossil-fuel powered tools, but by those guiding hand-driven, oxen-led plows.[15] Early beginnings of agriculture in the Skagit were based on subsistence farming, focusing on the essential needs of survival. The first dikes in the region were constructed in 1863. The Skagit quickly became known for potato, hay, and oat

Figure 14. Barn in the Skagit Valley

production, and farmers utilized excess food to procure additional goods needed to survive.

1897 is the first documented major flooding of the valley.[16] Flooding had naturally occurred in the region long before European settlers arrived, in fact the Skagit First Nations creation-story is rooted in a flood narrative, but in 1895 a memo to the Senate and House of Representatives from farmers in the Skagit suggested that development and logging greatly exacerbated the effects of rising waters.

Classic Agriculture

Subsistence agricultural methods in the Skagit began to give way around 1920, with soldiers returning from WWI and beginning to dig in to the region's agricultural productivity.[17] Land-planning and architectural remnants of this era remain today, building locations and plot layouts still drive the overall organization of farming practices.

Farmers primarily concerned with

efficiency might locate their buildings nearer to the center of their land, lessening daily travel distances but increasing isolation amongst groups of other farmers.[18] Those looking for a more social existence might locate their buildings along the edge of their property and adjacent to roadways or trails. This allowed farmers to see and interact with folks passing by, but also increased the travel distance to work one's land.[19]

This era is characterized by the transition from horse and oxen-led farm equipment to innovations of self-propelled machinery that freed the work, and costs, of animals. Previously, farmers relied on sensorial experiences and the knowledge of others to create holistic farming methods.[20] Farming innovations in the early 1920's gave rise to isolated farm componentry, chemical treatments, and genetic modifications centered around production efficiency. Rural farm life was a thing of the past and labor-intensive activities were quickly replaced by expensive machinery, and ethical decisions were driven by ideas of a higher standard of living. By 1925 the Skagit was producing millions of pounds of valuable cabbage seed, but this mono-culture crop contracted a virus in 1942 and farmers were left with roughly half of their anticipated crop.[21] Farmers and scientists quickly worked together to identify the need for crop-isolation and rotation.

Agro-industrial

Our current agricultural period is still effected by the developments of Classic Agriculture: crop production has primarily become a factor of external inputs rather than sustainable land management. The social make-up of the farm was redefined by chemical and equipment innovation. In the Skagit, transitions to seed production have greatly altered the ways in which farming is accomplished, requiring single crops to develop for decades and needing volumes of land to develop isolation from competing, and potentially gene-altering, adjacent crops.[22] Multi-national farm corporations are also taking stake in the distribution of international seed goods, illustrated by recent acquisitions of Skagit seed companies by Danish and Japanese investors.[23] Land-planning practices driven by seed crops have in part given rise to a unique relation of farming: the cooperative.

A return to the cooperative

Farmers in the Skagit River Valley have become well-known for the production of seeds. Today, the region is proud to boast, among other crops, production of 95% of the nation's table beet seed; 75% of the nation's spinach and cabbage seed; 25% of the world's beet and spinach seed; more tulip, iris, and daffodil bulbs than anywhere else in the U.S.; and 95% of Washington grown red potatoes.[24] Much of this produce ends up on tables in Seattle and Vancouver, creating a direct relationship between these metropolitan areas and the ways of cultivating the Skagit River Delta. (Figure 20) In seed production, the need for isolation and

Figure 15. Row-crops in the Skagit

rotation from adjacent crops has developed into a system of collective identification of land, need, resources, and planning. Each year Skagit farmers gather to coordinate this practice, but it is currently at risk due to a lack of farmers. Like many farming communities across North America, Skagit farmers are effected by an aging population and the consolidation of many farms into few as some modern practices, such as automation and bigger equipment, have permitted larger farms run by fewer people.

Conclusions

The relationship of farming and the land is inherently one of ecological conflict, as setting aside land for mono-functional use removes its role in the ecosystem. This simplified account is meant to illustrate the difficulties faced by the applications proposed in this thesis. As many elements of our society, contemporary farming has developed in an industrial manner, only increasing the gap between ecological relationships of land and the production of food. 'Eating is an agricultural act,' Wendell Berry wisely noted, and we are all bound to the appropriate development and robustness of production found on farms.

Much like the constructions proposed in this thesis, nostalgic images are difficult to resist. But the effects of agro-industrialism cannot be changed, and nostalgia only muddies the fact that a pre-industrial condition is neither desirable, nor achievable. However, rooted in this understanding of farming in the Skagit, the following chapters propose a method of construction that attempts to alleviate some of the burden born by contemporary farmers.

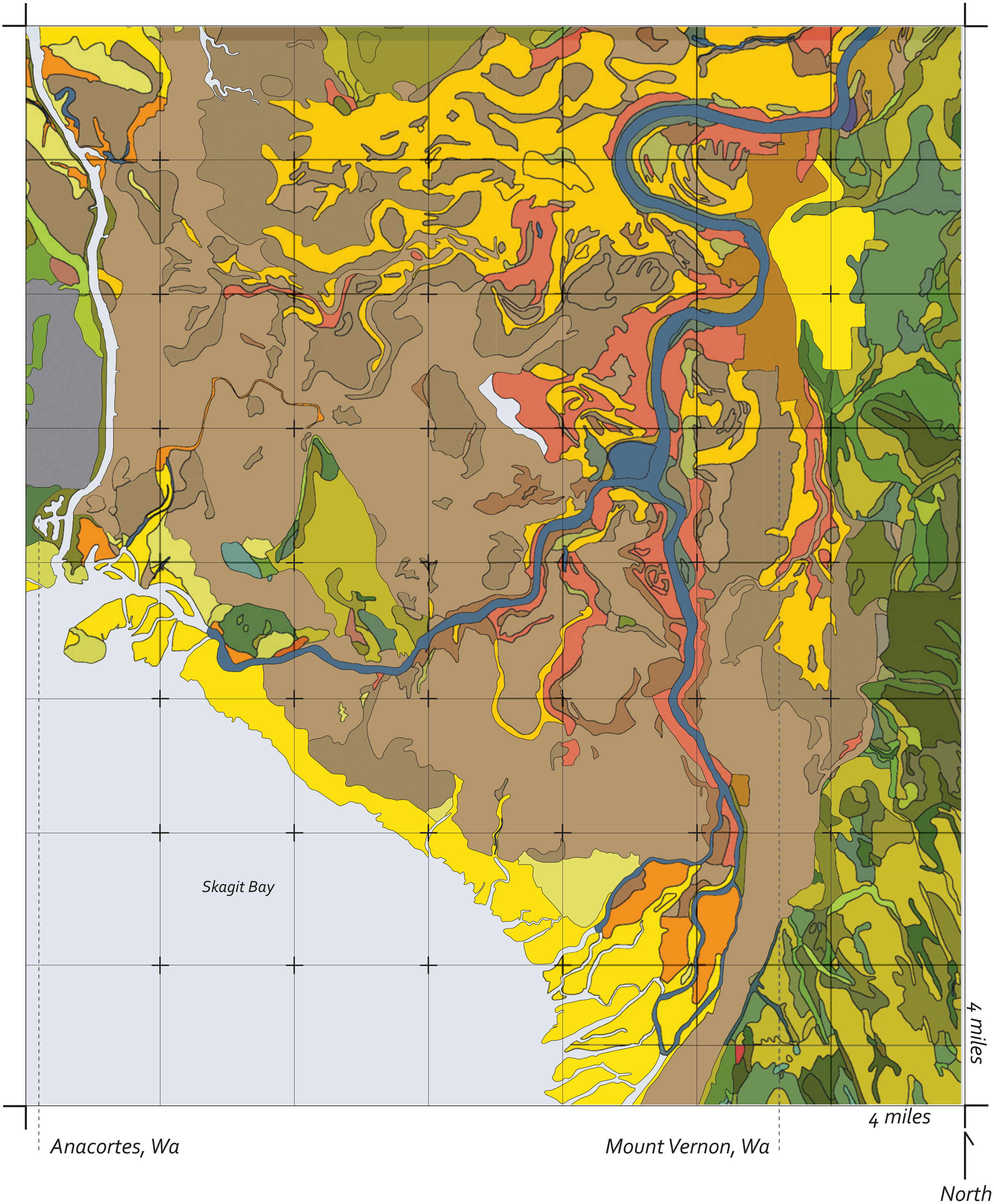
> *Let us remember too, that we live in a country of small farms, and free hold tenements; a country in which men cultivate with their own hands, their own fee simple acres; drawing not only their subsistence but also their spirit of independence and manly freedom from the ground they plow. They are at once its owners, its cultivators, and its defenders.*
>
> *Daniel Webster, 1840*

Figure 16. Skagit farming collage

Collage of conditions faced by Skagit farmers: encroaching urban development, increasing land-use intensity, and separation from the river.

Figure 18. Skagit Agricultural land and Seattle urban development

Figure 17. Skagit floodplain remnants



Skagit River Delta Soils Map

Figure 19.

The difficulty of flooding

The Skagit

In the Skagit River Delta, deforestation and narrowing of the river channel by the construction of levees has contributed to flood risk. In response to rising water levels, flood walls and higher levees have been constructed. While more research and design effort is put into coastal planning for metropolitan areas, strategies for rural communities seem to address concerns by implementing the same measures that initiated the risk in the first place.

In the Skagit, however, new initiatives are in place that educate farmers on the importance of setting aside land for the restoration of riparian buffers. The benefits to this restoration, however, largely exist outside the realm of profit, a reality in which farmers are already marginalized, making restoration difficult.

Diked and Drained

The first dike in Skagit County was constructed by Sam Calhoun in 1869.[25] Calhoun's land soon began producing an abundance of crops, roughly 60 bushels of barley per acre, establishing the on-going relationship between Skagit farmers and cyclical flooding.

As Mount Vernon, and the Skagit Delta grew, levees were constructed. Proper ones came in 1918, which reportedly followed drafts of drawings by Leonardo DaVinci.[26] Major flood management projects led by the U.S. Army Corps of Engineers were conducted between 1937 and 1941, and included the construction of concrete spillways, 'more robust levees,' and 'properly engineered bridges,' in addition to the Ross Dam. These measures, however, have not eliminated flooding; figure 22 shows occurrences of major(orange) and minor(light blue) flooding incidence since these infrastructure improvements in the late-1800's.

Acknowledging the increased risk associated with proximity to the levees, farmers in the Skagit River Valley have recently begun altering practices of land management to accept flooding rather than defend against it.[27] In 2011, the EPA, Fish and Wildlife Foundation, and Conservation Office worked together to

Figure 20. Flooding Diagram

remove a portion of the levee at Fisher Slough; the project recovered 50 acres of farmland for conversion to forested wetland. Increased runs of juvenile salmon have been documented, and the enlarged flood basins reduce the risk of flooding in adjacent farmland.[28] Beneficial as it is, this project was initially met with much skepticism.[29] Increased costs of doing business keep farmers in a marginalized situation, and converting a potential revenue source into conserved animal habitat was in stark conflict.

This is just one small effort to resolve a rather large ecological concern. Forested riparian buffers are one of the most important conditions effecting river water quality.[30] Yet, restoration projects often require potential harm to endangered species or ecosystems to be implemented; by that point the projects have so degraded ecological function that conservation is a requirement.

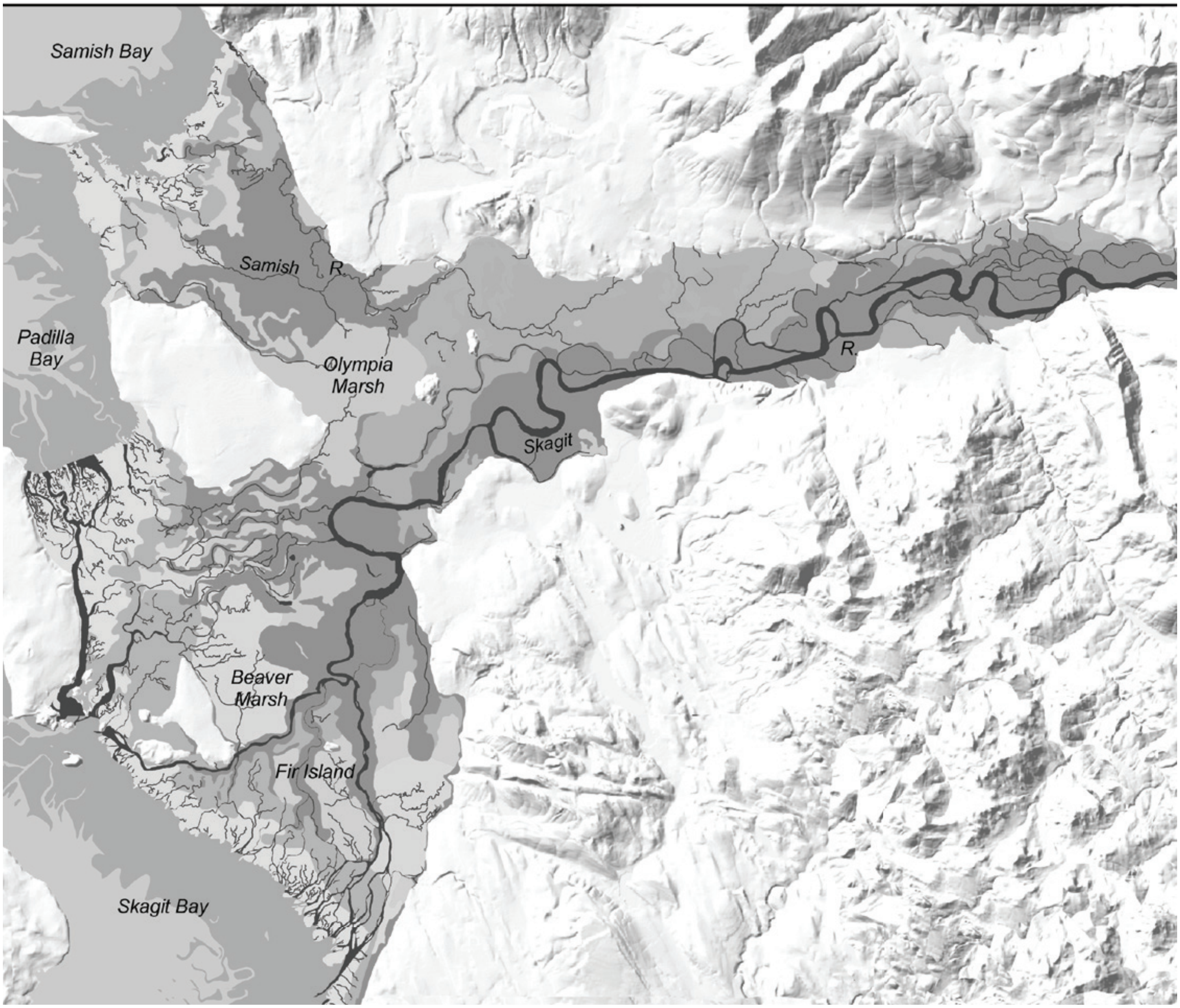


Figure 21. Map depicting the pre-European settlement wetland condition of the Skagit Delta

Figure 22. Map depicting the current settlement wetland condition of the Skagit Delta

The stationary cycle

The Skagit

To say that the timber industry is an important cultural activity in the Pacific Northwest would be an understatement. Construction developments in the mid-20th century, such as light-timber framing, were centered around a limited number of tree species, greatly altering the structure of existing forests.[31] Contemporary innovation in timber products largely exists within this globalized system. Currently, lumber mills in the Skagit River Valley, and much of North America, face growing concern over diminished quality of timber resources and decreasing profit margins generated by pressure from large corporations.[32] In our current environmental awareness, can new perspectives in forestry practices combine with local processes to develop hybrid methods of construction that exist within local ecological processes?

Forest as Resource

Like most places in North America, European pioneers discovered a nation full of healthy forests because First Nations Peoples practiced management principles that were in-line with ecological processes.[33] Early European forestry practices in the Skagit River Valley focused on clear-cutting and slash-and-burn methods to reveal arable land and process valuable timber products, such as cedar shingles and Red Cedar lumber.[34] During this time, trees were largely cut by hand and large sections of timber were carried out on skid-roads by teams of oxen. Since the most valuable trees were removed first, small-diameter and more diverse species of timber were left to provide habitat for animals and serve as 'forest food' for young seedlings. This worked well in the uplands, but by 1906 the once forested floodplain of the Skagit River had been completely logged, diked and drained, and was becoming one of the nations most agriculturally productive regions.

When this region was logged, there were no plans for regeneration of natural wetland forests. In fact, a quick visit to the region reveals more European Poplar, which suffers from fungal disease in humid environments, planted as agricultural fence-line than the native Balsam Poplar, which is acclimated to our region; not to mention the lack of Cedar, Alder, Cottonwood, Vine and Big-leaf Maple, Willow, Quaking Aspen, Sitka Spruce, Western Hemlock, and Douglas-fir that made up only a portion of these wetland forests.

Forest production reached its current industrialized situation just after World-War II. The 'working' forests became intricately tied to the demands of the construction market and the need to supply pine, Douglas-fir, and Spruce at an industrial scale is reflected in the subsequent replanting of mono-crops.[35]

Building Culture

Overwhelmingly in the Skagit River Valley, and increasingly abroad, limited-species, light-timber platform framing defines the building culture.[36] The ideas that drove this method of construction, however, have lost much of their relevance.

Platform framing evolved in the Mississippi River Valley in the early 1800's through the work of Franco-American timber framers who discovered the value of metal nails in reducing the need for complicated joinery.[37] Early developments in Chicago, Philadelphia, and Minneapolis gave rise to nuanced characteristics based on the craft backgrounds of immigrant communities. Assimilation into the mental landscape of America occurred through platform framing's capitalization on the nation's abundance of resources and perceived scarcity of skilled labor. However, it was through post-war reconstruction efforts in North America that the process developed in its current form.

Seen as a construction method that could provide quick, temporary structures for the Army, the method was adopted by veteran developers looking to provide housing solutions for returning soldiers. What was once rooted in the tradition and innovation of timber-framing had become bound to its fiscal economy, and was an integral part of American culture by the 1950's. By the mid-1960's innovation on the method, once driven by cultural diversity, had largely stagnated.[38] 'Similar to any new technology, platform frame construction found 'closure,' or a moment when it was perceived to solve all open questions, and work on the problem stopped.[39]

Solutions in small-scale forestry

Contemporary forest ecology theories are changing the approach to timber management; clearing the way for access to diverse timber species and a willingness to rethink the timber processing industry. In the Skagit, forested riparian buffers are one of the most important conditions effecting river water quality.[40] Where industrialized forestry methods require large tracts of land to support an efficient scale of production, small-scale forestry measures may reveal an alternative that allows for the harvesting of species with little-to-no disturbance of forest health.

One such alternative might be the method of coppicing timber. Coppicing is a traditional process of forest management in which trees are cut low to the ground, rather than removed entirely, so that regrowth occurs within the existing stump base. The process maintains soil integrity of the forest, while providing an ability to harvest material. Most common in Southern England, coppicing has been used in low-land European countries for thousands of years.

Conclusions

A building has a direct relationship to its territory; when we build primarily with one system, we alter our ecosystem in accordance with our needs for that one material. But we can also reverse this cycle, asking ourselves what might be needed to repair or restore our environment, then designing ways in which to work with those materials.

Figure 23. The Skagit River with cottonwoods in the background

In place of traditional notions that stability was desirable in ecology, there is increasingly recognition that disturbance is not only inevitable in many systems, but essential for their regeneration.[41]

- G. Mathias Kondolf

Seeking Solutions

Looking at the history of the Skagit River Delta, we can see the recurrence of extreme floods, each leading to a campaign of consolidation and the construction of new defense systems. Rather than working on rigid, mono-functional infrastructure, the following proposal investigates how a design strategy that is rooted in natural processes can emerge from the landscape to provide more space for the river, while increasing biodiversity and reducing flooding.

Working across scales, the proposal focuses on reinterpreting different locales which materialize the overall design strategy, with each strategy forming the basis for more detailed interaction. The afforested areas of the previous strategies becomes the origin of materials for future design proposals. Red Alder, a tree unique to the Pacific Northwest, is the afforested tree species of choice due to its ability to quickly repair damaged riparian sections and provide habitat for a variety of species.

Potential for re-connection

Seeking Solutions

In the Skagit River Valley, dominant methods of cultivation, settlement, and construction have embedded a pattern of separation from the river, the region's source of life. The wetland forest that once mitigated erosion and provided numerous ecosystem services was removed, and the landscape's natural defense replaced with levees, dikes and tide gates. This constriction of the river's channel, and removal of meanders and sloughs means that the river moves faster, and levee erosion and habitat degradation, accompanied by increasing frequency and duration of flooding, are all problems in the area. This pattern of settlement has developed cycles of accumulation, where farmers, fishers, and others, are often working within isolated systems, leaving opportunity for reconnecting natural processes linked to the river. These campaigns of consolidation have increased risk associated with flooding, and primary solutions are to build the levee higher. In view of rigid, mono-functional infrastructure, the river can be seen as the prisoner in the myth of absolute protection. (Figure 26)

A strong solution in design needs to develop across multiple scales; in response, this thesis envisions large scale interventions as the origin point for building scale design.

When the levees were built, Gorge, Diablo, and Ross Dams had yet to be constructed. Today, these dams help moderate the flows of the river; peak Winter discharge rates, for instance, have been reduced by 80%. The dams' ability to moderate flows, high cost of levee maintenance, and increasing awareness of the value of riparian systems are causing the effectiveness of the levee to be called into question. While the effects of climate change are still being understood, they may result in more extreme flows that impact farmland along the Skagit; one solution could be allowing the levee to erode in strategic locations to reconnect the natural processes of the river. (Figure 27)

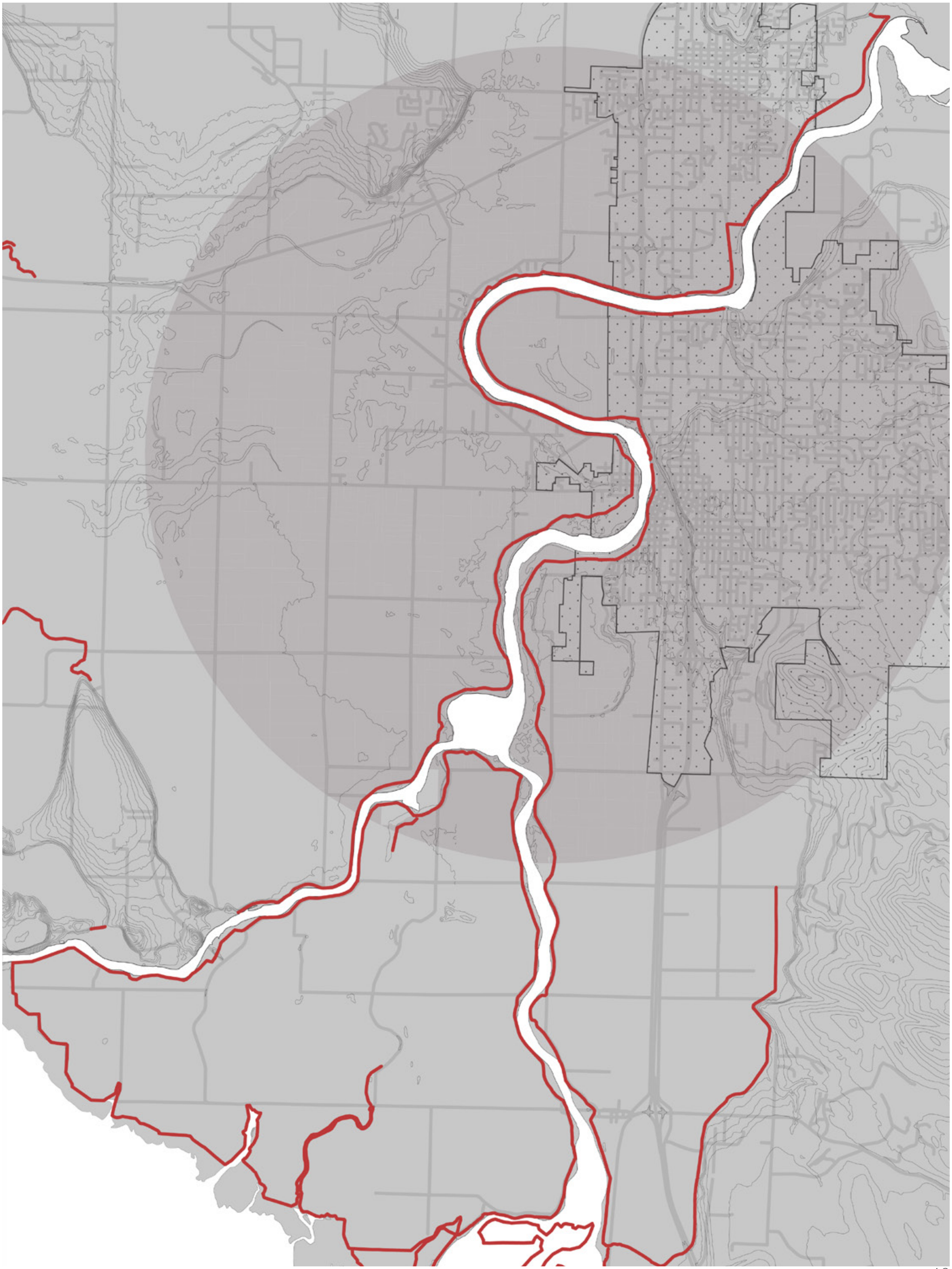


Figure 24. Skagit River imprisoned by campaigns of consolidation. Levee shown in red.

Figure 25. Erosion as element of design to redraw the landscape

To build the building is to build the territory

Seeking Solutions

Clear patterns in the Skagit River Delta are that the river wants freedom to move, increased habitat and forest buffer are of primary importance, and farmers want to benefit from their land. In effort to translate between conventional land-use practices and the above patterns, this proposal envisions three strategies as a way to engage context, increase habitat, and invite connection between people and place. Thus, by using flooding as a component of design, the river becomes an armature to support new uses and modes of inhabitation.

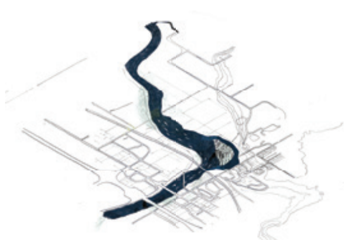
The envisioning of these alterations provides context for future building related proposals, and acknowledges the need for a mosaic of strategies in approaching the repair of a wetland ecosystem.

In relation to the Skagit, this proposal takes form through three primary strategies: meander, reconnect, and stabilize.

