

HARVESTING ENCOUNTER:

An Interpretive Research Center at Pack Forest

Tyrel Sullivan

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Committee:

Gundula Proksch

Rick Mohler

Elizabeth Golden

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PREFACE

I have always been impressed by engineered wood products. Not only are they stronger than traditional wood products, they use timber more efficiently, decreasing our demand on resources. While researching the topic, I encountered a breadth of information about the sustained health of American and Canadian forests. This directly contradicted what I had learned at young age, that harvesting from our forests would inevitably eliminate the resource. Although other continents may struggle to sustain working forestland, I found the current practices in America and Canada to be encouraging proof that depletion is not inevitable.

In addition to North America's success in forest management, I also learned of the continuous efforts to minimize the impacts forestry can have on an ecosystem. However, despite those efforts, I learned there are still many who disagree and even protest the idea that forestry can be a sustainable practice. Most alarming to me were the acts taken by "environmental terrorists", specifically the Earth Liberation Front, whose protests include over thirty incendiary attacks on private property, most notably the U.S. Forest Industries' Headquarters in Oregon.¹ In Seattle alone, the Earth Liberation Front has destroyed multiple buildings, the most significant of

which was Merrill Hall at the University of Washington's Center for Urban Horticulture in 2001. Although the agenda of the research at Merrill Hall was focused on decreasing our negative impact on the environment, it was viewed as harmful based on the false assumption of its role in developing genetically modified organisms.²

As a designer, I realize the built environment has a substantial impact on the natural environment. The building industry has worked hard in recent years to monitor, assess, and minimize those impacts. The environmental benefits of building with wood products are encouraging to me, and I believe it is important to promote their future use. Additionally, I find it important to eliminate misconceptions, especially when they lead to destructive acts. Therefore, this project combines my attraction to wood as a tectonically beautiful, tactile, and versatile material, with a desire to promote it as an environmentally responsible choice.

INTRODUCTION

A PROMOTIONAL AGENDA

The ever increasing awareness of adverse human impacts on the natural environment has changed our approach toward the built environment. It seems the more we construct, the more we destroy. The building industry is quickly reacting, using new fabrication and assembly methods to construct buildings, and smarter mechanical and passive systems to operate them. While it is important for buildings to implement these strategies, it is equally important that they are applied in ways that allow evaluation of their performance and promote their future use. This thesis involves a promotional agenda, seeking to expand how users perceive the exchange

between the built environment and natural environment.

The project proposes a public facility in the context of a working forest, with an agenda to facilitate ongoing forestry research, interpret that research to the public, and encourage appreciation for a harvested landscape. Through the medium of architecture, and through the lens of wood, the intervention uses its setting, structure, materiality, and program to construct a narrative that achieves a promotional agenda.

1. Typical forest harvesting



01. THE ENVIRONMENTAL BENEFITS OF WOOD

“Aside from being abundant, wood has offered Pacific Northwest Architects infinite design opportunities. Its insulation value, structural capacity, versatility and adaptability for various construction conditions, and, ultimately, its natural beauty made it the material of choice. These elements of Northwest Regionalism, which characterized the early work of the modernist pioneers and to this day still define the Northwest Regional Style, are the basic building blocks of sustainable design.” Dave Miller

LIFE CYCLE ANALYSIS

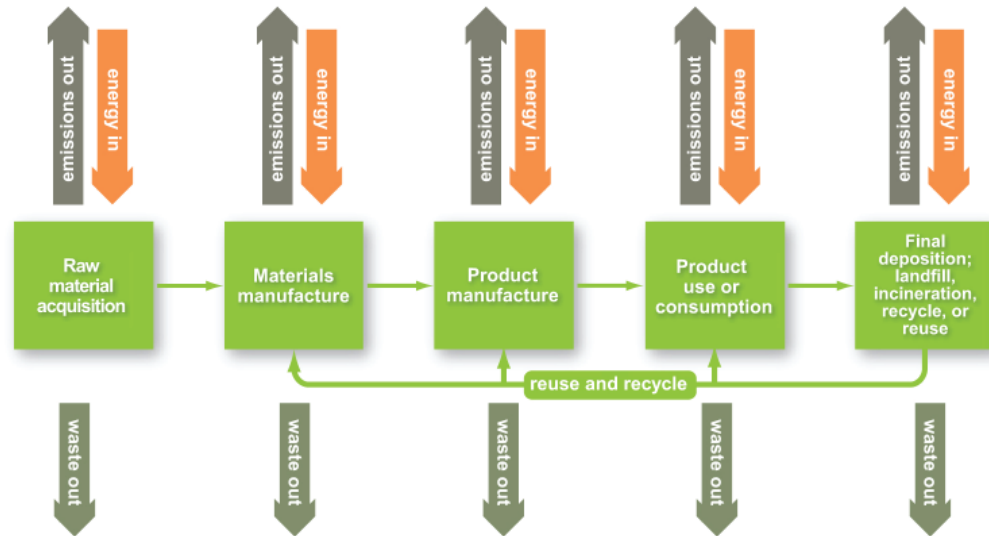
Humans have always instinctively relied on natural resources. However, since the industrial revolution, our manipulation of those natural resources has changed dramatically, involving more intensive processing of the raw material. While the human processing of natural resources provides us with materials that do bigger and better things, it often results in material inefficiencies and harmful emissions. Unfortunately, manufactured goods have become so prevalent, that they are utilized even when minimally processed natural alternatives are available. Food is a great example. All of the nutrition and sustenance required for survival can be found

in naturally occurring sources, yet processed foods have taken over our diets. Specifically in the building industry, the reliance on heavily processed man-made materials seems to eclipse that of more natural alternatives. With such a large demand on resources, it is pertinent for the built environment to utilize minimally processed natural resources whenever possible.

2. The process of life cycle analysis

Life cycle assessment considers every input and output

This diagram illustrates the general concept of life cycle assessment, where all of the environmental inputs and outputs are measured at each stage of a product's life.

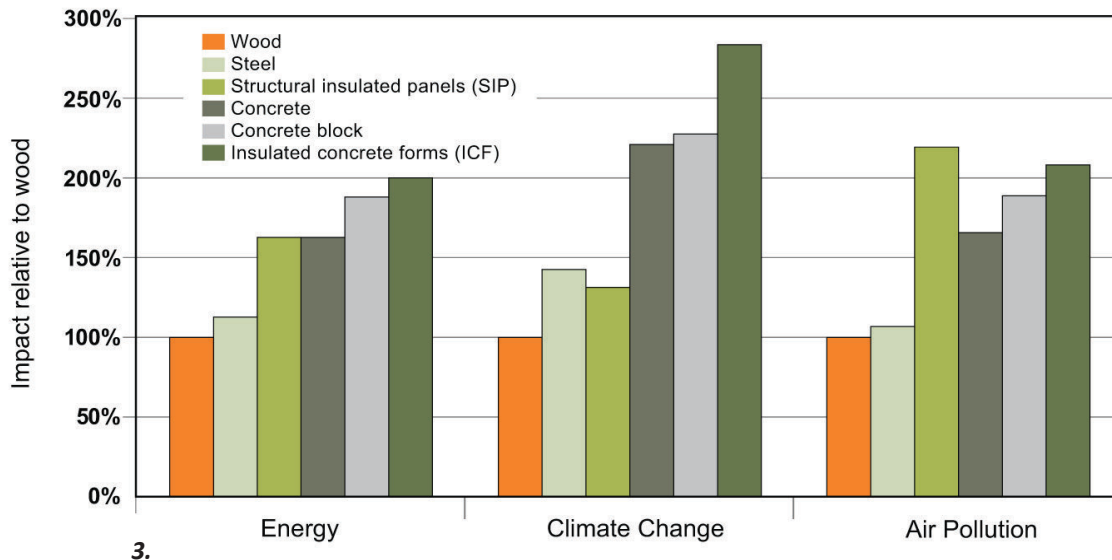


2.

While the catalogue continues to grow, concrete, steel, and wood remain as the predominant building materials. Of the three, wood products rely on the least intensive processing of the original substance, obvious in the resemblance between the manufactured product and the original material. Concrete requires cement, a fine powder created by grinding a mixture of gypsum, limestone, and shale that have been heated in a kiln, giving it a relatively high embodied energy. The resulting reaction between the materials emits a large amount of carbon dioxide.¹ Steel requires mining to extract iron ore which is then processed in a furnace fueled most commonly by

coal. Even the production of engineered wood requires less intense mechanical processes relative to concrete and steel.

In recent years, life cycle assessment has emerged as a way of quantifying the environmental impacts of various processes related to the building industry. Figure 2 demonstrates the considerations of life cycle assessment when it is used to analyze a specific material. For each stage of production, the energy in and the emissions out are quantified. That information is compiled to make assertions like: for x volume of plywood production, y



3. volume of carbon dioxide is emitted. When this type of analysis is used to compare wood to other materials, the environmental benefit of using wood is highlighted. Figure 3 shows one such comparison.

ENGINEERED LUMBER

The development of engineered wood products over the past century has revolutionized the application of wood as a building material. Appearing in the late nineteenth century and being showcased in the 1905 World's Fair in Portland, Oregon, plywood is the most common form of engineered wood. Plywood, which is made by gluing thin

sheets of wood together with the grains running perpendicular to one another, saw its greatest increase in popularity during World War II and in the years that followed. During the war plywood was used for almost anything, including barracks, huts, assault boats, lifeboats, gliders, and crates. As with most commodities, plywood production sky rocketed in the years following World War II to meet the high demands of the housing boom. It has remained a standardized product ever since.²

3. Environmental impacts of various wall assemblies
 4. Perkins and Will's Center for Interactive Research on Sustainability at the University of British Columbia is highlighted by the application of engineered wood.





5.



6.

