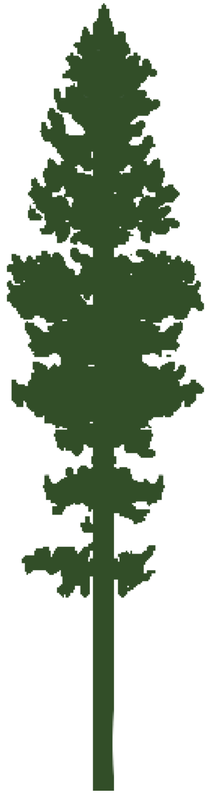

adaptive
learning center
sean patrick murphy



adaptive learning center

A Design Thesis Submitted to the Department of Architecture and Landscape Architecture of North Dakota State University

By Sean Patrick Murphy

In Partial Fulfillment of the Requirements for the Degree of Master of Architecture

Primary Thesis Advisor

Thesis Committee Chair 5/4/12

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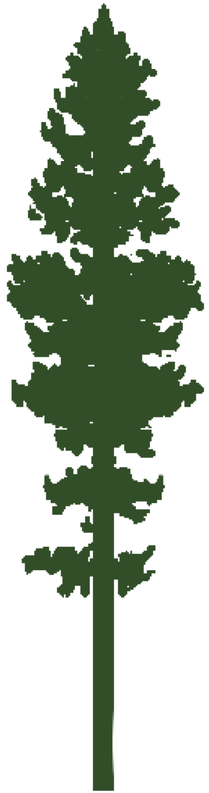

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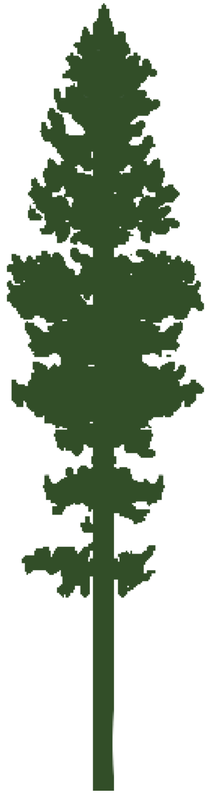

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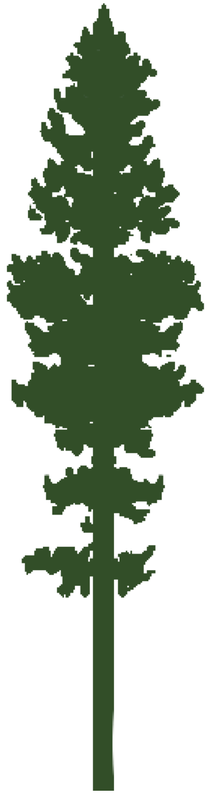
thesis abstract

FIGURE 1 **West face of Longs Peak, CO** (Sean Murphy)



abstract

abstract

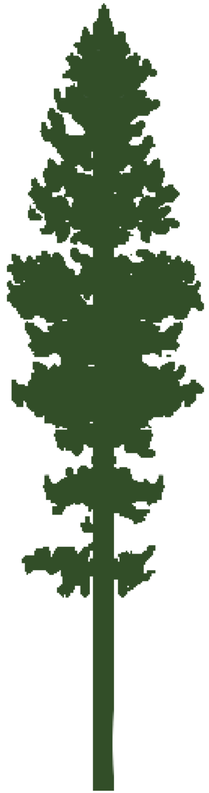
The title of the thesis is Adaptive Learning Center. The building is located in Rocky Mountain National Park, Colorado and is a 14,000 sq. ft. facility. The typology for this building is an environmental learning center/visitor center. This thesis seeks to answer the question, how can architecture respond to the natural environment? The theoretical premise/unifying idea that defines this thesis is, nature must be understood in order to create architectural forms that provide for human needs, but also exist in harmony with the environment. The project justification is, lasting buildings are often a result of conforming to their natural environment. Therefore, it is essential to understand this relationship between nature and architecture and its implications in order to create better buildings.

keywords

Natural Environment, Adaptable, Sustainable, Architecture, National Park, Colorado

statement of intent

FIGURE 2 **Mills Lake, CO** (Sean Murphy)



statement of intent

problem statement
How can architecture respond to the natural environment?

typology
An environmental learning center / visitor center

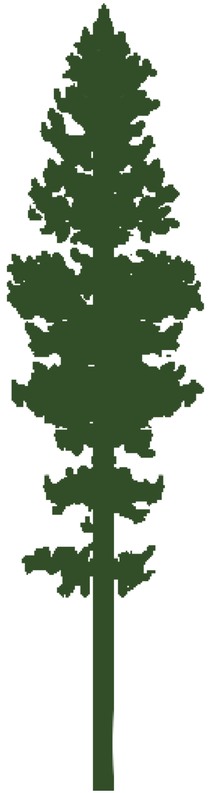
the claim
Architecture is often successful because it embraces the natural environment. By adapting to its climate, ecosystems, and resources, architecture can improve and be improved by the natural environment.
Actor: Architecture
Action: Embrace
The Object: Natural Environment
Manner of Action: Adapting

premises
Throughout the world, architecture has evolved from the environment it exists in.

Throughout history, successful architecture has embraced nature to overcome its challenges.

The natural environment influences many human decisions by guiding our way of life, resulting in specific architectural styles, methods, structures, and forms. This is particularly important in areas defined by natural beauty. “In any area in which the preservation of the beauty of nature is a primary purpose, every proposed modification of the natural landscape... deserves to be most thoughtfully considered” (Good, 1938).

Architecture continuously adapts to its natural environment in order to remain viable.



statement of intent

theoretical premise/unifying idea

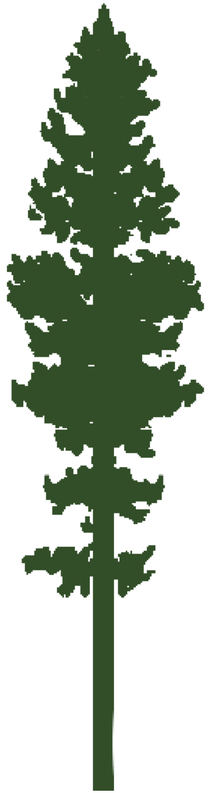
Nature must be understood in order to create architectural forms that provide for human needs, but also exist in harmony with the environment.

project justification

Lasting buildings are often a result of conforming to their natural environment. In order to create better buildings, it is essential to understand that relationship between nature and architecture.

project proposal

FIGURE 3 **Fall River,** CO (Sean Murphy)



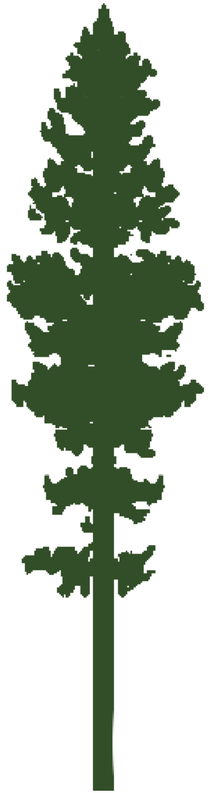
the narrative

The American West is a land of change. Over millenia, natural cycles have controlled flora and fauna relationships in an ever-changing landscape. In the past 200 years, humans have reshaped the continent and disrupted these natural processes. While most of the West has seen and continues to see human development in opposition to the natural environment, a few special places have been preserved. Rocky Mountain National Park is one such place that stands as a natural fortress in opposition to the unprecidented expansion of human development in the West.

Rocky Mountain National Park was created by an act of Congress in 1915. Set aside to protect the unique beauty of the Longs Peak region of Colorado, the park contains everything from mountain meadows to alpine tundra. The park now sees nearly 3 million visitors a year and is one of America's favorite national parks.

It is a place that is facing dramatic change, from the mountain pine beetle outbreak that is reshaping the forests of Western North America to climate change. These changes create a demand for expanded educational facilities to tell the story of a land in constant transition.

The Horseshoe Park Environmental Learning Center's design will explore ways to meet this demand. Its design will seek to make a minimal impact on the landscape both physically and visually. It will pursue environmental and sustainable design methods. It will tell the history of change in the park, including the changes and adaptations in the land and ecosystems. Lastly, the center will seek to be a building that adapts to changing uses and a changing environment.

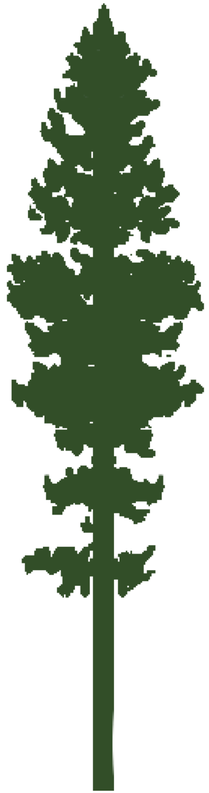


the client

The National Park Service (NPS) is the main client for the project and will run the facility upon its completion. The Horseshoe Park Environmental Learning Center will service both visitors to the park and park service employees. With a diverse number of visitors and historical precedents, the National Park Service has several client-specific details. Some common design themes include using “NPS Rustic” style techniques, environmental sustainability, low visual and physical impacts, minimal economic expense, and adaptable use to name a few.

The design of the center will be heavily influenced by its users. It is reasonable to assume the number of daily visitors at its July peak could be very high. Even if one in ten visitors stop at the center, the environmental learning center could see up to 2,000 visitors daily. Parking requirements would demand far less, due to relief from public transportation, carpooling, and rapid turnover in visitors. One hundred parking spaces or fewer would be required to meet needs.

One of the key features of the center is the wide variety of visitors it will be serving. As a public building, universal design elements must provide for disabled, elderly, and foreign visitors. Serious consideration must be taken when creating a building that serves and educates different types of people. All of these client-specific demands will be supplemented with further research.



major project elements

The Horseshoe Park Environmental Learning Center will be both a learning and information center. Visitors will have the opportunity to learn about the park's recreational opportunities, as well as the natural and human history of the park. Above all, it will present a theme of change and adaptation.

The primary spatial elements of the environmental learning center will include the following:

interior spaces

- Interpretive Spaces
- Junior Ranger Classroom Space
- Multipurpose Classroom Space
- Circulation Space
- Lobby Space
- Entry Space
- Public Restrooms
- Gift Shop
- Storage Space
- Mechanical Space
- NPS Employee Offices
- NPS Employee Multipurpose Meeting Space
- Information Desk
- NPS Employee Break Space
- NPS Employee Restroom

exterior spaces

- Native Plant Garden Space
- Small Outdoor Amphitheater
- Bus Stop
- Picnic Sites
- Interpretive Areas & Trails
- Parking Spaces
- Roads & Sidewalks

FIGURE 4 **Regional Map** (Sean Murphy)

site information

region

The site is within Rocky Mountain National Park in the Rocky Mountain's Front Range of northern Colorado. Elevations in this region extend from 5,000 ft. above sea level on the Great Plains 30 miles east to over 14,000 ft. at the park's highest point. Situated on the eastern slope of the Continental Divide, the area experiences much sunshine and drier conditions than the western slope. Most of the region is covered by coniferous forests and dry prairie. Some of the large cities in the region include Cheyenne, WY, Fort Collins, Loveland, Greeley, Boulder, Longmont, and Denver, CO.

city

The site is located just a few miles west of Estes Park, CO. Estes Park is a smaller tourist community consisting of nearly 6,000 residents. The town offers many concessions and tourist-oriented businesses for visitors that come to the park.

site

The site is located at the western end of Horseshoe Park within Rocky Mountain National Park. Horseshoe Park is a large meadow several square miles in size and located on the eastern side of the Continental Divide. It is surrounded by peaks and ridges on north, west, and south sides, and the valley extends east following the Fall River.

FIGURE 5 **Horseshoe Park Area Map** (Sean Murphy)

site information

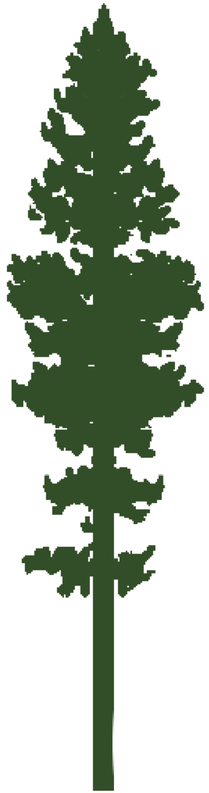
geography

The site is located near an intersection of two main roads within the national park. Both U.S. Highway 34 and the Fall River Road meet near the site, both cross the Continental Divide to the west and lead into Estes Park to the east. There are many ways to get to the site, and it has access to the park's bussing system.

The site area consists of an open meadow on the south side of Horseshoe Creek. The site has very little elevation change and is surrounded by aspen, lodgepole, and ponderosa trees on three sides. While this site looks ordinary, it has an interesting history. It was origanally the site of the Horseshoe Inn, a lodge built in the "Rustic" style in 1907 and torn down almost 25 years later. Frank Lloyd Wright was commissioned as the original designer for the lodge, but it was not built because the owner favored a more traditional design. The site also benefits from excellent views of Mt. Chapin, Mt. Chiquita, and Mt. Ypsilon at the top of the valley and Bighorn Mountain to the north.