Meander - Accumulation of sediment regenerates meanders, which would slow the river offering opportunity for an accessible riparian landscape.

Reconnect - Sloughs once connected the River to the Bay, nourishing a unique community of species. These re-connections hold potential to feed wetland forests that extend beyond the river.

Erode - In areas where the levee could be eroded, soil stabilization occurs through afforestation. This affords a deeper connection to the river while providing additional buffer against flooding.



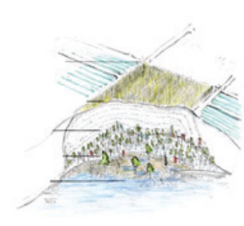


Figure 26. meander reconnect erode

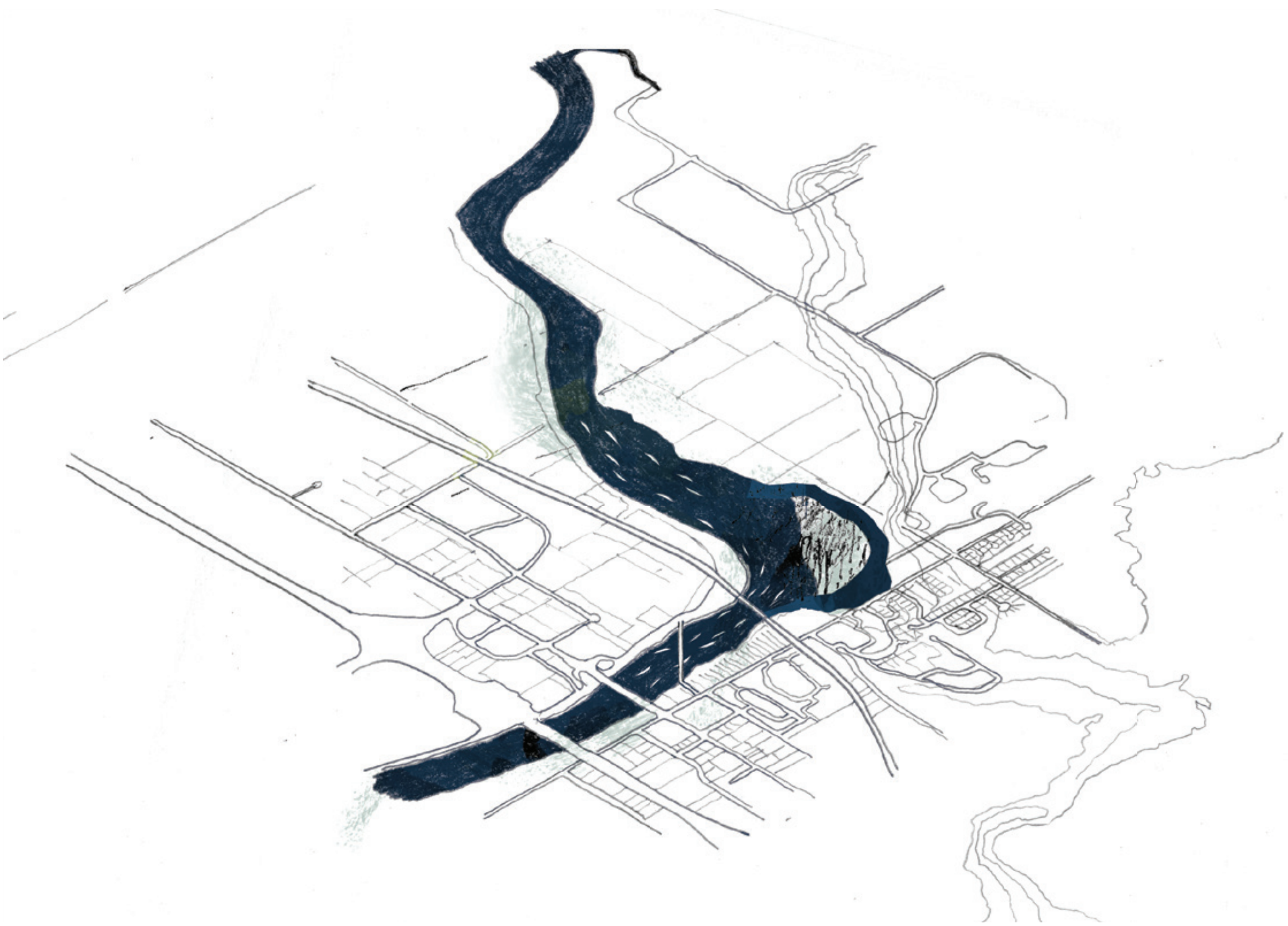


Figure 27. Meander intervention

Introduction of meanders upstream will help reduce flood risk for the urban areas of Mount Vernon, Burlington, and Sedro-Wooley. The meanders also afford a new relationship between the city and water by slowing water flow and increasing accessibility. Diverting and slowing the river decreases the flood risk associated with the waterfront in Mount Vernon, providing safe spaces for migrating salmon within city limits.

A new pedestrian connection between Burlington and Mount Vernon relieves the current pressure of a 'car-only' connection between the cities; this becomes an example of how Mount Vernon can accommodate additional growth to the West.

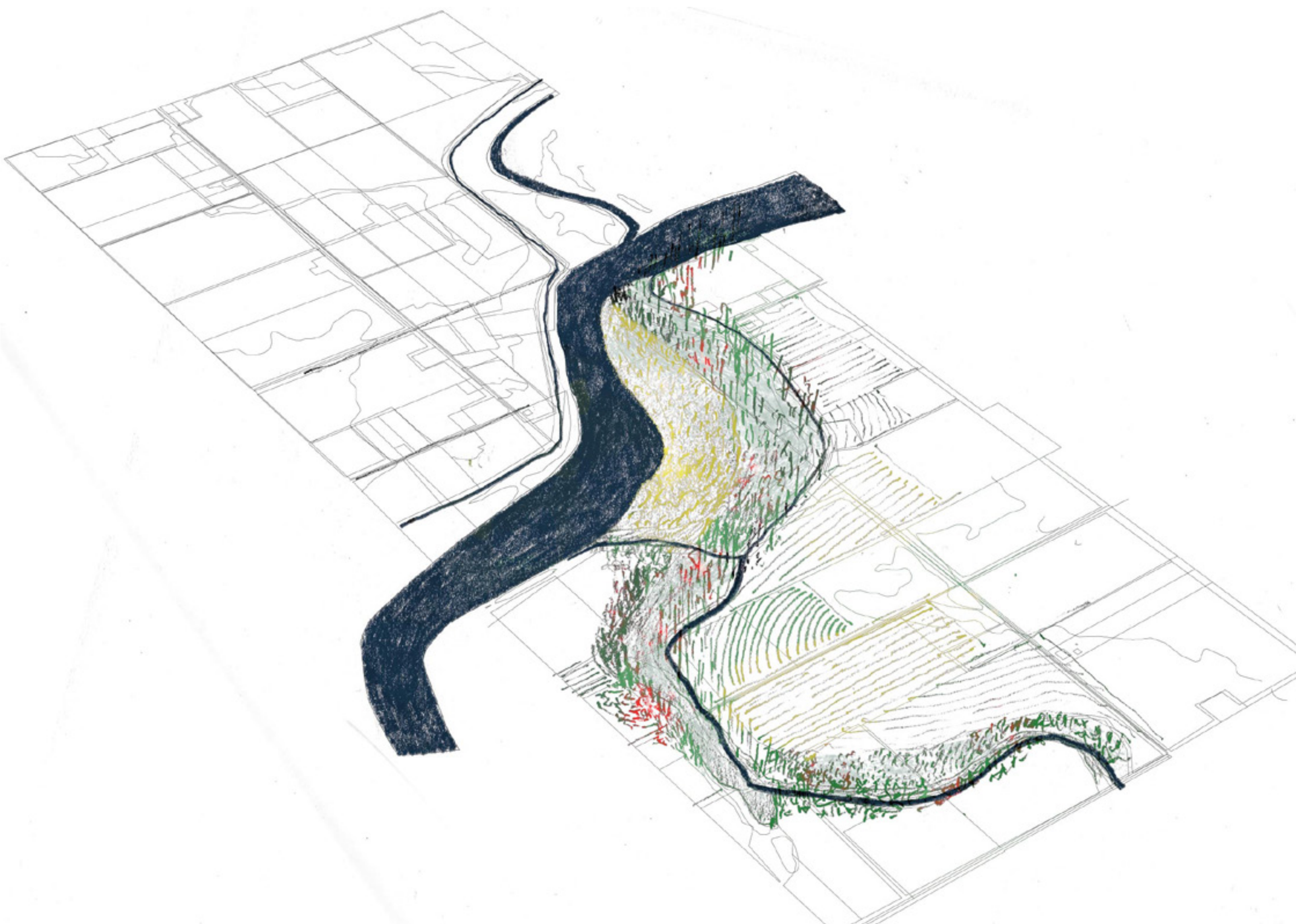


Figure 28. Reconnect intervention

Re-naturalization of the river and old sloughs which once connected the Skagit to the Bay help slow water flow and widen the river to deal with increased flood risk. These re-connections also bring new ecologies into the mono-culture topology of the interior delta. These wetland areas work as sponges, filtering water passing through it and buffering against extreme variations in water level and sediment load.

Unused and under-used fields become temporary reservoirs to accommodate increasing floods. These reservoirs help buffer summer droughts in areas further from the river.

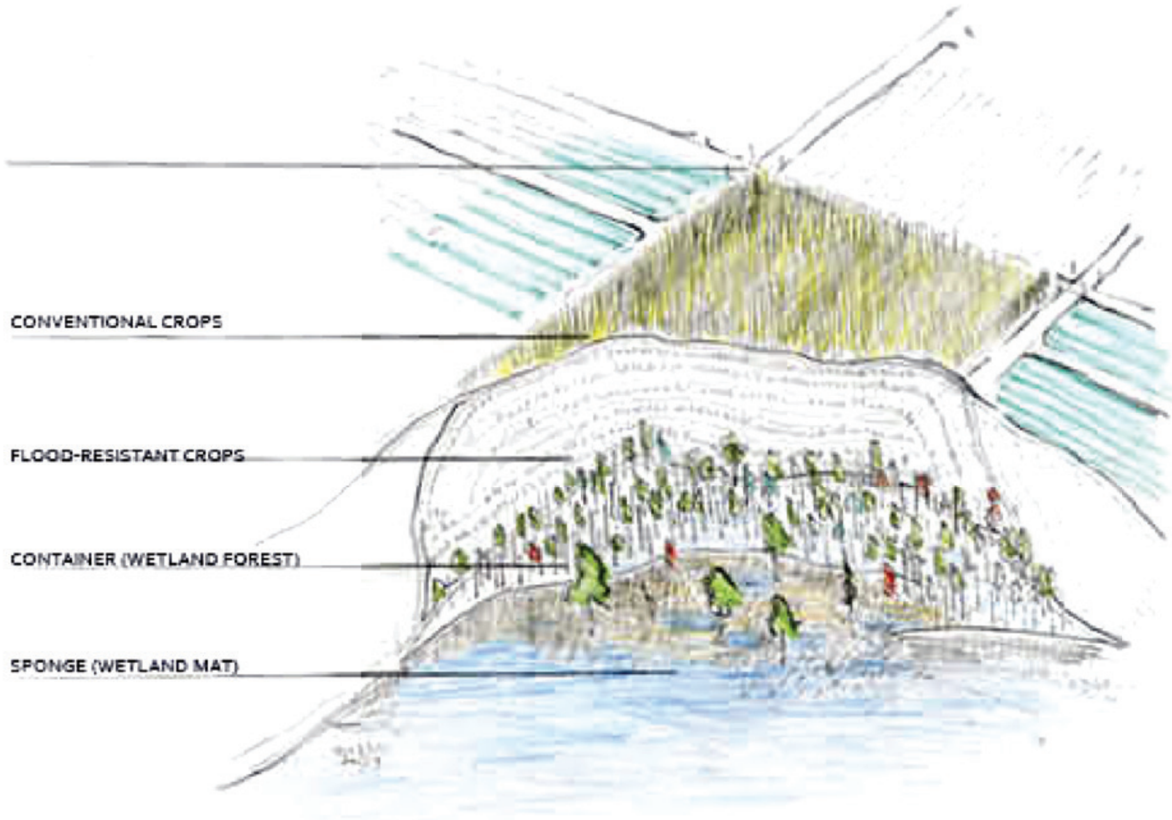


Figure 29. Erode intervention

By creating gaps in the levee, the river can alter the shore and scramble into the desired areas. Erosion then becomes a tool of design, where the river itself can redraw the landscape. Using afforestation to stabilize the land in areas, the project proposes we simply step aside and let the river continue its work of erosion and deposition. These afforested areas also work as sponges and reservoirs to slow water flow during floods, helping infiltration through the roots and reducing evaporation. The forest also provides a unique local resource for construction and furniture industries.

The structure of agricultural land-use translates to accommodate flood-resistant crops. This not only provides additional buffer space for the river, but also works to reduce food and economic loss during times of increased flooding.

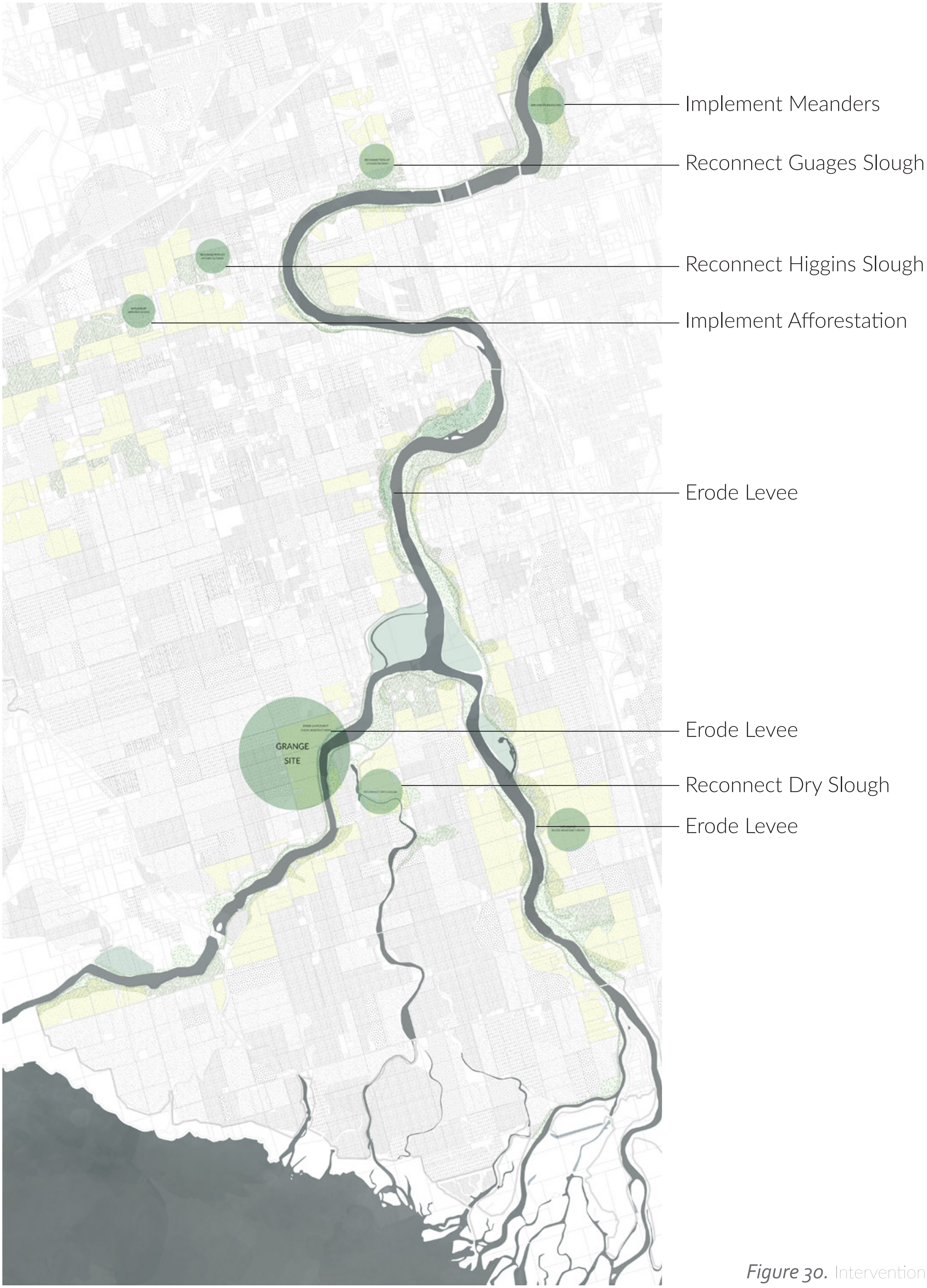


Figure 30. Intervention Map

The reconnection is characterized by damp air and the presence of amphibious animals and insects; wetland reeds and quaking aspen rattle in the wind while the ability to traverse the landscape is marked by seasonal changes in river elevation.

Figure 31.

Red Alder as intervention

Seeking Solutions

Building on the idea that riparian materials could offer remediation and be harvested for their material properties, Red Alder specifically relates to the needs of farmers and to the need for establishing a robust riparian section. Red Alder is fast-growing, stabilizes soils, sequesters carbon, and fixes nitrogen into the soil. Combined with Red Cedar, native reeds, Water Birch, Vine Maple, and others, Red Alder offers the beneficial ecosystem services listed above while providing an additional source of income or material.

Alnus rubrus, *red alder*, plays a vital role in the riparian section of Pacific Northwest hydrological systems. (Figure 34) The tree and established forests are key habitat for both land and marine animals. Freshwater shellfish, once common in the Skagit River but now rarely seen, are commonly found on the root system of Alder; these shellfish filter water and convert ammonia within the water column, and provide food for juvenile salmon. Re-establishment of freshwater shellfish serves as a visual indicator of overall water quality and health of the river. Native wetland reeds also serve to stabilize the soil, and provide additional benefit of filtering and slowing surface water runoff. Impacted agricultural land shares a similar run-off coefficient as an asphalt parking lot. Due to this compaction, the soil loses much of its ability to buffer heavy rain events and contributes significantly to flooding. Re-establishing this riparian system works to decrease the impacts associated with this increased land-use pattern. Re-connecting this natural cycle is of primary importance in shifting current modes of inhabitation to models of adaptation.

Harvesting from this location, however, requires a sensitive approach. Soil structure and root systems are all prone to fracture, and contemporary timber harvesting equipment is too heavy for such a task. Forest management research reveals that properly managed Red Alder forests can be harvested and maintained using coppice methods.[42]

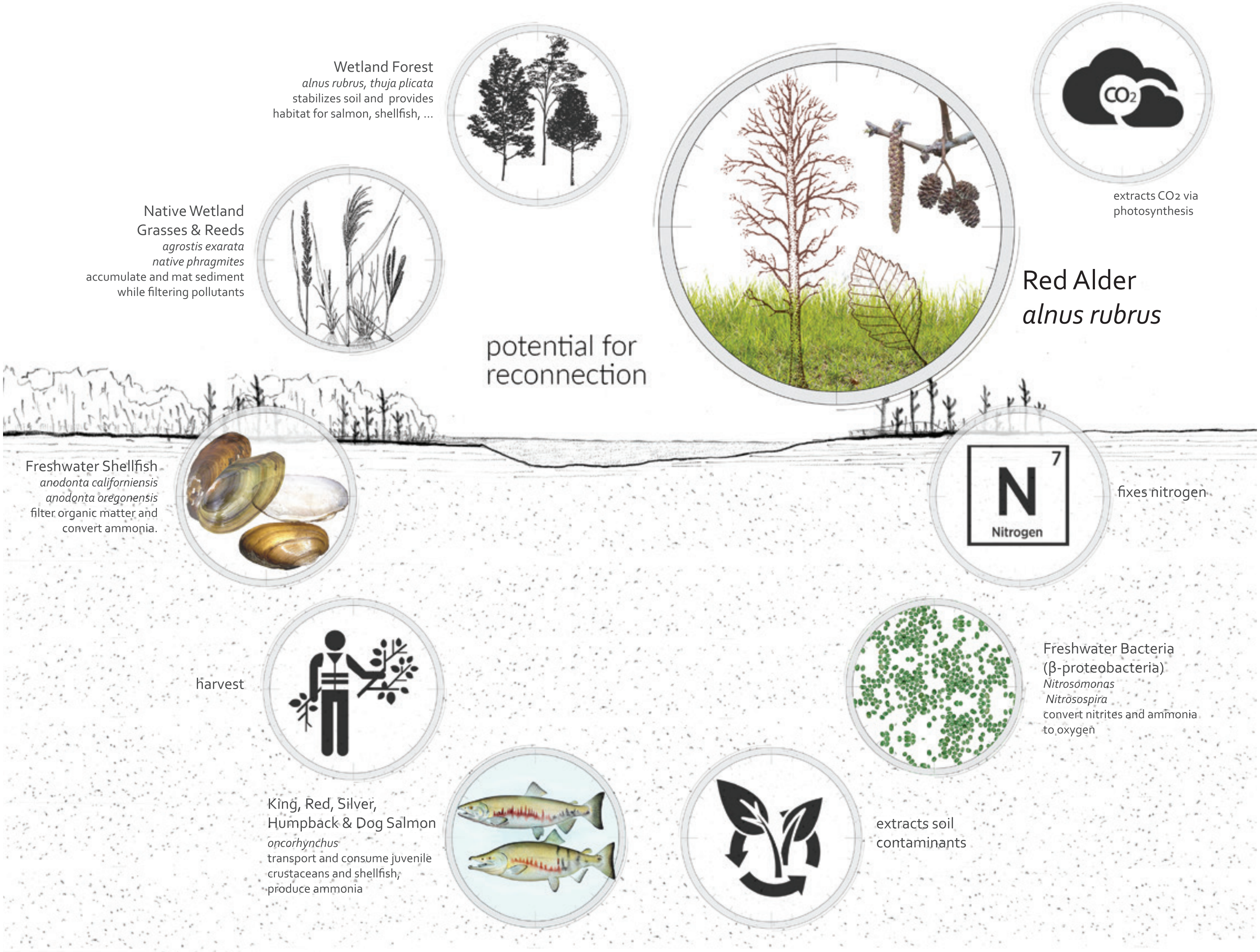


Figure 32. Diagram showing the ecological cycle of Red Alder and the Skagit River

Through coppicing, a process which trims a tree near the stump, allowing the tree to live and continue growing new material, a crop of building material can be established and harvested along the riparian edge. Low impact methods, namely boots and a chainsaw, can be used to gather material as the dimensions obtained can easily be hauled by hand. Additionally, the process of coppicing aligns with the values and strategies of farmers in the area.

As a building timer, Red Alder exhibits good strength characteristics, quick drying time, and dimensional stability with little cracking and checking; in fact, the kiln schedule of Red Alder is one-half that of all other building timbers. Red Alder also has propensity for coppicing, which results in smaller diameter poles and does so without killing the tree. In contemporary building construction, Red Alder has been little explored due to perception that it is a 'trash' tree. However, current market rates for Alder are nearly the same as Douglas-fir.

Red Alder's characteristics reveal potential to be worked as a green timber with great dimensional stability during drying. The construction approach focused on low-energy

Balsam Poplar

Native black cottonwood that is highly unique to the region. Does not extend east of Continental Divide, nor further south than Idaho and Oregon. Grows to 160' & 6' diameter, but generally 100' in floodplains. Grows with Aspen, wants full Sunlight, grows 50' in 9 years, can be propagated by cuttings. Durability is a concern

Quaking Aspen

Most widely distributed tree in North America, and grows near waterways and moist meadows. Low flammability. Nicknamed 'noisy leaf'

Grand Fir

Grows faster than Douglas-fir and likes wet, lowland forests. Needs sun to grow quickly

Vine Maple

Wetland timber that grows small diameter, straight shoots. Traditionally used in basket-making & weaving.

Willow

Wetland timber that was traditionally twisted into twine for harpoon lines and baskets.

Pacific Yew

Very durable and adept at growing in the under-story. Very slow grower.

Western Red Cedar

Grows well in wetland areas and along stream-banks. Bark can be peeled into long narrow strips. Can be split, and traditionally turned into shakes and shingles.

Red Alder

Fast growing and takes over disturbed sites quickly. Fixes Nitrogen into the soil, and serves role as wildlife habitat.

Big Leaf Maple

Tolerant of shade and competition, associated with Red Alder, Black Cottonwood, and Willow. Cannot tolerate long-term flooding.

Western Hemlock

Grows in wet areas in all West Coast coastal regions. Serves primal biological role as forest regenerator, but will overtake forest if not managed. Some say that if left to natural processes, eventually every tree species would be crowded out by Hemlock.