Plywood was just the beginning. It was followed in the 1970's by oriented strand board (OSB), which is made by gluing much smaller strands of wood together to form a sheet. Once again, the strength comes from the fact that the strands are laid with the grains running cross-wise. Similar strategies have been used over the past few decades to produce bigger and better products that substantially increase the strength of the material. Products like glued-laminated timber (glulam), I-joists, and rim boards, as well as those that fall into the category of structural composite lumber (SCL) like laminated veneer lumber (LVL), laminated strand lumber (LSL) and parallel strand lumber (PSL) have become common-place in wood construction.³

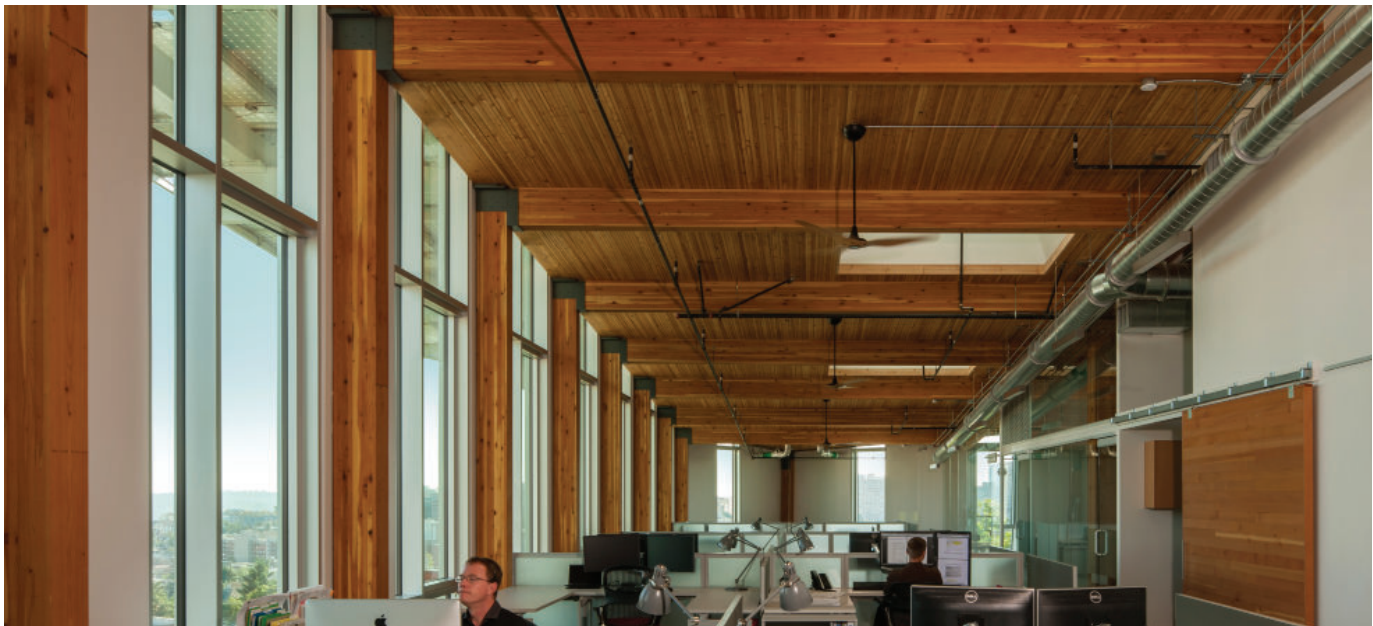
Structural composite lumber is becoming increasingly able to span longer distances and support greater loads,

- 5. Laminated veneer lumber
- 6. Parallel strand lumber
- 7. Miller Hull's Bullitt Center is highlighted by the application of a heavy timber glulam structure.

allowing it to be used in situations that may have previously required steel. In addition to the fact that less material is used to make something stronger, composite wood products significantly decrease waste. Breaking the wood down into smaller strands means that every piece is useful. Additionally, smaller pieces left over from the production of SCL can be used for OSB or become co-products such as wood based biofuel. Engineered lumber

is an appropriate term, as the products created by this process truly are engineered.

The most recent engineered lumber product to be introduced to the building industry is cross laminated timber (CLT). Similar to a glulam, it uses larger pieces of wood as opposed to small strands. CLT is produced as a panel that is made by gluing at least three layers of boards



7.

together. Each layer is inserted perpendicular to the previous layer, giving the material an immense amount of strength and giving it the name “cross-laminated.” The fact that large panels can be produced (up to forty-two feet in length and nine feet in width), means that cross laminated timber has many applications.⁴ Gluing together multiple layers of boards allows the panels to be up to 16 inches thick, resulting in a member that can stand vertically and support a load or span horizontally. While structural composite lumber has the ability to replace steel beams and columns, CLT panels take the capability of wood to an entirely new level, allowing it to replace concrete floors and walls in mid-rise buildings.⁵ Similar to pre-cast concrete panels, CLT panels are pre-fabricated off-site according to the design, and arrive at the job site ready for assembly.⁶ This means money can be saved, as production becomes more efficient, construction time is decreased, and waste is minimized.

All engineered wood products share the same qualities that make them efficient in their use of material and

therefore environmentally friendly. Engineered wood can be manufactured using fast growing species harvested at a young age, eliminating the reliance on old-growth. The fact that smaller pieces of wood are combined to make larger pieces means that large cross sectional members can be created from trees who’s cross section is nowhere close to that of the end-product. Furthermore, engineered lumber is much more reliable than traditional lumber, as most unwanted defects are eliminated. Not only are these products made with a smaller impact on forests, the result is a stronger material.

8. A CLT panel is raised during the construction of Perkins and Will’s Earth Sciences Building at The University of British Columbia.



02. SUSTAINABLE FOREST MANAGEMENT

SUSTAINING THE RESOURCE

Wood always has been and continues to be an essential component in building, especially for residential construction. Recently, however, wood's application has expanded to increasingly larger structures thanks to the development of engineered wood products and wood's promotion as the environmentally responsible choice. However, while the processes required to create wood products have a small impact on the environment relative to other products, there is still concern about the ability to sustain its resource. Forests are an invaluable asset to the environment, and a relying on those forests to create products may pose a threat. Fortunately, just as

more responsible construction methods have emerged, so have more responsible and efficient way of managing forests.

There are many ways of defining sustainable forest management because not all forests are managed for the same use. While forest management for timber production carries with it the most substantial consequences, it is important to remember that forests are valued for the recreational activities they provide such as hiking, bik-

9. A road leads into Pack Forest



ing, horseback riding, fishing, or hunting. Additionally, forests are valued for their majesty and natural beauty by conservationists and outdoor enthusiasts. Finally, forests are valued by various industries for the natural resource they provide. That resource and the value its products have for human life make sustainable forest management vital to the continued creation of timber products.¹

The first and most obvious concern of forest management is area. If the area of forest in a given region or country decreases from one year to the next, and that trend continues, the forest is in danger. This is a concern for many environmentalists who are opposed to forestry. A prevalent belief is that logging is an exploitation of a natural resource that will inevitably result in the elimination of forestland. Fortunately, in the United States and Canada, this is not the case. The Food and Agriculture Organization of the United Nations (FAO) closely monitors forestland around the world. Their 2011 report, *State of the World's Forests*, provides data on forestland

area over the past two decades for all continents (Figure 10). While global forest area has slightly decreased over the past twenty years, North American forest area has remained steady. Specifically in the United States, forest area has grown by over 750,000 hectares. Relative to overall forest area in the U.S. this is small, but demonstrates a steady and sustained increase of forested area.

The numbers provided in Figure 10 provide a good context for looking specifically at North American forestland that is designated primarily for production. According to the FAO, the amount of forestland in the United States that had this designation in 2010 was about 30 percent of overall forest area (Figure 11). With such a significant portion of overall forest being used for production, it is compelling that American forestland is not shrinking, but growing.

10. Forest area in North America, 1990-2010

11. Area of forest designated primarily for production in North America, 1990-2010

Forest area in North America, 1990–2010

Region	Area (1 000 ha)			Annual change (1 000 ha)		Annual change rate (%)	
	1990	2000	2010	1990–2000	2000–2010	1990–2000	2000–2010
Canada	310 134	310 134	310 134	0	0	0	0
Mexico	70 291	66 751	64 802	-354	-195	-0.52	-0.30
United States of America	296 335	300 195	304 022	386	383	0.13	0.13
Total North America	676 760	677 080	678 958	32	188	n.s.	0.03
World	4 168 399	4 085 063	4 032 905	-8 334	-5 216	-0.20	-0.13

10.

Area of forest designated primarily for production in North America, 1990–2010

Region	Area (1 000 ha)			Annual change (1 000 ha)		Annual change rate (%)	
	1990	2000	2010	1990–2000	2000–2010	1990–2000	2000–2010
Canada	3 928	3 928	3 928	0	0	0	0
Mexico	0	1 058	3 203	106	215	-	11.71
United States of America	76 632	82 520	90 007	589	749	0.74	0.87
Total North America	80 560	87 506	97 138	695	963	0.83	1.05
World	1 181 576	1 160 325	1 131 210	-2 125	-2 911	-0.18	-0.25

11.

“Planting a tree is one of the very few human actions which can really be called altruistic. A person plants a tree for his children, his grandchildren, or even for their children, but not for himself.” *John Seymour*

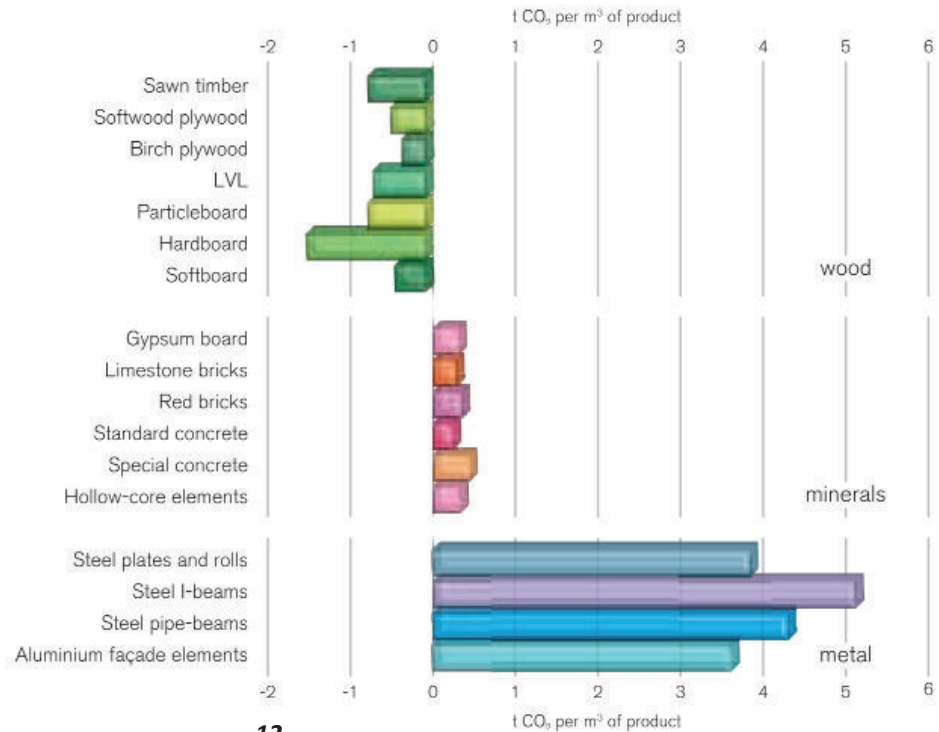
How is this happening? According to both the American Plywood Association (APA) and the reThink Wood Initiative, forest growth has continually exceeded harvest over the past sixty years. Additionally, the APA points out that, “The forest products industry, which comprises about 15 percent of forestland ownership, is responsible for 41 percent of all replanted forest acreage. That works out to more than 1 billion trees a year, or about 3 million trees planted every day.”² While sustainable forestry involves

several factors, the most fundamental one, sustained yield, has a simple solution. John Seymour describes what makes it so important when saying, “Planting a tree is one of the very few human actions which can really be called altruistic. A person plants a tree for his children, his grandchildren, or even for their children, but not for himself.”³

CARBON SEQUESTRATION

The less intensive manufacturing process associated with wood makes it preferable to other materials. However, wood is not only great because its negative impacts are smaller, but because of the positive impacts it can have on climate change. The idea that trees absorb carbon dioxide from the air and emit oxygen is nothing new. The important thing about this process though, is that when trees reach a certain age, the amount of carbon dioxide they absorb begins to decrease significantly. Eventually, old or dead trees begin to emit their stored

12. Net carbon dioxide emissions of various construction materials



12.

carbon back into the atmosphere. By harvesting those trees and replacing them with younger ones, the amount of carbon absorption can be maximized. Once the tree is harvested, the carbon absorbed remains in the wood as long as it is maintained. Only if it begins to rot will the stored carbon be released.