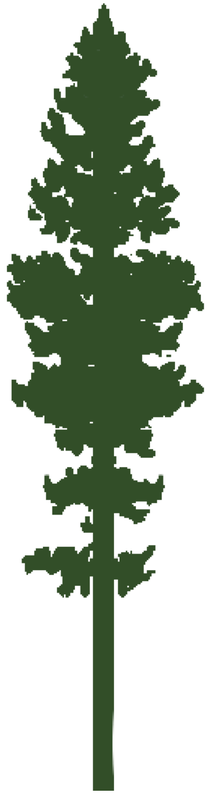
Some nearby landmarks include the following:

- Sheep Lakes
- Alluvial Fan
- Hidden Valley
- Lawn Lake Trailhead
- Deer Mountain Trailhead
- Endovalley Picnic Area
- Aspenglen Campground
- Fall River Entrance Station



project emphasis

This project empasizes the exploration of the relationship of nature to architecture. Successful architecture, like nature's most successful species, adapts to its surroundings and embraces change. In a place such as Rocky Mountain National Park, it is essential that architecture has a minimal impact on the landscape and conforms to the natural environment. The project will delve into several areas under this topic including the folowing: exploring environmentally sustainable architecture, seeking adaptable structures and uses, and implementing universal design. By exploring these ideas and utilizing these areas of research, the Horseshoe Park Environmental Learning Center will become a building within the landscape of Rocky Mountain National Park.



plan for proceeding

definition of research direction

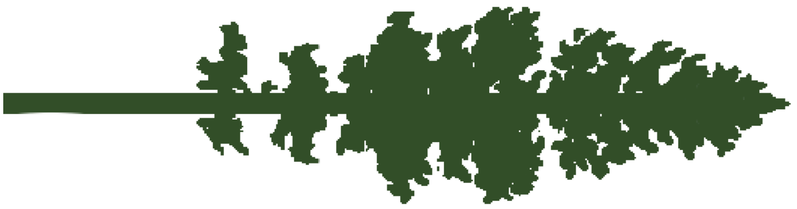
Research will be conducted in various directions. Following the premise that nature must be understood and architecture must exist in harmony with nature, sustainable and adaptable solutions will be sought. Case studies of other learning and visitor centers will be studied. Building programs will continue to develop as research expands. Most important of all, in-depth site analysis and historical context will play major rolls in the development of the project. All of these will define the direction of research for this project.

design methodology

The methodology of this project includes both qualitative and quantitative analysis. Graphic and digital analysis will be a major portion of the project and will serve to visually interpret the research. Research will be gathered from multiple sources, including the internet, documents, books, and other resources. All research methods will lead to an in-depth analysis of the project based on the premise that successful architectural forms must exist in harmony with the environment.

process documentation

All documents in this project will be collected regularly in a binder and a digital folder. All materials that are part of this process will be archived using digital and physical mediums capable of expanding research of this project beyond the scope of this thesis. Upon completion of the project, all information on the project will be turned over to the school in book and digital forms.



schedule of work

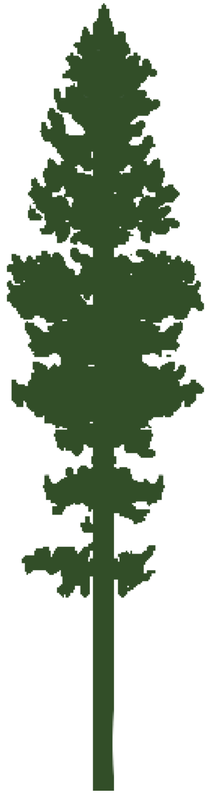
fall semester

Statement of Intent	9/3 - 9/8
Statement of Intent Due	9/8
Statement of Intent Faculty Review	9/8 - 9/15
Proposal	9/15 - 10/6
Program and Research Results	9/28 - 12/9
Case Studies, Project Goals, and Site Analysis	10 /4 - 12/9
Proposal Due	10/6
Proposal Faculty Review	10/6 - 10/20
Spatial Analysis and Program	10/25 - 12/9
Preliminary Program and Graphic Analysis of Case Studies Due	11/4
Graphic Analysis of Case Studies Faculty Review	11/4 - 11/6
Preliminary Program Faculty Review	11/4 - 11/17
Climate Data Diagrams, Interaction Matrices, and Nets Due	12/2
Climate Data Diagrams, Interaction Matrices, and Nets Faculty Review	12/2 - 12/7
Final Program Due	12/9

spring semester

Context Analysis	1/11 - 2/20
Conceptual Analysis	1/16 - 2/20
Spatial and Structural Analysis	1/16 - 3/5
ECS Passive Analysis	1/23 - 3/5
ECS Active Analysis	1/27 - 3/5
Floor Plan and Section Analysis	2/1 - 3/5
Structural, Envelope, Materisls, and Context Development	2/6 - 3/5
Midterm Reviews	3/5 - 3/9
Project Revisions and Presentation Layout	3/19 - 3/21
Project Documentation	3/21 - 4/16
CD Due to Advisors	4/16
Plotting and Model Building	4/16 - 4/23
Exhibit Installation	4/23
Preperation for Presentations	4/23 - 4/25
Thesis Exhibit	4/23 - 5/10
Final Thesis Reviews	4/26 - 5/3
Final Thesis Document Due	5/7 - 5/10
Commencement	5/11

FIGURE 6 **Schedule Timeline** (Sean Murphy)



past experience

second year of program

Darryl Booker-
- Fargo Teahouse
- Minneapolis Rowing Club
- Bear Lake Wildlife Photographer Dwelling

Bakr Aly Ahmed-
- Fargo Children's Museum
- Fargo Dance School

third year of program

Cindy Urness-
- Bottineau Business Incubator
- Cranbrook Library and Museum

Steve Martins-
- North Dakota Dinosaur Center

fourth year of program

Don Faulkner-
- San Fransisco High Rise

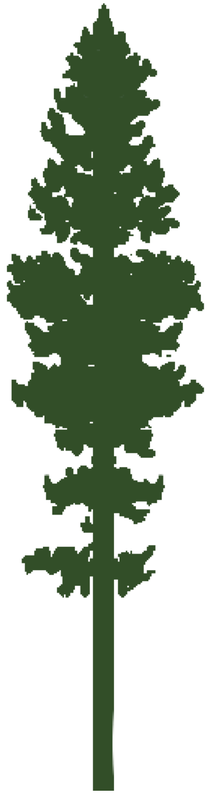
Frank Kratky-
- Santo Domingo Urban Design
- Andersen Window Competition
- Santo Domingo Community Center

fifth year of program

Paul Gleye-
- Fargo Urban Design
- Fargo Community History Center

program document

FIGURE 7 **Horseshoe Park in Winter** (Sean Murphy)



research results and goals

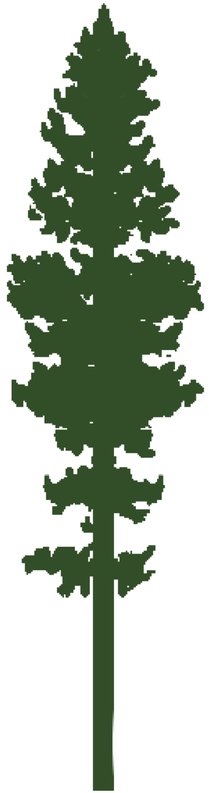
theoretical premise research

Nature must be understood in order to create architectural forms that provide for human needs, and exist in harmony with the environment, rather than opposing it.

Since the beginning of man, we have looked at the resources around us and asked what could be. Man is an adaptable animal and has always sought to use his resources around him in a manner that helps him thrive in every environment, from tundra to desert. Our architecture arose from utilizing the materials the land gave us to create form, function, and aesthetic beauty. Our architectural materials ranging from animal skins, woods and grasses, adobe and stone, took few resources from the earth, most of which were renewable. Humans did not practice these methods out of some higher duty to the conservation of resources but to survive.

Yet with the rise of civilizations, man felt less of a need to be a part of the community that is nature. The domestication of plants and animals for our own uses had taken much of humanity one step away from the wilderness. These dramatic changes in the quality of life for our species led many societies, especially those in Europe to change their views on nature. Religion also played a key role in shaping European views on nature. In societies controlled by kings and clergy, the Bible laid out the foundations for European life prior to Columbus' journey to America. The Bible states, "And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creeps on the earth" (Genesis 1:26 American King James Version). With this holy mandate from God, Europeans took the view that they were here to subdue wilderness and to bring Christianity to the savages of the world. Due in large part to these Christian views, European culture grew to view themselves as the enlightened people and view nature as an adversary to be conquered. This anthropocentric view would reshape the way we looked at the world.

Native Americans, on the other hand, had lived on the North American continent since the last Ice age and arose from the first hunter-gatherers that crossed from Asia. For nearly 15,000 years, Native Americans sought to live in a harmonious relationship with the land and its resources, out of necessity. Indigenous peoples took the approach of valuing the plants and animals that gave them life and never forgot their relationship with the land.



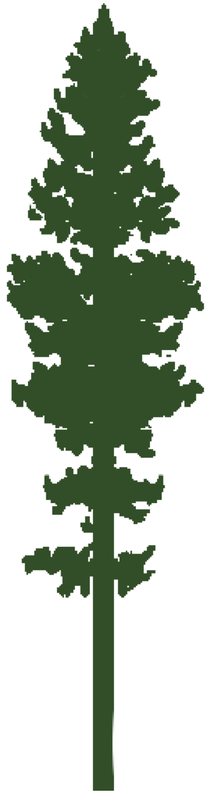
research results and goals

America, at its birth, grew out of the collision of these two opposing cultures and nature's role in our lives. Europeans arrived on unspoiled and wild American continent with their beliefs and set out to take control of the land and its resources. As America expanded and removed many of the native cultures, plants, and animals, few questioned the progress. We were given the opportunity to reshape this Garden of Eden into something truly beautiful, yet Americans instead sought to take all they could from the land for the almighty dollar. That American culture of manifest destiny, that exploration and conquering of nature is what has defined much of the progress Americans have made in the past 150 years.

With the end of the American frontier in 1890, the United States became a world power through urbanization, mechanized agriculture, and the most extensive use and abuse of our natural resources in the history of the nation. At the start of the twentieth century, we saw the near extinction of the bison and the extinction of the passenger pigeon, both of which once numbered in the millions. Grizzly bears and wolves were extirpated from most of the lower 48 states. It was a time when the north woods of the Great Lake states were cut down. It was a time when America's resources were being overexploited to feed growing nation. Even the early national parks such as Yellowstone and Yosemite, created to protect small pieces of wilderness often faced numerous threats. "even as the number of parks swelled no central organization existed to manage them. Consequently, many lacked protection and funding. In the early 20th century the future character of the parks remained very much in doubt. Private commercial interests, including hotels, railroads, ranches, and sawmills, saw great profit potential in the parks and began to exploit their resources—often relatively unchecked" ("U.S. national parks—in," 2012).

While most Americans stood by and considered this destruction and exploitation "progress," a select few saw the value of conserving and preserving some of the nation's remaining resources. "Some in government, like forester Gifford Pinchot, shared a utilitarian vision for the parks that included more than preservation. Pinchot and others suggested that the parks become part of a Forest Service that would promote the well-managed use of their timber and other resources to serve "the greatest good for the greatest number." This philosophy led to the damming, in 1913, of Yosemite's Hetch Hetchey Valley for the San Francisco water supply. But others preached preservation and lamented the lack of an overarching federal management that could make this possible" ("U.S. national parks—in," 2012). Men such as John Muir, George Bird Grinell, and Enos Mills saw value in saving our resources and beautiful places. "In 1915 a millionaire industrialist named Stephen Mather began a crusade to establish a distinct National Park Service dedicated to the preservation ideal. His efforts succeeded, and when the National Park Service was created in 1916, Mather became its first director and began work with a mandate to protect the parks "unimpaired for the enjoyment of future generations," and to promote their use by all people" ("U.S. national parks—in," 2012).

Through their actions, we grew to value and understand that we had limited resources. We began to rethink the American landscape through the creation of national parks to preserve these treasured places for all Americans forever.



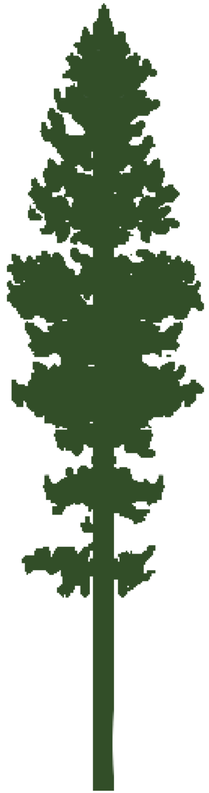
research results and goals

At the same time, American architects sought to design uniquely American buildings created with nature as their guide. Out of the art nouveau and arts and crafts movements, designers such as Louis Sullivan celebrated nature in his ornamentation and design elements. Frank Lloyd Wright developed the idea of organic architecture as a way to connect design and experiences in nature. This was to create a holistic approach that valued nature rather than opposing it. In the national parks, designers created the rustic style of “parkitecture” as the original response to creating structures for the public good that fit in with the landscape.

With all of these advances in our general thoughts on the man-nature relationship, many pushed society away from our relationship with nature and instead embraced the machine age. Modern architecture grew from the want of mass produced, cheap, and efficient structures and materials that sought to convey basic architectural elements. Ornamentation was deemed excess. New buildings used man-made materials instead of natural, traditional materials and methods. As time has passed, and many realized that our material wealth was not making us happier, people once again questioned our direction. Many felt we had lost something in our rush to design in opposition to nature. “Civilization has so cluttered this elemental man-earth relationship with gadgets and middlemen that awareness of it is growing dim. We fancy that industry supports us, forgetting what supports industry” (Leopold 1949).

We sometimes forget that nature still controls the world we live in. As we have seen in the past and continue to see at present, when man opposes and abuses nature for its own uses, we often see negative consequences. The Dust Bowl of the 1930s in the states of Colorado, New Mexico, Oklahoma, Texas, and Kansas was a catastrophe that resulted from farming land without consideration for whether the land was meant to be farmed at all. Residential developments in places such as California and Colorado continue to be built in places with extreme wildfire hazards. Building the city of New Orleans on top of swamps and below sea level led to the flooding it saw during Hurricane Katrina in 2006. In the years following, many asked the question as to whether we should rebuild in these vulnerable places at all.

While careful consideration choice of the site and location is essential to designing a functional building, we have forgotten in the United States that we can build to our environment. We can create buildings that adapt and thrive i9n these adverse conditions if we are willing to bend our own wills.



research results and goals

It is only in our recent history that many of us, especially in the western first world have lost touch with nature.

In recent times, we have rethought our relationship with nature, especially in the design fields. As our planet deals with limited resources and environmental issues, many seek to create sustainable buildings that benefit both human beings and the environment.

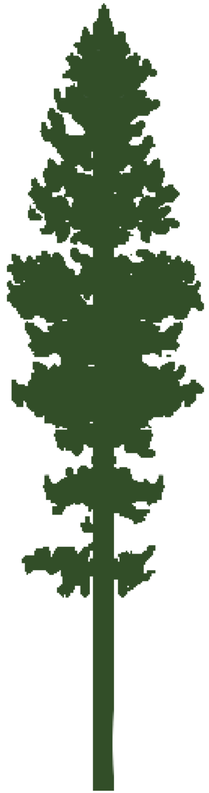
David Pearson, a famous designer and writer, set forth several very important principles on what sustainable and healthy design should aim to be.

Let the design:

- be inspired by nature and be sustainable, healthy, conserving, and diverse
- unfold, like an organism, from the seed within
- exist in the “continuous present” and “begin again and again”
- follow the flows and be flexible and adaptable
- satisfy social, physical, and spiritual needs
- “grow out of the site” and be unique
- celebrate the spirit of youth, play, and surprise
- express the rhythm of music and the power of dance.

(Pearson, 2001)

“The concept of sustainable design has come to the forefront in the last 20 years. It is a concept that recognizes that human civilization is an integral part of the natural world and that nature must be preserved and perpetuated if the human community itself is to survive. Sustainable design articulates this idea through developments that exemplify the principles of conservation and encourage the application of those principles in our daily lives” (“Guiding principles of,” 1993).

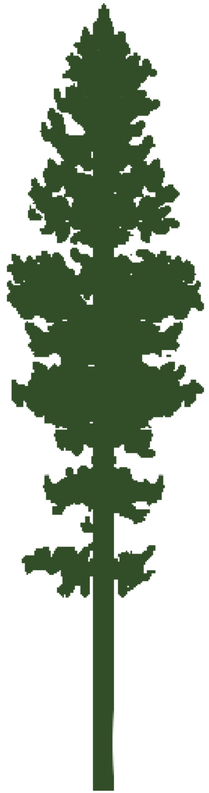


research results and goals

A model of the new design principles necessary for sustainability is exemplified by the “Hannover Principles” or “Bill of Rights for the Planet,” developed by William McDonough Architects for EXPO 2000 which was held in Hannover, Germany.

1. Insist on the right of humanity and nature to co-exist in a healthy, supportive, diverse, and sustainable condition.
2. Recognize Interdependence. The elements of human design interact with and depend on the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry, and trade in terms of existing and evolving connections between spiritual and material con sciousness.
4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems, and their right to co-exist.
5. Create safe objects to long-term value. Do not burden future generations with requirements for maintenance or vigilant administration of potential danger due to the careless creations of products, processes, or standards.
6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems in which there is no waste.
7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from per petual solar income. Incorporate this energy efficiently and safely for responsible use.
8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not an inconvenience to be evaded or controlled.
9. Seek constant improvements by sharing knowledge. Encourage direct and open communication between col leagues, patrons, manufacturers, and users to link long-term sustainable considerations with ethical responsibil ity, and reestablish the integral relationship between natural processes and human activity.