Figure 33. Identified qualities of Pacific Northwest riparian trees. (see appendix for additional information)

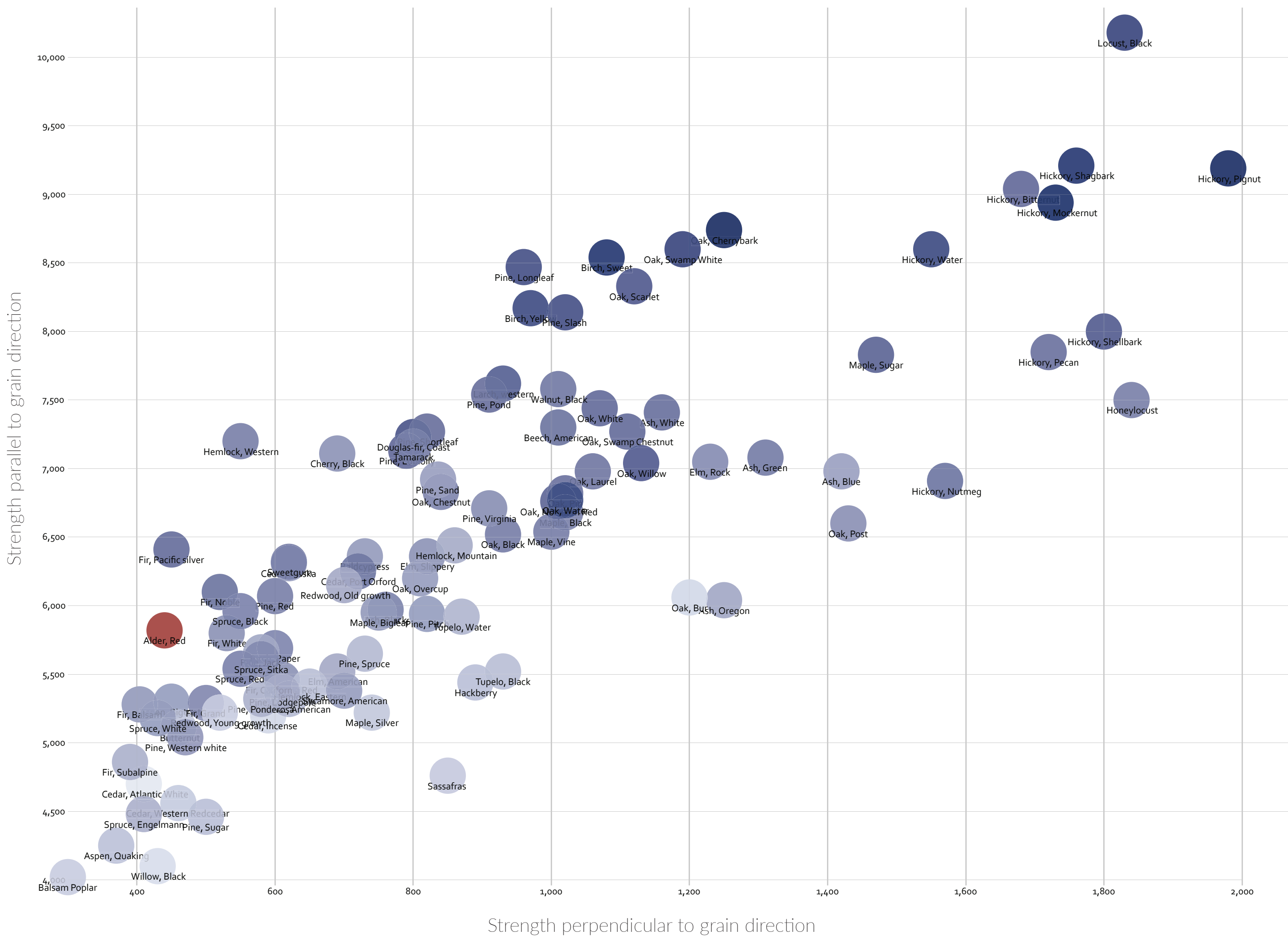


Figure 34. Strength characteristics of timber; Red Alder noted in red.

processing, and established ways of working with timber of a varying diameter.

Strength characteristics and properties of Red Alder shown in figure 36 indicate that best use of the timber is when the load path directly follows grain direction. This is known as an anisotropic characteristic, and is true of most timbers. However, when considered in the context of available dimensions of coppiced lumber, use as a beam may require large built-up sections. In an effort to mitigate this, experiments in structure attempt to reduce the need for 90 degree connections and look for ways to keep the load path predominantly parallel to the ground.

As part of the riparian timber investigation, qualities and historic human uses of wetland materials were researched and documented, and are listed in figure 35, and the appendix.

Figure 35. Clockwise from top left: Floating logs down the Swinomish Channel; Dust Collector; Raw log milling; Kiln

In April a visit to Northwest Hardwoods, just off Hwy 20 near Mount Vernon, shed light on the local hardwood manufacturing industry, and turned up details which further informed the direction of the thesis project. Broderick Nersten gave a tour of their saw-mill operations; which currently processes Red Alder, Birch, and Maple. Currently the mill primarily purchases material from larger corporations, such as Sierra Pacific. Timber dimensions are steadily decreasing and much of this smaller diameter Alder is processed for pallet-making.[43] Additionally, advancements in digital imaging are automating grading and sorting tasks in the mill, with little

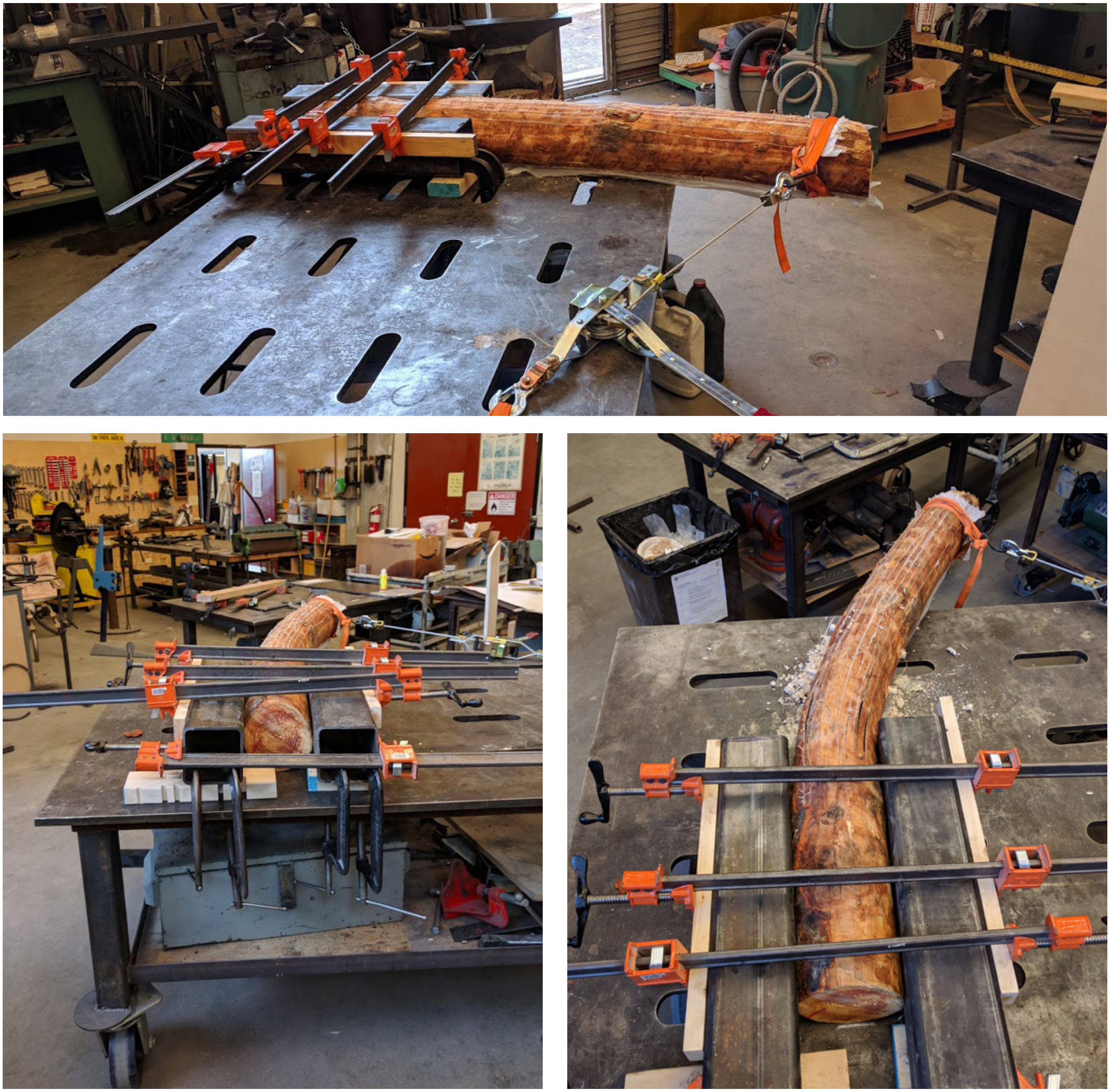


Figure 36. Bending sliced log with 2,000lb come-a-long'

to no room for the accommodation of those lost jobs. An understanding of the processing and characteristics of timber frame the methods used for exploring the use of Red Alder in construction, as well as translating some of those lost jobs into the local community.

Working with Red Alder requires an unconventional approach to accommodate the characteristics described previously, but the material offers great value for both human and ecosystem needs. To reduce, or possibly even eliminate, perpendicular loading, experiments with bending the timber were conducted. (Figure 38) Bearing in mind available machinery and labor

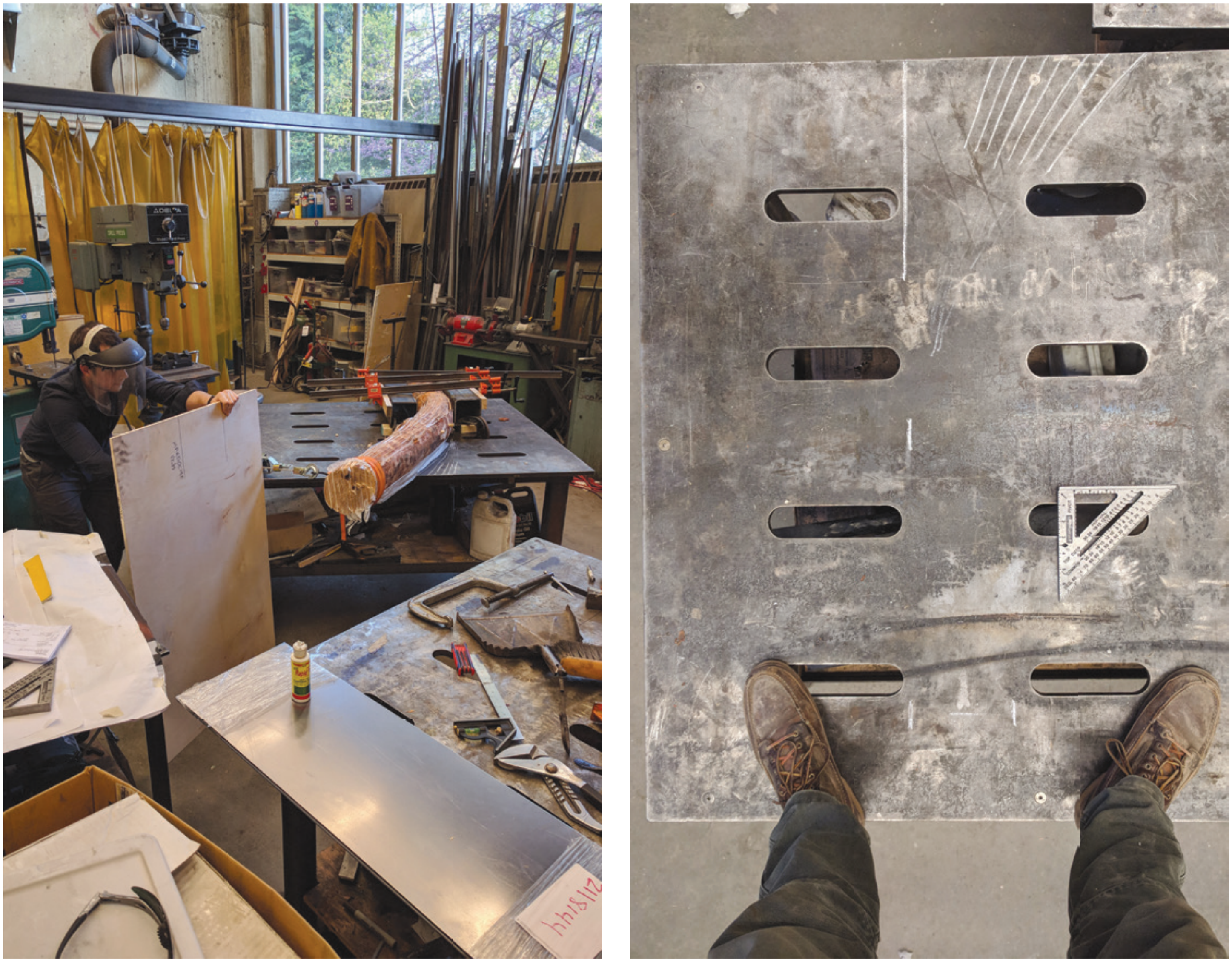


Figure 37. Bending sliced log with a one-ton come-a-long'

for production, a section of whole log was sliced at 1" intervals using a band-saw, and placed into a steel jig; small pieces of waxed paper help reduce friction of the rough cut during bending.

Initially, tests experimented with using 1/2" dowels as a means of controlling the point of curvature while bending, however this proved to be a less-than-ideal method for achieving a consistent and fair curve. The bending radius was documented, and determined that a maximum 18" radius can be achieved before the material begins to split apart. (Figure 39)

This process of bending a whole section of lumber can be accomplished with a limited number of tools and space, and reduces the need for specialty connectors. Following this processing technique, structure can be established using a variety of assembly methods. Construction methods focus on simple, but reliable, approaches to laying out a building on a site. Using a section of line and pivot point, round buildings can be constructed by establishing a singular point in the soil, and laying out footings along a scribed circle. In a round building, orientation to cardinal directions is less of a concern as surface exposure to the

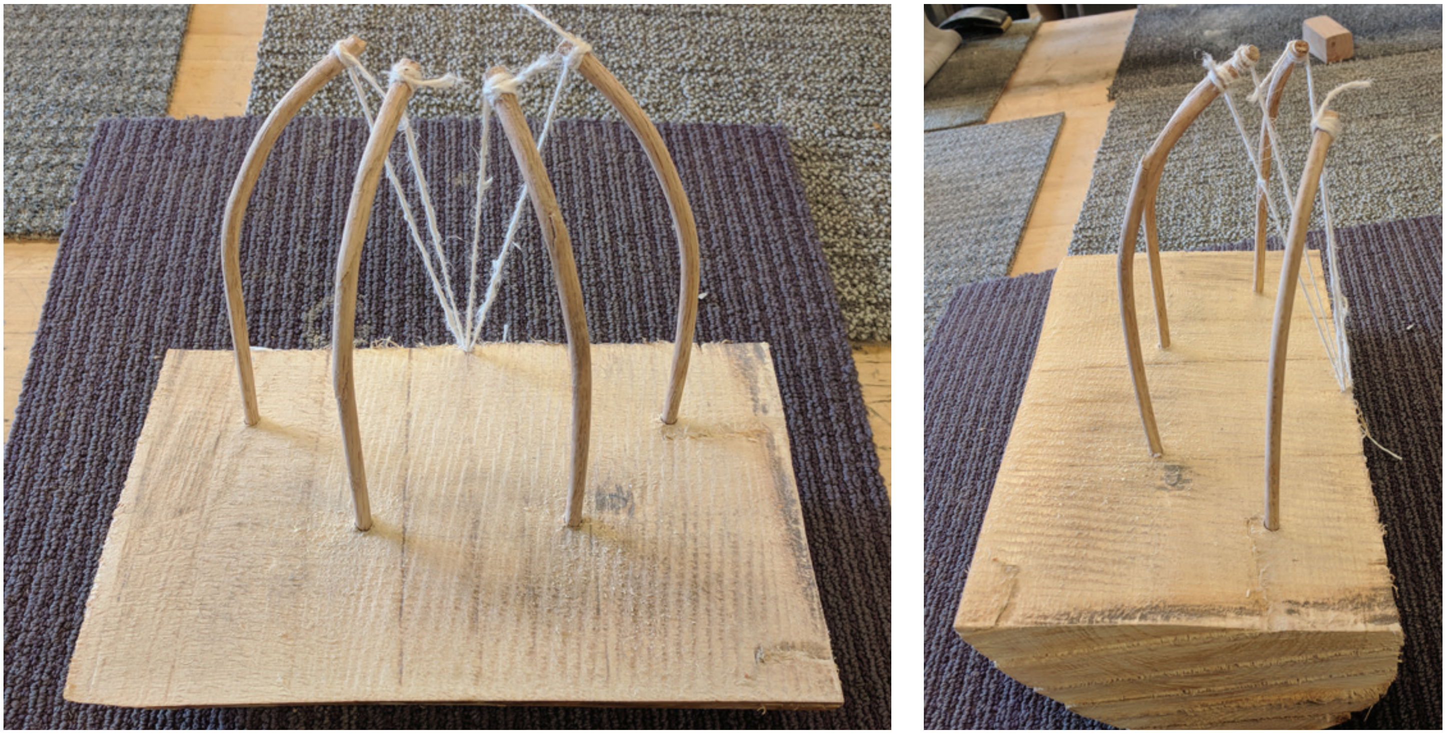


Figure 38. Round Structure

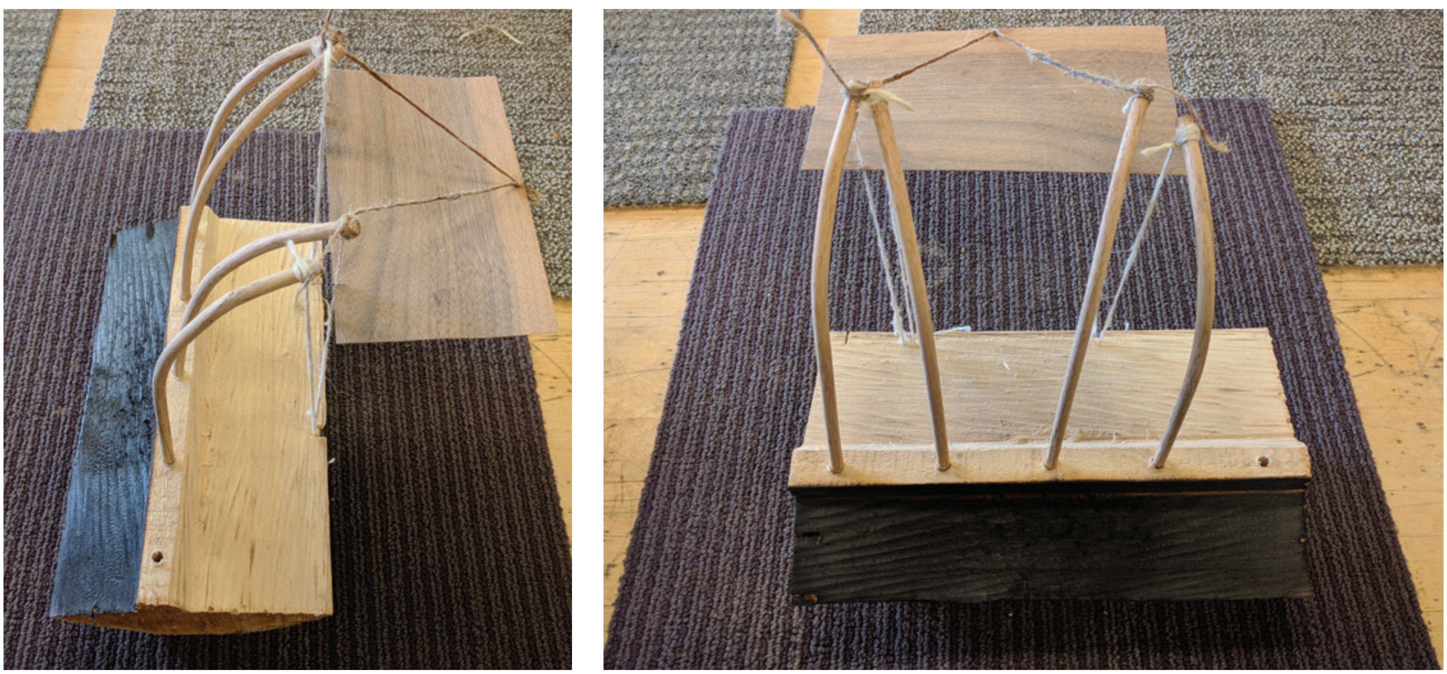


Figure 39. Rectangular Structure

sun is relatively constant throughout the day. Round buildings (Figure 40) tend to be a more efficient use of structure, however their ability to be modified and reconfigured over time presents a number of obstacles.

Linear structures also offer unique benefits, particularly in the realm of construction simplicity and layout of floor-plan. (Figure 41) Rectangular buildings are also generally easier to adapt, expand, and renovate to accommodate differing future uses.

Establishing methods of column assemblies focused on building up multiple sections of timber with varying diameter. Early

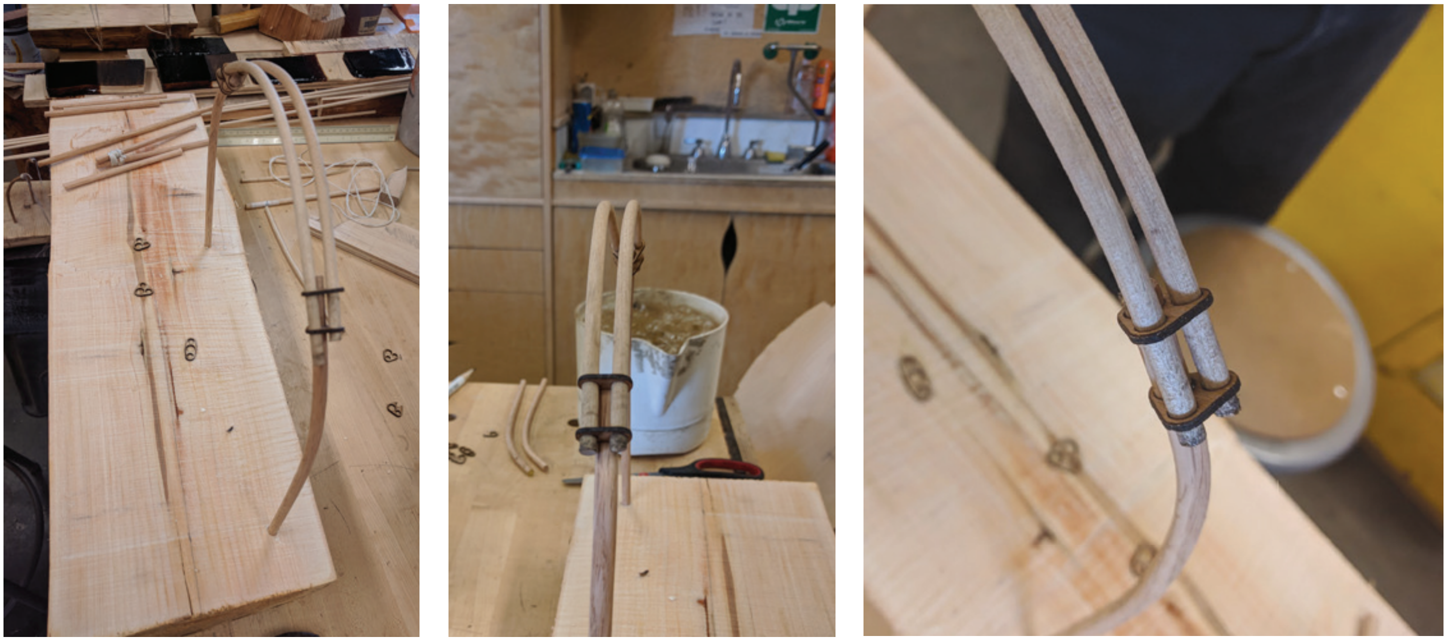


Figure 40. Column assembly

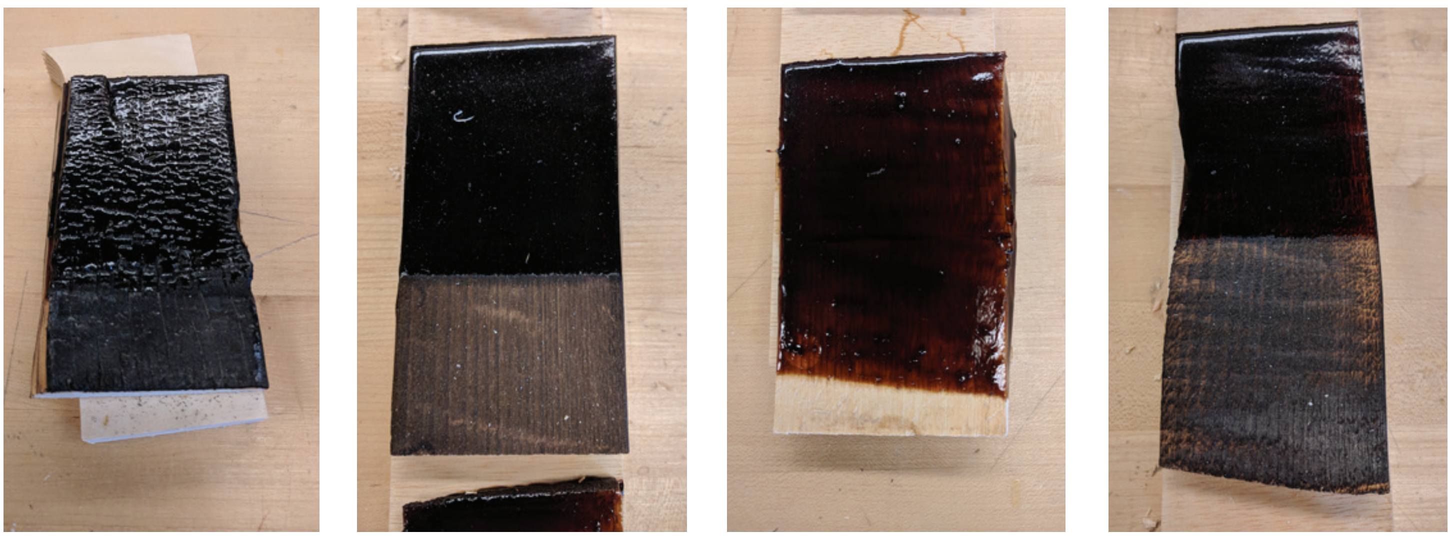


Figure 41. Charred and tarred.

experiments explored the intersection of manufacturing resources in the Skagit (Figure 42), while final column assemblies focused on even simpler methods. (Figure 44) The final column bands together varying diameter timber in order to form a truss with a wider base, and greater stability, than a singular column.