The life cycle comparison shown in Figure 3 is convincing. That analysis, however, does not take into account the amount of carbon that was absorbed by those materials. When carbon sequestration is factored in, the

carbon emissions from manufacturing wood products become neutralized, or even negative. Figure 12 shows that when carbon absorption is factored into the life cycle of wood materials, it is enough to offset the emissions from manufacturing and transportation, meaning timber harvesting can actually have a positive impact on climate change. In *A Case for Tall Wood Buildings*, architect Michael Greene points out, “A typical North American timber-frame home captures about 28 tons of carbon dioxide, the equivalent of seven years of driving a mid-size car.”⁴

03. LOOKING AHEAD

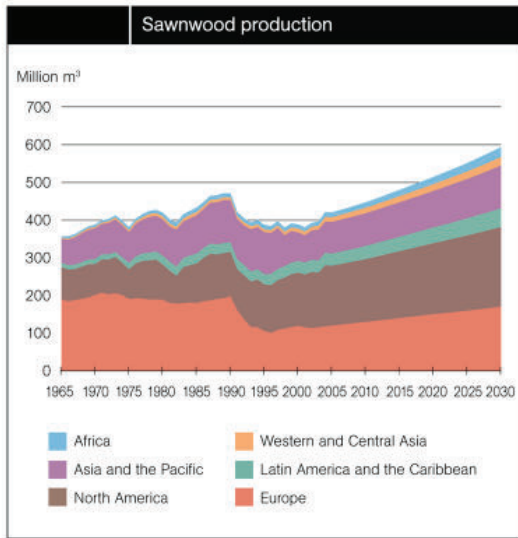


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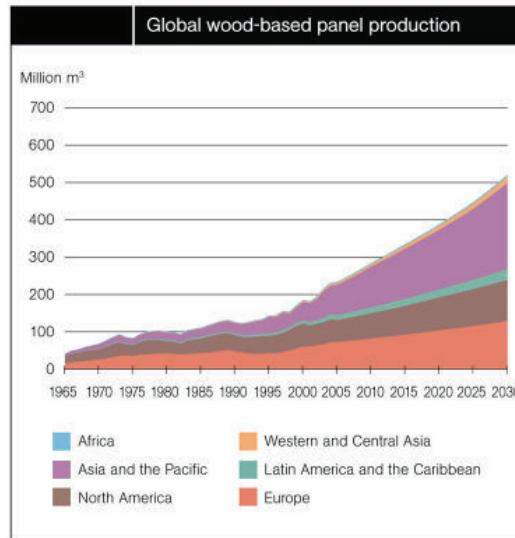
REMAINING CHALLENGES

While replanting trees is a simple solution to sustaining the resource, human reliance on forest resources still faces several challenges. Of greatest concern is the impact on ecosystems. Preserving soil quality, protecting water resources, maintaining biodiversity, and minimizing pollution are all considerations of sustainable forestry. These areas are the current focus of forestry research, and will continue to be as the demand for forest products increases. Through examining market trends, the FAO predicts how forest products will be used in the coming

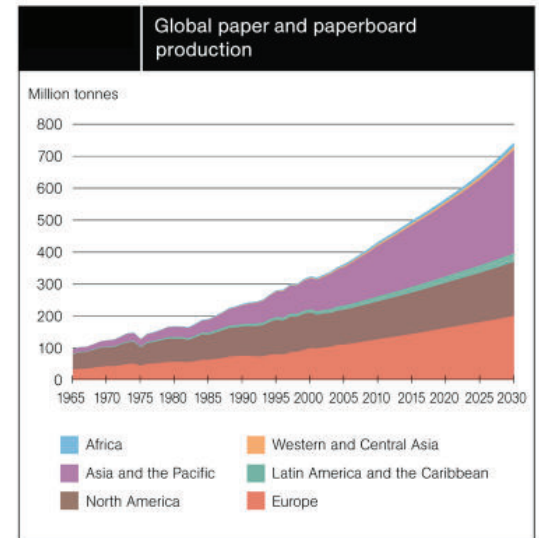
- 13. A student conducts field research at Pack Forest
- 14. Projected demand for wood and paper products



SOURCES: FAO, 2008a, 2008c.



SOURCES: FAO, 2008a, 2008c.



SOURCES: FAO, 2008a, 2008c.

14.

years. Their predictions (Figure 14) show a substantial increase in the production of sawnwood, wood-based panels, and most significantly, paper and paperboard materials.¹ This is likely based on the anticipated growth in population but may also be influenced by the acceptance of wood's environmental benefits. If the production of wood and paper based materials is to rise as the FAO has predicted, it is more pertinent than ever to adopt sustainable methods of procuring those products.

As the challenges of sustainable forestry have been recognized, third party certification entities have played

an increasing role in monitoring forestry practices. While many certification programs exist, the most popular one in the United States is the Forest Stewardship Council (FSC). Founded in Canada in 1993, and in the United States in 1995, the FSC now operates in more than 80 countries.² The FSC does much more than simply certify that a forest will sustain growth, as its mission is, "to promote environmentally sound, socially beneficial and economically prosperous management of the world's forests." The principles and criteria that an FSC forest must follow include a wide range practices like respecting the rights of indigenous people, conserving biological diver-

sity, conserving water resources, and even ensuring the social and economic well-being of the individuals who work in these forests.³ Third party certification identifies products that are procured and manufactured consistent with standardized guidelines, allowing consumers to choose responsibly harvested wood products.

Perhaps the greatest remaining challenge is public perception. Although third party certification is having a large influence on sustainable forestry practices, many consumers are still unaware of certified products and likely unaware of what certification means. While political action contributes to this awareness, its capacity to reach a large audience is limited. Additionally, because of non-sustainable strategies that have been prevalent world-wide, many cannot accept the notion of sustainable forestry. As the built environment continues to encroach on the natural environment, it's difficult to accept any further destruction to natural landscapes.

DEFINING NATURE

The term natural can be interpreted in a number of different ways depending on the context of its use. This is essentially caused by the debate of whether human activity is a part of nature. To some, nature is thought of as an inimitable phenomenon that is only compromised by human activity. Alternatively, as humans are considered natural beings, nature can include humans and their activities. Therefore, a distinction is made between non-human nature and nature constructed through human activity.⁴

Roger Sands points out, "Humans are completely contained within and constrained by nature and its laws. Humans can only exist by consuming natural resources and all resources are natural. Humans are a part of nature and cannot escape this."⁵ Most people would describe a forest as a natural landscape. However, many would likely describe a working forest that is continually harvested for its resources as un-natural. Through the argument made by Sands, a working forest can be seen as no less natural than an untouched forest. While there

is a clear difference between the two, the human impact of logging should be seen as a natural force.

SUMMARY

While the effects logging imposes on the existing ecosystem and habitat are difficult to accept as natural occurrences, it is important to consider the significance of forest products to human life. Acknowledging the reliance on paper and wood products encourages the acceptance of logging as a necessary evil. However, having the mindset that something destructive should simply be accepted as necessary is antithetical to the premise of nature. The procurement of a natural resource - timber, executed by natural beings - humans, with an agenda to do so as sustainably as possible, cannot be viewed as destructive; it should be viewed as consistent with natural processes.

The short term consequences of forestry practices seem destructive. It is important to realize, however, that when practices carefully follow stewardship guidelines, the

long term consequences are minimized. Because the timber industry is necessary to our way of life, further progress in sustainable forestry requires continued research, but more importantly, a well-informed public that can see beyond the immediate consequences. The ability of architecture to reach a large audience gives it the capacity to communicate the values and culture of a population. With the rich culture and history that forestry has in the region, the Pacific Northwest is an ideal setting to promote sustainable forestry, specifically through an interpretive research center.

04. PLACE AND PROGRAM



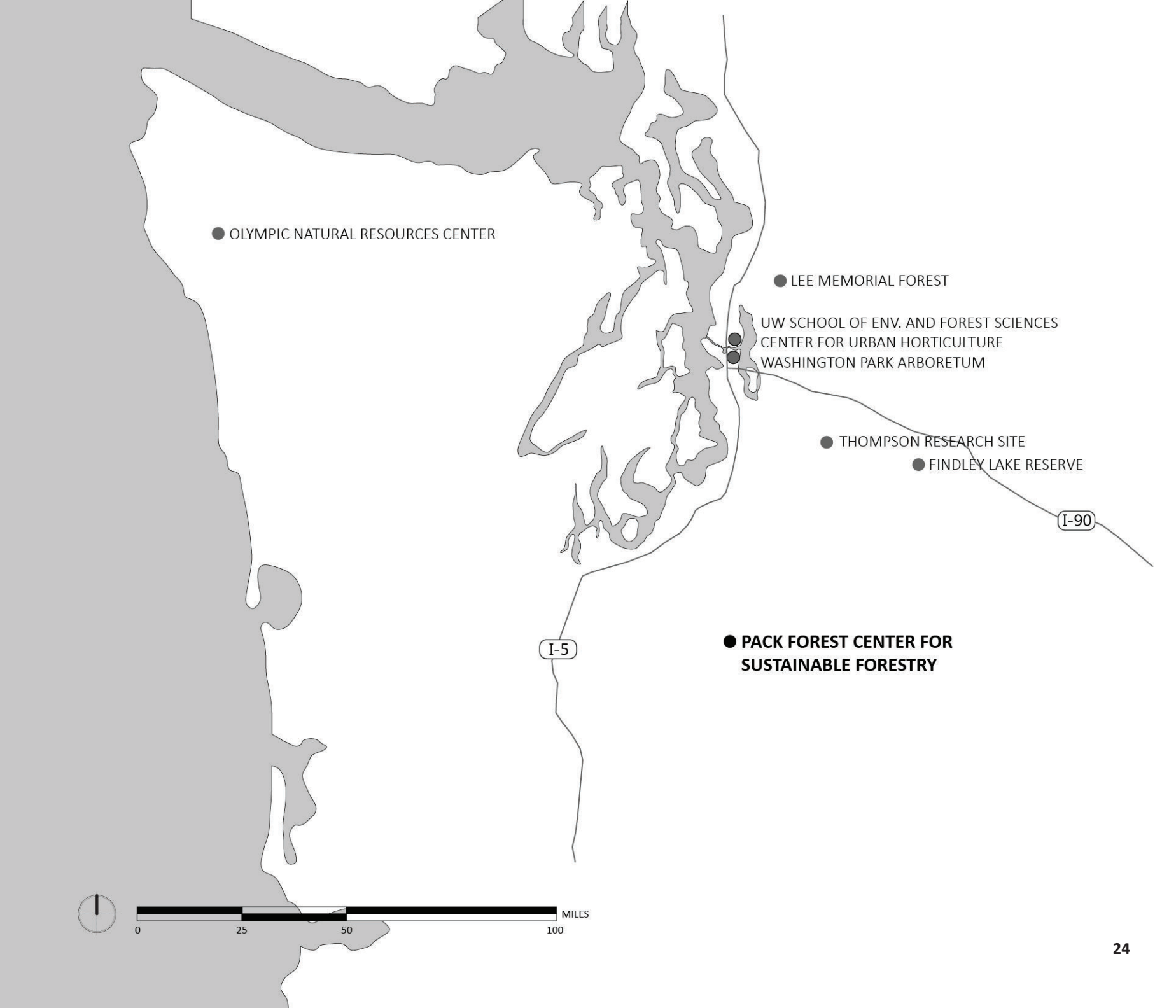
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SITE OVERVIEW

The University of Washington's School of Environmental and Forest Sciences benefits from its proximity to forestland. The school uses several forested sites for field research, one of which is Charles Lathrop Pack Experimental and Demonstration Forest, the setting for this project. On that site, the school operates The Center for Sustainable Forestry at Pack Forest which provides "leadership for sustainable forestland manage-

15. The entrance to the Center for Sustainable Forestry at Pack Forest

16. A regional map of the Puget Sound shows the School of Environmental and Forest Science's collection of field research sites.