(“Guiding principles of,” 1993)



research results and goals

The pros and cons of developing architecture that exists in harmony with its environment effects all aspects of both humanity and nature.

The economic aspects of designing for the environment has many benefits that architecture opposed to its surroundings never realizes. Climate, weather, plant and animal life, and resources available all play a role in the decision making process for structures that can either benefit a structure functionally and aesthetically or can oppose the elements with higher expenses at a later point in terms of economic value.

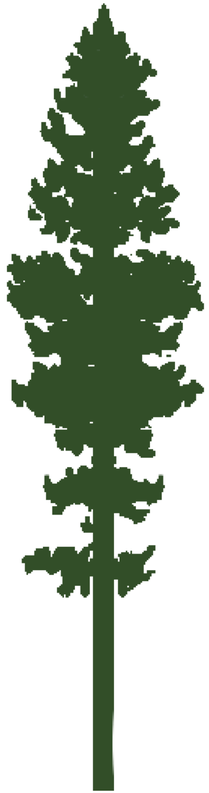
The aesthetic value of architecture adapting to its environment, is for the most part, subjective. At the same time when we are in a natural setting, where beauty plays an important role, it is common sense that architecture should complement nature's beauty, rather than distract from or destroy its beauty. The national parks have always been a place where Americans have placed value in the preservation rather than the exploitation of natural scenery.

We must also consider the moral aspects of designing with nature. It has been said that we do not inherit the earth from our parents, but we borrow it from our children. This statement rings true at a time in Earth's history when we are using resources at a rate that cannot be sustained. When designing buildings, we have to consider our moral obligation to the future.

One of the greatest environmentalists of the twentieth century, Aldo Leopold recognized our deep connection to natural processes that should effect our choices. "Aldo Leopold recognized that no matter how sophisticated we become, people will depend on the land—the land being shorthand for a large community that not only includes and values people but also plants, animals, soils, and waters. We may take natural resources and ecosystems for granted, but, ultimately, the land is what sustains us. Conservation is a state of harmony between men and land, Aldo Leopold wrote. When the land is degraded, the community suffers—people included. By promoting the health of the land, we are striving to practice the Land Ethic and promote healthy land and prosperity in our lifetime and for future generations" ("The land ethic," 2012).

Leopold's land ethic can be directly applied to our own design decisions in order to create a building that is harmonious with its natural environment. "Examine each question in terms of what is ethically and aesthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949).

At present, we are at a crossroads of design. While much of society places a high value on the mass production and efficiency of structures, we have now begun to rediscover the validity of designing for the environment as well.



research results and goals

When we think about understanding nature and its effects on our architecture in fragile places like Rocky Mountain National Park, we must consider the mission statement from the National Park Service Organics Act of 1916. “The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purposes of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (“Organic Act,” 2011).

Americans have struggled since the creation of the park system to find a balance between both the use and preservation of the parks. Design and development of recreational and educational facilities in parks such as Rocky Mountain have been and will continue to be a hotly debated topic as we try to define that harmonious relationship between man and nature.

Ultimately, the goal of harmony with the environment is a nearly impossible goal for architects, yet that does not mean that we should not make it our mission to reach for the highest in design. We can do our best with the resources both man and nature give us to achieve that balance. “We shall never achieve harmony with the land, anymore than we shall achieve absolute justice or liberty for people. In these higher aspirations the important thing is not to achieve but to strive” (Leopold 1993).

typological research

FIGURE 8 **Beaver Meadows Visitor Center Auditorium** (David Benbennick)

FIGURE 9 **Eielson Visitor Center** (Kent Miller)

FIGURE 10 **Aldo Leopold Legacy Center** (Mark Heffron)

FIGURE 11 **Beaver Meadows Visitor Center Auditorium** (David Benbennick)

beaver meadows visitor center
estes park, co

architect: taliesen associated architects, ltd.
year: 1967
size: 17,500 sq. ft.
typology: visitor center / administration building

The Beaver Meadows Visitor Center serves as Rocky Mountain National Park headquarters and as the primary visitor center for the U.S. Highway 36 entrance to the park.

The building was conceived in the mid-1960s when the new Beaver Meadows Entrance Station and road opened along with the addition of 320 new acres to the park. As one of the nationwide Mission 66 projects, a movement to modernize park facilities, the Beaver Meadows Visitor Center was unique for the fact that Frank Lloyd Wright's Taliesen Associated Architects were hired to create a natural, modern building as opposed to many other contemporary, modernist Mission 66 structures. Here designers sought to create a building that highlighted Rocky Mountain National Park's assets but also disappeared into the surrounding landscape.

The structure and spatial elements of the design focused on creating a ship-like design built into the site's hillside. On the building's interior, administrative offices occupy nearly the entire west end of the building. At the center, an information desk, lobby, and restrooms meet visitors arriving to the park by car. At the same time, the building's most distinct spatial element and choice was to build an auditorium at the east end of visitor center. The choice to show a 20-minute introductory movie to visitors on the park rather than creating the typical interpretive spaces was made as a "progressive" step in telling the story of the park.

FIGURE 12 **Beaver Meadows Visitor Center Under Construction in 1966** (Lockwood)

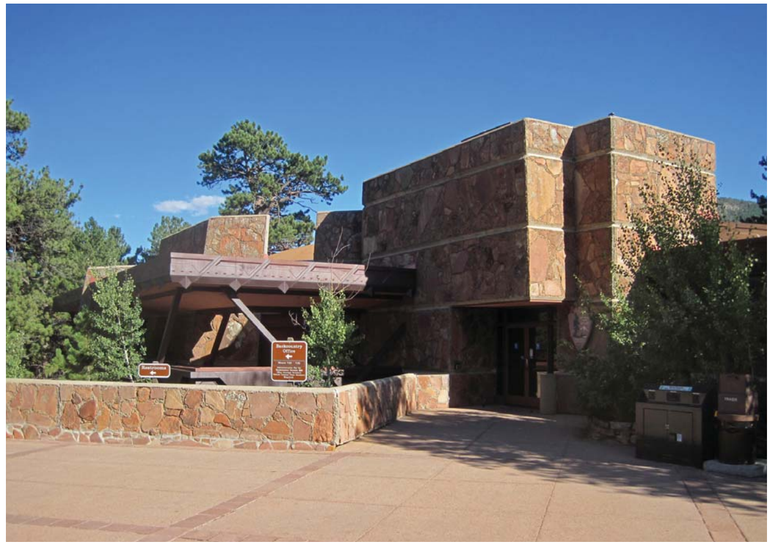


FIGURE 13 **Beaver Meadows Visitor Center Main Entrance** (Sean Murphy)

beaver meadows visitor center

south elevation

FIGURE 14 **Beaver Meadows Visitor Center** (Sean Murphy)

The building's structure is a unique combination of cor-ten steel, glass, and local concrete and stone. These materials seek to blend with the environment through aesthetic beauty. The core-ten steel rusted to the color of ponderosa pine bark. Local stone and concrete were used in a way similar to Frank Lloyd Wright's Taliesen studio, pulling masses right out of the ground. Glass walls opened the entire building up to the views and daylighting the site had to offer. All of these materials worked together to create a building that merged into its surroundings while challenging typical architecture of the time.

Massing consists mainly of the auditorim and entry anchoring the rest of the glass and steel administration wing to the site. The building's hiearchy centers on its entrance on the north side of the building. Here, as with many other Wright buildings, the entrance happens at the corner of the large mass that is the lobby. The lobby creates a focal point on the building to which all other areas are subordinate.

Natural light was always an integral part of the project. Large glass windows cover both north and south sides of the building and drastically reduces lighting needs for the building, while the auditorium contains a large skylight maintaining low lighting conditions necessary for the space.

Circulation for the public is relatively limited in the building. The lobby space is very small in size and there are no existing exhibit spaces to speak of. Administration takes up both floors of the long, west end of the building where a hallway runs up the center. The exterior of the auditorium does feature a balcony wrapping around the structure that shows numerous views of the park on south, east, and west sides of the building.

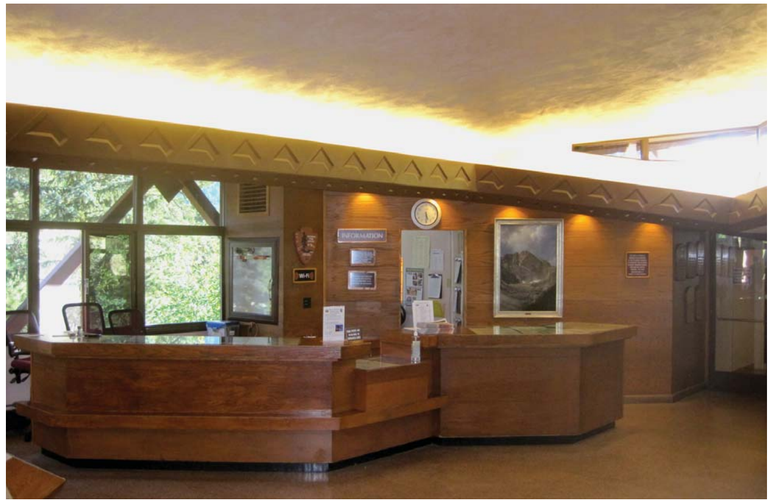


FIGURE 15 **Beaver Meadows Visitor Center Information Desk** (Sean Murphy)

beaver meadows visitor center

main floor plan

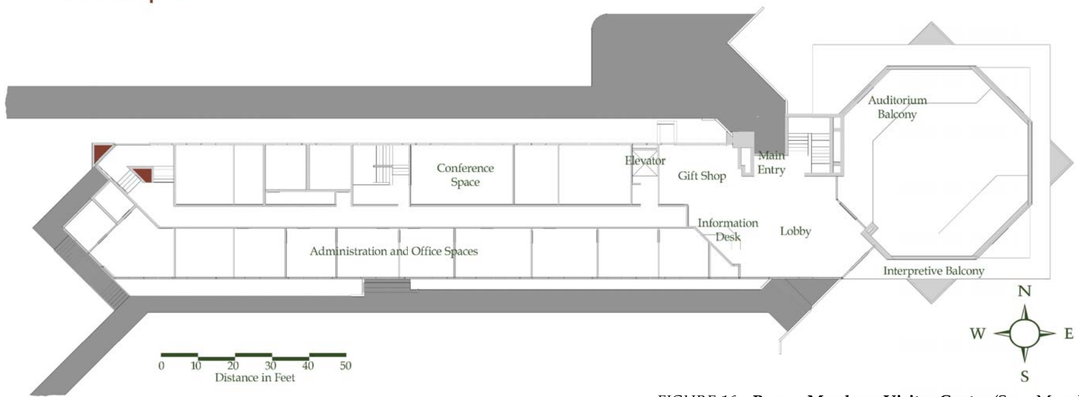


FIGURE 16 **Beaver Meadows Visitor Center** (Sean Murphy)

Geometry in the structure utilizes many angles and triangles, especially in the cor-ten steel facade that runs the length of the building, where these features function to break the box and to cut into the landscape.

While the structure is quite simple, it has many unique design features. Originally, it included a fireplace in the lobby. Also, all administration spaces originally had moveable walls for the expansion and contraction of office spaces. Lastly, administrative and public entries remain separate. Employees approach from the south and enter on the back side of the building, while all visitors enter through the formalized front entry.

The building is symmetrical in many of its exterior aspects and its spatial layout along the east-west line the building sits on, but its interior and site features break that appearance down. Within the lobby and the other public spaces is where asymmetry breaks all notions that this is a simple structure. Its sidewalks, stairs, and entries all break with typical designs and fit the site, rather than the the man-made symmetry of the administrative end of the building.

FIGURE 17 **BMVC Lobby 1967** (National Park Service)

FIGURE 18 **BMVC Lobby 2003** (National Park Service)

beaver meadows visitor center

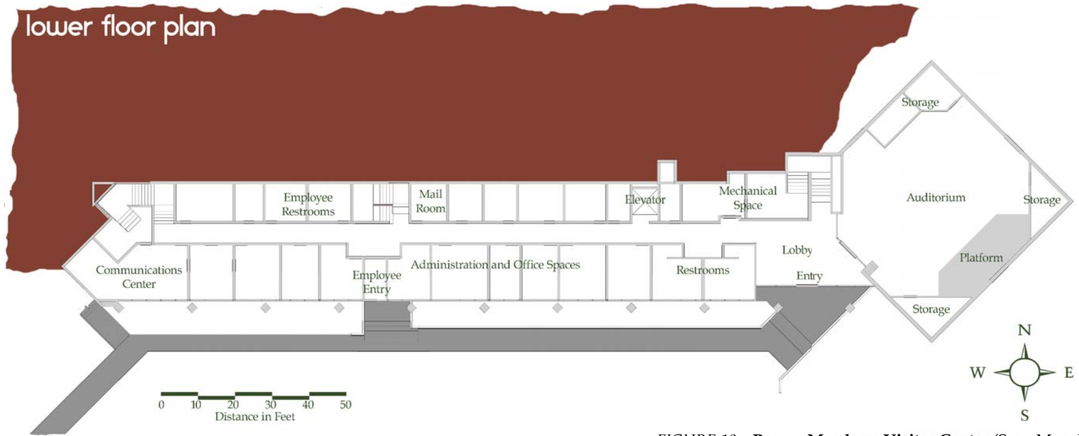


FIGURE 19 **Beaver Meadows Visitor Center** (Sean Murphy)

As a whole, the building does play a direct role in this thesis project. As the main visitor center for the park, it has not kept up with demand. The building required additional restrooms to be built in the early 2000's. The size of the building's public spaces and services are very limited for their uses today. The auditorium is used but was not as successful as originally planned. This thesis project seeks to make up for many of the failures of this and other visitor centers in the park with the expansion of learning spaces that can tell the story of change in the park.

FIGURE 20 **Eielson Visitor Center** (Kent Miller)

eielson visitor center
healy, ak

architect: rim architects
year: 2008
size: 8,500 sq. ft.
typology: visitor and interpretive center

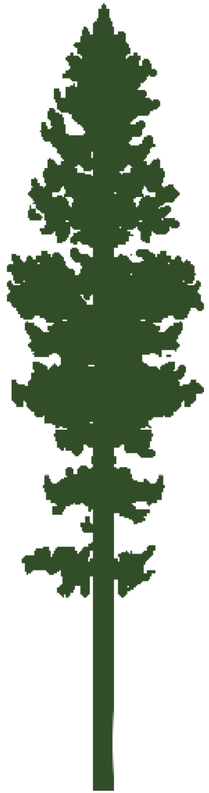
The Eielson Visitor Center was built in 2008 as a replacement for the previously existing Eielson Visitor Center on the same location 66 miles into the wilderness of Denali National Park and Preserve in Alaska.

The original Eielson Visitor Center was built as a part of the Mission 66 government program to upgrade park facilites throughout the country. However, many were not pleased by its construction. The now famous "Park biologist Adolph Murie railed against any developments that might downgrade the prevailing purity of wilderness atmosphere in the park. Two years later, Murie and other conservationists loudly protested against Eielson Visitor Center at Mile 66, which was then under construction, because it did not blend into the tundra landscape; they derided it as a monstrosity and a Dairy Queen" (Norris, 2007). The building was constructed nonetheless in 1961 and served visitors into the early 2000s. Yet, the facility's heavy use and Alaska's harsh winters had taken their toll on the structure, and it was understood by the park service that they needed a new visitor center.