In addition to use as structural material, Red Alder being of the family *betulacae* can be explored for its potential to make tar that can be used as a preservative/sealant. Charring the wood alters its properties to reduce the impacts of weathering, while a layer of tar provides additional protection. (Figure 43)

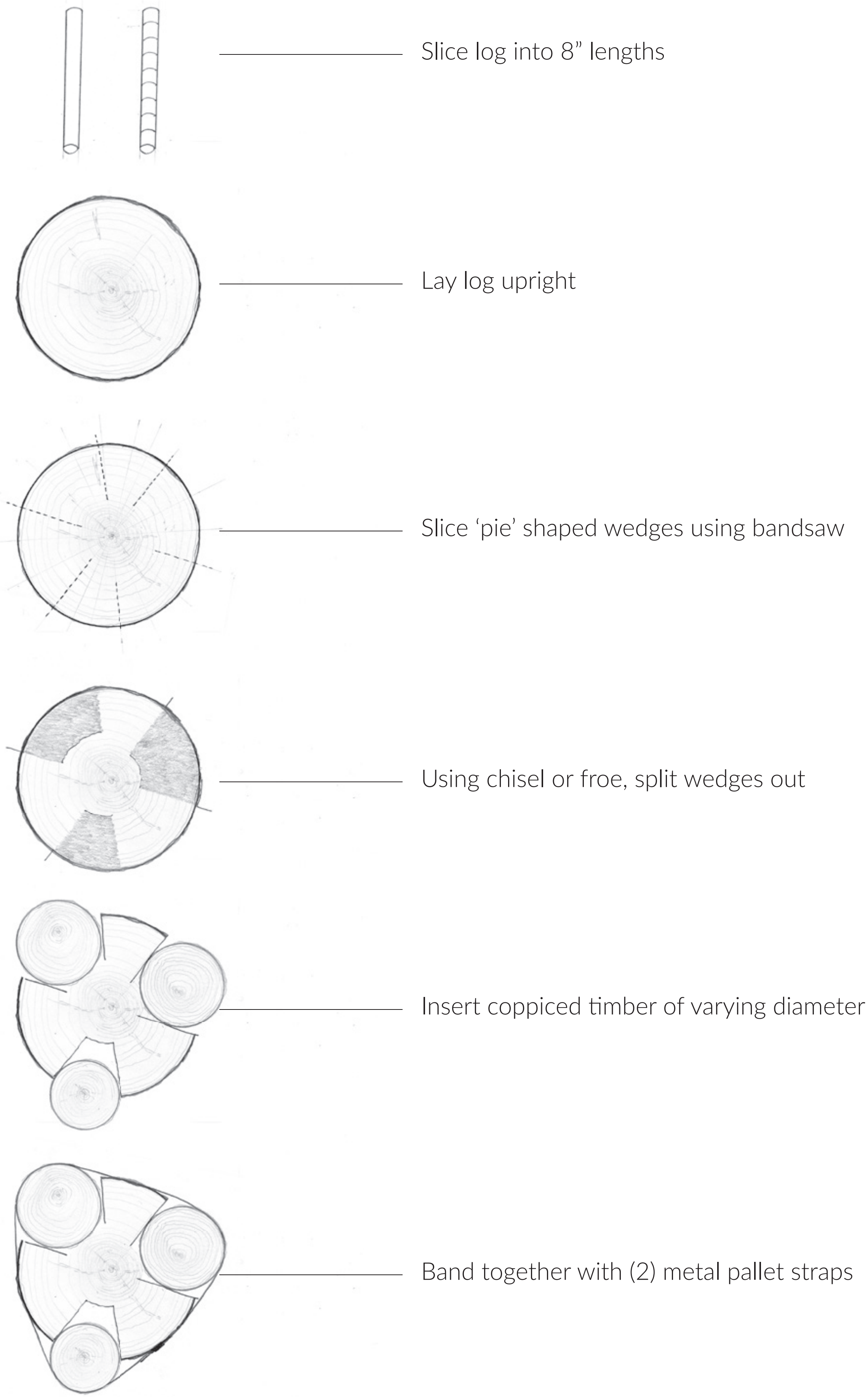


Figure 42. Built-up column section.

Grange as material expression

Seeking Solutions

This thesis tests the relationship of the proposed land-use alteration, materials intervention, and construction assemblies, through the design of a grange. The Grange provides an open public forum which serves to represent the values of the farmers in the area.

What is a Grange?

At first glance, a grange is simply a meeting hall intended to enhance rural life. Deeper investigation, however, reveals a building deeply rooted in agrarian life. Founded in 1867, the Grange is the oldest fraternal organization in the United States.[44] Granges serve to enhance rural life by providing access to cultural events, while serving as non-partisan, political advocacy organizations.[45] Granges are always intended for general public use, and are often constructed on donated land and of donated materials and labor.

The Grange is representative of those who care for and maintain their land, and who value simple, local solutions to accommodate incremental building needs. A historic manual for Grange Halls, titled *Grange Hall Suggestions*, points out that "A Grange hall must be more than just a Grange home; it should be a community home; it should be constructed in such a manner that it can be used as a local community building.[46]

Target Group

As mentioned previously, the Skagit River Valley is facing concern over an aging population. While there are groups encouraging young farmers to take up land and till the earth, conflicts of proximity, income, and equipment are major hurdles for any new farmer. Additionally, proximity to rotating land around seed crops is necessary to encourage the exchange of knowledge in a single location.

In response, the Grange is intended to accommodate the needs of young farmers by providing space for sharing knowledge related to seed processing, a gathering space for events, such as yoga and meals, and an equipment share. Situated on the fringe of urban and rural conditions, the Grange site is located near to

Figure 43. Rexville Grange

3 long-term seed crops. The site is located adjacent to the river and neighboring farmland, looking over the riparian forest while reaching out towards the community.

Constructing

Building methods of the Grange are derived from the material context explored in previous pages. Building with green timber provides an easy working method while reducing costs and energy inputs associated with kiln drying and transportation. In relation to this, the building is dried in during a few sunny days in the Winter, allowing wall infill to occur as time and material becomes available. The method of construction explored embodies the identity of the Grange in its relation to the cultural practices of the people whom it serves.

Selecting a Site

In speaking with farmers in the Skagit River Delta, it became apparent that concerns over an aging population are of primary importance. The Skagit River Delta is host to an extension of Western Washington University, particularly with a focus on territorial wheat varieties and agricultural research, but the bulk of farms in the region are finding it more and more difficult to find young people interested in carrying on the work.[47] Further, the young farmers arriving in the area are focusing on small-scale farming measures that disturb the soil less and require fewer tools and machinery.

In the Skagit River Valley, long-term planning associated with seed crops has resulted in a unique method of crop rotation; combined with the increasing age of farmers, however, the crops grown adjacent to seed land are at risk of going fallow over a long period,

The grange site was chosen by overlaying locations of long-term seed sites(Figure 46), shown in red, with those of typical rotating grain crops, such as peas, wheat, corn, and vegetable crops shown in green, blue, yellow and gray.

This site offers a strong connection to 7 agricultural sites which host long-term seed crops, while serving as a gathering location for farmers located away from the city. Although the town of Mount Vernon is a short drive, more and more young farmers are seeking ways to reduce their carbon footprint and fossil-fuel energy consumption, and locating a grange at this site fulfills their needs for communal gathering space near to the place of work.

The site, shown in magenta in figure 48, is currently a corn field on Mount Vernon Sandy Loam soils, and with spatial separation from the river and ecological processes associated with it.

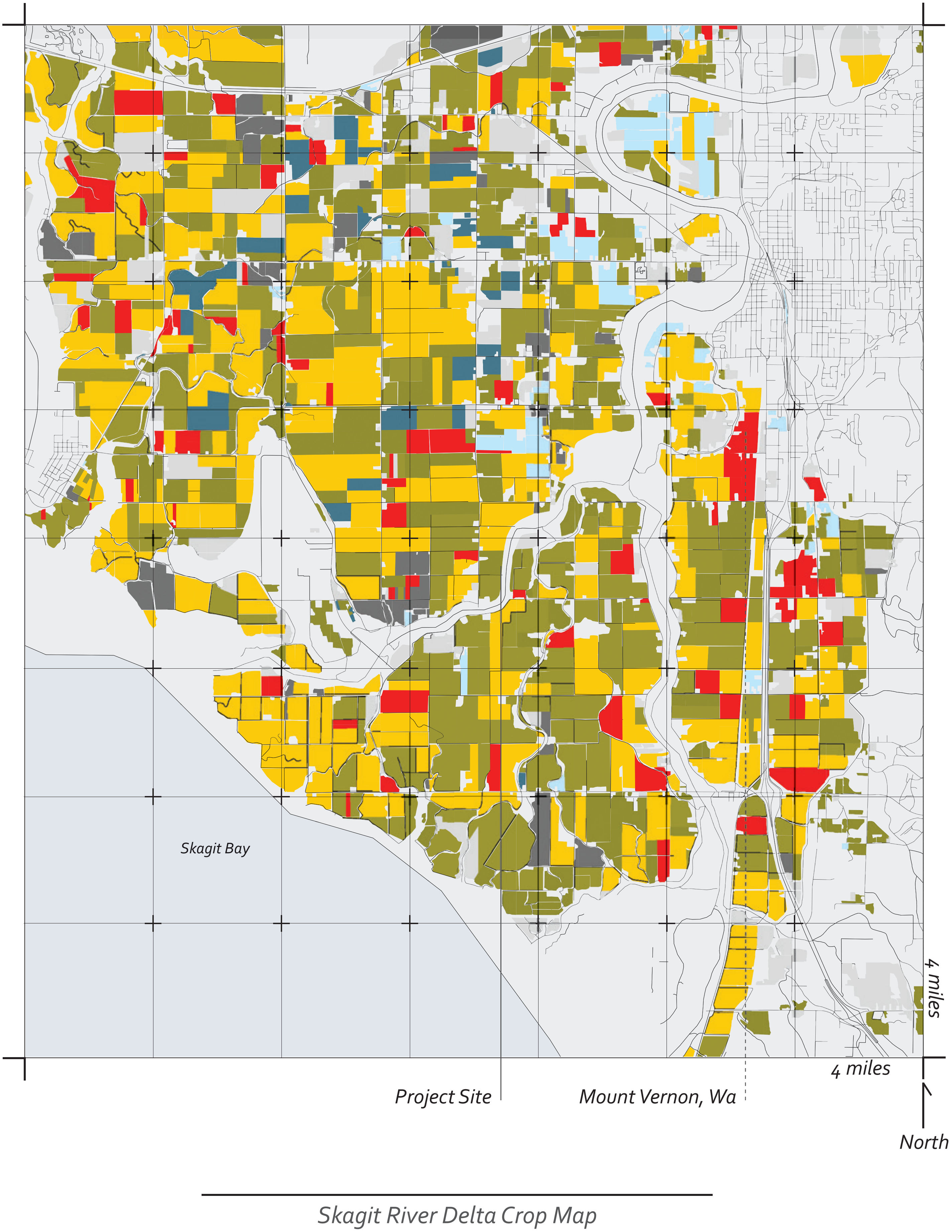
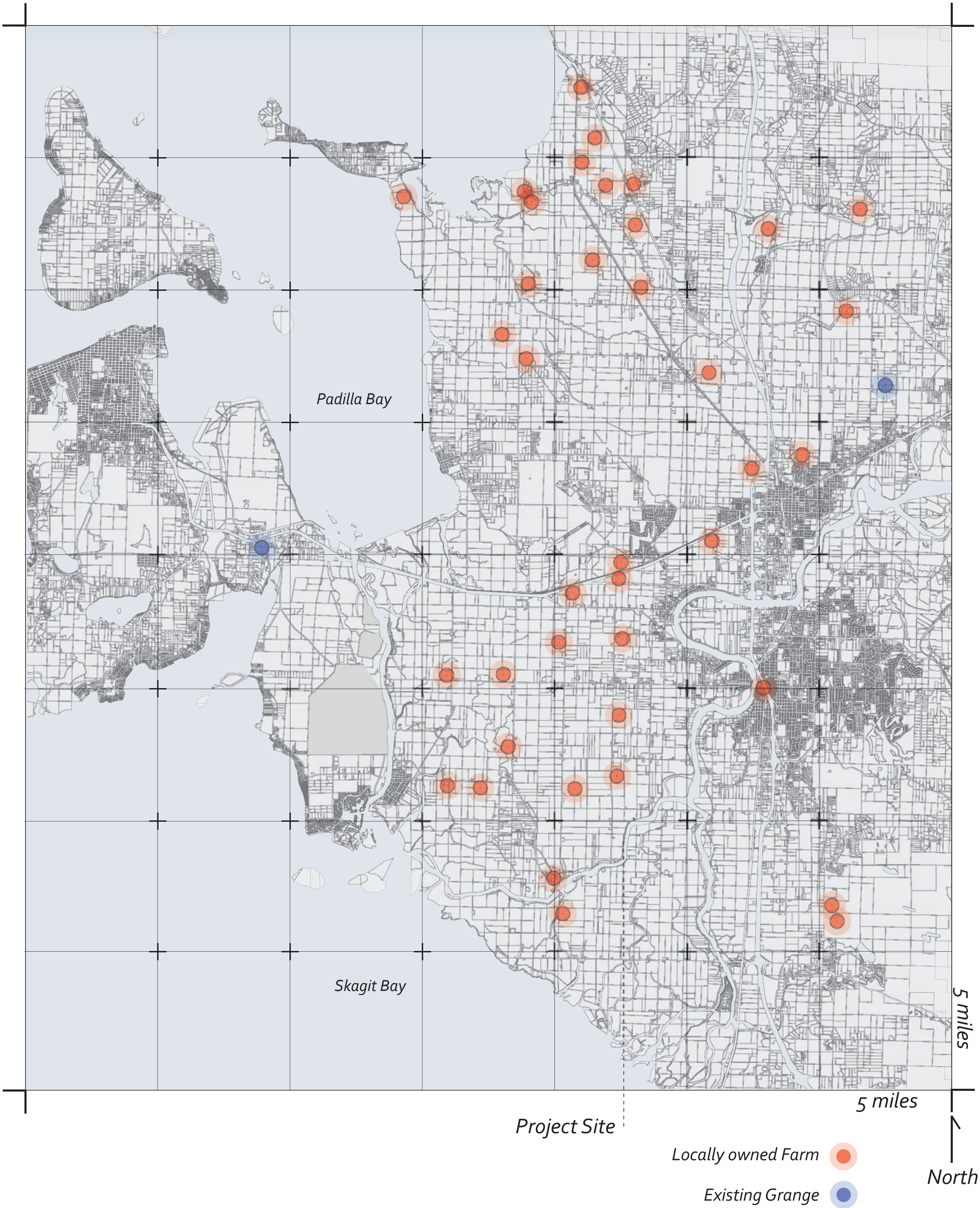


Figure 44. Skagit Crop Map



Farm & Grange Location Map

Figure 45. Location of independently-owned farms and existing grange facilities in the Skagit River Delta

Grange Program

Seeking Solutions

Grange programs often feature an open floor plan, allowing for great flexibility in use and an ability to adapt to changing needs of the population. Across the U.S., grange hall's have very different floor plans, with a few including 'gaming rooms,' and even pubs, however every grange hall shares one similar process: the opening and closing procession. (Figure 48)

To accommodate the needs of young farmers, the grange provides a processing area for sharing resources and knowledge around seed saving, and a cool, dry location to keep seeds long-term; in the dining hall, activities include cultural and political events, yoga, pancake breakfasts, and the like; Equipment storage provides space to store tractors and larger agricultural equipment.

In addition to grange meetings, grange halls are intended to serve many purposes centered around the social connections among grange members and the community at large.

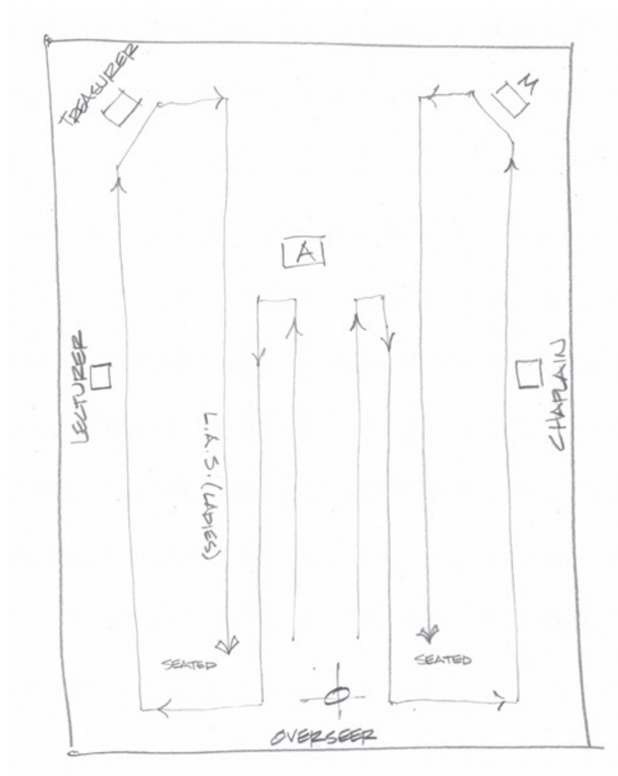


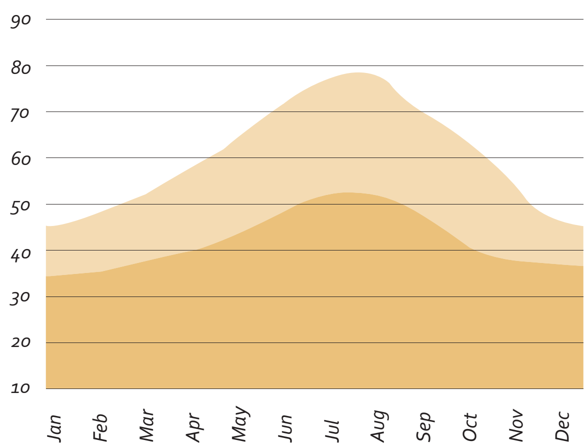
Figure 46. Typical Grange Hall procession

Building Program

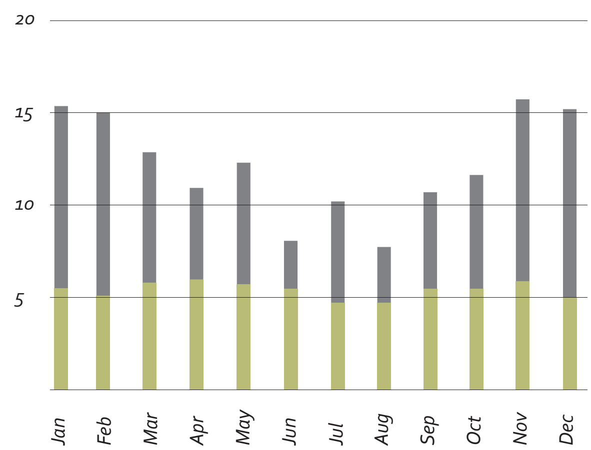
Dining & Lodge (Hall)	1200
Stage Area	200
Processing Floor	600
Seed Storage	400
Restrooms & Showers	300
Equipment Storage	400

Climate

Seeking Solutions



Temperature



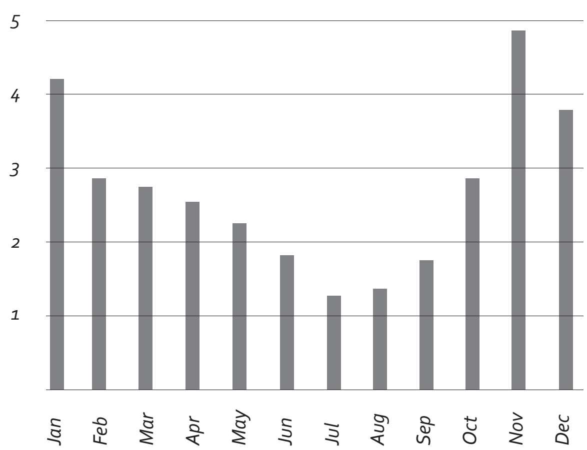
Wind Speed

Temperatures in the Skagit River Valley are regulated by proximity to the Pacific Ocean. The Köppen Climate Classification is 'Csb', warm summer Mediterranean climate. This generally results in warm, dry summers and cool wet winters, with seldom freezing temperatures.

Unique to these Mediterranean climate regions are distinct long-term freshwater biomes structured around drought and flood. These communities are acknowledged as sensitive to climate change, with a unique ability to rebound swiftly. [48] [49]

In the Skagit, wind largely comes from the South-South-East in the summer, 8 - 10 mph; and in the Winter from the North-West at 5 - 8 mph. In building, this means that the structure can capture dry Summer breeezes while shielding against cool Winter wind with simple climate strategies, such as orientation and operable windows.

In terms of cultivation, this means providing northern wind breaks to shield against cooler Winter winds will create a more comfortable micro-climate while harvesting coppiced lumber in Winter.



Precipitation

Precipitation in the Skagit River Valley, like much of the Pacific Northwest, occurs during the Winter. The biggest effect of this is seen in River elevation. In building, managing water during this time period is of primary importance. Deep or wide gutters, keeping water from eroding the building foundation, and vertical cladding are examples of how this might affect the building.

In relation to cultivation, this means the period of highest precipitation is also when one needs to harvest timber.

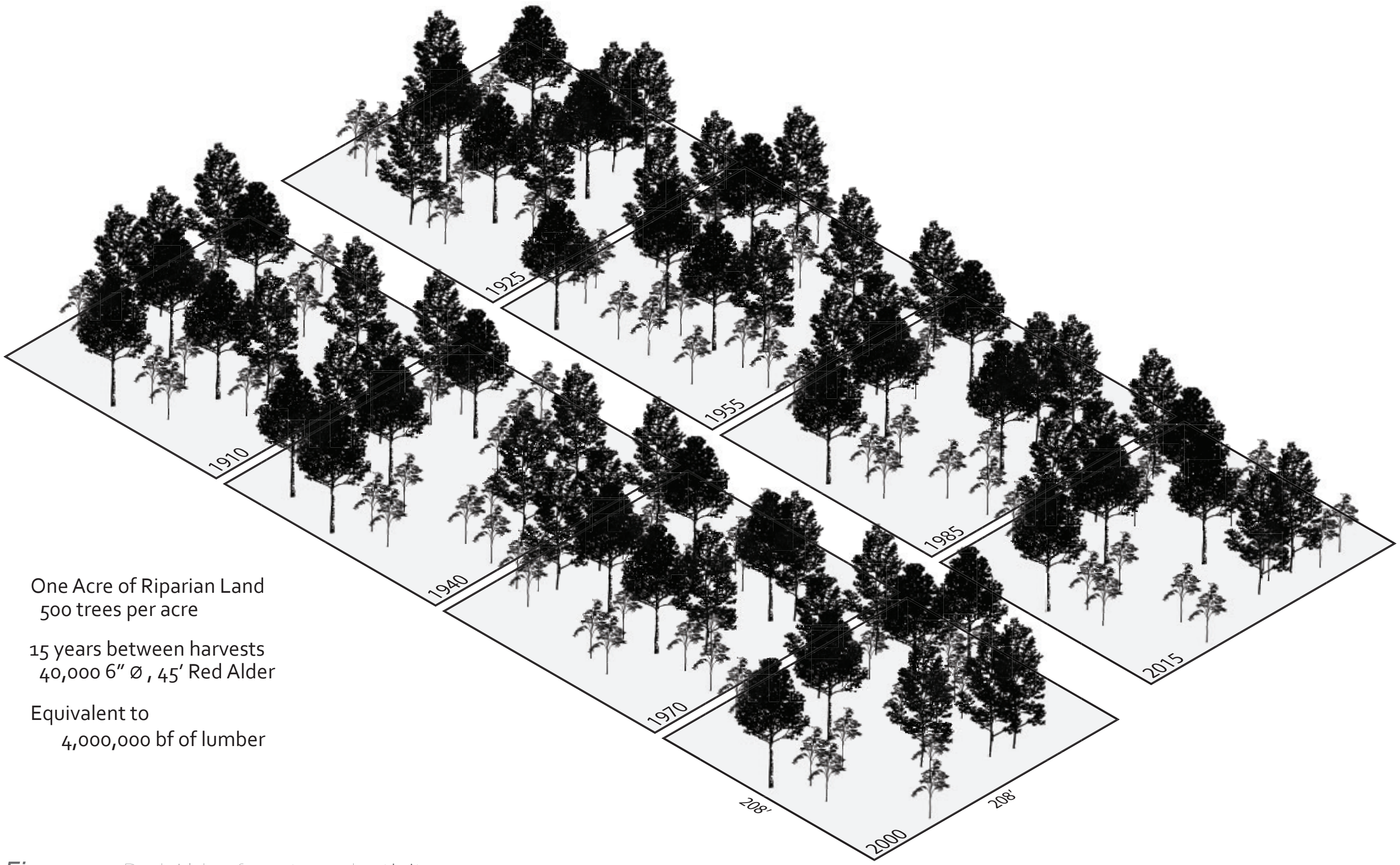


Figure 47. Red Alder forest productivity

One acre of riparian land can provide a large amount of valuable timber. Had the wetland forest remained in tact, the resource could have provided nearly 4 million board-feet of lumber.

Planting of Red Alder occurs through cuttings or seedlings.

Material growth over 7 years.

Harvest through coppicing trims the timber leaving 4" of trunk in the ground; coppicing does keeps the root system fully in-tact.

Regrowth from the trunk produces numerous smaller shoots

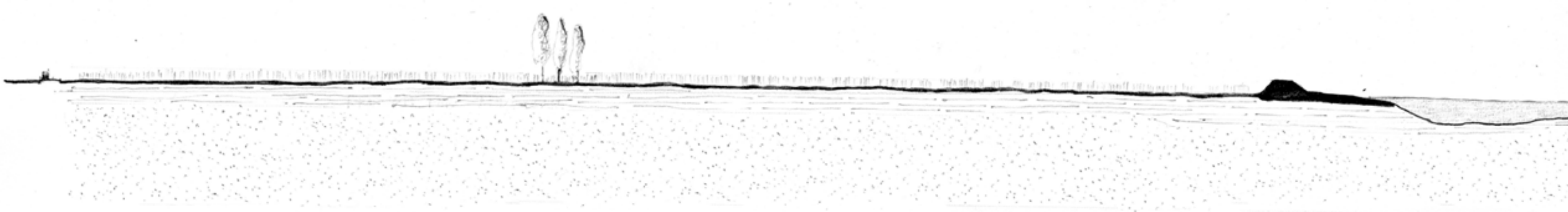
After 7 years, coppiced timber is ready for harvest and the cycle repeats indefinitely.

Red Alder shows propensity for being coppiced in a well-managed forest. The cycle of coppicing occurs over a series of 7-year intervals, establishing long-term material access, while offering ecosystem services.

Grange Site

At the Grange site, afforestation provides the material resource for construction and through erosion the river regains authority to redraw the landscape. With time, increasing stabilization of soils through growth of the riparian forest reduces risk associated with flooding.

Among other benefits, through implementation of the measures investigated earlier in this thesis, the Grange site will experience less soil-loss due to erosion, a more diverse resource of income and material, and increased biodiversity.