● OLYMPIC NATURAL RESOURCES CENTER

● LEE MEMORIAL FOREST

● UW SCHOOL OF ENV. AND FOREST SCIENCES
● CENTER FOR URBAN HORTICULTURE
● WASHINGTON PARK ARBORETUM

● THOMPSON RESEARCH SITE

● FINDLEY LAKE RESERVE

I-90

I-5

● **PACK FOREST CENTER FOR
SUSTAINABLE FORESTRY**





17.

ment through research, demonstration and technology transfer.” Established in 1926 with the mandate that it would continue to be used for logging, Pack Forest is now a 4,300 acre certified working forest.¹ The availability of working forestland to conduct research, along with the school’s reputation as one of the top forestry schools in the country, make Pack Forest an ideal setting for an interpretive public experience.

Pack Forest is located 70 miles south of Seattle, Washington, near the town of Eatonville. The closest city is Tacoma, Washington which is roughly 35 miles north.

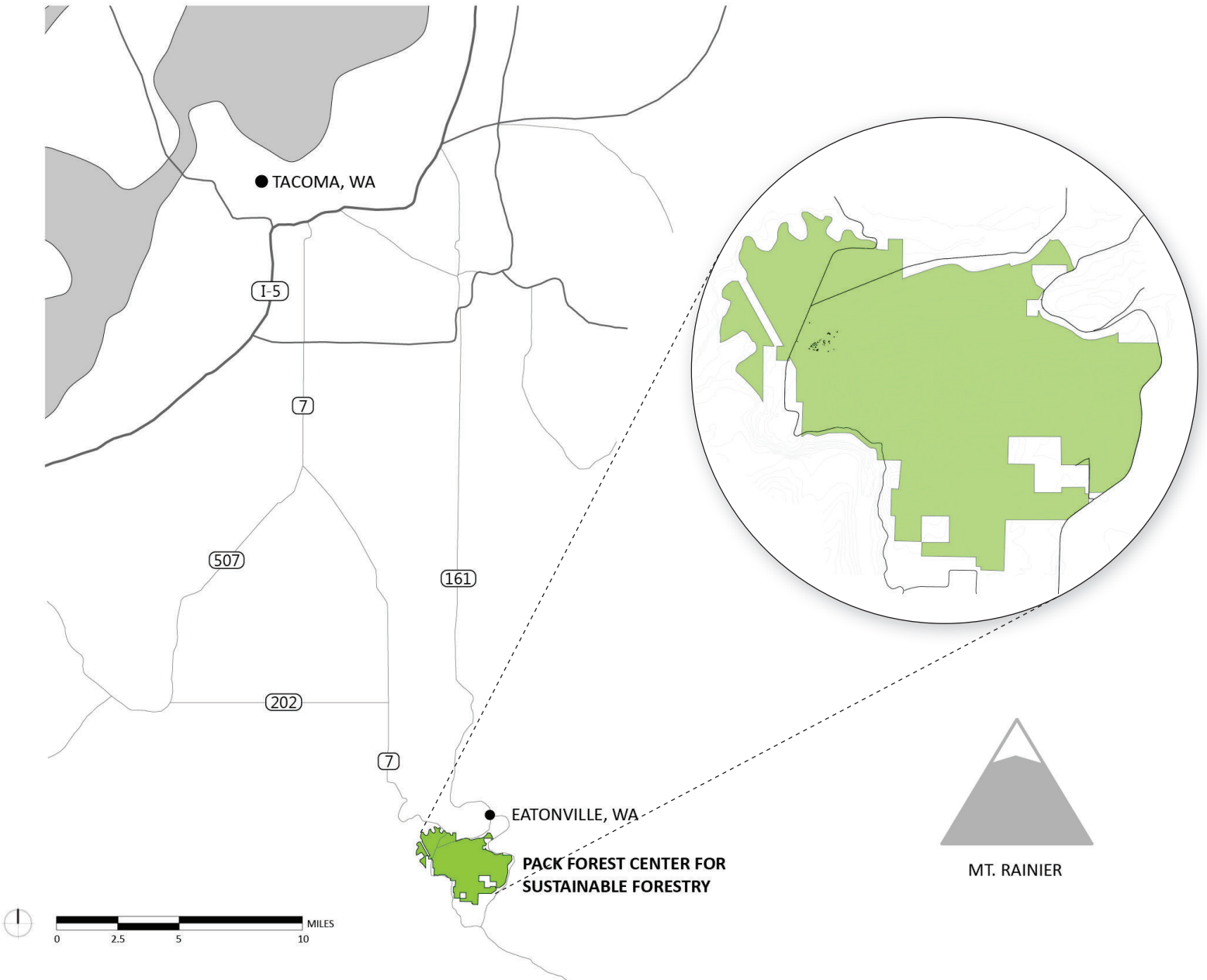
The most significant landmark near Pack Forest is Mount Rainier, the tallest peak in Washington state, which is visible from parts of the site.

THE CAMPUS

While Pack Forest covers nearly seven square miles of property, only a small portion contains built structures. The site’s main access is in its northwest corner, off of Highway 7. Very close to that entry point is a small campus, consisting of a series of cabins primarily used for lodging. As University of Washington students and faculty frequently visit the forest to conduct field research, these cabins provide the opportunity for overnight visits or extended research internships. At times, the lodging is available to the public, as the campus provides a retreat for large or small groups. Additionally, the campus provides administrative offices for those who work there, halls and classrooms used by the university and the public, and service buildings consisting of garages and sheds.

17. An administrative office building at Pack Forest

18. A map shows Pack Forest’s proximity to Tacoma and Mount Rainier.





19.



21.



20.

The campus buildings are consistently characterized by their use of wood siding, gabled standing seam metal roofs, and single story wood framed construction.

- 19. A service building at Pack Forest
- 20. A classroom building at Pack Forest
- 21. Lodging at Pack Forest
- 22. A group of students visit Pack Forest
- 23. A sign in the forest displays information about a forest plot

THE FOREST

Beyond the campus, a series of logging roads and trails provide public access to all of Pack Forest's 4,300 acres, which ranges from 800 to 2,000 feet in elevation. While the small system of trails allow hiking, mountain biking, and horseback riding, the site does not seem to be a popular destination for recreational use. However, the forest is frequently visited by groups of elementary and middle school students, who are guided through the forest to learn about forest research. The combination of harvesting and research occurring on the site provide a rich learning experience, but the campus facilities struggle to accommodate these large groups in an indoor setting.

Throughout the site, one can witness the attempts made to create an interpretive experience. These attempts consist of signs indicating the name of a plot and when it was harvested (figure 23), or fenced off areas simply labeled as "Research Site" (figure 25). While these types of displays are informational, they fail to capture the unique qualities of the site, and fall short of creating an interpretive experience.



22.



23.



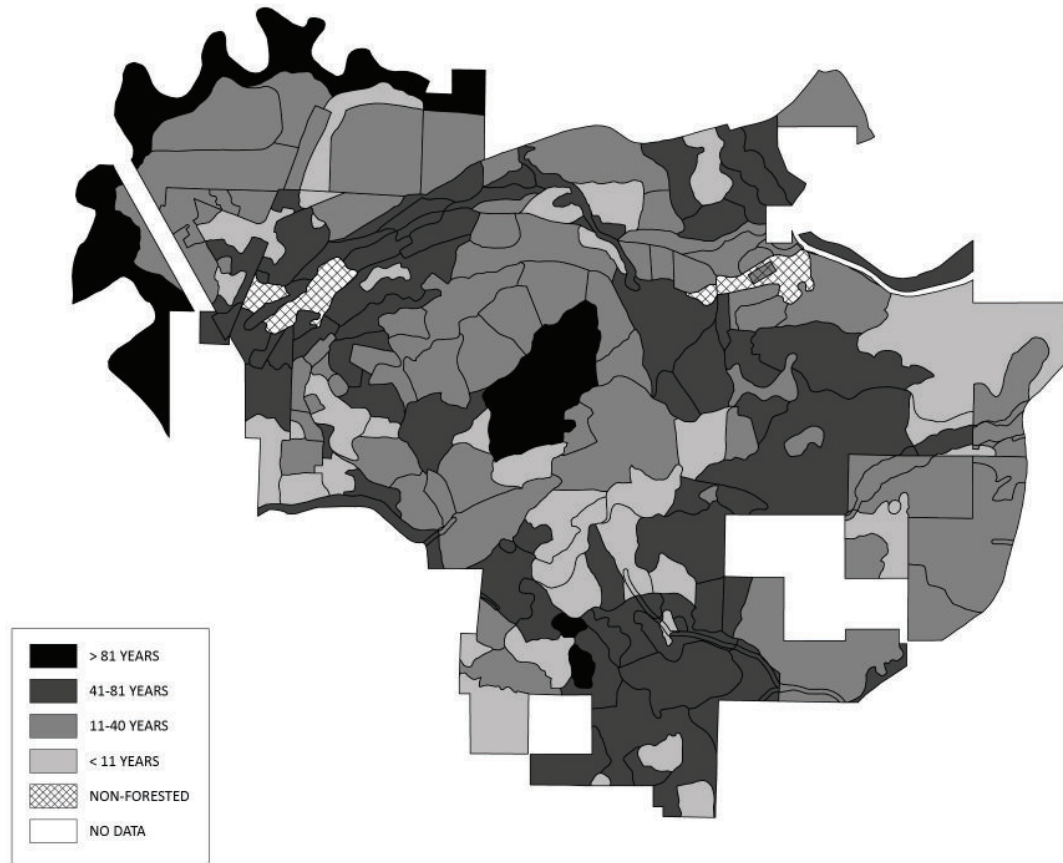
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The reason Pack Forest is such a great resource for conducting research is the fact that it continues to be a working forest, continually harvested for the natural resource it provides. Through experimental logging practices and subsequent analysis, The Center for Sustainable Forestry at Pack Forest monitors impacts to soils, water resources, and the overall ecosystem. While the forest itself is the obvious source for research, the School of Environmental and Forest Sciences has expressed a need for dedicated research labs, an asset not currently available on site.



25.

24. Students conduct soil analysis at Pack Forest
25. A fenced off area indicates a protected research site
26. A site map of Pack Forest shows the various ages of tree stands



26.

SITE OPERATIONS

In order to manage and coordinate the processes of harvesting and research, the large site is broken into a series of plots. The cyclical nature of these processes means each plot is relatively homogenous in terms of the species and age of trees it contains, but also means that two adjacent plots may drastically contrast one another.

As seen in figure 26, the ages of tree stands vary from zero to 80 years and up. While a large portion of the site is available for harvesting, some have been reserved, resulting in a few plots of second growth that will continue to age.