The goals set forth in the design of the new visitor center had a strong focus on an independent, sustainable structure that did not mar the beauty and wildness of Denali. Utilizing new design methods and technology, the Eielson Visitor Center is the first LEED Platinum certified building in the National Park Service and in the state of Alaska.

The building serves as the major destination of visitors on the interior of the park as a last stop for bus riders and a drop off location for backpackers and hikers. Its spaces serve administration, living, information, interpretive, and support uses and functions as its own remote base of NPS operations.

FIGURE 21 **Original Eielson Visitor Center 1967** (National Park Service)



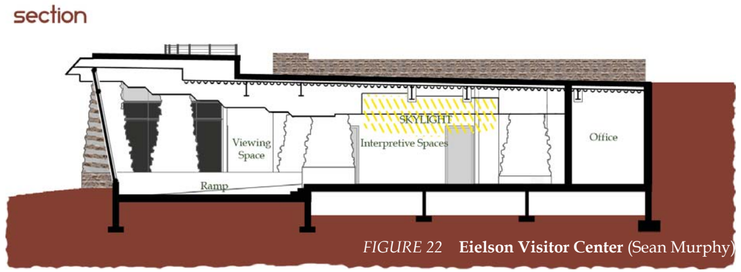


FIGURE 22 **Eielson Visitor Center** (Sean Murphy)

eielson visitor center

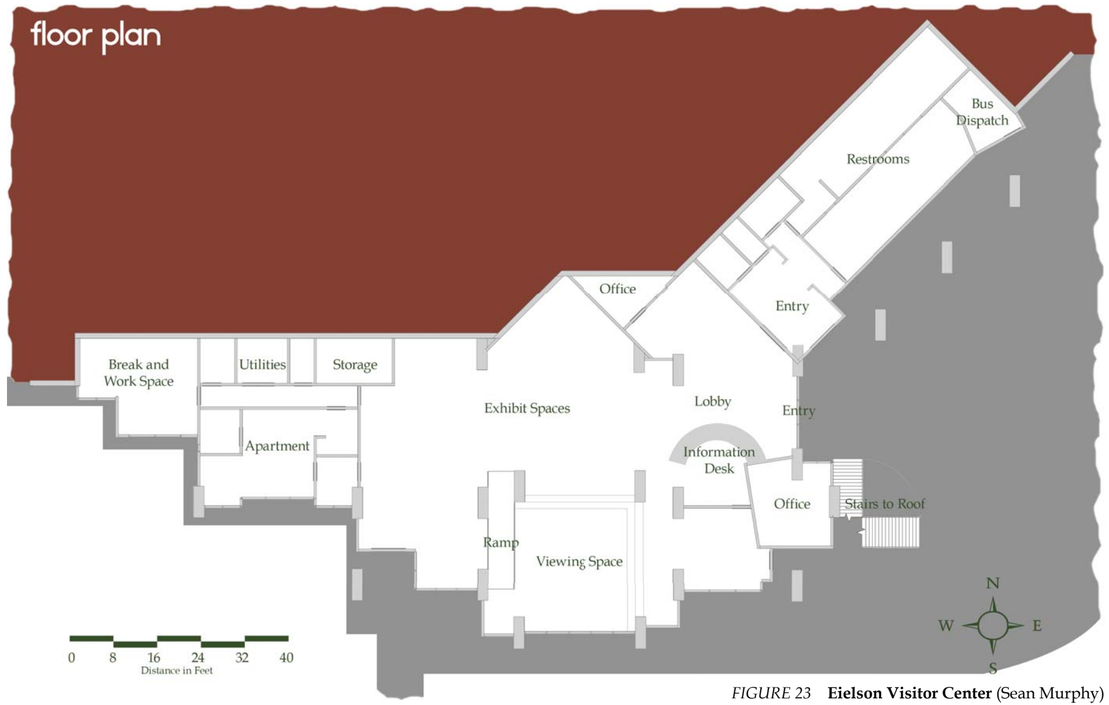


FIGURE 23 **Eielson Visitor Center** (Sean Murphy)

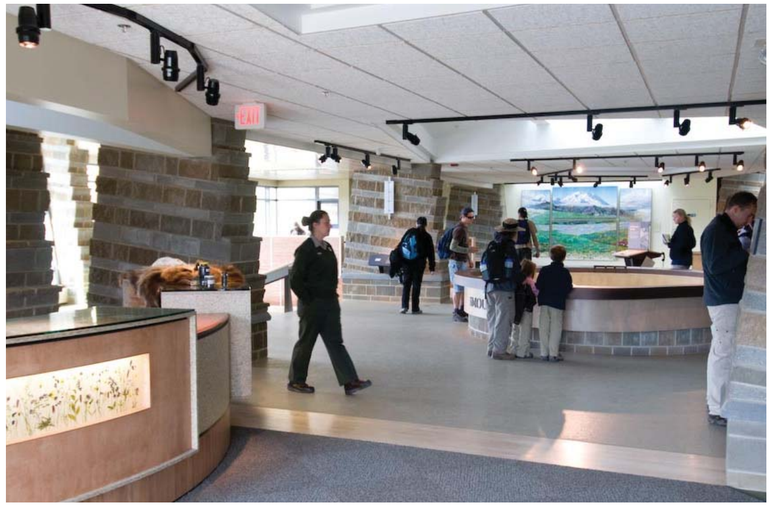


FIGURE 24 **Eielson Visitor Center Information Desk and Park Map** (Kent Miller)

eielson visitor center

south elevation

FIGURE 25 **Eielson Visitor Center** (Sean Murphy)

The building could be broken down into three main areas of use. The main public spaces, such as the lobby, interpretive space, and information desk all provide services and inform the visitor. The center also features large restrooms to handle the large number of visitors it receives at its distant location and to minimize impacts elsewhere on the site. Last of all, it has employee housing and support space to allow employees to remain stationed at the visitor center 24/7. All of these spatial characteristics relate to the visitor center's truly remote location and need for a self-sustaining facility.

The structure of the building utilizes a combination of certified sustainable wood products along with many materials, including steel that has been recycled from the prior existing structure. Simple post and beam construction and rectangular spaces made building the center far more simple and efficient. The structure uses solar panels, a hydroelectric generator, and propane support its electrical and heating needs. Improved toilets and sinks cut water use. These design features create a visitor center that is as modern as it is efficient.

The massing of the building is broken down between the main public spaces and the two "wings," where restroom and support spaces are. Yet, all of the mass is built into the hillside to obscure the structure.

Circulation on the site and in the building begins with getting off the bus at the visitor center. One approaches from the building's rear on top of its roof. Here, in an open plaza, visitors can not see the building and instead only see the beauty of the wide open tundra. Visitors progress down stairs or a ramp down to the building level and directly into the lobby and exhibit spaces. This open floor plan allows visitors to wander inside the visitor center at their own pace.

FIGURE 26 **Eielson Visitor Center Exhibit Space** (National Park Service)

eielson visitor center

Natural lighting plays an important part in increasing efficiency in the visitor center. Numerous windows face the south side of the building, utilizing passive solar heat, while skylights allow light to penetrate the interior spaces.

The hiearchy of the building is centered primarily around the viewing space and the exhibit spaces. Visitors can explore the center and learn about Denali National Park or plan the next stop in their trip. The entire building intentionally remains a very subdued design.

Symmetry does have a role in much of its structures, but its built space is broken down into its primary uses as a cohesive cluster of public, services, and support.

The building holds some unique characteristics, namely the use of the building's roof for an active plaza space and entering the building by moving across its roof, then down, and back in. Furthermore, it truly functions independantly of other buildings and services and represents the qualities a remote building in the wilderness must have.

This Eielson Visitor Center can apply to this project in many ways. Its sustainability features display what is possible in even remote locations with few nearby manufacturers and suppliers. Aesthetics are considered in the building's exterior design but it is of note that the most important feature is that it is hidden from view and that it is nestled into the natural topography. Here, advanced technology, a simple design layout, and a simple structure remain essential parts of the design.

FIGURE 27 **Aldo Leopold Legacy Center** (Mark Heffron)

aldo leopold legacy center
baraboo, wi

architect: kubala washatko architects, inc.
year: 2007
size: 12,000 sq. ft.
typology: interpretive center / offices

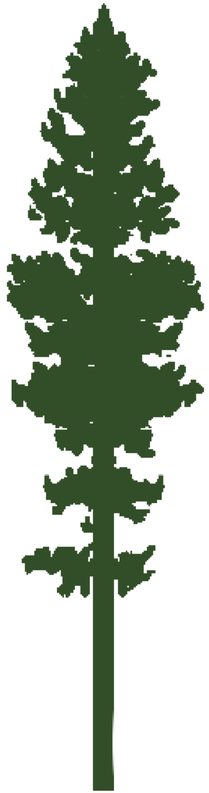
The Aldo Leopold Legacy Center is a project built in 2007 by the Aldo Leopold Foundation to create a center for learning and administration of the foundation.

Aldo Leopold was one of the greatest environmentalists of the twentieth century. He is most famous for his book, *A Sand County Almanac* in which he developed his idea of "the land ethic" or an environmental conscience best described as, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise"(Leopold, 1949). *A Sand County Almanac* and many of his other writings were written at his family's shack and farm in Baraboo, Wisconsin, now a National Historic Landmark. The non-profit foundation was created following his death to "weave a land ethic into the fabric of our society; to advance the understanding, stewardship, and restoration of land health; and to cultivate leadership for conservation" ("The aldo leopold," 2011).

In that tradition, the foundation sought to create a new center that fufilled the goals of the land ethic set forth by Leopold. Through innovation and design excellence, the firm of Kubala Washatko Architects in Milwaukee developed the Legacy Center as a LEED Platinum structure and the first certified carbon-neutral building in the nation.

The center is broken down into three seperate structures in a campus setup surrounding a rain garden and greenspace. Two of the smaller structures serve as learning spaces while the main building includes administration, meeting spaces, archives, and exhibit spaces.

FIGURE 28 **The Leopold Shack** (Dan Perlman)



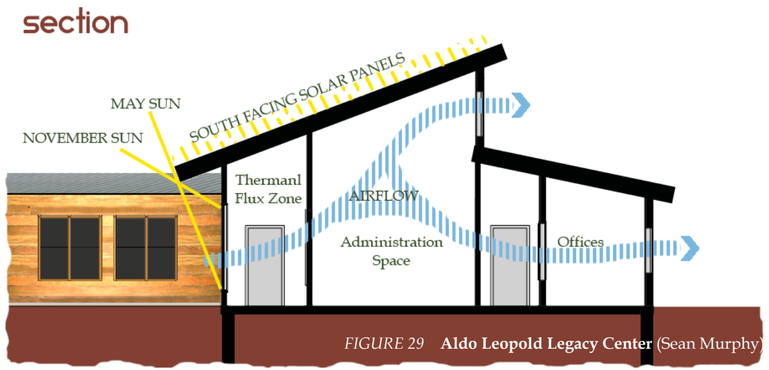


FIGURE 29 **Aldo Leopold Legacy Center** (Sean Murphy)

aldo leopold legacy center

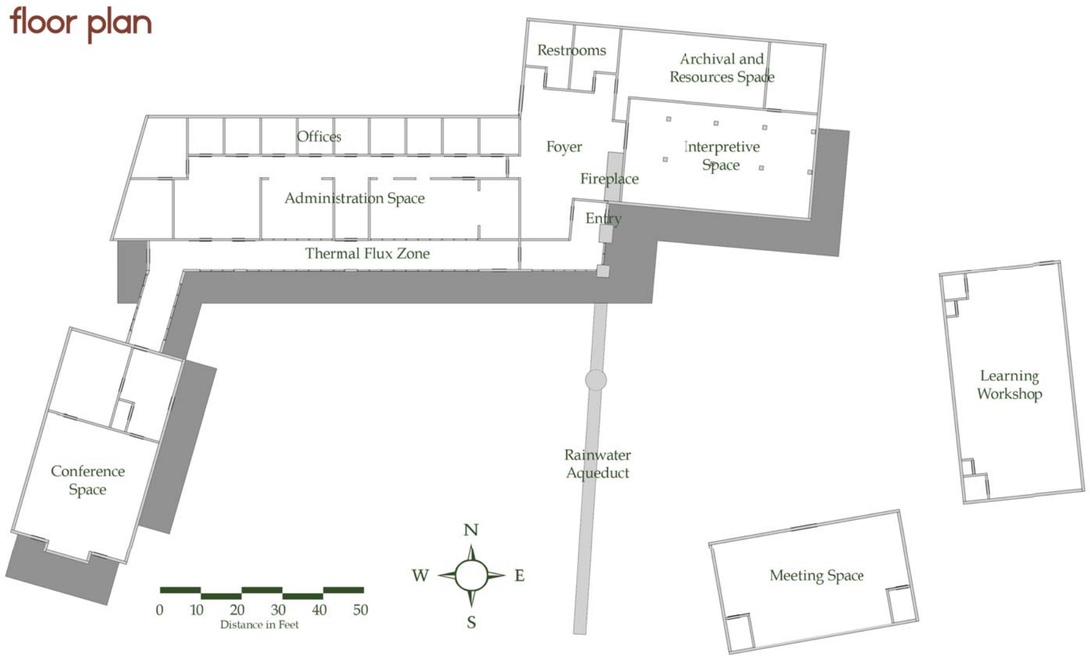


FIGURE 30 **Aldo Leopold Legacy Center** (Sean Murphy)

FIGURE 31 **ALLC Interpretive Space** (*Kubala Washatko Architects*)

aldo leopold legacy center

south elevation

FIGURE 32 **Aldo Leopold Legacy Center** (Sean Murphy)

The building was primarily designed utilizing green design systems and technologies both proven and experimental. Designers were given freedom to solve issues and to create a state-of-the-art facility. One hundred percent of the structure and siding comes from pine, maple, and oak trees on site. All other building materials come from recycled and sustainable sources. "The Legacy Center was designed to use seventy percent less energy than a comparable conventional building. A 39.6-kW rooftop photovoltaic array produces more than one hundred and ten percent of the project's annual electricity needs" ("Aia/cote top ten," 2008). The building has far lower water and HVAC needs than comparable buildings. All landscaping is xeriscape, requiring only rainwater collected from the roof. Finally, trees planted on site offset the remaining carbon footprint of the center.

Natural lighting is an essential factor in all of the buildings. Numerous high-performance windows retain heat, create views to the outdoors, and allow the building to be almost completely daylit during operating hours.

Circulation primarly runs on the south perimeter of the main building in the "thermal flux zone," a hallway that links the building's spaces, creates daylighting and solar heat, and allows natural ventilation of the building. Outdoor open circulation occurs between the main building and the learning spaces.

Geometry in the design is simplified to using wood structures that could be found in any design. Timber trusses cross rectangular spaces without much deviation. This is primarily due to most materials being created on site without the possibility of specialized forms and shapes. Simplicity was a key feature of the design geometry.

FIGURE 33 **ALLC Conference Space** (*Kubala Washatko Architects*)

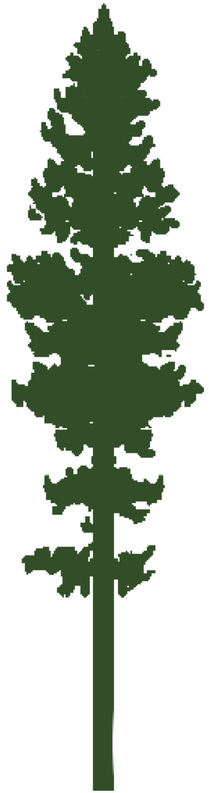
aldo leopold legacy center

Hiearchy revolves around the fireplace in the main building, the visual and structural heart of the center. Recycled stone from a local airport creates a focal point using its mass at the building's main entry and foyer area. The rest of the structures are designed to gather around the fireplace and aqueduct and act as the design's main element.