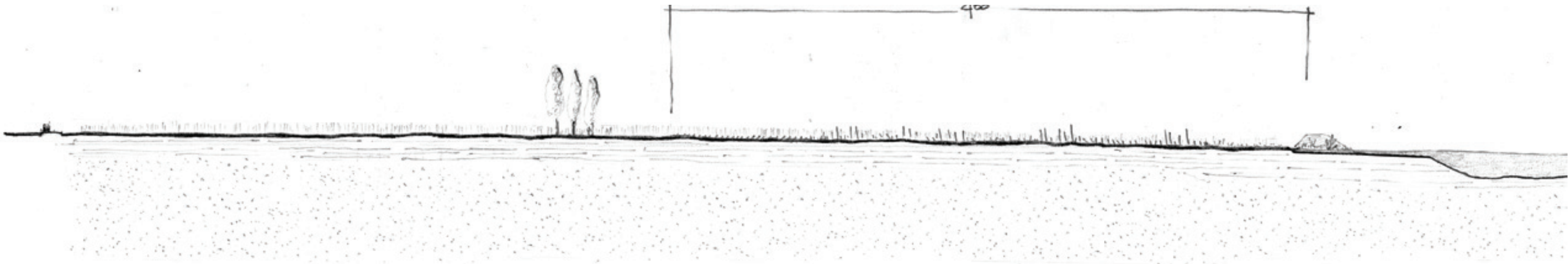
Site Section

Site Plan

Site Year: 0

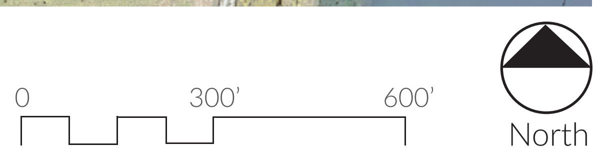
Currently, the project site is used for growing corn and oats. The land is separated from the river by the levee to the East, which is 12’ high at this location. The site features a gradual slope, with a 10’ elevation just 1200’ West of the rivers edge.

Directly East of the project site is a deposition bank which is largely flat and currently used for agriculture as well. This portion is part of an old slough, and would utilize the reconnect strategy.



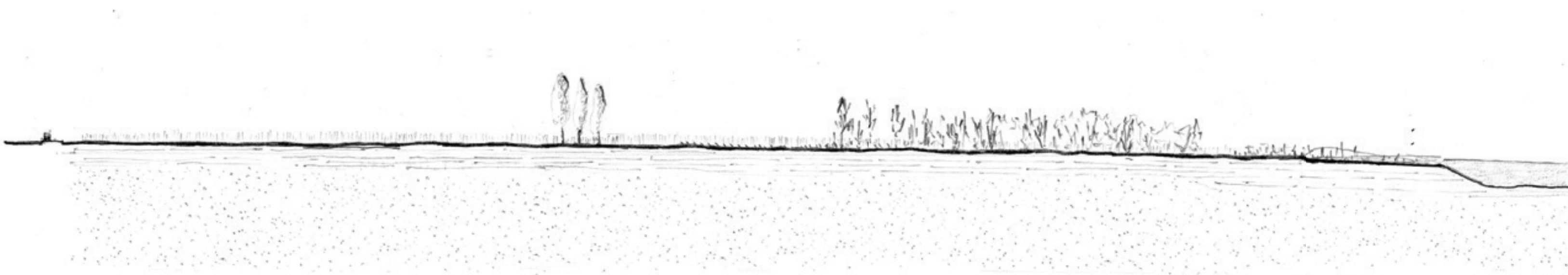
Site Section

Site Plan

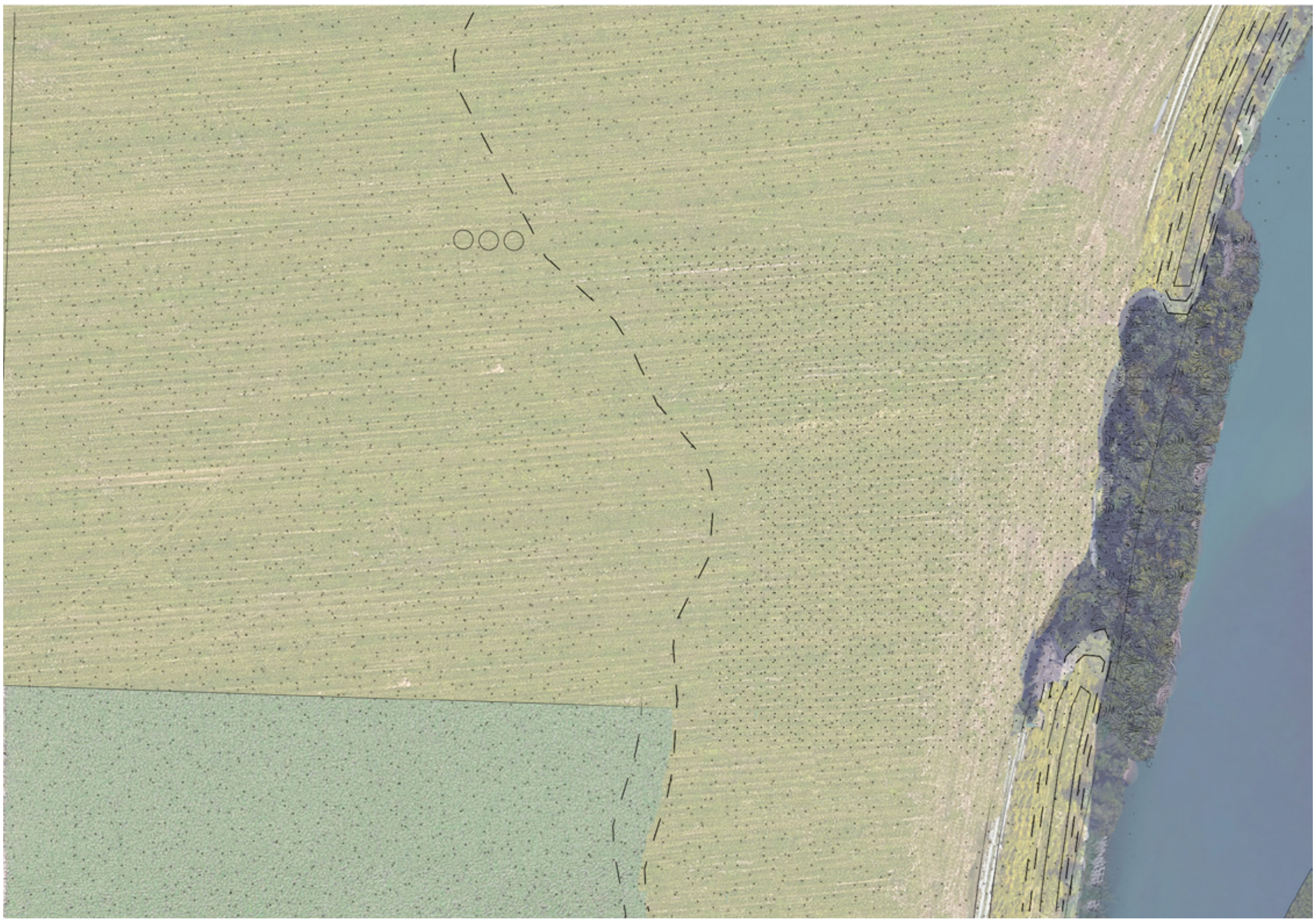


Site Year: 1

By eroding a portion of the casier, the natural relationship between land and river can begin to be re-established. Wetland reeds and the wetland forest are established alongside the new river frontage. At year 3, flood-tolerant crops are established and harvested annually. Afforestation at the site stabilizes soil and reduces risk of erosion due to flooding and wind. Additionally, this young forest provides a native wind-break for the crops due East.



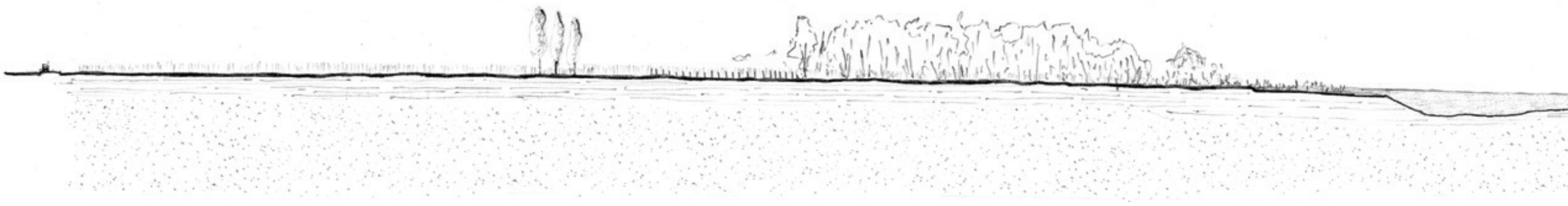
Site Section



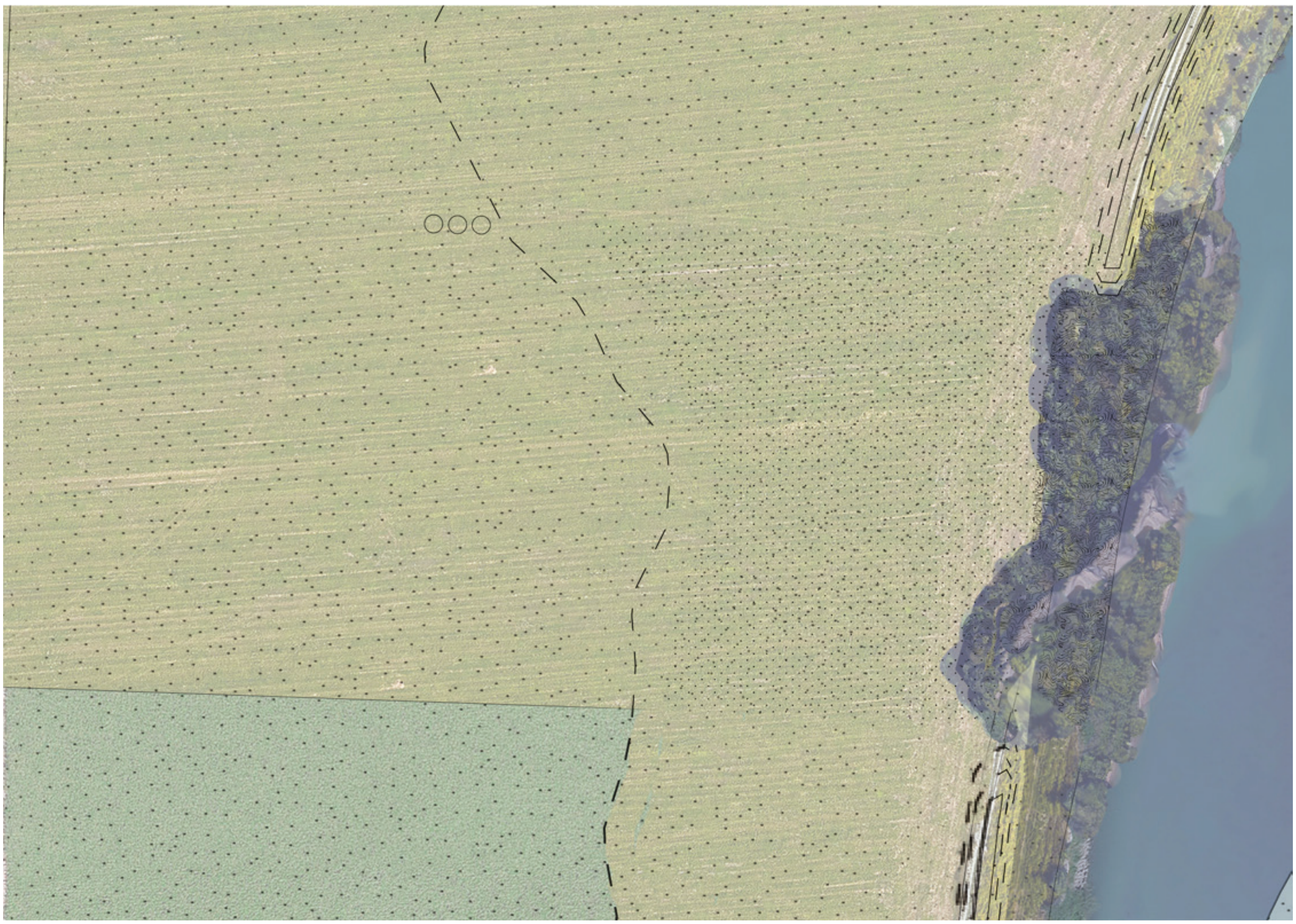
Site Plan

Site Year: 3

With time, the forest establishes its network of roots. The quick-growing Alder provides shade and protection for companion-planted Red Cedar and Water Birch.



Site Section



Site Plan

Site Year: 7

The first harvest of Alder occurs at the seven-year mark. Anticipated tree dimensions follow the projection in figure XX; which shows that the majority of the harvested species will be around 5” in diameter, with 8” and 4” diameter trees interspersed.

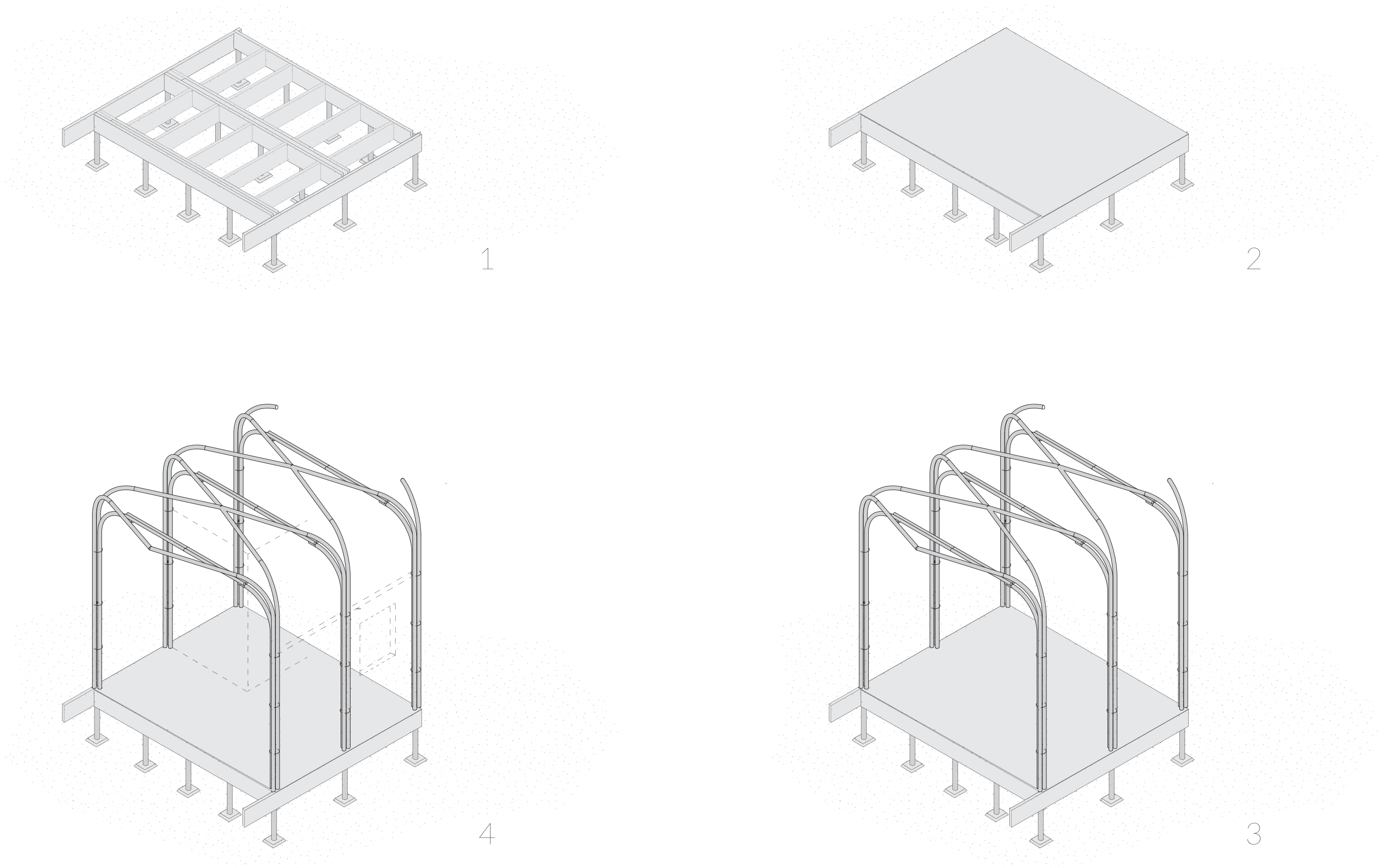


Figure 48. Construction sequence axonometric drawings.

The construction sequence is based on combining the built up Red Alder structure with existing construction methods.

1. Pressure-treated piles are driven into the soil to provide appropriate footing for the building. Utilizing conventional 2x12 floor joist construction, a weather-resistant foundation is established.

2. Atop this foundation is tongue-and-groove dimensional lumber. This provides a durable, easily constructed flooring system that is easily maintained and accommodates flexibility.

3. This platform provides both a working surface, and the final wear surface of the Grange. Laying out and banding the columns on the floor, each bent can be erected and easily connected to each adjacent bent.

4. Once dried-in, the structure can stand on its own, hosting events and sheltering processing activities. As time and material become available, interior structure is provided using dimensional Red Alder lumber to construct casework and partitions as necessary.

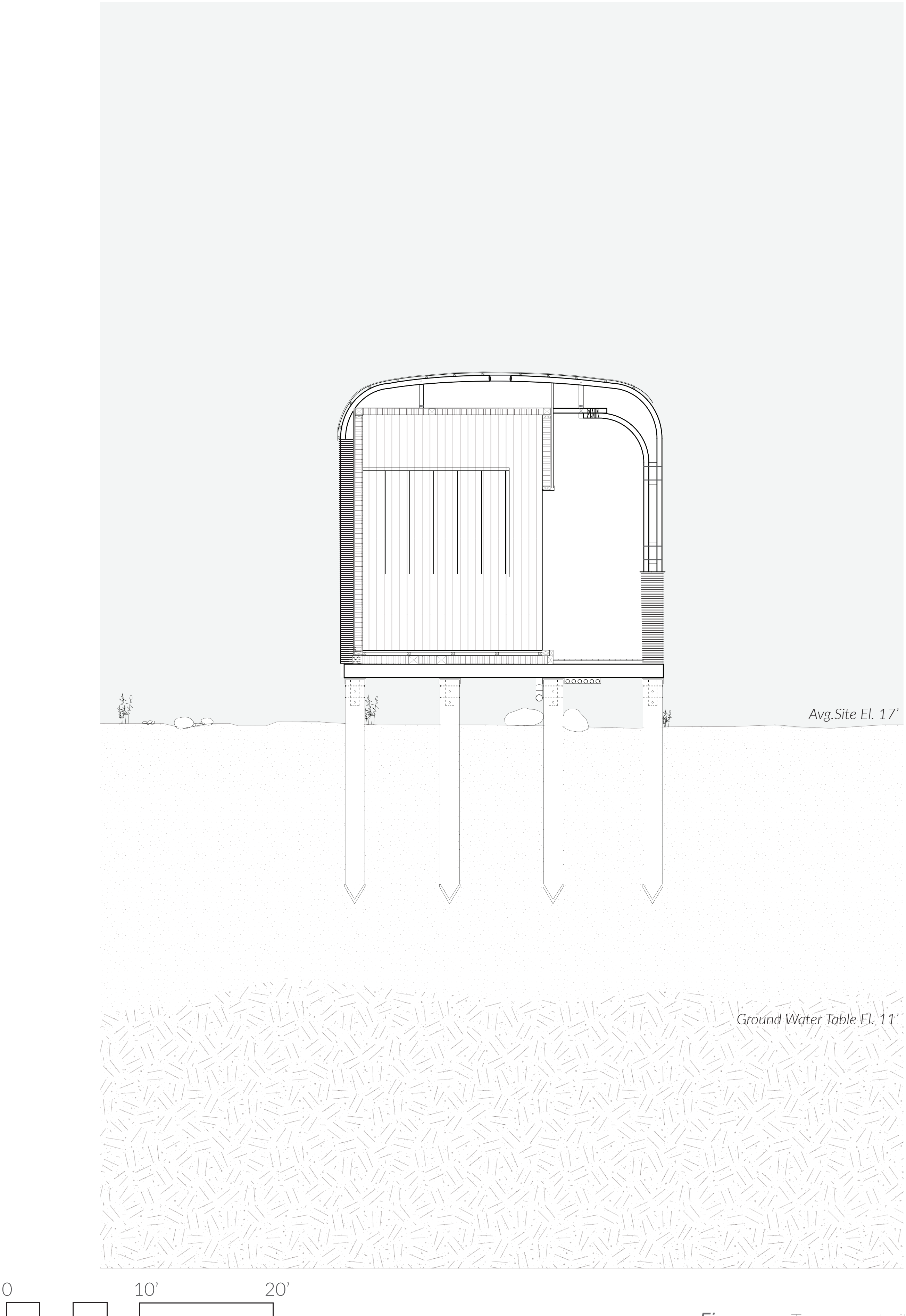


Figure 49. Transverse building section

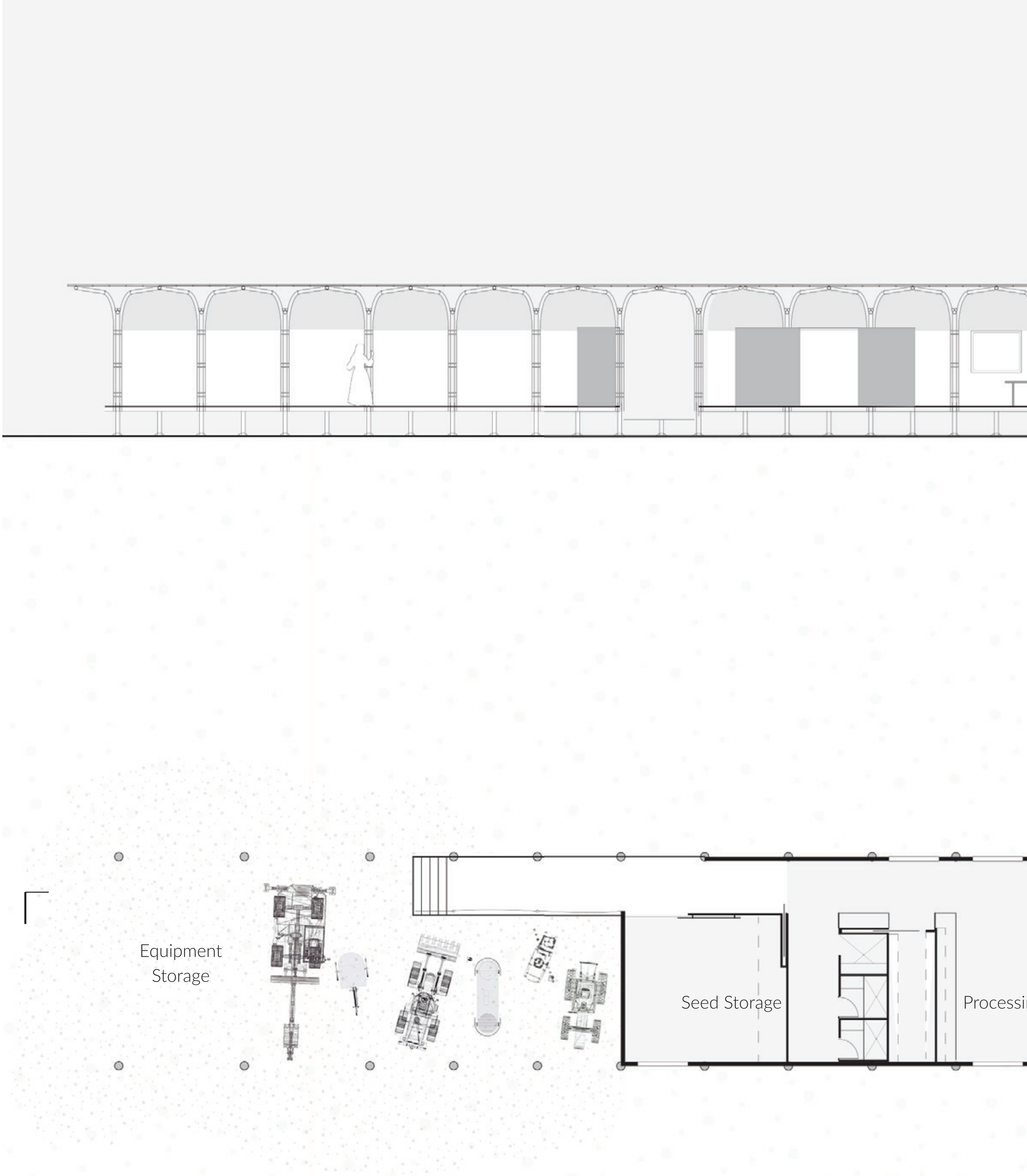
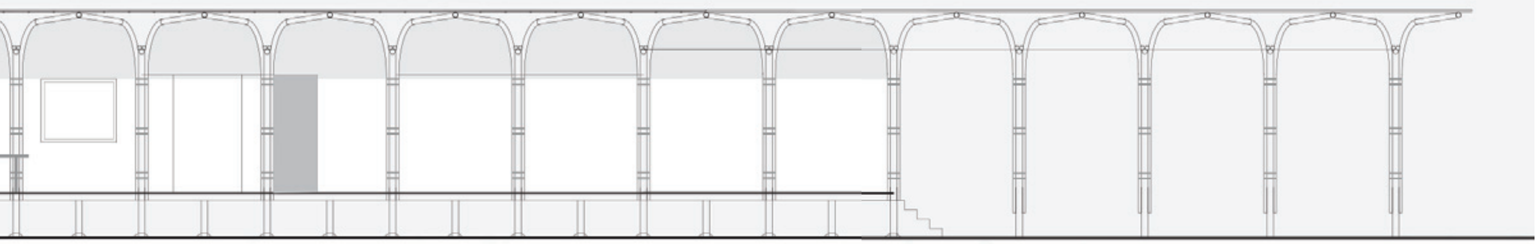
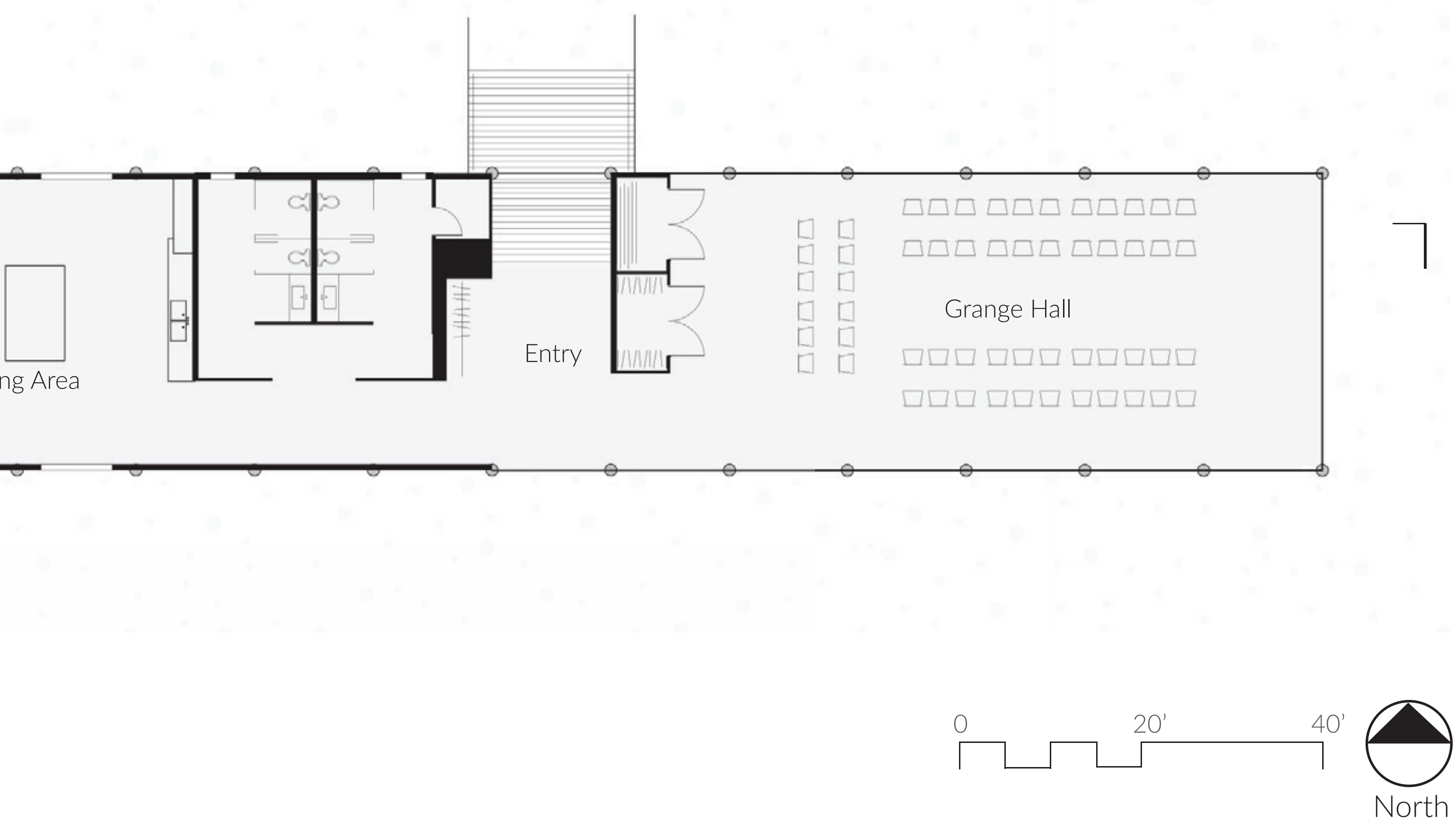


Figure 50. Building Plan & Section




ng Area
Entry
Grange Hall
0
20’
40’
North

Intentionally blank

Results and reflections

The Skagit River Delta is a place with a multi-layered history and uniquely agrarian identity, and people there have always had an intimate relationship with the river. The origin story of the Skagit First Nations is founded in the wildness of the river, early settlers established arable land through altered hydrological regimes, which required immense dedication and resource allocation, and current residents re finding creative ways to adapt their land to suit changing ecological and environmental awareness. In the Skagit, flooding is an every-day problem; with the effects of climate change still being understood, the risk associated with flooding can only increase.