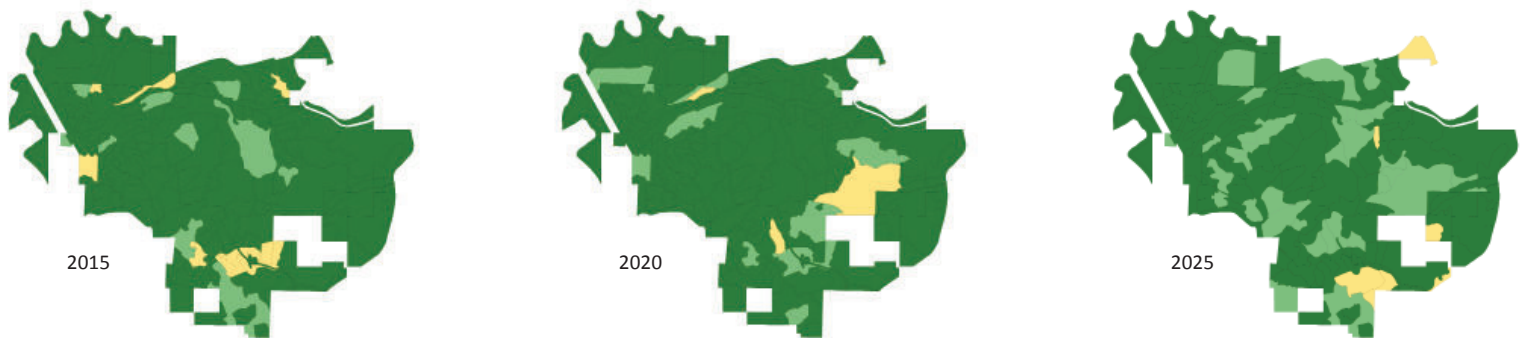
Managing a forest for cultivation requires a detailed forest management plan. As a result, it has been determined which plots will be harvested when, up to 50 years in advance. When a plot is harvested, it is completely clear-cut and replanted, leaving a highly visual mark. Additionally, tree stands are periodically thinned to maximize their health and growth, which also has a visual impact on the forest. When grouping these operations into five year segments (figure 27), one can see the cycle created

by the forest management plan. Combining the next 35 years of site operations into one diagram highlights the degree to which the landscape will change over time.

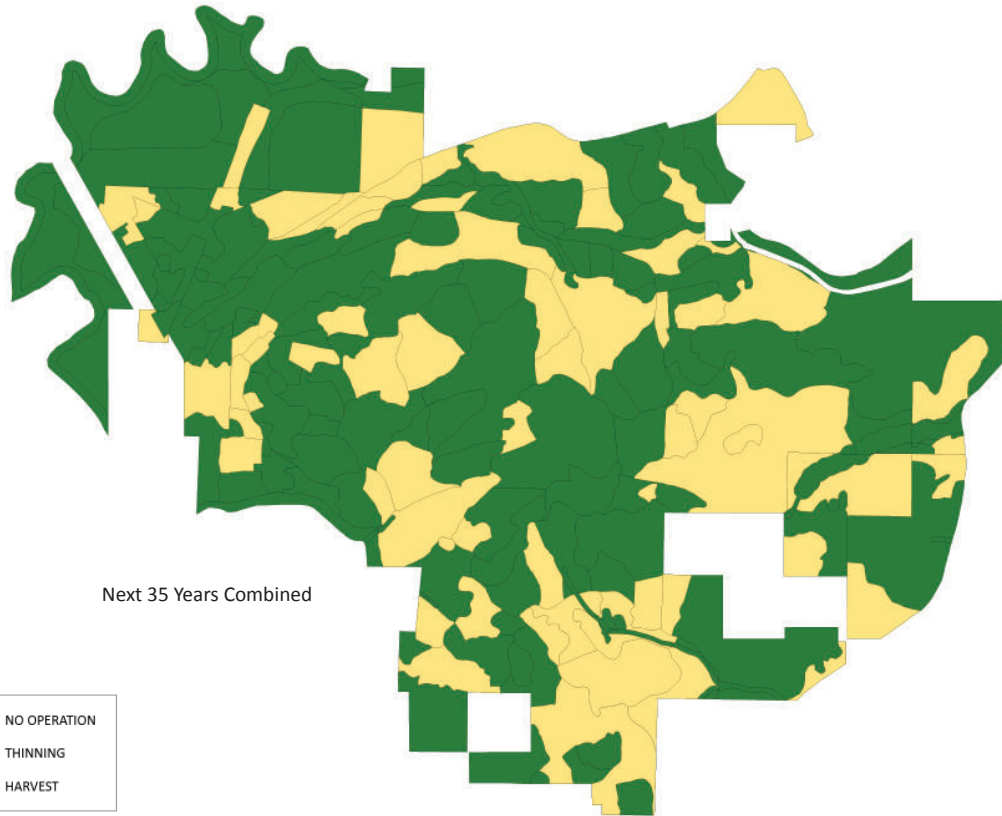
Bringing more users to the site to experience its dynamic landscape is the focus of this project.

27. A series of site maps show the cycle of forest operations.

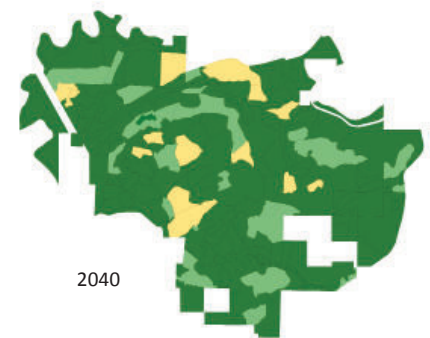
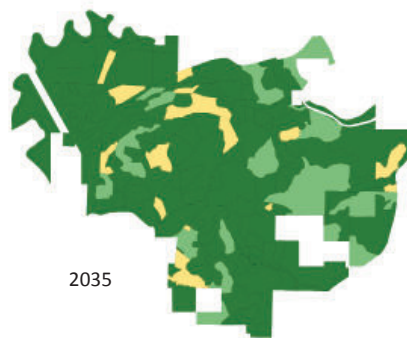
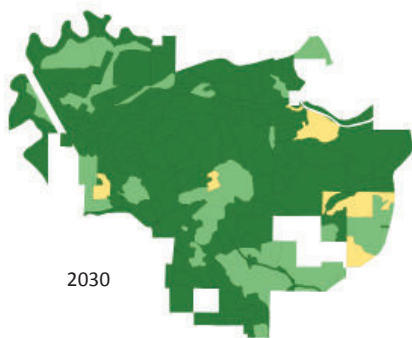
28. A site map shows the combination of forest operations over the next 35 years.



27.



28.



THE PROGRAM

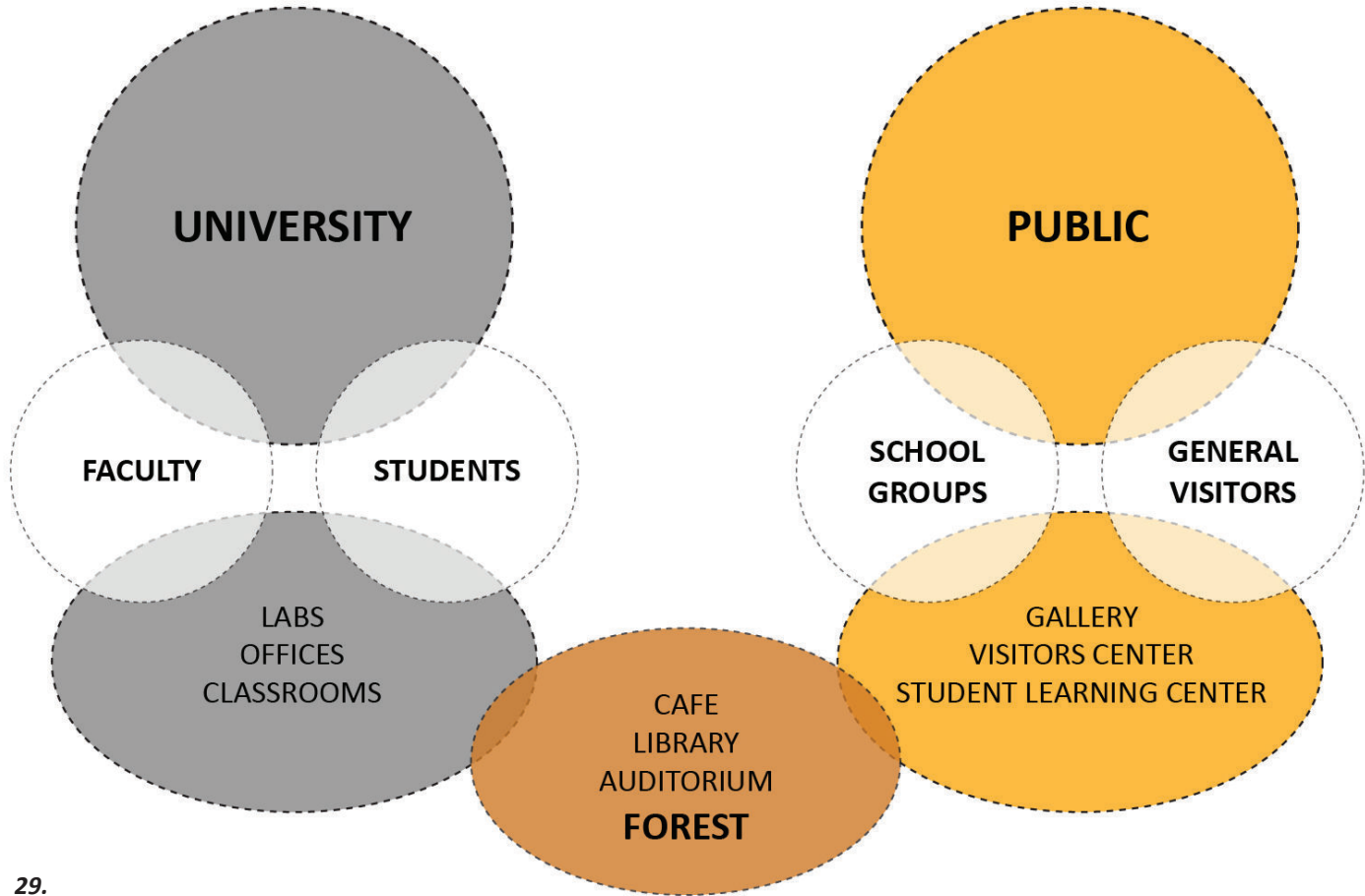
The proposed program for the project is a result of several factors, the first of which is the lack of facilities for both university and public use. The university portion, to be used by both faculty and students, consists of research and computer labs, faculty offices, and classrooms. These spaces provide a better means of creating an educational environment for the School of Environmental and Forest Sciences, but also the opportunity for research functions to be communicated to the public.

The public portion of the program, to be used by school groups or general visitors, responds to the desire to create an interpretive experience, focused not only on encouraging users to interact with the landscape, but also on connecting the public with the university functions on site. An interpretive gallery, the highlight of the public program, aims to attract users to the site. Through displays about the forest operations and exhibits of how wood products are created, users understand the relationship between harvested landscape and built structure. To better serve large school groups, the program

also includes a student learning center, where a more focused education can occur.

Shared by the university and the public, are an auditorium for large events or lectures, a small library for studying or learning more about forestry, and a café.

29. A program diagram shows the spaces and users for the new interpretive research center.



29.

05. DESIGN APPROACH

SITE ANALYSIS

The landscape is marked by various physical features. As noted in figure 26, some of the site's plots are non-forested, one of which is the location of the campus. Here, the forest has been carved away, creating an apparent void from the solid tree mass. While many trees still exist within that void, a hard edge remains as the boundary of the campus. The subtractive space is first experienced during the journey to Pack Forest, as the highway has carved its way through the landscape. The stretch of road between the highway and campus maintains the same quality, creating a procession that rises nearly 100 feet in elevation. The campus occupies a relatively flat area,

sitting on a shelf created by the terrain. From there, the topography consistently climbs in the southeast direction toward the center of the site.