The entire center is broken down into its separate components, primarily for efficiency reasons. The two outer buildings only receive temporary use and can effectively shut down when not in use. This drastically cuts heating and cooling needs that would otherwise be shared if part of the same structure.

Its asymetrical design functions to exploit energy efficiency and daylighting on the site. While all three buildings are effectively of the same timber frame and wood structures, each room and space has a slightly different character.

All of these features work to create a sustainable building that is both functional and beautiful. The legacy center offers a dramatic example of how a simple structure can draw from the site and local materials in creating a structure that benefits its location. Furthermore, using technology and efficiency to guide a design, rather than purely aesthetics, can be beautiful and effective in its own right. The Aldo Leopold Legacy Center provides for human needs but also exists in harmony with the land and the world around it.



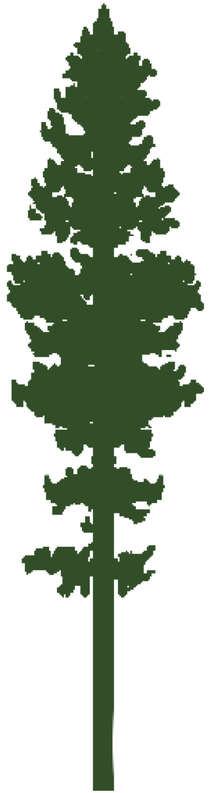
typological research summary

When one examines the typology research, one can draw many conclusions from these designs.

Some of the common characteristics these buildings share are the relative size and spatial arrangments. Most visitor centers are under 15,000 square feet in size. Spaces are set up for interpretation, administration, and support uses and are clearly defined. These structures are rarely over two stories in height and often sprawl out on their sites. Structures typically used local materials but over the course of the past 100 years have used every modern material and building technique available. Aesthetics and siting of the structures have always been a high priority, yet this principle has not always been followed.

Historically, buildings in these environmentally sensitive locations have not necessarily pursued environmentally sustainable characteristics but nonetheless used local materials and less energy than many contemporary buildings, not out of a desire to protect the environment but to save money and material.

The newest trend in designing for nature in its most sensitive areas is the use of the LEED design standards, sustainable materials, and new, energy efficient technologies. The U.S. government has fallen in line, backing sustainable design for our national parks. Nearly all NPS facilities built in the past five years are LEED certified and have “green” features. Most new designs are simple in structure, materials, and design but feature very complex mechanical systems. Many designs have taken to more subdued structures that actually sit in the site partially buried as with the Eielson Visitor Center or the Head-Smashed-In Buffalo Jump Interpretive Center in Alberta. All of these new practices have rightly sought ways to minimize the impact of these buildings on the local flora, fauna, and other natural resources.



typological research summary

Uncommon qualities linked to this building typology are the deliberate celebration of nature in almost all of their designs and decoration. Natural and rustic design motifs exist in nearly all NPS visitor centers. Public art often has a place in many of these centers. Large windows and the framing of natural views was also a feature commonly incorporated. Interpretive exhibits were often set up for multiple presentation methods, including naturalist discussions, hands on exhibits, and audio visual presentations. Restrooms are often sized for large numbers of visitors. All of these smal, intricatel details define what separates NPS visitor centers from other similar typologies.

In conclusion, it is evident that designing with efficiency and aesthetic care, we can create self-sustaining buildings that don't produce waste or negative consequences on the environment. We can harness new technologies and old design solutions to create buildings that are cheaper to maintain, last longer, and can teach about nature, adaptation, and sustainability.
Nature must be understood in order to create architectural forms that provide for human needs while also existing in harmony with the environment.

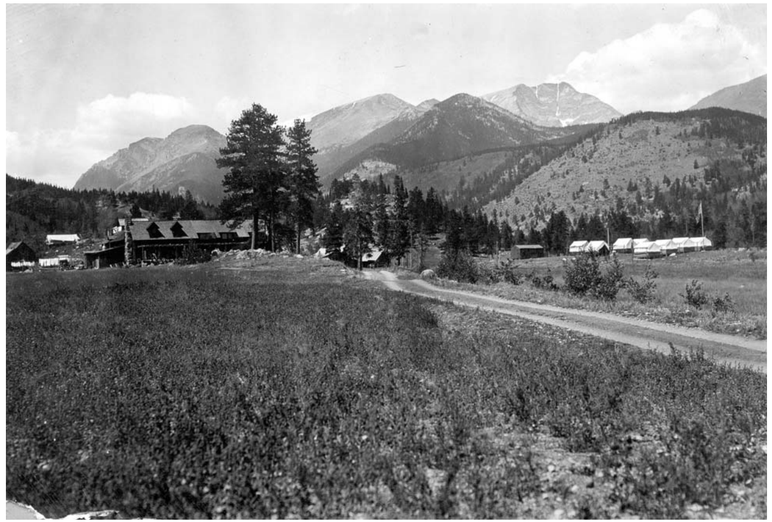


FIGURE 34 **The West Horseshoe Park Site in 1916** (*W.T. Lee*)

FIGURE 35 **The West Horseshoe Park Site in 2011** (*Sean Murphy*)

FIGURE 36 **Longs Peak** (*Albert Bierstadt*)

historical narrative

This thesis seeks to balance the needs of nature and humans through an adaptable and sustainable design. This premise also has a deep connection to the ideas of place and time. Understanding both the natural and human history of the location is often the best place to seek inspiration for designing in harmony with the environment.

The history of the Estes Park and Rocky Mountain National Park region is similar to many other places in Colorado and throughout the American West. Following the last Ice Age over 10,000 years ago, early Native American peoples began living in the region that is now Northern Colorado. Later, tribes such as the Ute, Apache, and Arapaho lived seasonally in the high country of the region, yet none remained on a permanent basis in the area due to its harsh winters. Utilizing wikiups, "small brush shelters" and tepees for temporary homes as they hunted for large game in the area, this continued all the way into the mid-1800's. Trappers and explorers were the first whites to visit the Estes Park region, but none remained in the area.

Finally, in 1858, Joel Estes became the first known white man to enter the Estes Park Valley. Here he developed the first of many homesteads in the area, primarily for ranching in the valleys and parks of the area. Mining also occured throughout the park but few minerals were found and mining disappeared by the middle of the 20th century. As the small settlement of Estes Park grew on the east side of the divide, homesteads and numerous lodges began to spring up throughout the area. These lodges primarily served sick patients who came for the dry, mountain air, rather than tourists, initially. Yet, as many learned of the natural beauty of the area northwest of Denver, many came to exploit it. Timber poaching became a common practice in the area, and alpine lakes were dammed for irrigation on the east side of the divide. Many locals grew concerned over the depletion of resources in this special place. The community of Estes Park and the state of Colorado, led by local naturalist and writer Enos Mills, fought to preserve the land straddling the divide. In 1915, they succeeded in creating the nation's eighth national park.

While this was a positive step forward in preserving the wilderness of the region, much of the park remained in private hands as inholdings, including this project's site. Park policy from the outset pushed towards managing the park as a wilderness and lodges, homesteads, and ranches were progressivly removed as the park expanded. Neighboring communities grew quickly to support the tourist industry with hotels, restaurants, shops and resorts. As the Colorado cities of Ft. Collins, Loveland, and Boulder continued to expand, water needs expanded and the Big Thompson project was created to divert water from the west slope of the divide by tunneling under the park.Water needs of the Front Range continue to be an issue within the debate on appropriate park use.

FIGURE 37 **Enos Mills: The Father of Rocky Mountain National Park**

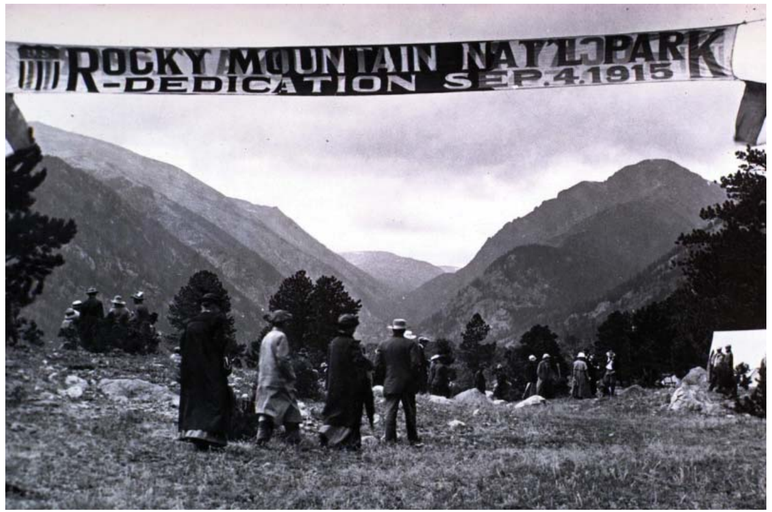


FIGURE 38 **Rocky Mountain National Park Dedication Ceremony** (*National Park Service*)

historical narrative

By mid-century, visitation began to overwhelm the area's facilities and services, especially those within the actual park. Through the Mission 66 funding during the 1960s the park was redeveloped with new roads and visitor centers to handle these changes. Since then, growth has continued in the community of Estes Park, as well as the retoration and expansion of the park. In recent years, a large number of retirees have moved to the area, and the park has expanded its research studies in conjunction with Colorado State University and other organizations. Current visitation to the area exceeds three million visitors annually and the full-time resident population of the area continues to expand and encroach on the park. All of these features contribute to a rich history in the surrounding communities, and their link to a national park that celebrates nature.

When it comes to the design of local buildings and structures in the Estes Park region, several patterns emerge. Original structures utilized the materials that were immediatly available, namely pine trees and local stone. With these materials they created a unique local architecture, sometimes referred to as "Rocky Mountain Rustic." This style is very similar to the "Adirondack" style on the East Coast. It is known for using almost exclusively local wood and split log siding. The style is also known for its use of sticks to create ornate decorations on the exterior and interiors of buildings. This style originated to create a natural look but more importantly to save money by avoiding material transportation expenses. At the same time, many of the more important buildings in the Estes Park village used local wood but European styles, as in the neo-Georgian, Stanley Hotel. As time passed these styles fell from favor and much of the area fell into typical American modernist architecture for most of the 20th century. Recent trends draw on past rustic and arts and craft styles but, for the most part, exemplify much of the same boring design found elsewhere in the country. While much of the new architecture outside of the park attempts to create the rustic style or at least mimic it, most fail in blending with or enhancing the surrounding natural environment. This could be traced to the material choices made by designers and could be changed with the responsible use of local materials and better designs. Ultimately, much of the architecture outside the park has fallen from the natural aesthetic, which, if done right, could benefit area designs.

FIGURE 39 **Shep's Place in Estes Park, CO** (*Sean Murphy*)

Historically, designing buildings that adapt to their natural surroundings has almost always been an important and sensible value to possess. Yet, the methods used to achieve harmonious designs have always been in a state of change.

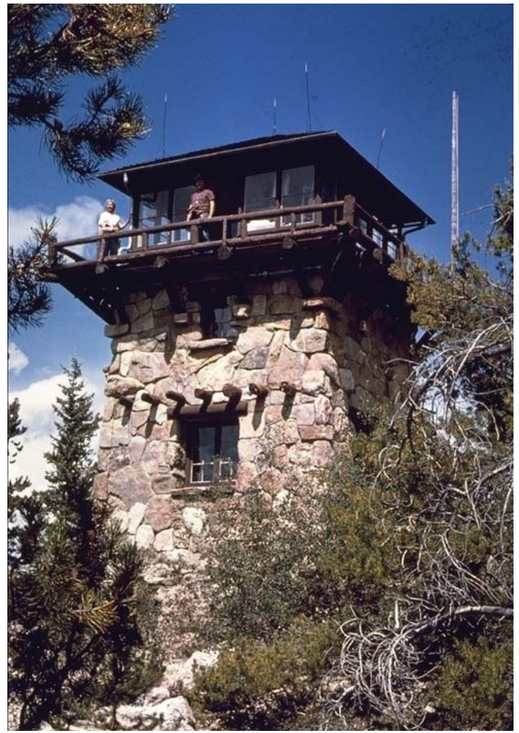


FIGURE 40 **An NPS "Rustic" Building: RMNP Shadow Mountain Lookout**

historical narrative

The design of building types such as visitor and environmental learning centers has always changed with the times in terms of form, space, and function. This is especially true in the history of public lands in the United States.

Architecture and design in the national parks parallels many of the trends found throughout architecture in the 19th and 20th centuries. With the creation of Yellowstone in 1872, people began to build in these unique places to support the tourist industry that was bound to follow. In the early days, the U.S. Cavalry managed the national parks and brought military buildings and architecture to the parks to house and support soldiers. This military design tradition still applies to the layout of employee housing and support structures. Traditional European styles, such as Art Noveau and Arts and Craft were often applied due to their popularity at the time, while others pursued more natural motifs. Glacier National Park in Montana was developed by the Great Northern Railway in the early 1900s. The railroad built many elaborate and beautiful Swiss lodges throughout the park. In Yosemite, a wide variety of styles were explored. Then in 1916, the National Park Service was created. Led by the visionary first director of the agency, Stephen Mather created the idea of what national parks represented. All park designs from that point on sought similar materials and structures that would create a unified Park Service design standard. NPS "Rustic" was the chosen style for all of the park service until after World War II and Rocky Mountain National Park was no exception. NPS "Rustic" is defined by its asymmetry and hand-built qualities and using local stone and wood. It also grafts these materials onto various styles, most commonly with Arts and Craft structures. This style was used to save money through simplicity and local resources and also used for nearly all buildings from the 1910s until the 1950s. These buildings featured excellent craftsmanship and most remain in use today. After the war, visitation skyrocketed nationwide, and it was found that original structures could not handle the new needs. Mission 66 was a government NPS funding initiative that gave the parks the funding to modernize nearly all of their structures and features. Through this program, the parks turned in the direction of modernism. Some buildings still sought the rustic style and materials, while others aesthetically and physically were designed without any concern for site or environment. In Rocky Mountain National Park, the Beaver Meadows and Alpine Visitor Center were exceptions and harkened back to more rustic designs and materials.This split has also shown the failings of these move to modernism.