But nearly 100,000 people call this place home, and most have no intent on relocating any time soon. Having grown up just a 3-hour drive from New Orleans, I am well aware of just how difficult a task relocating peoples lives can be; no matter how extreme the risk. People living in the Skagit River Delta face increased risks of flooding, land-use intensity, and erosion; all factors that can be altered, or at least lessened, through adjustments in settlement patterns, approaches to ecology, and tectonics.

At the root, this thesis explored a design which builds upon long-term thinking in order to provide context for shorter-term goals. The design tactics used are intended to stand on their own, but increase in functionality when combined. The territorial plan envisions the effects of small scale alterations: regenerating a slough becomes an opportunity to experience flooding and seasonal changes in native flora and fauna; introducing meanders affords an opportunity for pedestrian connection between cities; and eroding the levee gives the river freedom to move, increases habitat, and provides access to a valuable material. By relating to these broad-scale proposals in building, the structure itself embodies the intervention narrative, and the grange becomes an observatory of nature in motion.

Throughout this process, I found myself continually asking a question I hadn't considered before: what does it look like to construct for restoration and repair? This serves as a guiding question from which I will continue to work. Answering this question through building holds potential to address a variety of needs, such as increasing bio-diversity and enhancing spatial relationships between people and place. My hope is that this method can become a lens which can be applied to any site and place, and help me develop building practices that emerge from, and contribute to the health of, a specific local context.

List of Figures

Unless noted, all images are by author

list of figures continued II

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Appendix

The following is a list of materials data compiled for each timber in the Skagit Riparian section; these were evaluated to determine what characteristics they have, and what they may afford in construction.

Material properties data sheet

date 12 NOV 2017 — observer RYAN

common name: RED ALDER (BETULACEAE) — latin name: Alnus

density	28
shear strength	2.6 / 590
elongation	9.5
crushing ~~compression~~ strength	5,820 lb/in²

observed characteristics

Large, broad ~~leafs~~ leaves. Topping out around 60', avg. appears to be 40'. Smooth and mottled bark, similar to birch, but doesn't peel well. Rust color and appears to do fine in cottonwood/poplar understory. (apparently can grow 80' in 2 decades)

historical human uses

Tremendous importance as ecological habitat. Dyes of red, orange & brown from bark. Fixes nitrogen into the soil, used in soil reclamation endeavours and remediation. Dense, even grained timber, takes finish well and seldom splinters.

Material properties data sheet

date Nov 12 2017 observer RYAN

common name BALSAM POPLAR (SALICACEAE)

latin name Populus ~~tricop~~ trichocarpa

density 23

shear strength 1.3 | 300

elongation 8

compression strength

observed characteristics

fine toothed leaves, broad canopy. Rugged and gnarly bark, tough as nails and difficult to peel. Light cream-colored flesh. Thick branches growing upright.
(deep root system that can tolerate heavy flooding)

historical human uses

Penny Maulden told me a story about cutting down Black Cottonwood, b.pop.'s relative, in that when cutting it down literally streams of water were spilling out. Historical medicinal uses of bark into salve, inner bark & sap edible, dyes from fruit. Used currently as a furniture and pulp wood.

Material properties data sheet

date NOV 12 2017 *observer* RYAN

common name	*latin name*
ASPEN (SALICACEAE)	Populus tremuloides
density	26
shear strength	1.5 / 350
elongation	8
compression strength	

observed characteristics

Easy to spot this time of year! Tremendous bursts of color. Not right up against water like cottonwood, but close. Wide - broad leaves. Similar trunk ø with many small branches that support canopy.
(Rapidly expanding root system)

historical human uses

Many animals feed on the bark and foliage, and migratory birds nest in Aspen. Human use of bark as medicine to relieve pain, fever, infection and colds. Cream - colored timber that is light and soft. Cuts like butter and doesnt splinter.

Material properties data sheet

date 12 NOV 2017 observer RYAN

common name
RED ALDER
(BETULACEAE)

latin name
Alnus

density 28

shear strength 2.6 / 590

elongation 9.5

crushing ~~compression~~ strength 5,820 lb/in²

observed characteristics

Large, broad ~~leafs~~ leaves. Topping out around 60', avg. appears to be 40'. Smooth and mottled bark, similar to birch, but doesnt peel well. Rust color and appears to do fine in cottonwood/poplar understory.
(apparently can grow 80' in 2 decades)

historical human uses

Tremendous importance as ecological habitat. Dyes of red, orange & brown from bark. Fixes nitrogen into the soil, used in soil reclamation endeavours and remediation. Dense, even grained timber, takes finish well and seldom splinters.

Material properties data sheet

date

observer

common name

WILLOW
(SALICACEAE)

latin name

Salix

density 26

shear strength 1.6/430

elongation 7

compression strength

observed characteristics

Shrubby, tall thicket; similar to vine maple, but taller and more varied. Maybe 15" avg height? likely less.

(grows quickly after flood and establishes soil mat)

historical human uses

Very significant tree to Coastal First Nations, and other North American tribes. Medicinal uses for pain and headache, sore throat remedy. Woven for twine, and larger sections used for sweat-lodge and shelter frames. Woven for baskets, snowshoes, fish-traps etc. Like Alder & Aspen, forms wildlife habitat for aquatic & terrestrial species.

Material properties data sheet

date 12 NOV 2017 **observer** RYAN

common name
PACIFIC YEW
(TAXACEAE)

latin name
Taxus brevifolia

density	44
shear strength	7.1 | 1600
elongation	9.31
compression strength	

observed characteristics

'Stringy' tree. Short but dense. Amongst true and false fir at low elevations. Consistent size in lower branches, which form broad canopy.

historical human uses

Highly prized for hunting tools and building. Often traded to inland people. Very strong, heavy, elastic timber of yellow/red color. Highly rot resistant (for timber), maybe as much as cedar/cypress? Very ~~curvy~~ chewy grain, lots of run-out potential.

Material properties data sheet

date NOV 12 2017 *observer* RYAN

common name VINE MAPLE

latin name Acer circinatum

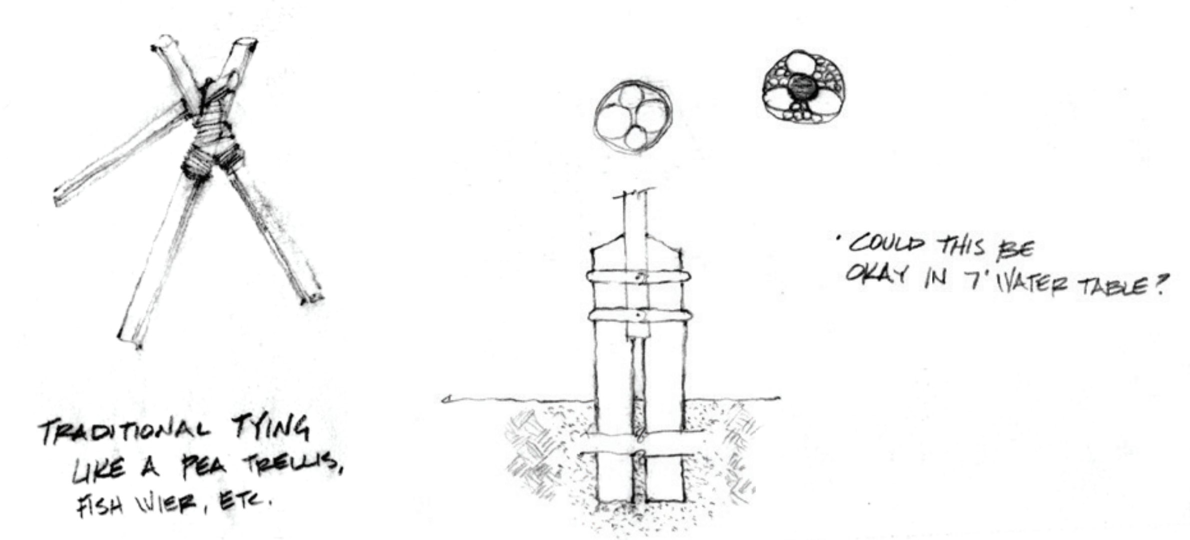
density	~~2.6~~ 33
shear strength	~~1.6 430~~ 3.1 / 700
elongation	12
compression strength	

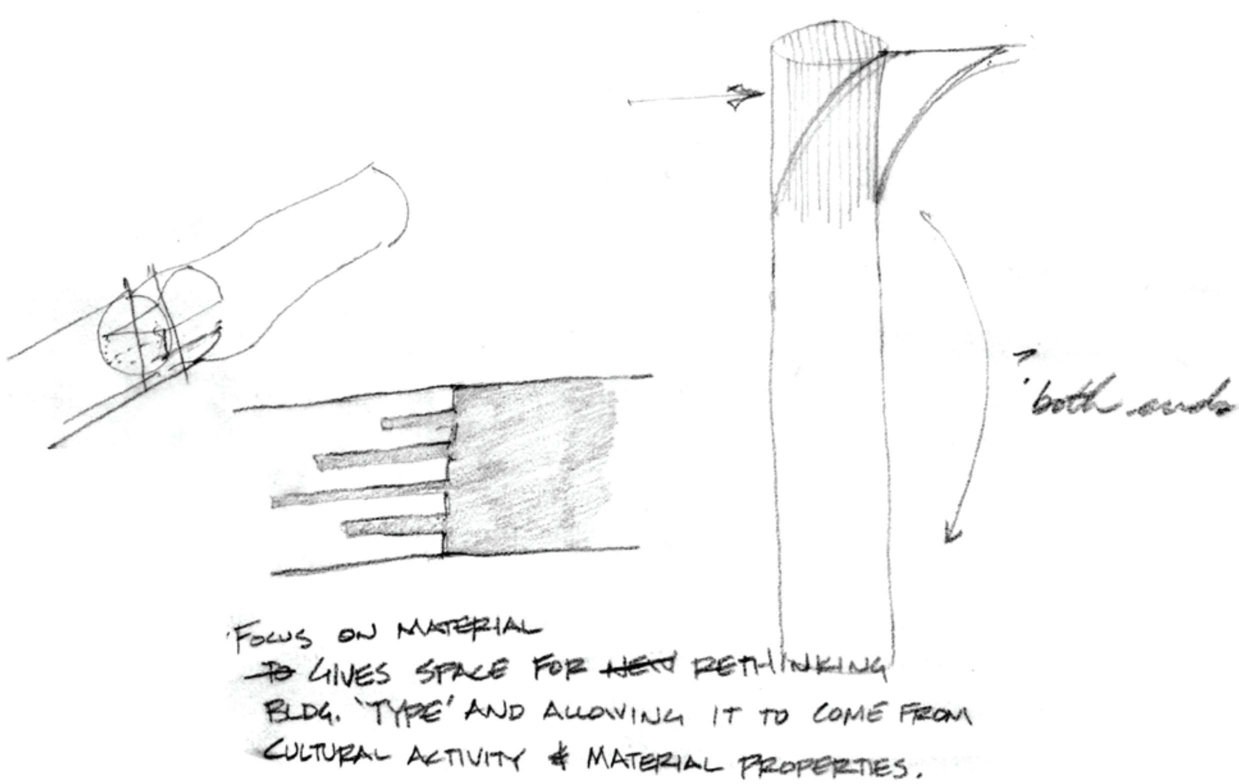
observed characteristics

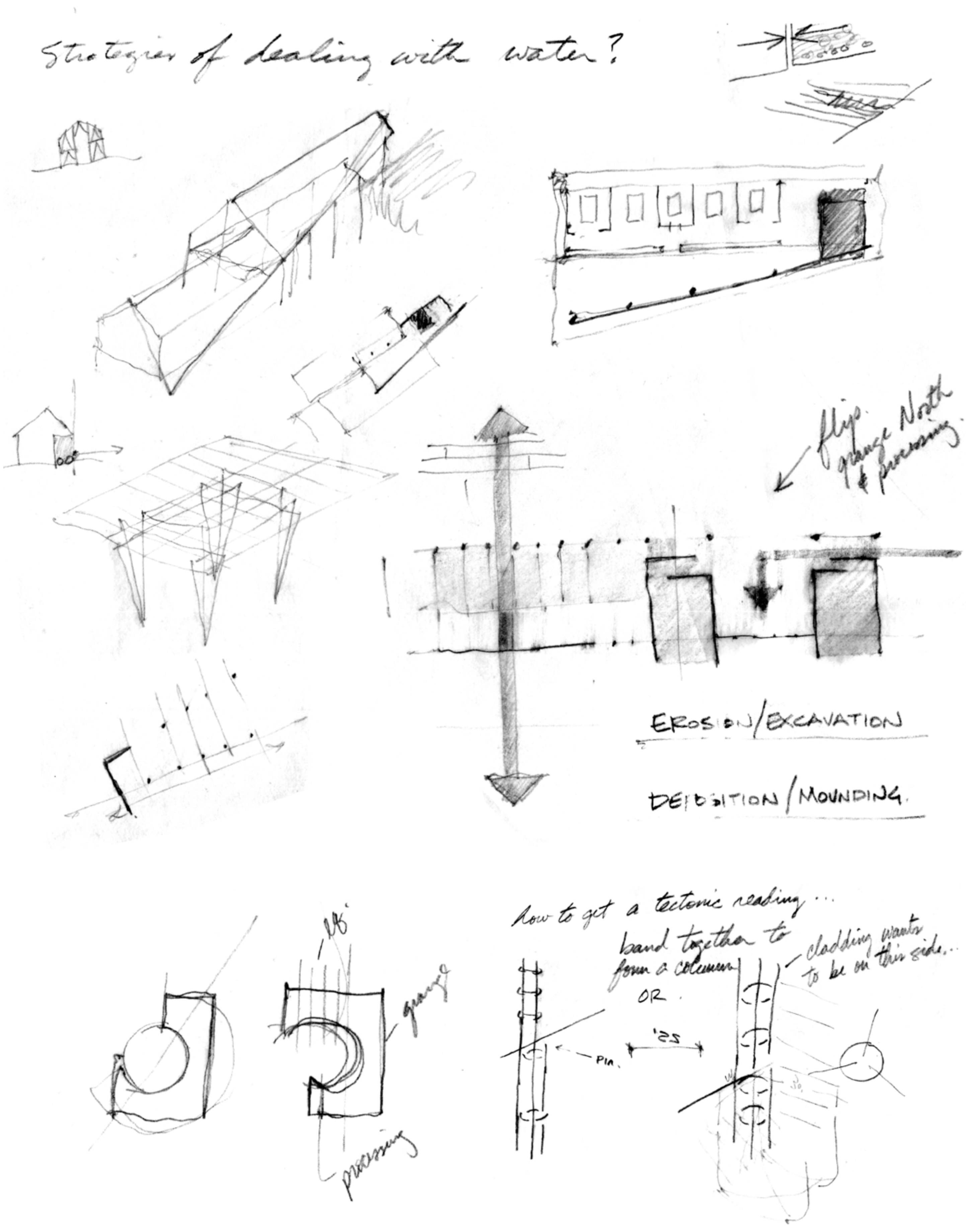
Small, shrubby tree (bush really). Branches flex easily without breaking. Smells ~~supp~~ super earthy, fuzzy leaves. Slender, sprawling ~~to~~ limbs, but more upright in open areas.

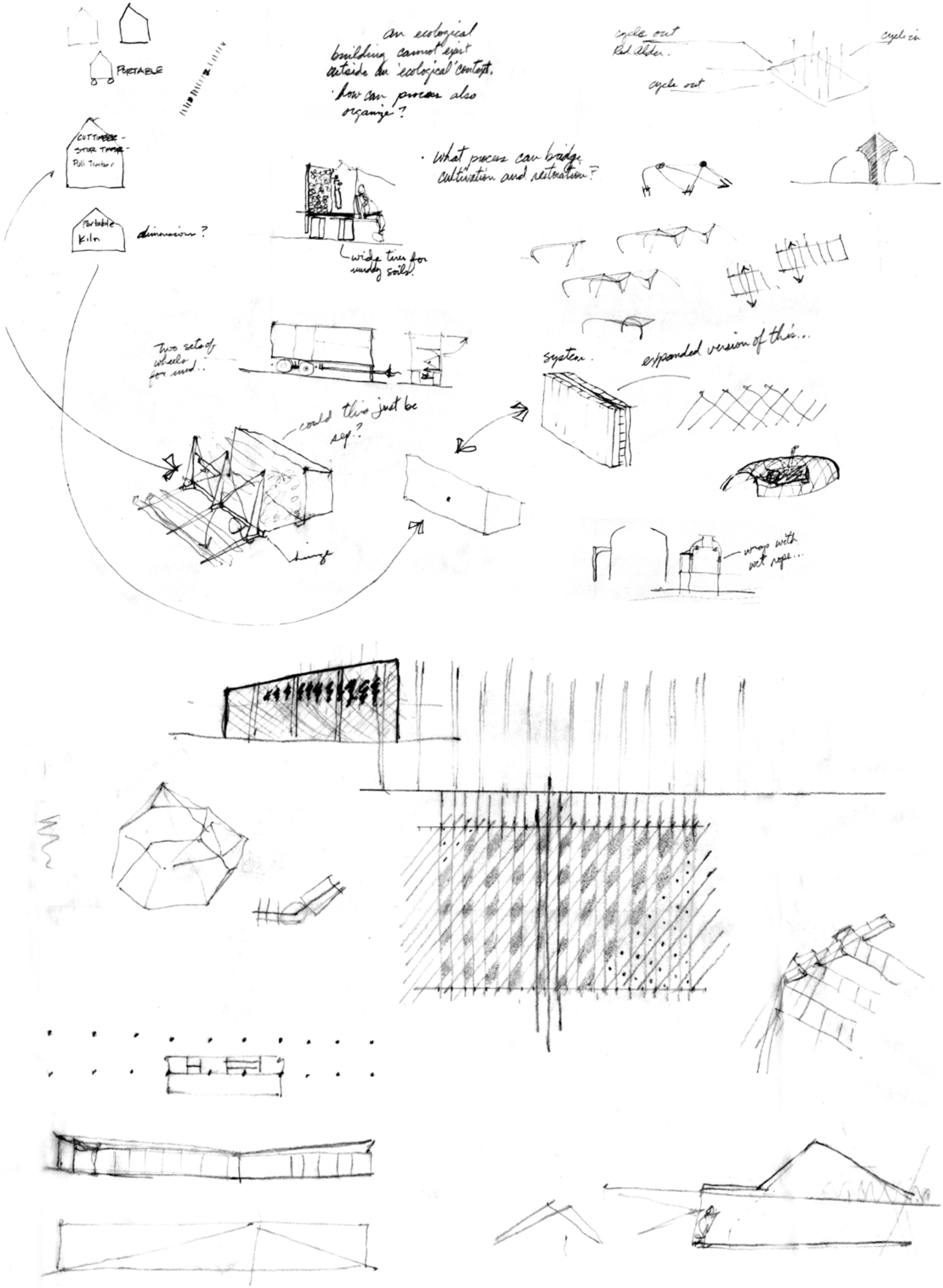
historical human uses

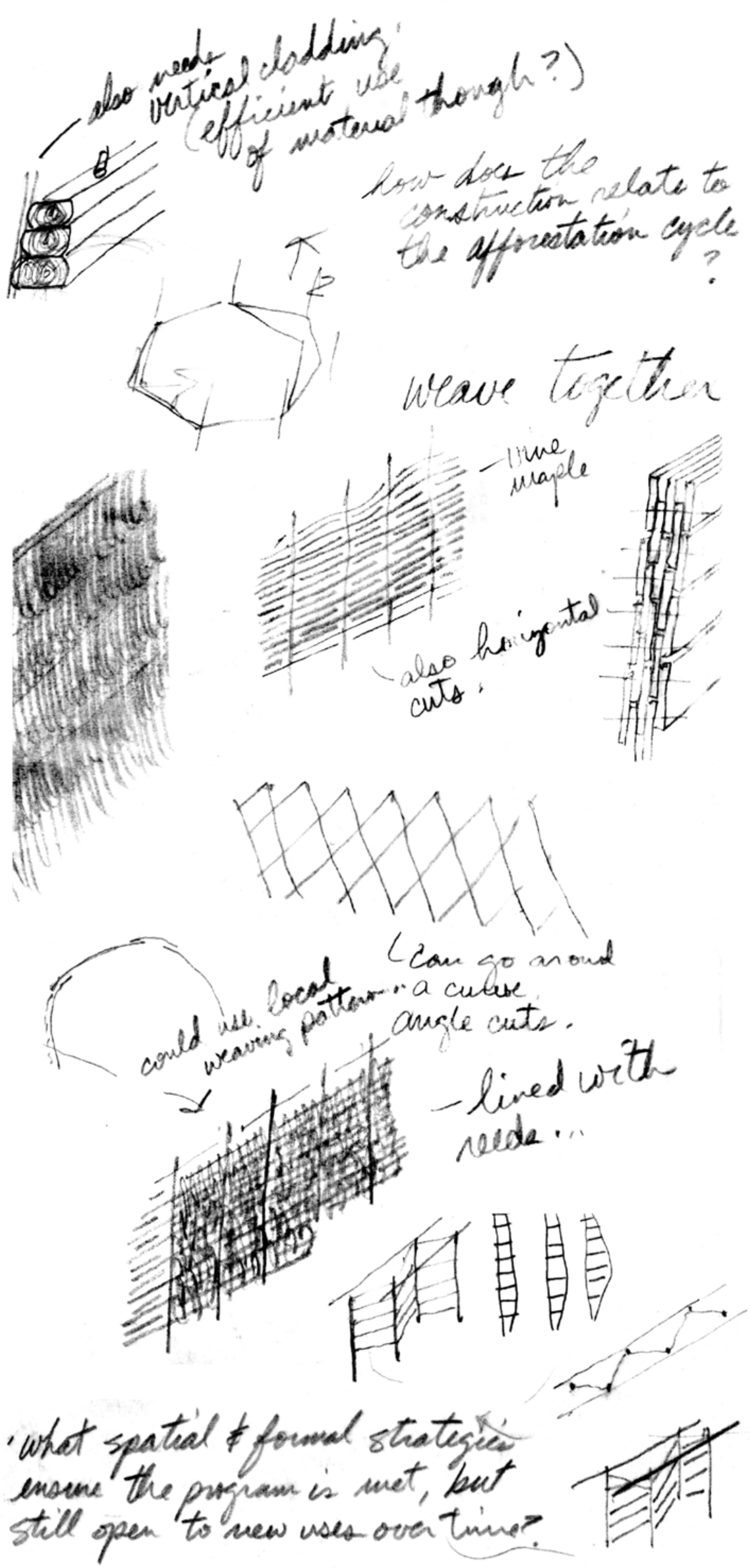
Quinault refer to it as 'basket tree' as the long, straight shoots are easily woven and strong.


TRADITIONAL TYING
LIKE A PEA TRELLIS,
FISH WIER, ETC.
·COULD THIS BE
OKAY IN 7' WATER TABLE?