The arrival to the campus is not marked by any significant elements. The first structure, which houses administrative offices, is mostly hidden by trees, creating an ambiguous entrance to the campus. Directly to the east of that building, a quick climb in terrain creates a ridge along the boundary of the campus. However, the solid mass of trees around the campus hides that ridge, pro-

30. A site plan of the existing campus

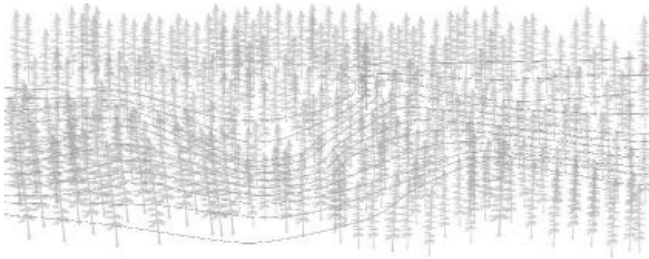


30.

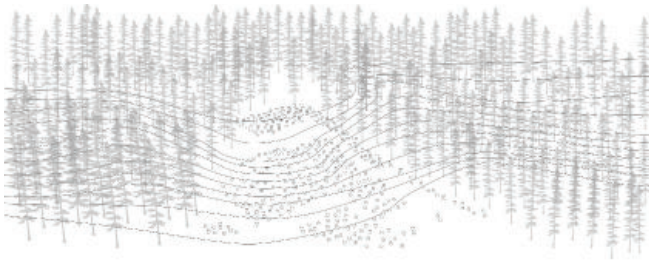
viding no suggestion of the landscape beyond. Furthermore, the campus lacks a marked trailhead, as the access to the site's trails is through one road, leading away from the campus in the northeast direction. To a first time visitor of Pack Forest, it may seem that the small campus is all the site has to offer.

SITE INTERVENTION

The interpretive research center aims to establish a threshold. As the campus lacks a strong connection to the rest of the site, the new facility strengthens that connection. The arrival to the site is marked with a significant beacon, portraying the institutional yet public character of Pack Forest. Occupying the prominent ridge at the edge of the campus, the new facility intentionally carves from the tree mass to not only make itself visible,



31.



32.

but to introduce a level of transparency into the surrounding landscape. The elongated form of the building begins at the level of the campus, and stretches up a 45 foot climb, highlighting the terrain and allowing users to experience it.

CONCEPT

Figure 31 shows the current edge condition of the campus, characterized by a steep slope, but only perceived as a solid wall of trees. The intervention carves into the tree mass to create a threshold at that edge, and in doing so, harvests the trees. However, when those trees are harvested, the stumps remain, marking the forest that once stood there. Consequently, the stumps become part of the architecture and part of the program, creating a unique outdoor space that users can interact with. Conceptually, the structure of the building begins with the placement of columns across the harvested hillside, relating to the form of the surrounding trees. The

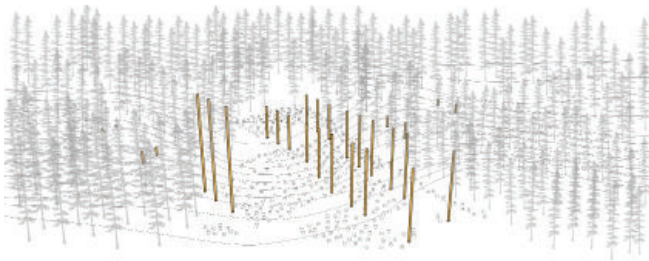
31. Existing tree barrier

32. Trees are harvested, stumps remain

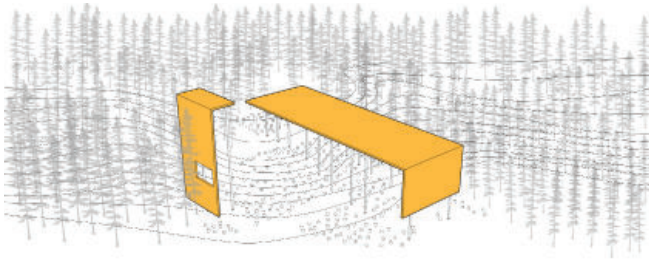
33. A site plan of the campus with the new facility



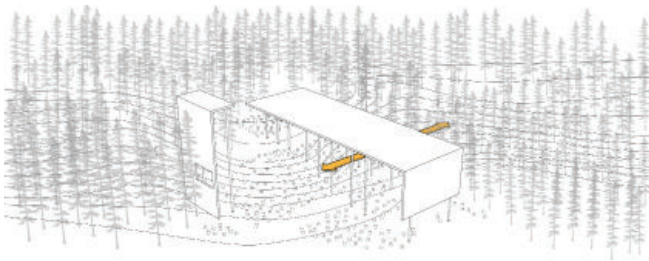
33.



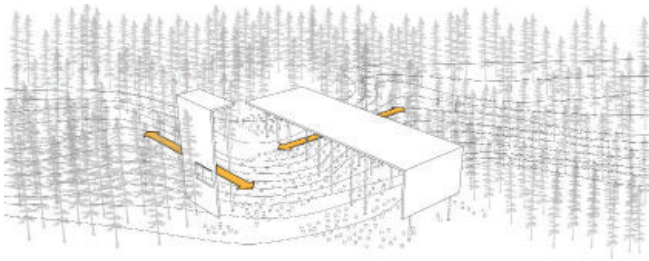
34.



35.



36.



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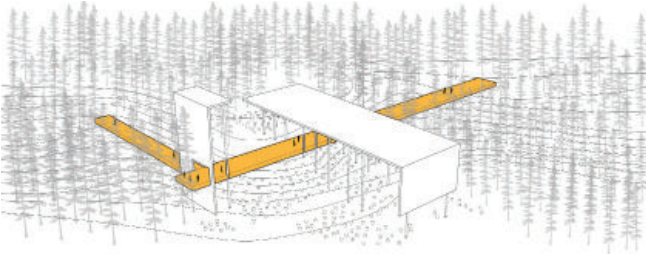
columns are encapsulated by two similar roof forms that react to various conditions of the site. The larger form, which contains the majority of the program, has a long east to west orientation to maximize passive environmental benefits. Additionally, its long northern façade is oriented directly toward the entry point to the campus, and its shorter western façade is oriented toward the center of the campus. Contrasting the long conditioned building is a tall, unconditioned tower which marks the trailhead.

The most important consideration in designing the roof forms was their perpendicular relationships to the topography, which suggest movement through those structures parallel to the contours of a rounded knoll. This allows the introduction of long paths extending from the building and into the forest. The flat, built paths leave

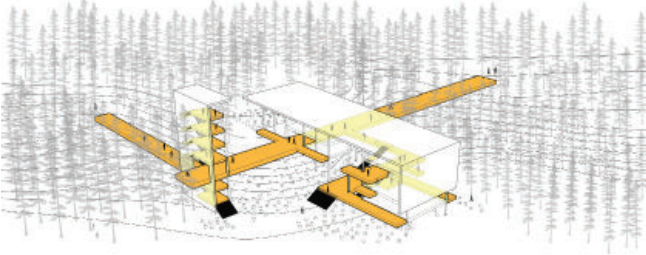
- 34. Columns replace harvested trees
- 35. Roof forms encapsulate columns
- 36. Form has north/south orientation
- 37. Movement through forms is parallel to contours
- 38. Paths connect users to the surrounding landscape
- 39. Paths extend through the building
- 40. Program organization

the structures at a point elevated from the ground and eventually meet the rising terrain, providing users with a variety of vantages of the adjacent forest. While the prominent path forms are removed from the landscape, the path into the forest begins from the arrival point to the site. From there, it follows a choreographed sequence through the building, interacting with the program, before eventually leading into the surrounding landscape, thereby creating a threshold.

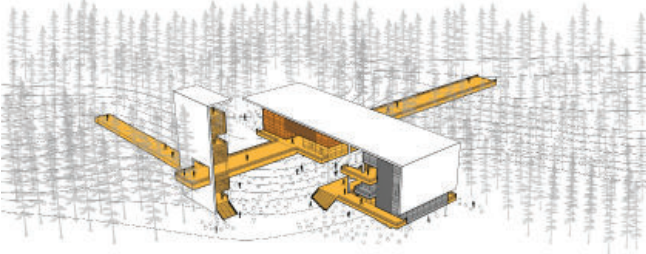
The university portion of the program occupies the western portion of the building, the side closest to the rest of the campus. The circulation throughout the project is all exterior space, having a connection to the tower, where the exhibits are contained. The shared portions of the program are placed where the university spaces and public spaces intersect.



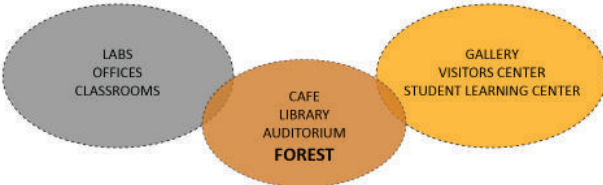
38.



39.



40.



06. THE EXPERIENCE

THE APPROACH

As one arrives at the Center for Sustainable Forestry at Pack Forest, its interpretive research facility portrays the center's institutional significance. More importantly users encounter a public facility that opens itself through a series of outdoor spaces. The first outdoor space one encounters is the open field of stumps left from harvesting the site, which introduces the narrative substance of the project, while providing the amenities of a traditional public courtyard. After navigating through the stump courtyard, entrance into the facility can occur directly into the gallery tower, or more formally into an outdoor atrium within the main building. The atrium contains

exterior flights of stairs that lead users through a series of exterior decks that connect to the larger paths.

41. The approach to the interpretive research center



THE STRUCTURE

The structure, which is expressed throughout the building to showcase the built form of forest products, is composed of heavy timber and engineered wood with the obvious exception of concrete footings. Traditional post and beam construction of glulam columns and beams is braced by the core and auditorium structures, built with cross laminated timber and clad with a wooden rain screen. The beams, which span 60 feet from north to south, cantilever to provide deck space and multiple vantages of the forest. The roofs, also consisting of cross laminated timber, are minimally sloped in one direction for drainage and clad in standing seam metal, resembling the rest of the campus.

PROGRAM INTERACTION

The outdoor atrium creates an entry to the building that is used by both the university and the public. Additionally, it divides the program functions, as the university spaces sit to the west of the atrium while more public spaces are to the east. The university spaces are organized around a central core that houses vertical cir-

culaton, restrooms, and mechanical spaces. Although the atrium splits the university and public programs, ascending up the atrium allows public users to witness the university activities, highlighted by an elongated deck that overlooks a double height research lab. After moving up through three levels of the atrium, exterior decks lead across the atrium to the student learning center, café, and library. Between the café and library, a large path projects through, allowing the café to occupy both interior and exterior space.