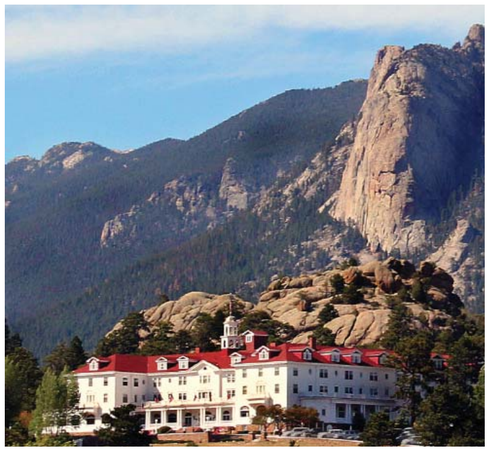


FIGURE 41 **Stanley Hotel in Estes Park, CO** (*Sean Murphy*)

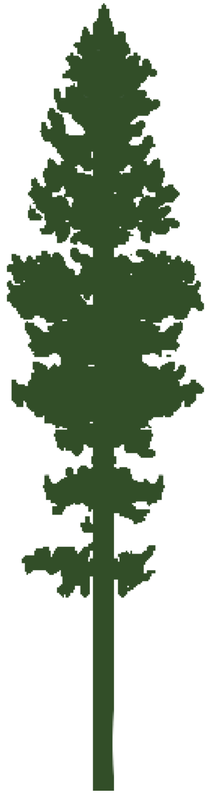
FIGURE 42 **A Mission 66 Building: RMNP Alpine Visitor Center** (*David Benbennick*)

historical narrative

Forty years later, many Mission 66 structures are being dismantled or replaced. Many either failed aesthetically or simply wore out from use and the natural elements. Modern efforts have focused on making nearly all NPS buildings sustainable, LEED-certified, and aesthetically pleasing. New buildings often utilize state-of-the-art technology and regional materials, yet stray from many of the rustic designs of the past in favor of new, unique designs. Whether these buildings truly are built with the ideas of site and place has yet to be seen. New design in our parks is headed in the right direction though.

The visitor center typology grew from the national park experience that NPS founders Stephen Mather and Horace Albright embraced as a logical introduction or gateway to the park. This was a place where visitors could arrive via automobile, acquire information, and learn about the experience they would have in the park, and then continue to explore the park. Information services and interpretive spaces have continued to be at the heart of the typology and have been experimented with over the years. Most centers have sought to make a statement about their park's identity. Sites have always been strategically located at points of entry or at significant locations. All of these traits remain defining charaterisics of the typology

The thesis project can draw from both the historical background of Colorado and Rocky Mountain National Park. It can also draw from the history of design in natural places, specifically from the environmental learning center and visitor center building typologies. Local materials can save both time and money while making the building much more efficient from the start. Some of the most aesthetically subtle and appealing designs utilize and display the natural materials they are made from.



historical narrative

park timeline

10,000 BC - Clovis Paleoindian hunters enter the park as the glaciers retreat.

6,000 BC to 150 AD - Archaic hunter-gatherers occupy park in the spring and summers. These are probably Uto-Aztecan speaking peoples who are the ancestors to many tribes in the western United States (Ute, Comanche, Goshiute, Shoshone).

1200-1300 - Ute enter North Park and Middle Park and Rocky Mountain National Park.

1500 - Apache are in the high country, including the park.

1800? - Arapaho make first appearance in the park.

1803 - Louisiana Purchase includes land that would become the park.

1843 - Rufus B. Sage is first explorer to enter east side of park and write about it.

1858 - Joel Estes enters what is now Estes Park and starts a ranch. Philip Crawshaw builds a cabin in what is now Grand Lake on the west side of the park.

1868 - John Wesley Powell, William Byers (Rocky Mountain News) and others make the first ascent of Longs Peak.

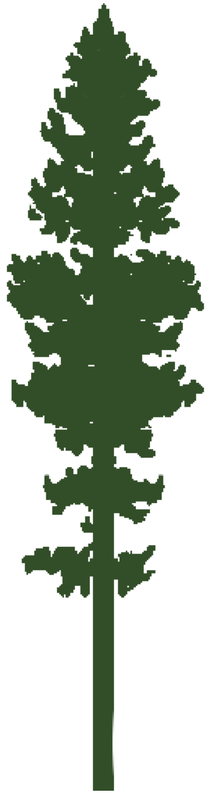
1872 - Yellowstone becomes first National Park in Wyoming and Montana.

1874 - Ferdinand Vandiveer Hayden's "U.S. Geological and Geographical Survey of the Territories" enters the park.

1874 - Abner Sprague homesteads in Moraine Park and builds Sprague's Ranch (later Stead's Ranch) and establishes tourism and dude ranching in the park.

1876 - State of Colorado created by Congress - "The Centennial State."

Park Timeline Source:
("Rocky mountain national," 2011)



historical narrative

park timeline

1874 – 1886 - Mining on the west side of the park; Lulu City and Gaskill Towns established.

1895 – 1935 - Grand Ditch is built to bring water from Never Summer Range across La Poudre Pass and down the Cache La Poudre to the plains for agriculture.

1906 - Road up the Big Thompson River (now Highway 34) completed.

1907 - Enos Mills, James Grafton Rodgers, and others begin lobbying for the establishment of Rocky Mountain National Park.

September 4, 1915 - Rocky Mountain National Park dedicated.

1916 - Organic Act establishing the National Park Service is enacted by Congress.

1913 – 1920 - Fall River Road constructed as first road over Continental Divide between Estes Park and Grand Lake. Replaced by Trail Ridge Road.

1929 – 1933 - Trail Ridge Road constructed.

1933 – 1942 - CCC Camps in Hollowell Park, Little Horseshoe Park, Kawuneeche Valley.

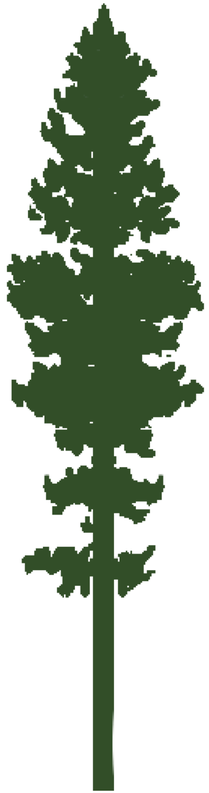
1936 - Hidden Valley becomes a ski area; closed in 1992 and removed by 2002.

1937 – 1947 - Colorado-Big Thompson Project and Alva B. Adams tunnel completed under park.

1955 - National Park Service Director Conrad Worth announces Mission 66, a construction program designed to bring the National Parks into modern conditions for increasing amount of visitors.

1964 - Wilderness Act passed which later allows for further protection of the park.

Park Timeline Source:
(“Rocky mountain national,” 2011)



historical narrative

park timeline

1966 - National Historic Preservation Act protects historic and prehistoric resources on federal lands.

1968 - Beaver Meadows Headquarters building finished; declared National Historic Landmark in 2002 as the only building in the NPS designed by the Frank Lloyd Wright school of architecture.

1982 - Lawn Lake dam collapses – flood kills 3 people and severely impacts Estes Park.

1988 - McGraw Ranch purchased and buildings are remodeled and turned into a research center by 2001.

1992 - Lily Lake area purchased and popular handicapped trail constructed.

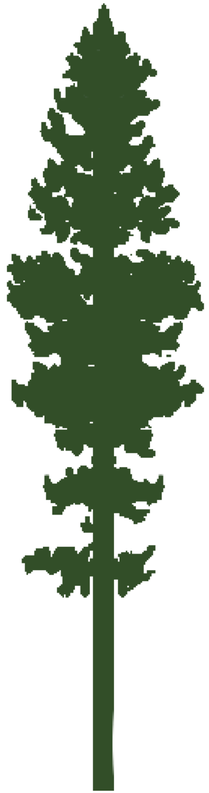
2000 - New Fall River Visitor Center opens. Congressional act required to allow private company to build visitor center outside the park, with NPS staff.

2003 - Grand Ditch breach occurs.

2004 - Hidden Valley reopens for winter sledding and summer picnics.

2007 - Final Elk and Vegetation Management Plan/Environmental Impact Statement released. The initial phase of the preferred alternative relies on a variety of conservation tools including fencing, redistribution, vegetation restoration and lethal reduction (culling). In future years, the park will, using adaptive management principles, reevaluate opportunities to use wolves or fertility control as additional tools. Record of Decision signed February 2008.

Park Timeline Source:
(“Rocky mountain national,” 2011)



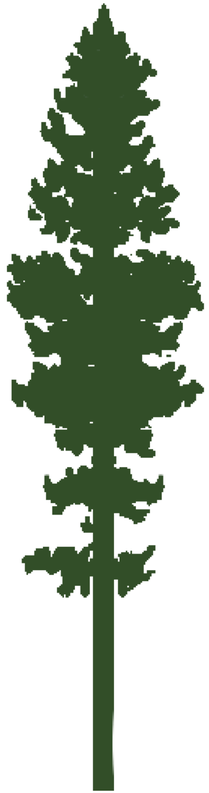
thesis project goals

The goals of this project that I have set for myself are as many as they are varied. In academic, professional, and personal pursuits, I hope to create a project that is satisfying and challenging in its investigation of a wide variety of topics including:

- Architectural design in our national parks
- Ecologically sustainable building materials
- Adaptable structures and and spatial use
- Creating interactive learning environments
- Designing through case study use
- Minimizing impact on environmentally sensitive locations

In researching these, I want to put together some conclusions resulting in an interesting and thought-provoking design solution, while attempting to define the project premise that nature must be understood in order to create architectural forms that provide for human needs but also exist in harmony with the environment.

Academically, I am attempting to create a thesis project that allows me to explore my interests in environmentally sustainable design, as well as the experimental creation of adaptable structures. I want to create a project that displays my prowess in the creation of detailed physical models and a graphic display of my design and presentation capabilities. Most of all, I hope to learn in my last year of schooling a wide variety of new techniques in design and research that will develop my abilities further and benefit me the future.



thesis project goals

To help myself professionally, I am seeking to create a project that is professional grade on all levels. I want to display the best of my skills to future employers in the areas of research development, graphic design, and my capabilities in architectural and landscape architectural design. With these in mind, I am in the process of building a website featuring my design portfolio, highlighting my thesis project. Ultimately, I plan to utilize this project in finding employment in the future.

The personal goals I have set for myself in this project include creating a project that shows the diversity of work that I am capable of and something that will allow me to explore my talents. I have looked forward to the thesis project since I began my schooling in architecture, and I feel that I have come a long way in developing my skills. This is a chance to create something that I can be proud of for the rest of my life.

I hope that at the end of this project I will have a well thought out and interesting work that can provide some insight on the topics of adaptable and sustainable design and provide me with the comprehensive learning experience I am seeking.

site analysis

FIGURE 43 **West Horseshoe Park Site** (Sean Murphy)

FIGURE 44 **View from North Side of Site: Facing Sheep Lakes** (*Sean Murphy*)

site analysis

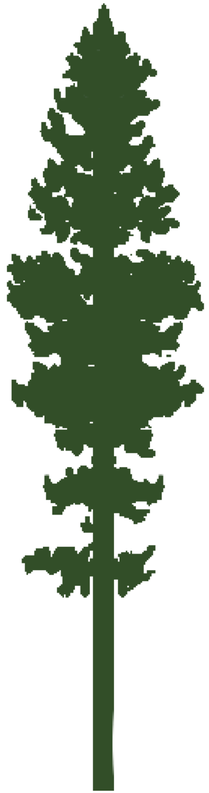
qualitative aspects

The site at the west end of Horseshoe Park in Rocky Mountain National Park is a unique spot. Situated to contain a meadow within a forest, it offers 360-degree views of beautiful mountain scenry. Yet, standing within this large, U-shaped valley gives the impression of being within a halfpipe that channels one's vision up and down its length more than its sides. In this case one looks to the east and west. Design should specifically take advantage of these views to the east and west.

Existing features on the site are limited to the two-lane, Highway 34 and the adjacent pulloff on the east side of the site. These features serve as the access point to the site but also as a boundary and a distraction from nature. While the road guides visitors through the park, it limits their freedom to stop and explore the site and other areas around them. Most seek serenity in these wild places, yet the road makes that experience at the site far more difficult. The road creates the connection but also serves as the border between nature and civilization.

Light and shade add color and drama to the site. During the summer season, all shades of green, grey, and tan stand against the bright blue sky. The site receives constant rays of sunlight throughout summer days with minimal play of light and shade. The greatest change in light, colors, and tones occurs at both sunrise and sunset. The topography of the surrounding ridges and peaks often obscures the sun for up to 30 minutes at the beginning and end of the day. The sky changes to shades of red, pink, and orange, while the landscape becomes dark long before light from the sky is gone. During the winter, light increases in its intensity through its reflection of snow. All of these factors should be considered in the design process.

The site's vegetation defines the location through its variety and changes. Coniferous trees on the site remain dark green year-round in stark contrast to the pure, white landscape of winter and the lush spring green of the aspen and grasses in the sun. The changes in color begin and end with the undergrowth of grass, shrubs, and wildflowers that bring shades of yellow green, and every other color one can imagine to the site. Yet, the wildflowers that explode in color in June disappear by July, and by September, the undergrowth loses its color and returns to dormancy for the remaining year. Fall offers the beautiful gold of the aspen trees in one last display before the silence of winter.



site analysis

qualitative aspects

Water is not a central feature to the site experience, yet the site neighbors the Fall River to the north and is within its drainage. Water does play a small role in bringing various water-loving flora and fauna to the west end of Horseshoe Park, as well as offering limited views to the north and northeast of the site.

Human interactions on the site are limited, with the occasional hiker passing through. Motorists stop sporadically at the pulloff to take in the views. Most often, horse riding groups use the pulloff as a place to park and stage their groups prior to their trail rides around Horseshoe Park. These activities are few and far between, but they offer a human connection to the site. Driving a car along Highway 34 at 30 to 40 mph offers no more than a passing glance at the site, while stopping at the pulloff can draw one's interest and activities across the road to the small meadow.

One of the most intriguing aspects of the site is the change it has seen in the past 130 years. From virgin wilderness to cattle ranching beginning in the late 1800's and the establishment of a small summer lodge named the Horseshoe Inn in 1907. With the founding of the park in 1915, the demolition of the lodge in 1931, and the development of Highway 34 through the park, this site has been altered and modified many times over. The site has been stressed by human impact which is still visible in the site's vegetation and soil. This human impact offers the opportunity to build in an area of the Horseshoe Park that has already seen development in the past and thus preserves other less impacted locations.

Overall the site's greatest asset is that it straddles the divide between many elements. From the vertical to the horizontal, the forest to the meadow, and the human to the natural, this site offers the chance to create a design that adapts to all of these contrasting elements.

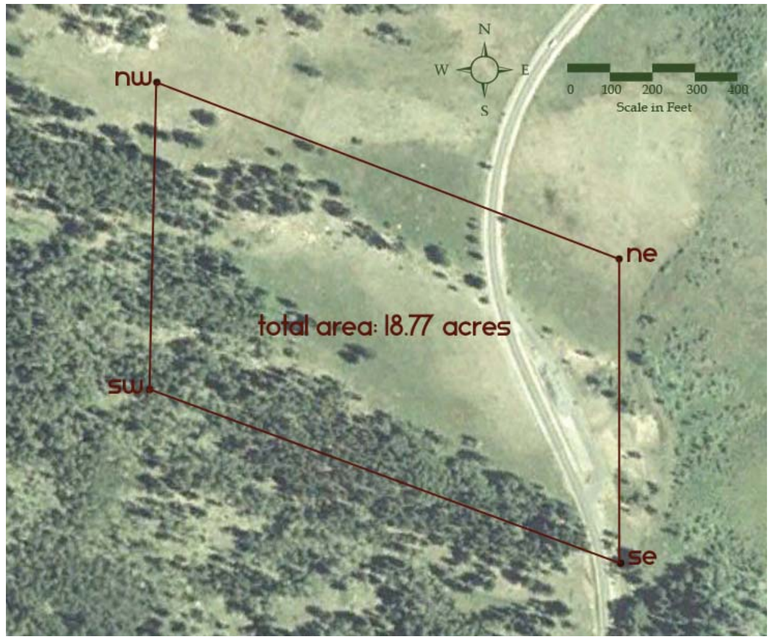


FIGURE 45 **Aerial Map of the Site** (*Sean Murphy*)

site analysis

site location

The site is located in the north central area of the state of Colorado. It is positioned within the east central part of Rocky Mountain National Park.