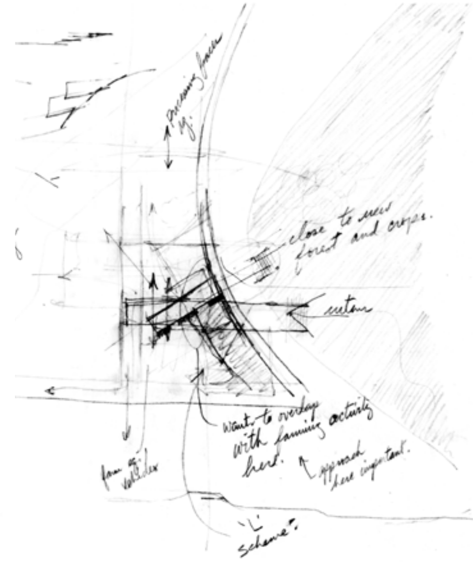

·both ends
·FOCUS ON MATERIAL
~~TO~~ GIVES SPACE FOR ~~NEW~~ RETHINKING
BLDG. 'TYPE' AND ALLOWING IT TO COME FROM
CULTURAL ACTIVITY & MATERIAL PROPERTIES.


Strategies of dealing with water?
flip grange North & processing
EROSION/EXCAVATION
DEPOSITION/MOUNDING
how to get a tectonic reading...
band together to form a column
OR
cladding wants to be on this side...
PIN
grange
processing

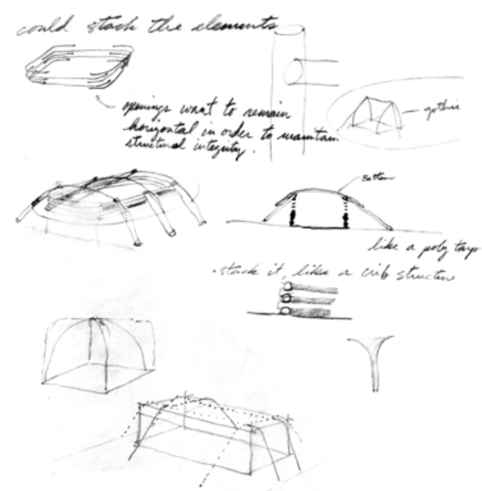

PORTABLE
an ecological building cannot exist outside an 'ecological' context.
'how can process also organize?
cycle out
Red Alder.
cycle out
cycle in
Pull Timber
Portable Kiln
dimensions?
What process can bridge cultivation and restoration?
wide tires for muddy soils!
Two sets of wheels for mud..
system.
expanded version of this..
could this just be sep.?
hinge
wraps with wet rope...



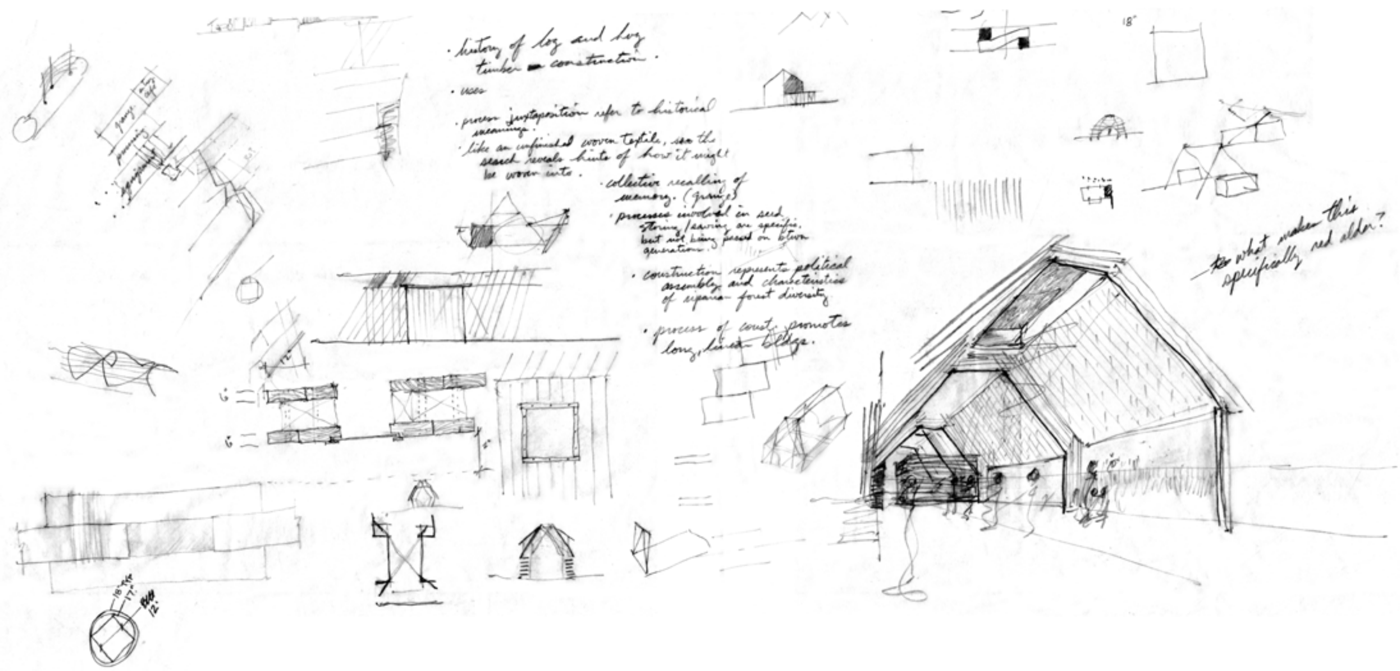
also needs vertical cladding
(efficient use of material though?)
how does the construction relate to the afforestation cycle?
weave together
pine maple
also horizontal cuts.
can go around a curve
angle cuts.
could use local weaving pattern
lived with reeds...
what spatial & formal strategies ensure the program is met, but still open to new uses over time?

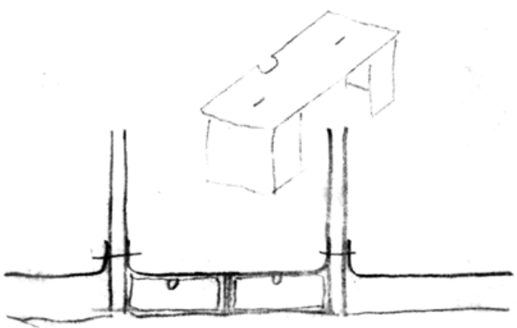


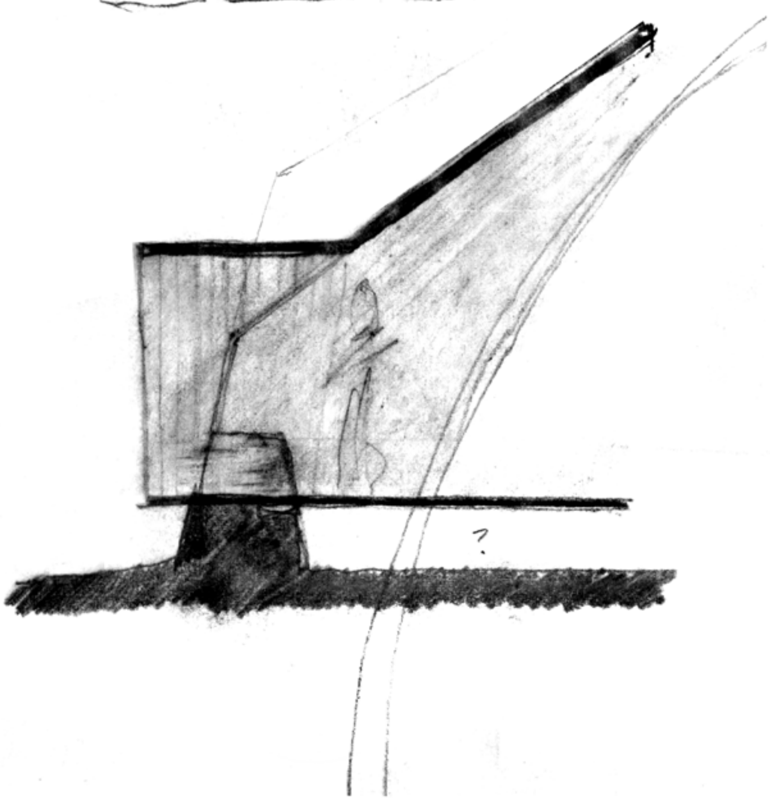
close to new forest and crops.
want to overlap with farming activity here.
approach here important.
scheme

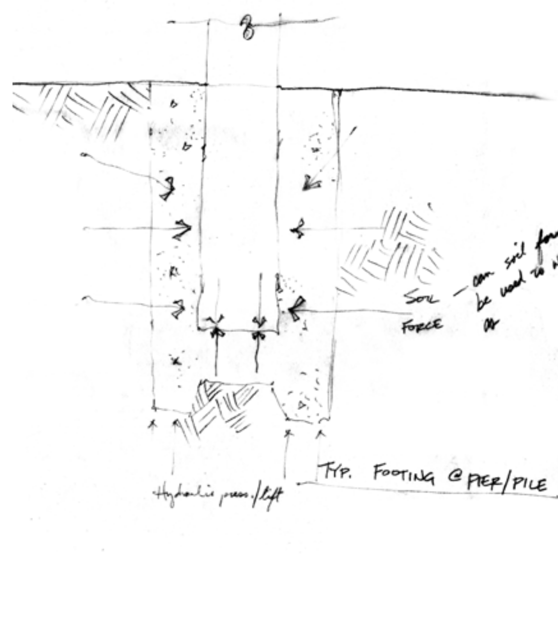


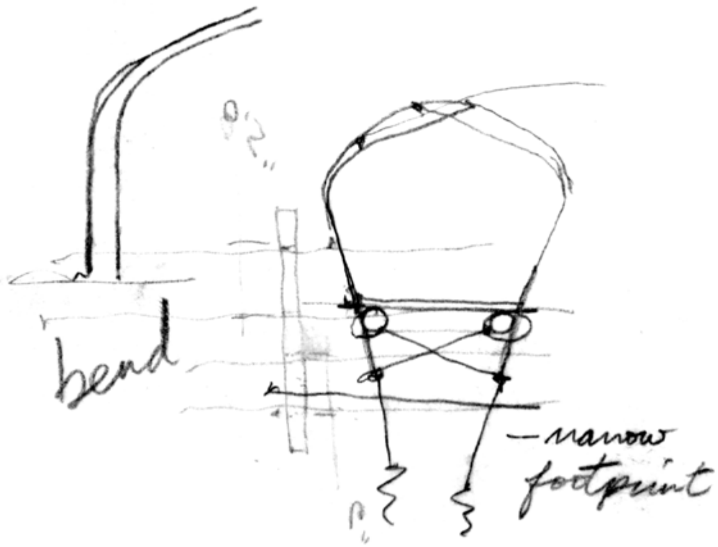
could stack the elements
openings want to remain horizontal in order to maintain structural integrity.
gothic
like a poly tarp
stack it, like a crib structure

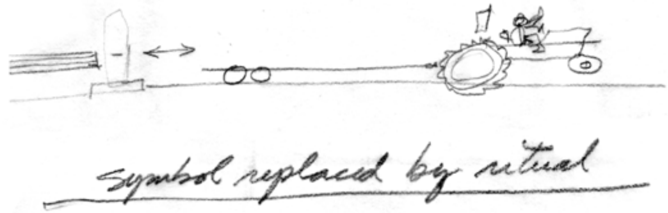

history of log and log timber construction.
uses
process juxtaposition refer to historical meaning.
like an unfinished woven textile, see the search reveals hints of how it might be woven into.
collective recalling of memory.
construction represents political assembly and characteristics of riparian forest diversity
process of const. promotes long, linear bldgs.
what makes this specifically red alder?

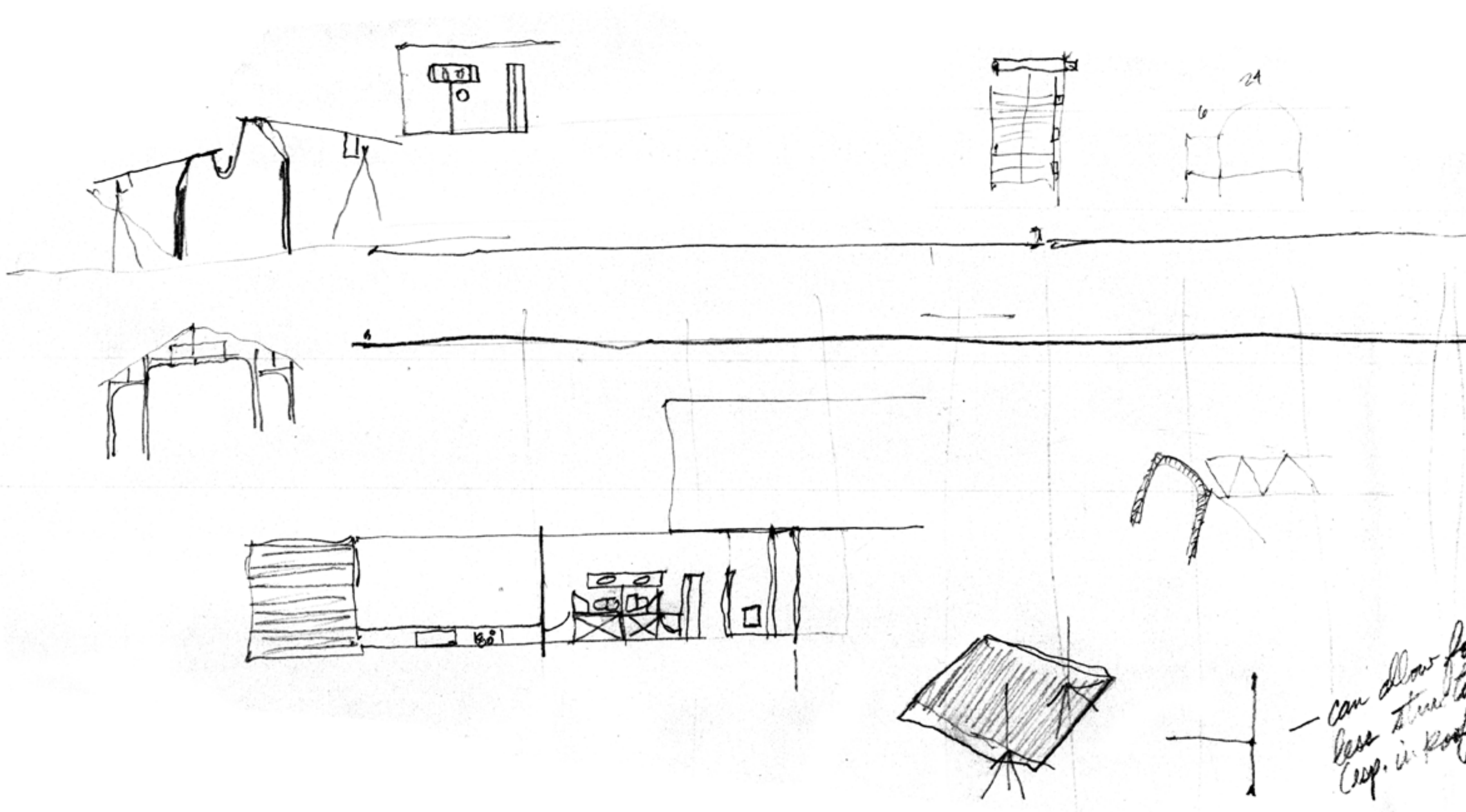


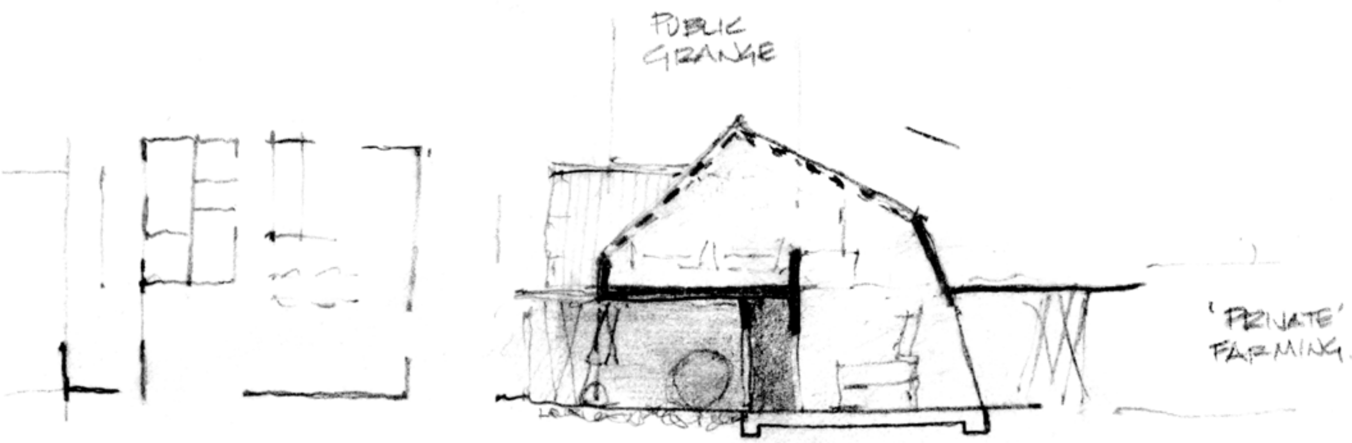


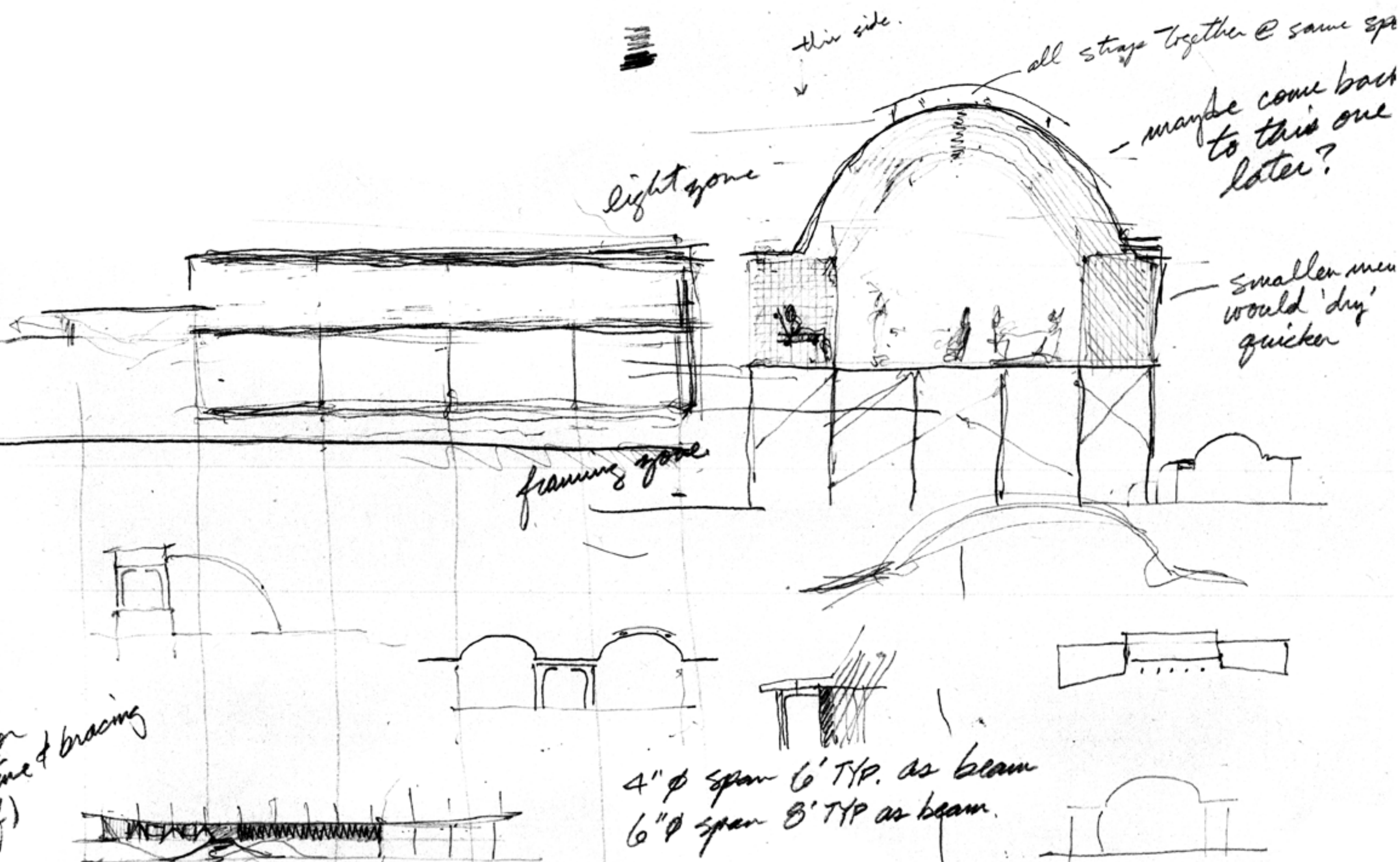

SOIL FORCE
can soil force be used to work as
Hydraulic press./lift
TYP. FOOTING @ PIER/PILE

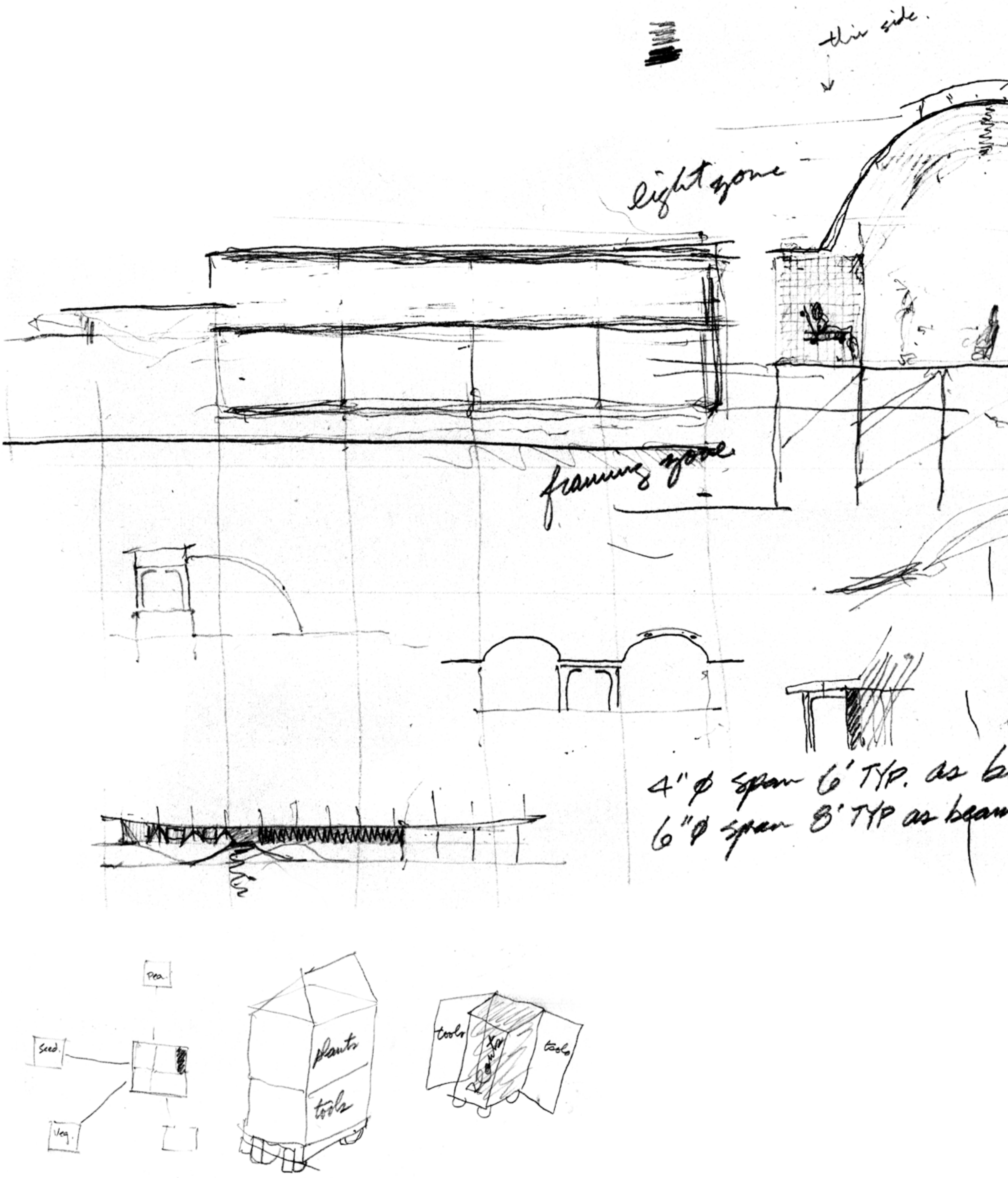

bend
—narrow
footprint

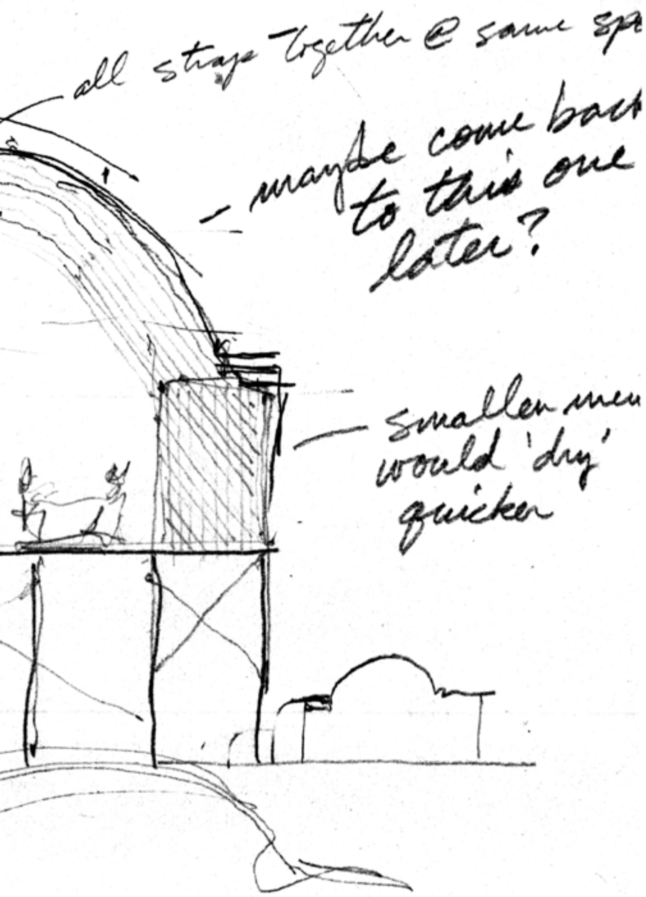

symbol replaced by ritual

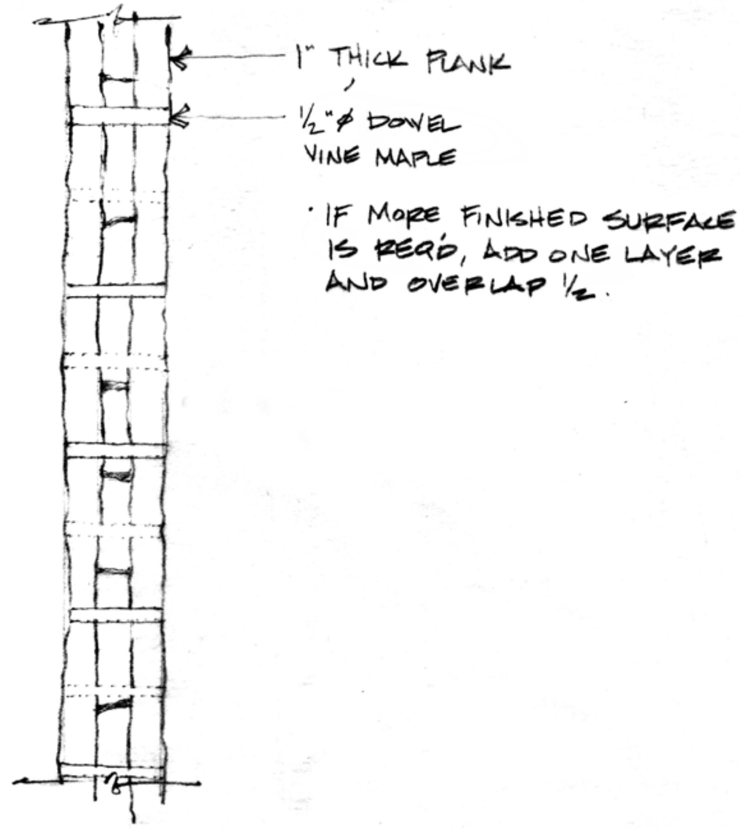


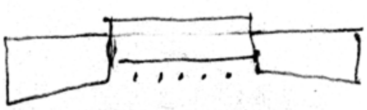

PUBLIC
GRANGE
'PRIVATE'
FARMING.