42. The outdoor atrium



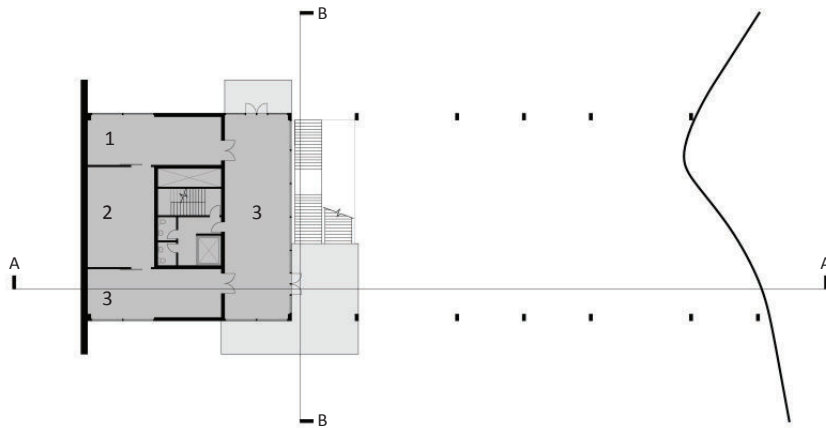


43. Section A - Building

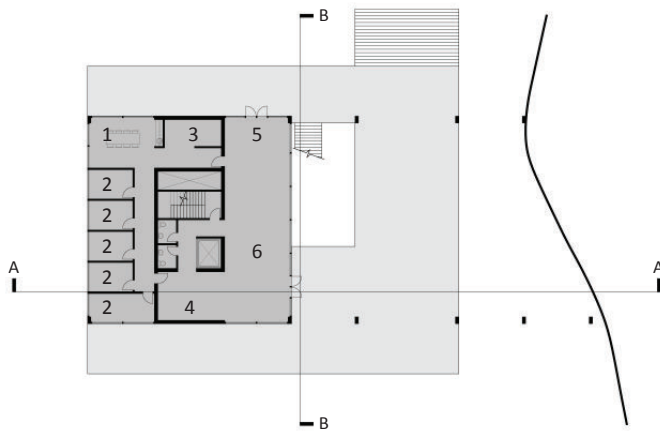
1. classroom
2. research lab
3. office
4. student learning center
5. auditorium
6. cafe
7. library



44.



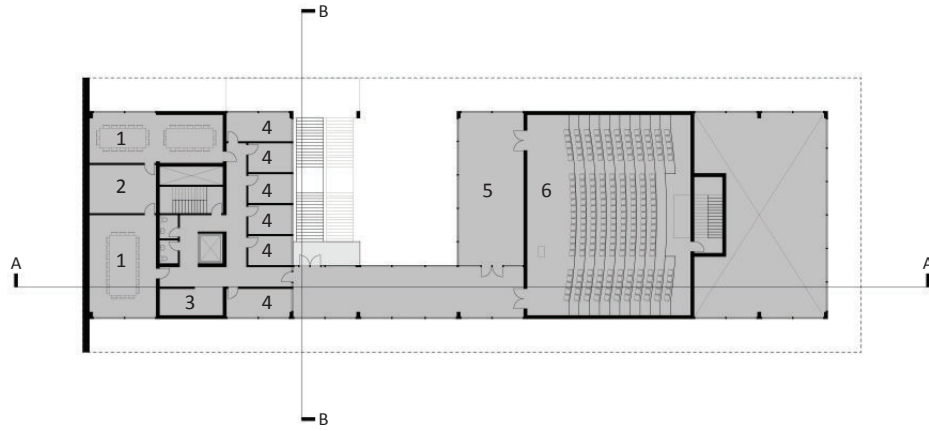
- Level 2
- 1. computer lab
 - 2. lab storage
 - 3. research lab



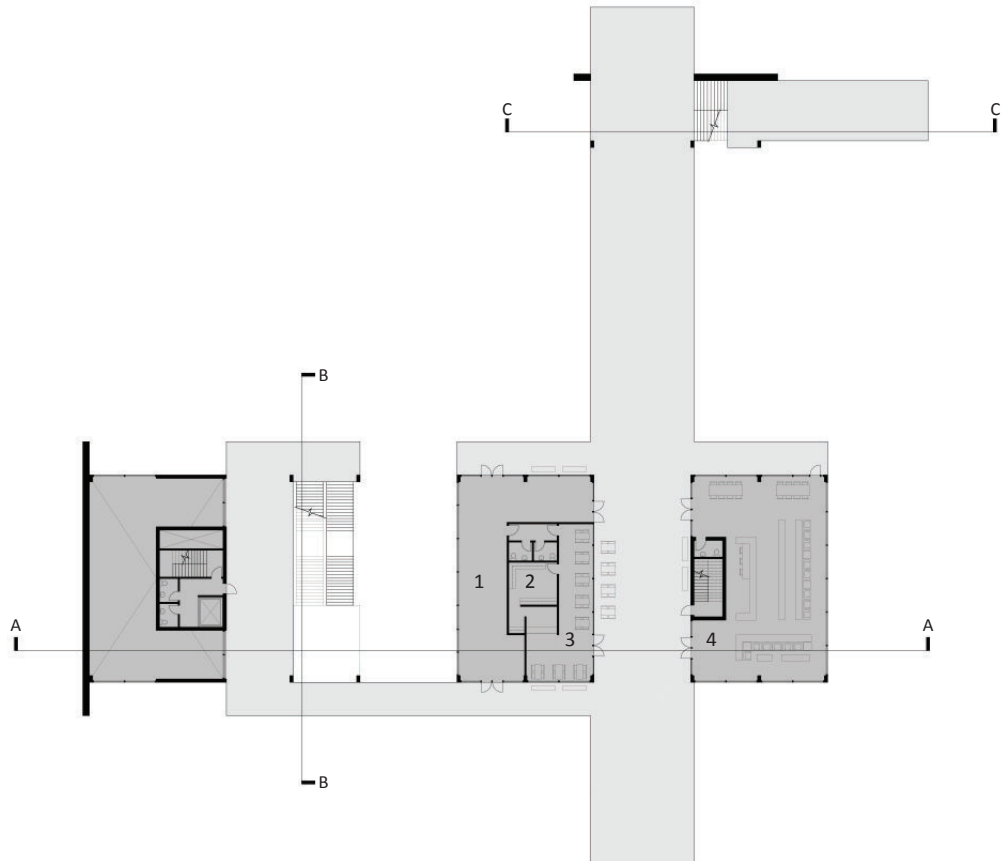
- Level 1
- 1. lounge
 - 2. staff office
 - 3. copy
 - 4. bookstore
 - 5. entry
 - 6. exhibit

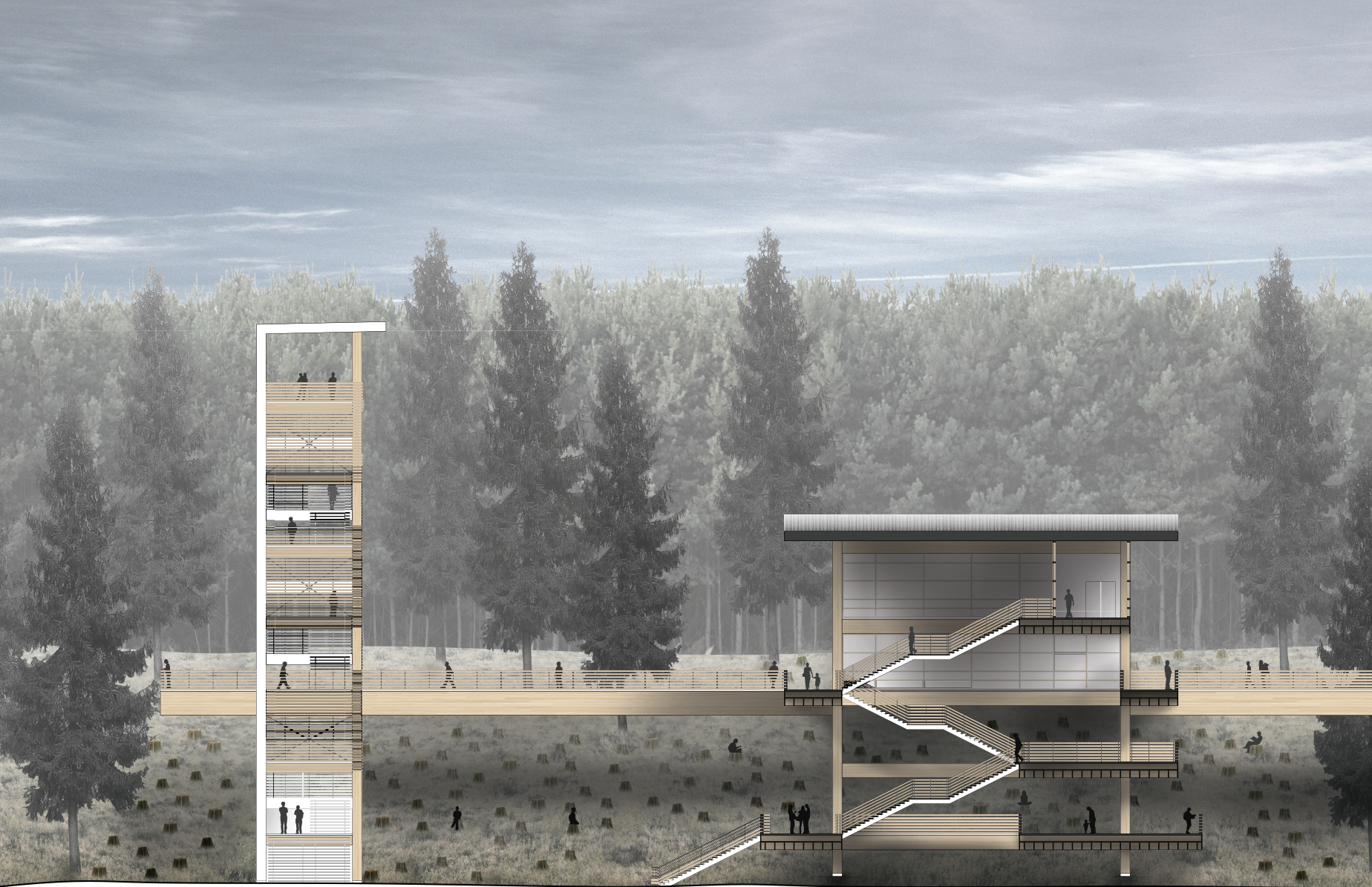
45. Building Floor Plans

- Level 4
- 1. classroom
 - 2. storage
 - 3. copy
 - 4. faculty office
 - 5. event
 - 6. auditorium