GPS Coordinates:

NE Corner	NW Corner	SE Corner	SW Corner	Center
40° 24′ 8″ N	40° 24′ 12″ N	40° 24′ 1″ N	40° 24′ 5″ N	40° 24′ 6.5″ N
105° 37′ 35″ W	105° 37′ 49″ W	105° 37′ 35″ W	105° 37′ 49″ W	105° 37′ 42″ W

Distances:

Northeast Park Entrance - Fall River	2.6 miles
Southeast Park Entrance - Beaver Meadows	4.5 miles
Estes Park, CO	7.3 miles
Alpine Visitor Center	18.4 miles
West Park Entrance - Kawunechee	38.6 miles
Grand Lake, CO	41.0 miles
Denver, CO	76.8 miles

FIGURE 46 **Panorama of the Horseshoe Park Site: Facing Northwest** (*Sean Murphy*)

FIGURE 47 **Panorama of the Horseshoe Park Site: Facing South** (*Sean Murphy*)

site analysis

FIGURE 48 **Site Map 1 and Supporting Images** (*Sean Murphy*)

1

2

3

4

FIGURE 49 **Site Map 2 and Supporting Images** (*Sean Murphy*)

site analysis

1

2

3

4

FIGURE 50 **Site Map 3 and Supporting Images** (*Sean Murphy*)

site analysis

1

2

3

4

FIGURE 51 **Site Map 4 and Supporting Images** (*Sean Murphy*)

site analysis

1

2

3

4

FIGURE 52 **Site Map 5 and Supporting Images** (*Sean Murphy*)

site analysis

1

2

3

4

FIGURE 53 **Site Map 6 and Supporting Images** (*Sean Murphy*)

site analysis

1

2

3

4

FIGURE 54 **Northeast Corner Site Map and Supporting Images** (*Sean Murphy*)

site analysis

northeast corner

North View

South View

East View

West View

FIGURE 55 **Northwest Corner Site Map and Supporting Images** (*Sean Murphy*)

site analysis

northwest corner

North View

South View

East View

West View

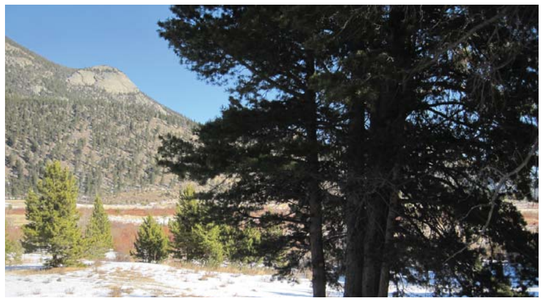
FIGURE 56 **Southeast Corner Site Map and Supporting Images** (*Sean Murphy*)

site analysis

southeast corner

North View

South View



East View

West View

FIGURE 57 **Southwest Corner Site Map and Supporting Images** (*Sean Murphy*)

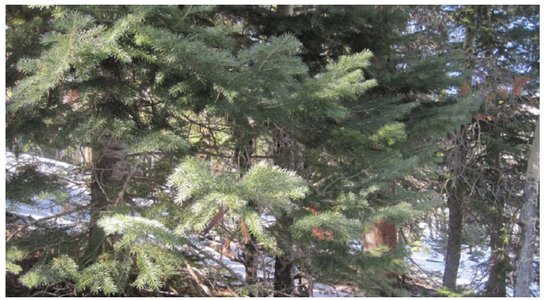
site analysis

southwest corner

North View

South View

East View



West View

FIGURE 58 **Center Site Map and Supporting Images** (*Sean Murphy*)

site analysis

center

North View

South View

East View

West View

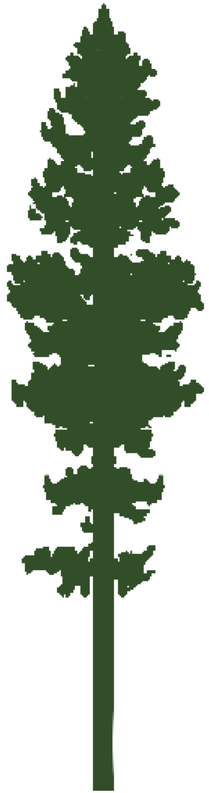
FIGURE 59 **Center Panorama Site Map and Supporting Images** (*Sean Murphy*)

site analysis

center panorama

North View

South View



site analysis

park visitor area map

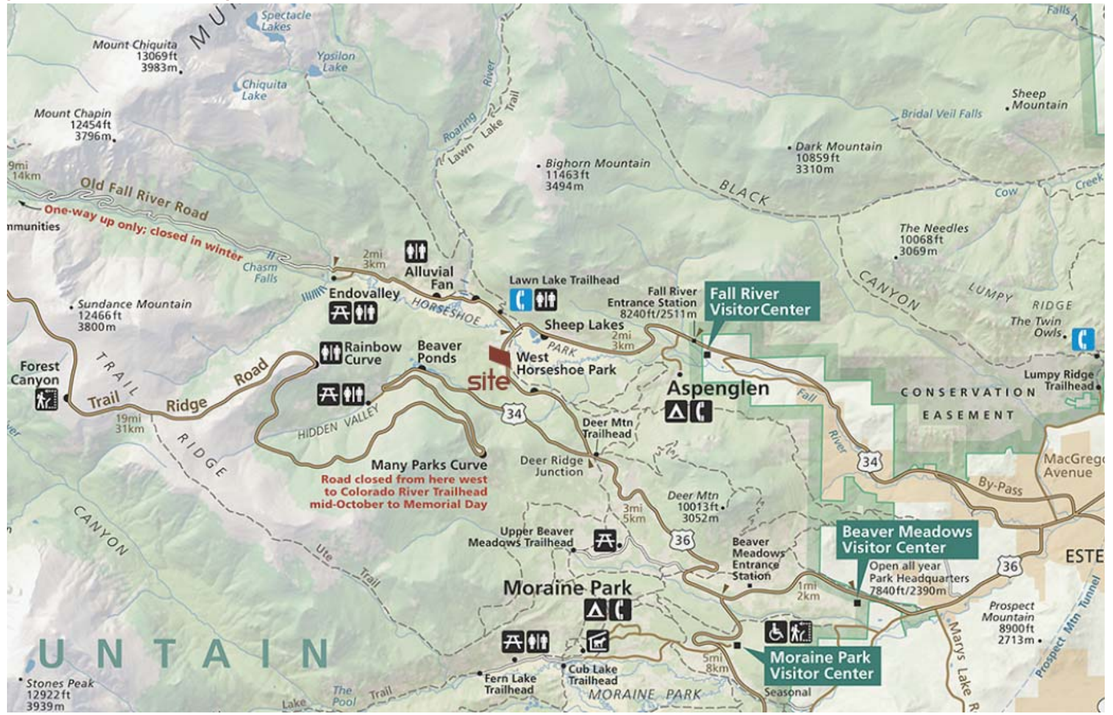
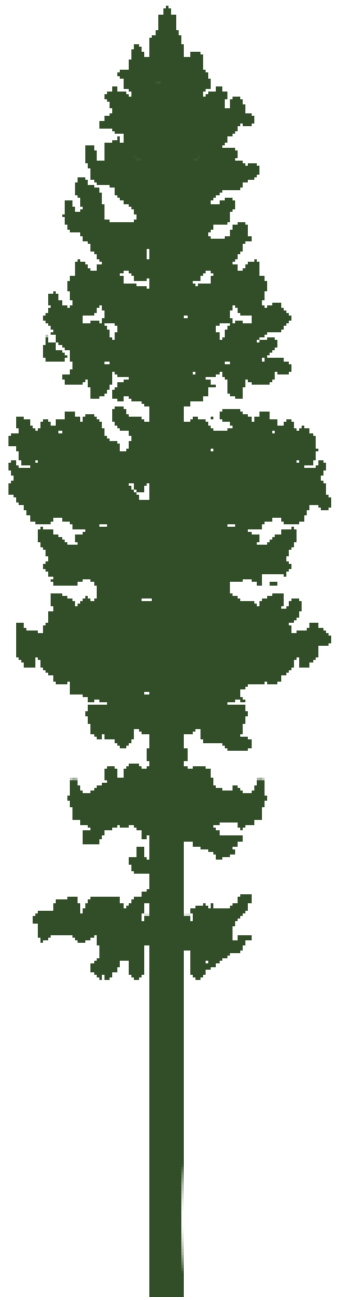


FIGURE 60 **Park Visitor Area Map** (*National Park Service*)



site analysis

topographic area map

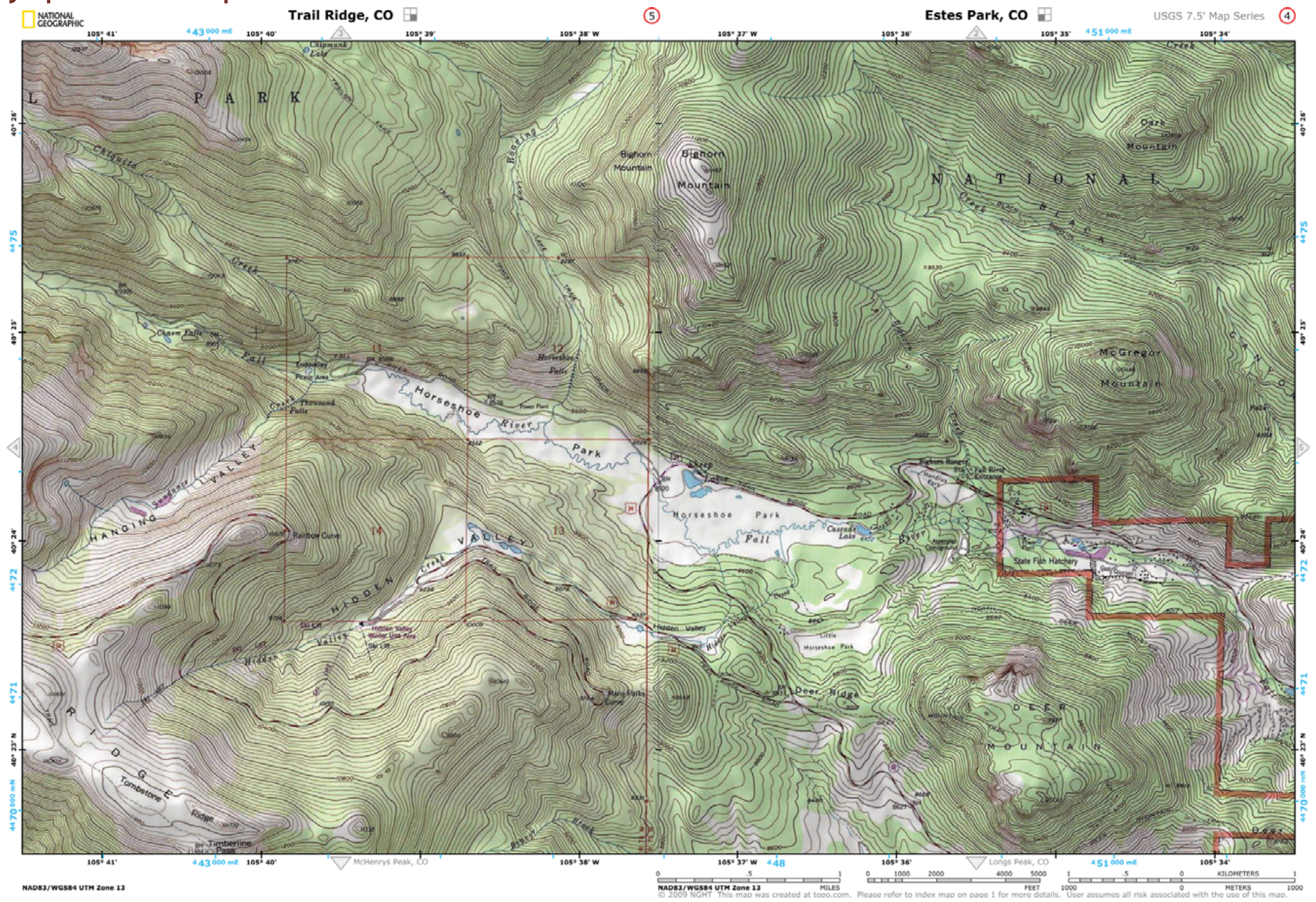
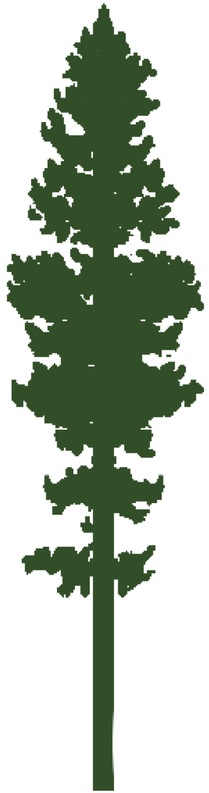


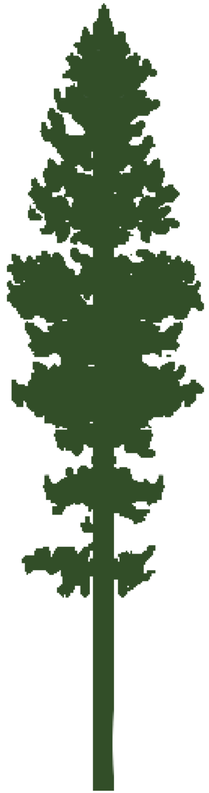
FIGURE 61 **Topographic Area Map** *(National Geographic)*



site analysis

aerial area photo

FIGURE 62 **Aerial Area Photo** (*Google Earth*)



site analysis

visual form

The visual form of the site is created by the surrounding mountains and ridges bordering Horseshoe Park on the north and south. The topography here naturally guides views up the valley to the west to Mt. Chapin, Chiquita Mountain, and Ypsilon Mountain as well as the Continental Divide. One then turns around and naturally looks back across Horseshoe Park to the east where the view drops off unobstructed. The site itself rests at the western end of the park near the boundary between meadows and coniferous forests, and the level and the vertical. This transition of vegetation and topography gives the site many aesthetic opportunities to play on these contrasting environments.

FIGURE 63 **Horseshoe Park Panorama: Facing East** (*Sean Murphy*)

FIGURE 64 **Site Topographic Map** (*Sean Murphy*)

site analysis

topography

The topography of the site is the direct result of glacial erosion. During the last Ice Age, a glacier over 500 feet in height carved out the U-shaped valley that is now Horseshoe Park over a period of hundreds of years. The site sits at the upper end of Horseshoe Park where the open flood plain meets with the glacial moraines paralleling the valley. The site is located at an elevation of more than 8,500 feet above sea level and contains nearly 75 feet of vertical change within the site's 18.77 acres. Slopes on the site, for the most part, remain between 0% - 5% slopes but can go as high as 20%. Within a mile of the site, peaks rise to nearly 2,000 feet in elevation above Horseshoe Park. With these extreme topographic features and its location adjacent to the Continental Divide, weather and wind patterns are also affected and can differ dramatically from valley to valley in Rocky Mountain National Park. This dramatic change in elevation and topography is a defining characteristic of the site.