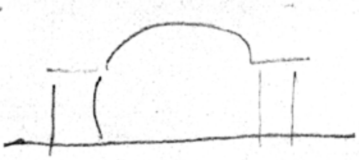

this side.
all stays together @ same
maybe come back
to this one
later?
light zone
smaller
would 'dry'
quicker
framing zone
4"ø span 6' TYP. as beam
6"ø span 8' TYP as beam.

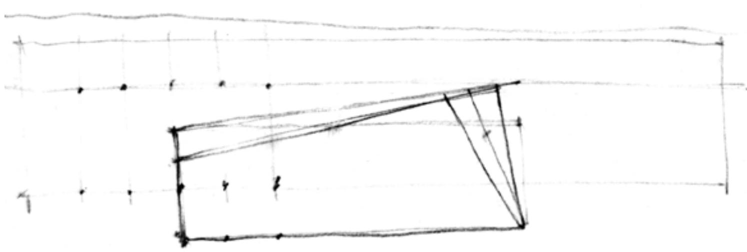

this side.
light zone
framing zone
4"ø span 6' TYP. as
6"ø span 8' TYP as
pea.
seed.
veg.
plants
tools
tools
tools

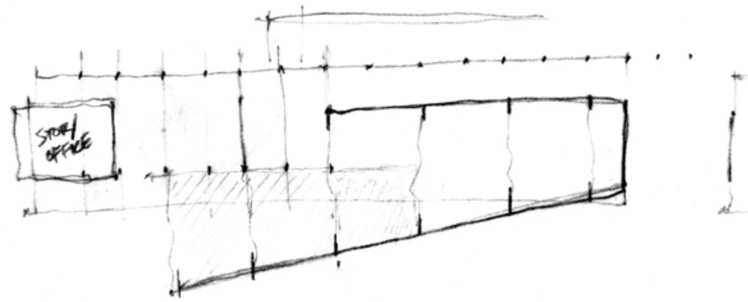

all stays together @ same sp
maybe come back to this one later?
smaller mem would 'dry' quicker

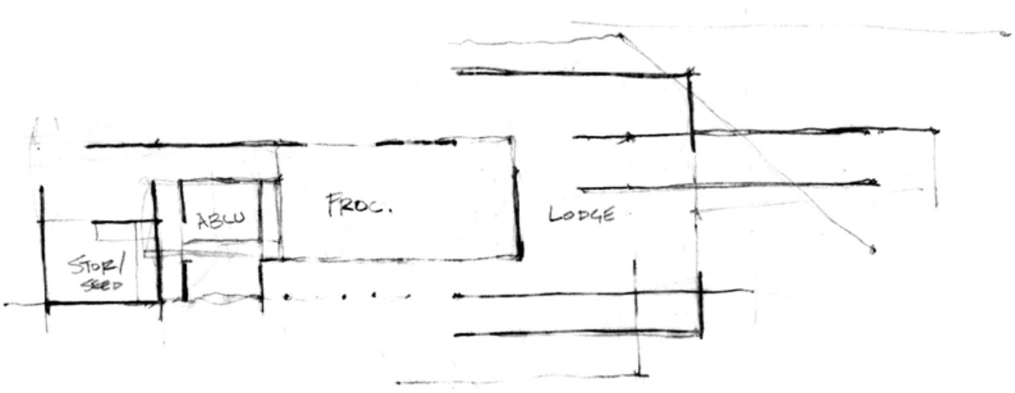

1" THICK PLANK
1/2"ø DOWEL
VINE MAPLE
· IF MORE FINISHED SURFACE IS REQ'D, ADD ONE LAYER AND OVERLAP 1/2.

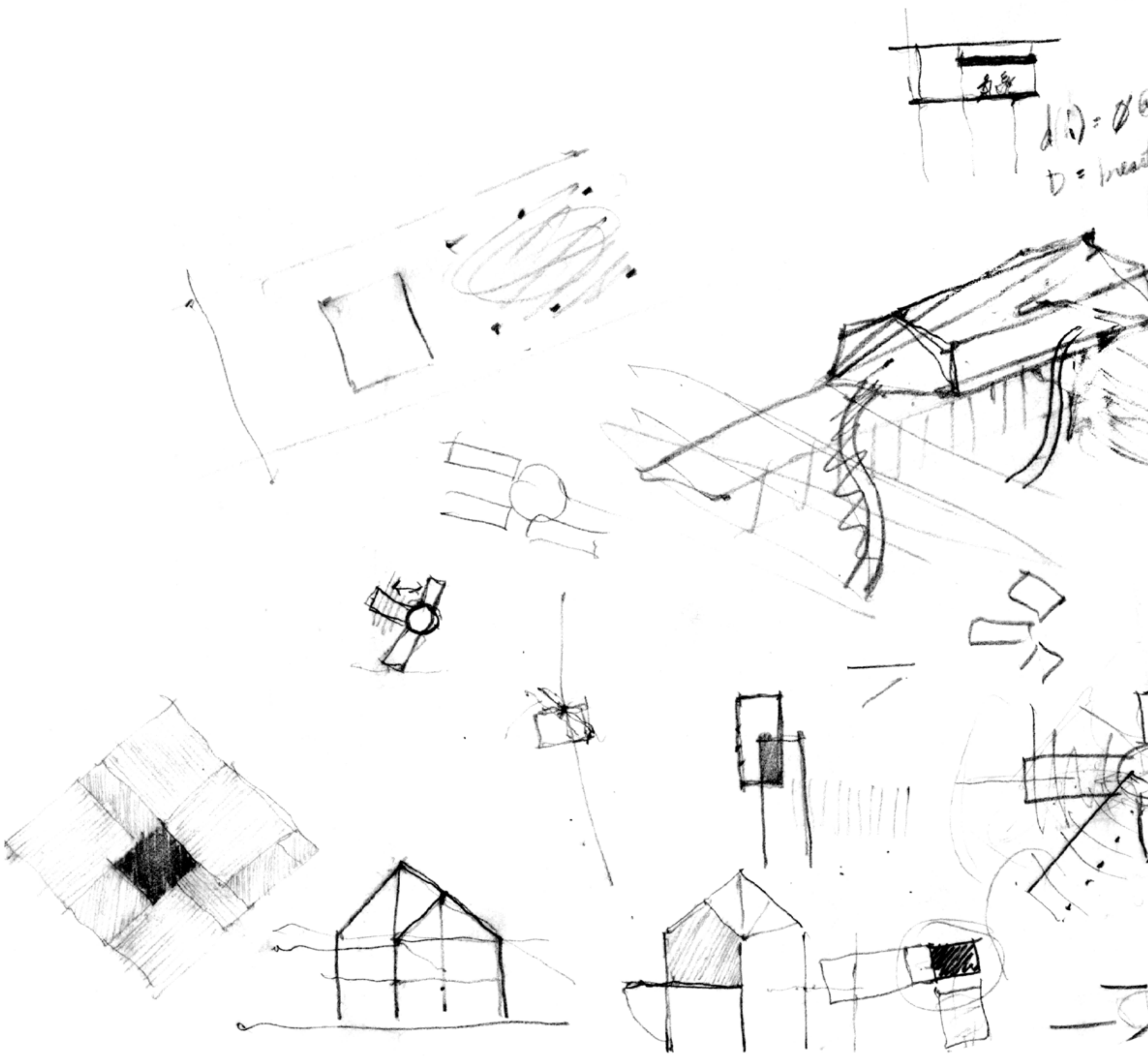


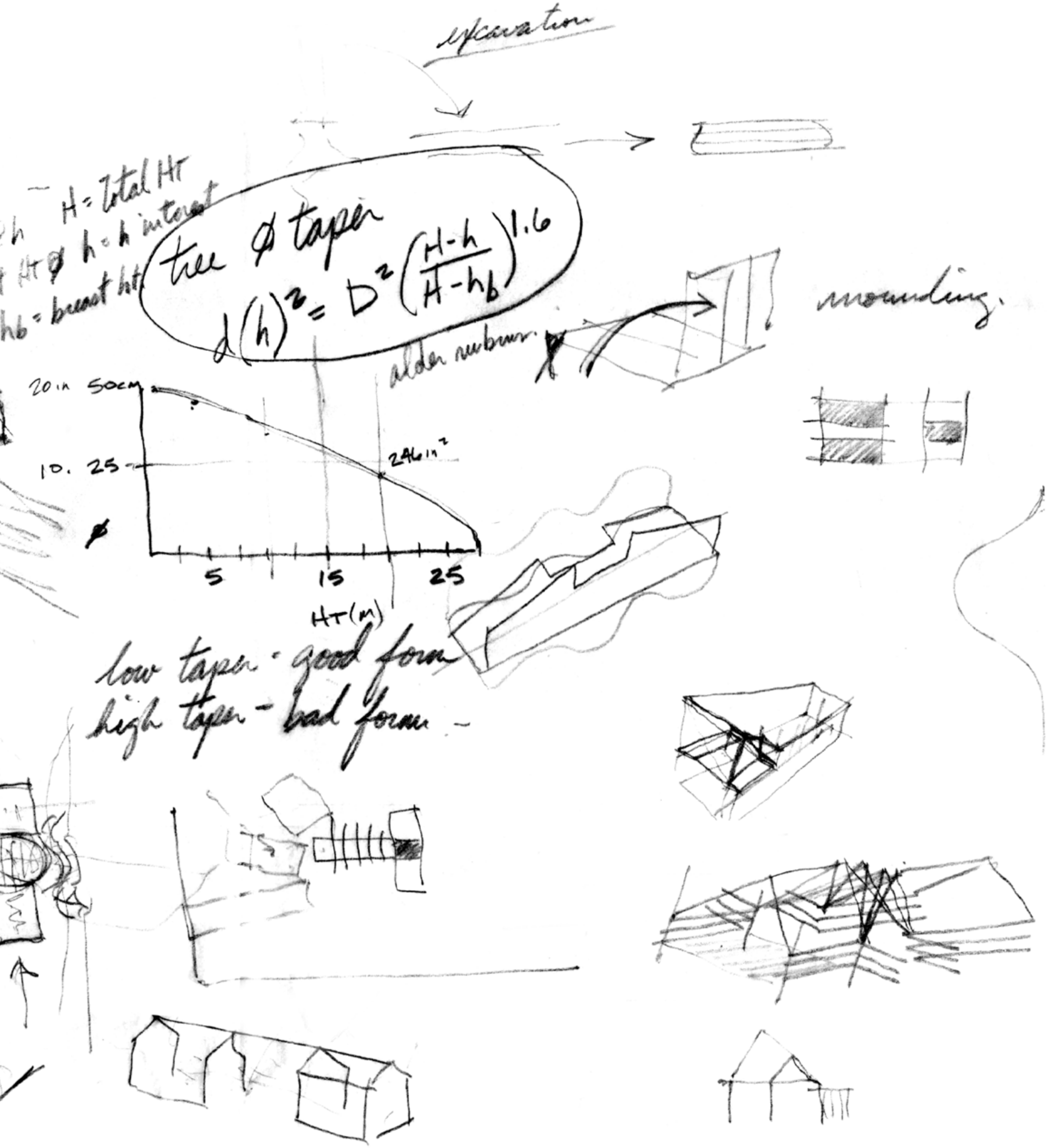




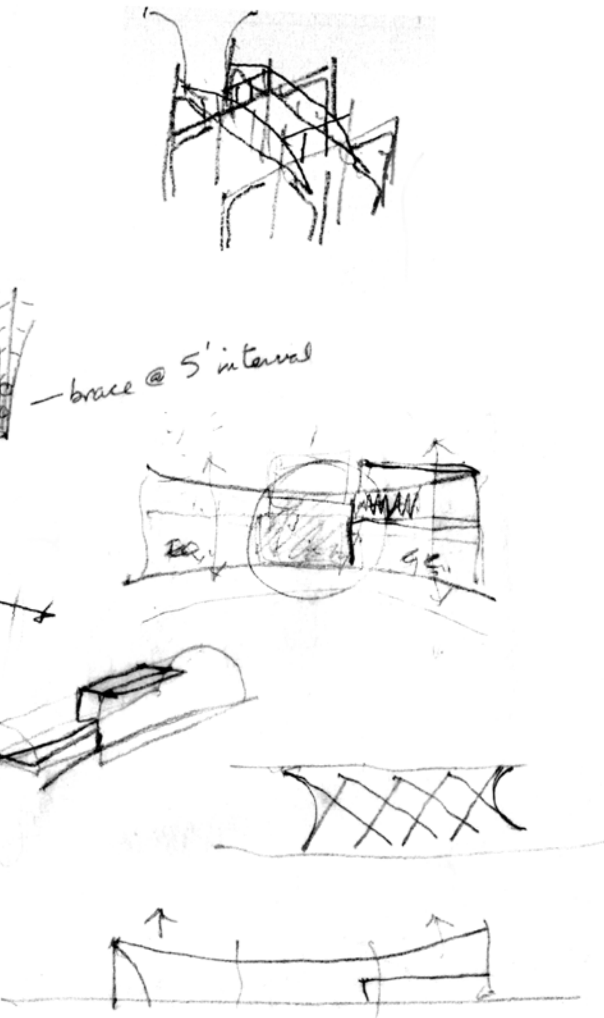

STOR/ OFFICE


STOR/ SEED
ABLU
PROC.
LODGE



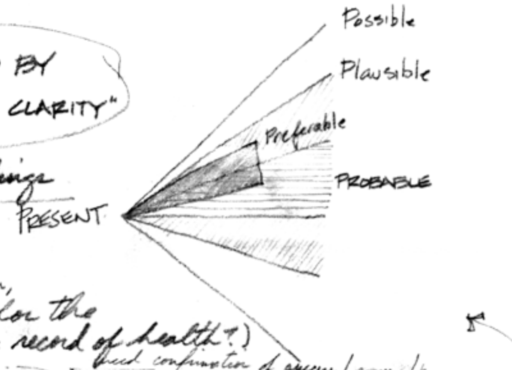

excavation
H = Total Ht
h = h interest
hb = breast ht
tree ∅ taper
$d(h)^2 = D^2\left(\frac{H-h}{H-h_b}\right)^{1.6}$
mounding
20 in 50cm
10. 25
∅
5
15
25
Ht (m)
low taper - good form
high taper - bad form


how much wood would one bent take?
a place to experience the cycles of the river, and earth.
a place to exchange knowledge & politics.
wet
KIT.
What is the purpose?



GOTHIC CHARACTERIZED BY
"PERFECT STRUCTURAL CLARITY"

· ribbed & vaulted ceilings



· the color of Red Alder
changes with soil. iron,
heavy metals, etc. discolor the
timber... (could become record of health?)

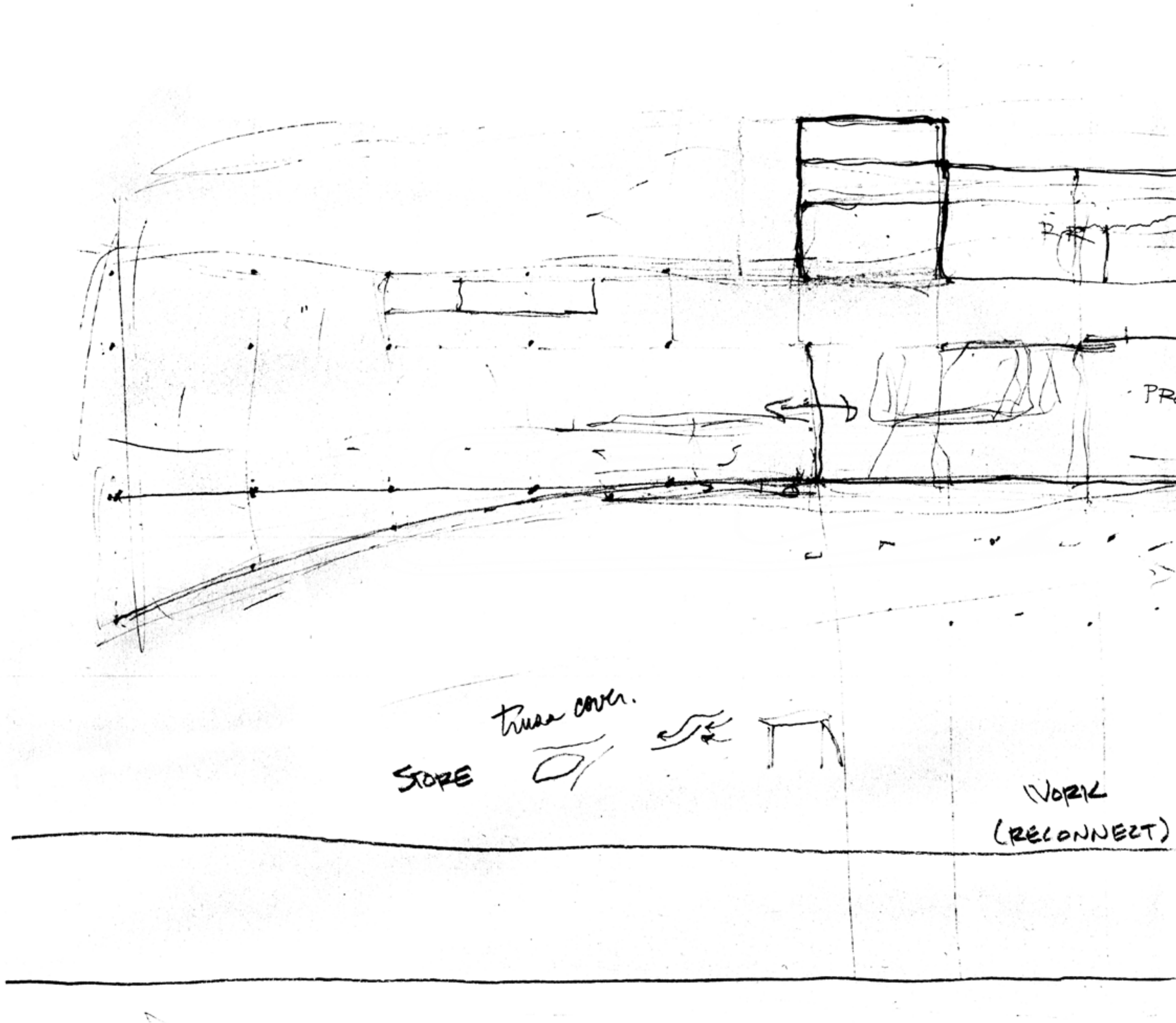
need confirmation of success / proven / known
DUNNE & RABY.

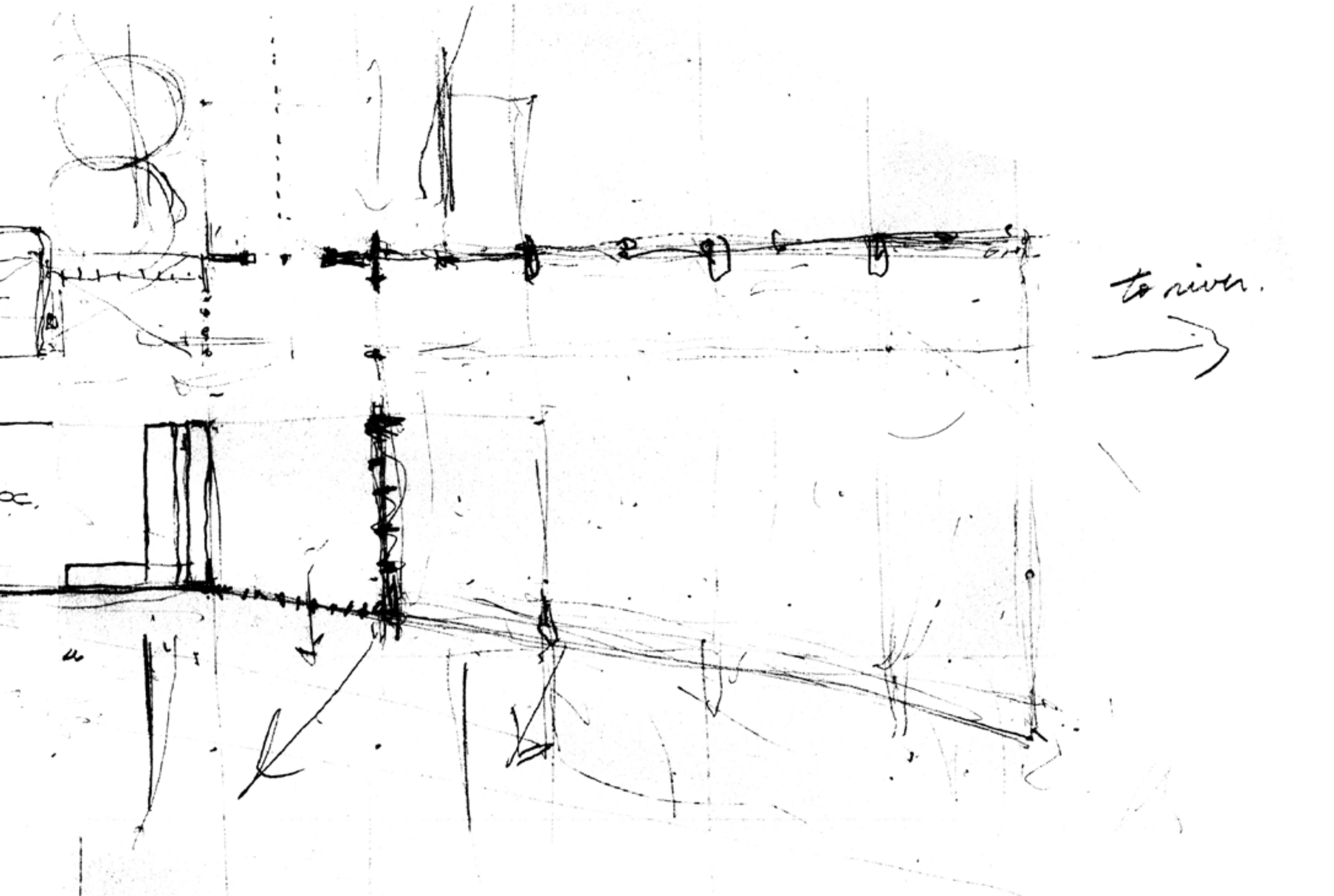
unknown contributor
to change.

@6"Ø 22#/-
8" 50#/- / linear foot.:

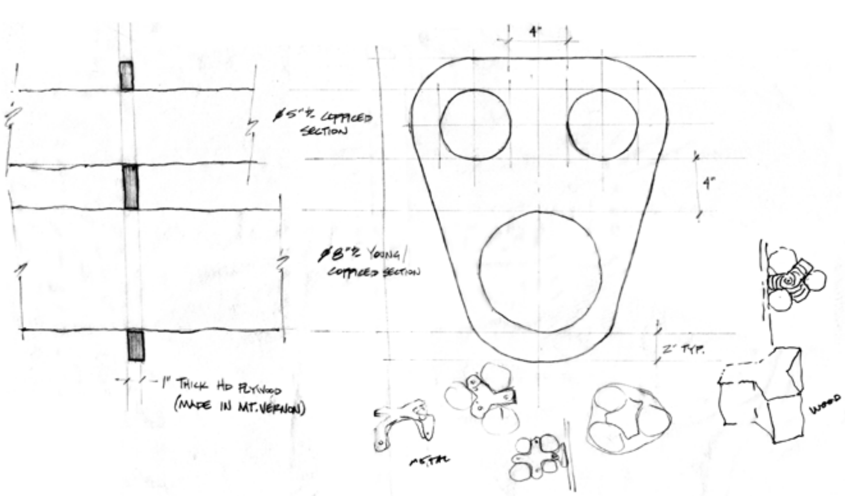
but... 8"Ø @ 4' weighs 80#/- mushroom, onion, 2/3 cu. stock,
tomato & garlic.

so... maybe (8" = 20%
6" = 10%) cotija? tortillas.


PR
truss cover.
STORE
WORK
(RECONNECT)


to river.


GATHER
(MEANDER)


4"
ø5"± COPPICED SECTION
4"
ø8"± YOUNG/ COPPICED SECTION
2" TYP.
1" THICK HD PLYWOOD (MADE IN MT. VERNON)
WOOD
METAL