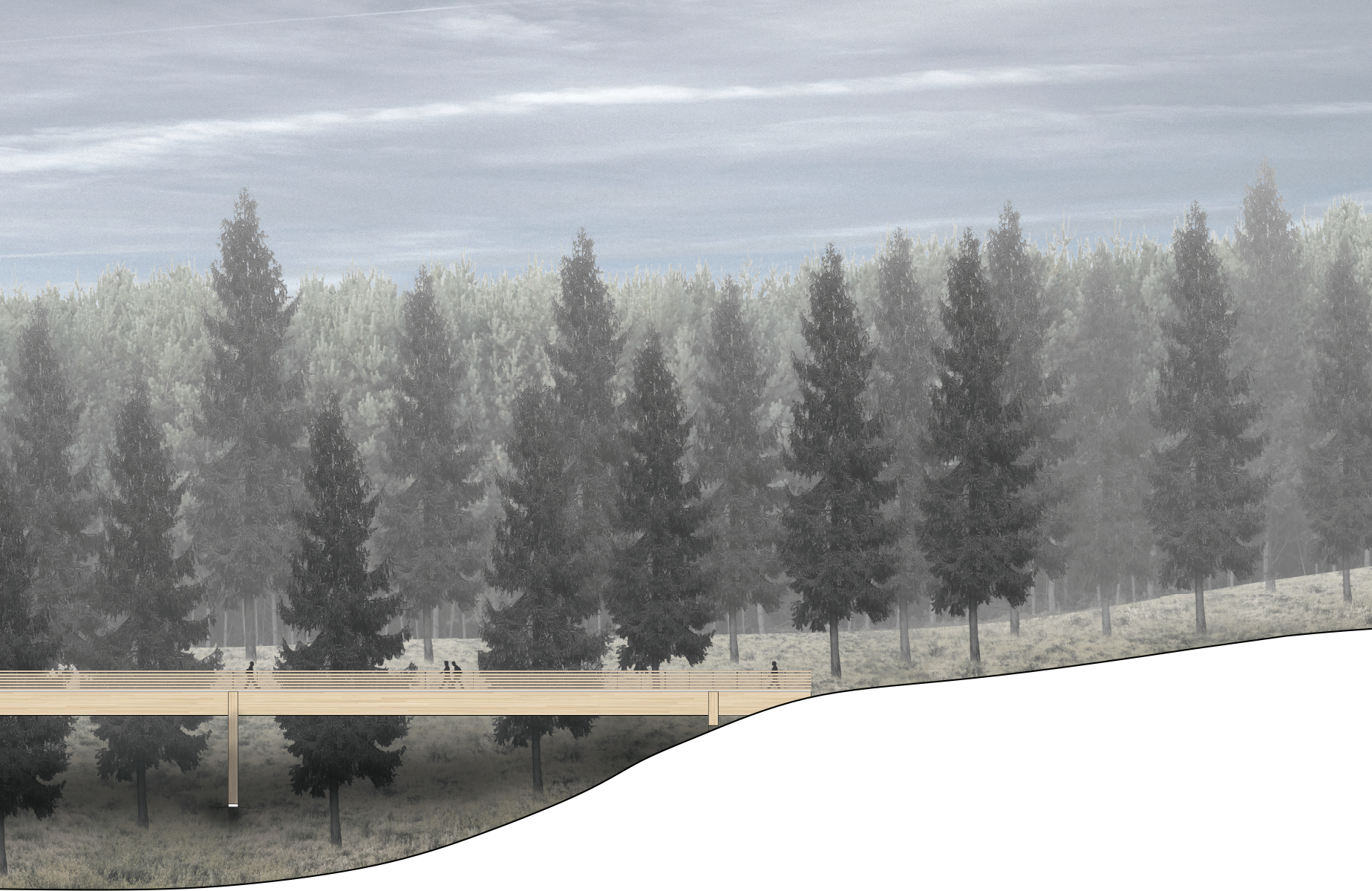


- Level 3
- 1. learning center
 - 2. kitchen
 - 3. cafe
 - 4. library





46. Section B - Path



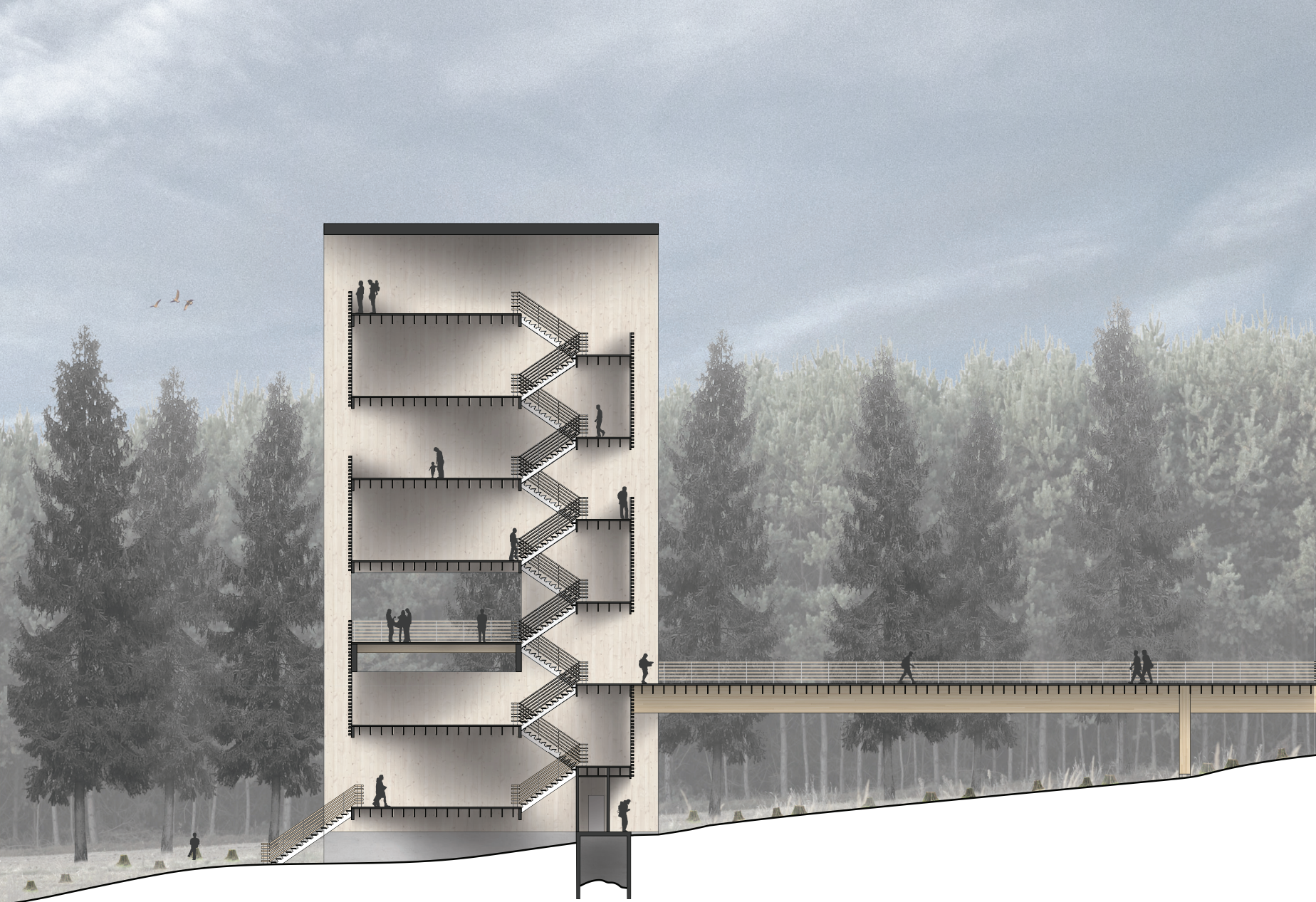
SITE INTERACTION

The new facility is designed to accommodate forest research and communicate that research to the public within a building that highlights the architectural qualities of wood products. However, the interaction the facility encourages with the rest of the landscape is the focus of the project. For one who simply wishes to explore that landscape, the gallery tower functions as the trailhead for departure. Similar to a traditional trailhead, the base of the tower offers restroom facilities. After climbing a few levels of the tower, the path into the forest begins, placing users above the landscape and gradually returning them back to the forest floor and providing the

interaction with various levels of the tree canopy. Those who wish to simply climb the tower experience all levels of that canopy, eventually ascending above the trees.

Exploration into the forest leads to encounter. While departing along the forest, users experience the interjection of a built path into a natural landscape. Once the built path ends, a system of trails allow users to wander through all of Pack Forest. The dynamic landscape can then be experienced, as one will encounter a variety of

47. Section C through the tower



conditions. First, similar to a typical hike, the majesty of a thick forest can be experienced. Upon traveling further into the landscape, one encounters the contrast between an aged forest stand and a recent harvest. Additionally, one may travel through an area where two adjacent stands have been harvested, providing the full experience of a clear-cut landscape. As the high points of the forest are ascended, views of Mount Rainier are encoun-

tered. Finally, the trails allow users to come full circle and return to the building along the second, larger built path. The path protrudes through the building, where one can stop at the outdoor café, or continue through to the gallery tower. The language of protrusion continues, as the path projects through the tower structure and

48. The sequence of encounter

49. The built path returns to the building



48.



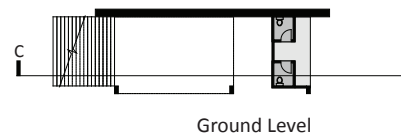
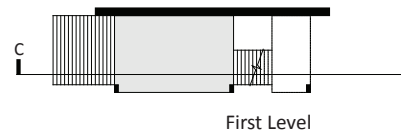
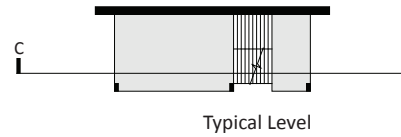
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cantilevers into the tree canopy. Finally, the climb to the top of the tower and through each of the gallery exhibits leads to the ascension above the tree mass, with views of the campus and surrounding forest.



51.

50. The path projects through the tower

51. Tower floor plans

52. The view from the top of the tower



CONCLUSION

This project was originally influenced by the perceived dichotomies between the built environment and natural environment. The opposition between those promoting the architectural use of wood and those concerned about destruction of the natural landscape prompted a desire to rectify the division. The ensuing response was the envisioning of a setting where the debated process of forest cultivation could be entirely exposed to the public, thereby demonstrating developments in forestry practices, and allowing independent assertions to be made. The selection and analysis of a specific site allowed an

architectural investigation that examined multiple scales and responded to real constraints.

While the inclination to unmask the processes of resource extraction was the impetus for the project, the use of a specific site as its medium encouraged its evolution. The discovery of a dynamic forest that offers an unconventional connection with nature led to the study of human interaction with the landscape. Marked by a stark contrast between solid tree mass and clear-cut void, rich with a tradition of procurement, and highlighted by

the opportunities for research and learning, Pack Forest is an unusual form of nature that offers a truly unique experience. The architectural intervention, characterized by its introduction of man-made wood products into a landscape filled with timber resources, further enhances the experience by demonstrating the forest's contribution to the built environment.

When considering how the project will change over time, questions arise as to how the area around the building will transform. If the harvested hillside where the building sits is left to nature, new growth will begin to gradually appear. Is it more appropriate to maintain this area so only the stumps remain, or would the demonstrative aspect of the project be enhanced by allowing the growth to be a marker of time? Perhaps the building site could be broken into smaller plots, similar to those of the surrounding forest, where each one is managed individually, creating a micro-scaled version of the entire site.

The Center for Sustainability at Pack Forest is an asset that allows the University of Washington's School of Environmental and Forest Sciences to significantly contribute to developments in forestry practices. Its establishment as a public landscape makes it an invaluable resource for demonstrating and promoting those developments through a public experience.

ENDNOTES

Preface

1. <http://earth-liberation-front.org/>
2. Columns, p. 1

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1. Godfrey p. 205
2. APA, p. 3
3. Ibid, p.8
4. Green, p.37
5. Naturally:wood, p.3
6. Sutton, p.1

Sustainable Forest Management

1. Sands p. 160
2. APA, p. 1
3. Seymour
4. Green, The Case for Tall Wood Buildings, p.26

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1. FAO 2009 p. 66-69
2. FSC: Our History, <http://us.fsc.org/our-history.180.htm>
3. FSC: Mission and Vision, <http://us.fsc.org/mission-and-vision.187.htm>
4. Soper p. 149-152
5. Sands p. 157

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