("Trail ridge, co," 2011)

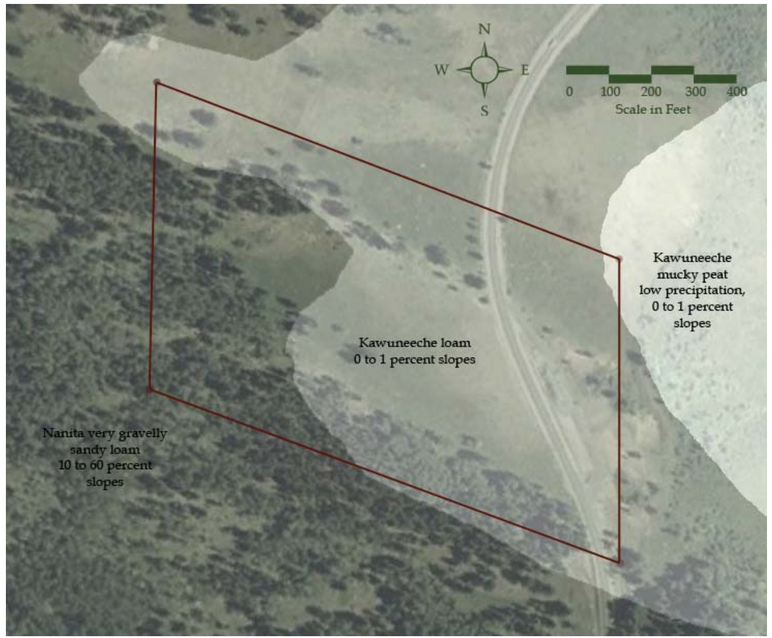


FIGURE 65 **Site Soil Map** (*Sean Murphy*)

site analysis

soil

Soil at the site consists of glacial silts, sands, and gravels that are leftover deposits from the last Ice Age. All are located on top of bedrock but also offer challenges to building any substantial structures on the location. These soils are prone to retaining a large quantity of water and do not typically lend themselves to large, multi-story structures.

	Total Acreage	Percentage of Site
Kawuneeche loam, flood plains, 0 to 1 percent slopes	**12.4 acres**	**66.3% of site**

Parent material: Alluvium over sandy and gravelly glaciofluvial deposits derived from granite, gneiss, and schist
Typical Profile:
A1—0 to 6 inches; loam
A2—6 to 12 inches; loam
Bg—12 to 20 inches; gravelly sandy loam
Cg1—20 to 35 inches; gravelly loamy fine sand
2Cg2—35 to 61 inches; extremely gravelly coarse sand

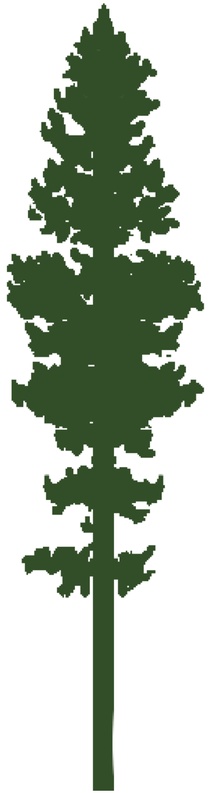
Nanita very gravelly sandy loam, moraines, 10 to 60 percent slopes	**5.7 acres**	**30.5% of site**

Position on landform: Backslopes
Parent material: Sandy and gravelly till derived from schist, granite, and gneiss
Typical Profile:
Oe—0 to 1 inch; moderately decomposed plant material
E1—1 inch to 10 inches; very gravelly sandy loam
E2—10 to 23 inches; extremely gravelly loamy sand
E and Bt1—23 to 41 inches; extremely gravelly sand
E and Bt2—41 to 71 inches; extremely gravelly sand

Kawuneeche mucky peat, flood plains, low precipitation, 0 to 1 percent slopes	**0.6 acres**	**3.2% of site**

Parent material: Alluvium over sandy and gravelly glaciofluvial deposits derived from granite, gneiss, and schist
Typical Profile:
Oe—0 to 5 inches; mucky peat
A—5 to 12 inches; clay loam
Bg—12 to 23 inches; loam
Cg1—23 to 31 inches; coarse sandy loam
2Cg2—31 to 66 inches; very gravelly loamy sand

(Soil survey of rocky, 2007)



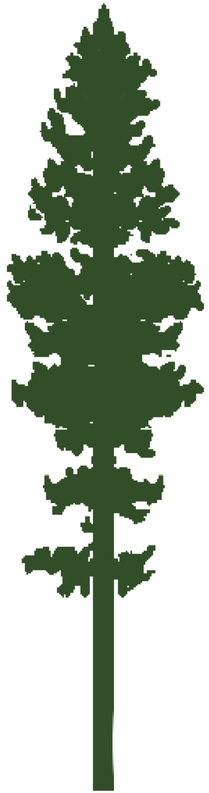
site analysis

drainage and water table

No permanent surface water exists on the site and currently it drains into the Fall River to the north. Drainage and a high water table pose issues for development of the site. Furthermore, weak, moist soil types and the slope of the site will likely require a plan for diverting or using runoff water.

	Total Acreage	Percentage of Site
Kawuneeche loam, flood plains, 0 to 1 percent slopes Drainage class: Poorly drained Flooding hazard: Occasional Seasonal high water table depth: About 12 to 18 inches Runoff class: High	**12.4 acres**	**66.3% of site**
Nanita very gravelly sandy loam, moraines, 10 to 60 percent slopes Drainage class: Somewhat excessively drained Available water capacity: About 1.9 inches (very low) Runoff class: Low	**5.7 acres**	**30.5% of site**
Kawuneeche mucky peat, low precipitation, flood plains, 0 to 1 percent slopes Drainage class: Poorly drained Flooding hazard: Frequent Seasonal high water table depth: About 0 to 18 inches Runoff class: High	**0.6 acres**	**3.2% of site**

(Soil survey of rocky, 2007)



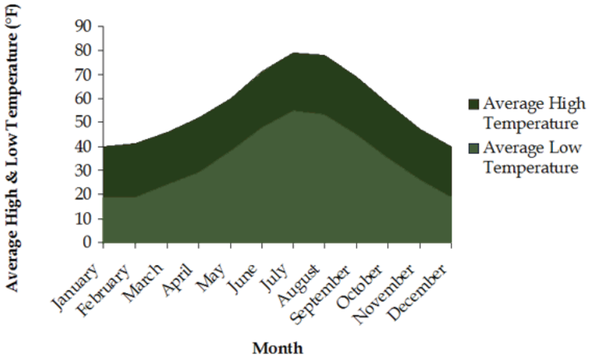


FIGURE 66 **Horseshoe Park Average Temperature Graph** (*Sean Murphy*)

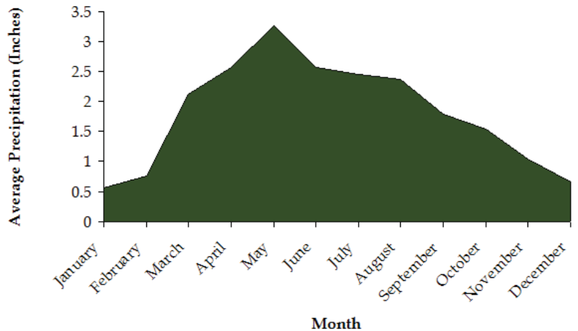


FIGURE 67 **Horseshoe Park Precipitation Graph** (*Sean Murphy*)

site analysis

climate data

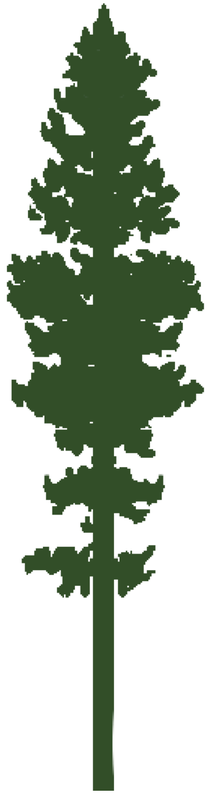
Temperature:
Average temperatures in Rocky Mountain National Park stay on the cooler side during the summer season in comparison with the rest of the state, primarily due to the elevation. Yet, winters are usually on the mild side, with temperatures remaining in the 30s and 40s. Winter storms occasionally drop temperatures far lower.

Humidity:
Humidity at the site remains around 30% on average most of the year.

Precipitation:
Precipitation at the site is less than many other areas of the state due to the rain shadow effect that the mountains create. Here, the site sits on the eastern, dry side of the Continental Divide, and limited rainfall has a direct effect on the plant and animal life in the area. May is the rainiest month with most precipitation at the site resulting from frequent afternoon rain showers. Snowfall is common at this higher altitude from September all the way into early June, with March being the winter's snowiest month.

Cloudiness:
Colorado is well known for its nearly year-round sunshine. On average the site gets nearly 300 days of sun every year. This offers many advantages in designing with the sun in mind.

Shading:
The site, as a whole, does not recieve a large amount of shade from trees or topography. Shade is limited primarily to the south and west sides of the site under the canopy of pine and aspen trees. However shade on the site will likely decrease with many of the trees dying off in the next few years.



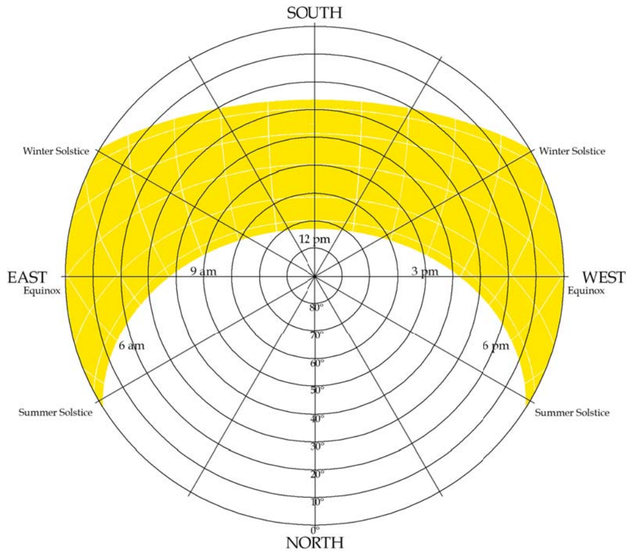


FIGURE 68 **Horseshoe Park Sun Path Chart** (*Sean Murphy*)

site analysis

climate data

Sun Path:
The site's location is uniquely situated to take advantage of the sun. While surrounding topography can affect the quantity of sunlight occasionally during winter months, the site has great access to sunlight from the south. The solar elevation at its highest angle during the summer solstice is 73.01° above the horizon and at its lowest angle during the winter solstice is 26.19°.

Wind Speed & Direction:
Winds on the site almost exclusively come out of the west. Winds here are typically between 5-15 miles an hour. They can also be highly variable due to their proximity to the mountains and the volatility of weather systems as they cross the Continental Divide. Occasionally, during the winter, winds can top speeds of upwards of 100 miles per hour. At the Alpine Visitors Center, just miles away atop the divide, winds have been recorded at speeds in excess of 160 miles per hour. These sporadic, hurricane force winds are essential to consider in the design process. Furthermore, wind energy studies in the 1980s stated that the park's wind could be "exceptionally turbulent and among the world's most severe. Wind turbines would be impractical" (Glidden, 1982).

Noise:
Noise is a factor on the site, mainly coming from Highway 34 which lies on the east side of the site. Cars and especially motorcycles are a common, but sporadic distraction from the natural sounds of the forest and meadows.

Other Considerations:
The site is located in a climate that can face severe drought conditions and the dangers of wildfires. While the site is well within range of fire protection, buildng materials and design should consider these hazards.

FIGURE 69 **Parking Area Adjacent to the Horseshoe Park Site** (*Sean Murphy*)

site analysis

pedestrian traffic

Pedestrian activities on site are currently very limited. Hikers and motorists occasionally stop at the site. Bicyclists and horse riders frequent this side of the park as well. While the site sees a limited number of visitors, the Horseshoe Park area offers numerous attractions for hikers. Nearby, visitors climb the Lawn Lake Trail up the Roaring River to one of the park's largest lakes. To the southwest, many visitors hike the Deer Mountain Trail nearly 1500 feet above Horseshoe Park. To the east, motorists stop at the Sheep Lakes pulloff where bighorn sheep regularly congregate in the meadow. Throughout Horseshoe Park there are many more unnamed social trails that both horse riders and hikers use. While the area sees heavy use, the trails lack organization. Most people choose to drive between these locations, rather than walk, even though they are less than a mile apart. The site is located at the center of these attractions and could be a hub for area trails and for hikers who want to leave their vehicles and to dive into their natural surroundings.

vehicular traffic

Vehicular traffic at the site has a constant presence. Highway 34 passes on the east side of the site, and, while it is no longer the park's primary thoroughfare, on an average summer day it sees between five to ten cars a minute. While traffic will likely continue to increase with increased park visitation, the park does have a bus system in place to support the park's use. Currently buses serve the Bear Lake Road from the Beaver Meadows Visitor Center to both the Bear Lake Trailhead and Fern Lake Trailhead. The addition of service to a central Horseshoe Park could greatly benefit visitors and could help reduce automobile use.

utilities

At the site there are no existing utilities. Access to electricity would likely tap existing electical lines located two miles to the east at the Fall River Entrance. Water would likely have to come from a well drilled at the site or be hauled in by truck on a daily basis. A sewage system would also have to be created in order to support visitors.

FIGURE 70 **Aspen and Ponderosa Pine at the Site** (*Sean Murphy*)

site analysis

plant cover

Rocky Mountain National Park contains thousands of plant species and contains many examples of southern Rocky Mountain flora. Plant cover of the site and the surrounding area varies from coniferous trees to grasses and shrubs.

Types of trees that can be found on the site include lodgepole pine, Engelmann's spruce, ponderosa pine, aspen, and Rocky Mountain Douglas-fir.

On the level areas of the site in the meadow areas, a wide variety of water loving plants exist. Some species which can be found here include, tufted hairgrass, Nebraska sedge, bluejoint, rush, American mannagrass, alpine timothy, bluegrass, shrubby cinquefoil, water sedge, western wheatgrass, Baltic rush, diamondleaf willow, tufted hairgrass, mountain rush, rush, and slender wheatgrass.

In the forested slopes on the perimeter of the site, hardier plants exist such as, elk sedge, common juniper, kinnikinnick, fivepetal cliffbush, heartleaf arnica, mountain goldenbanner, Woods' rose, and Oregongrape.

Exotic and invasive species also exist on the site and are an issue throughout the park, including Canada thistle, bull thistle, and cheatgrass.

It is also noteworthy that the site contains two categories of plant cover. Mature, older growth forests have dominated the area over the past 100 years due to fire suppression. Yet the recent pine beetle epidemic in the West is progressively eliminating much of the existing monoculture forests in massive die-offs of lodgepole pine. This as well as the effects of global warming are dramatically changing the ecosystems in Northern Colorado and throughout the Western U.S. Younger succession plants, including aspen and low-growth plants also cover the area and are expected to overcome many places that are seeing older trees die off. This return to a more diverse plant community will ultimately change the site in the coming years in many different ways.

("Rocky mountain national," 2011)

FIGURE 71 **Shooting Star Flower** (*Sean Murphy*)

FIGURE 72 **Elk in Rocky Mountain National Park** (*Sean Murphy*)

site analysis

wildlife

Rocky Mountain National Park contains a wide variety of wildlife common in the Western United States. Most species have at least a temporary presence at the site or will be impacted by activities at the site. This must be considered in any designs. Listed below are many of the species that live in the park for the majority of the year that do not migrate. Species in italics are under consideration or are currently protected by the Endangered Species Act.

Mammals: 63 species
Bighorn Sheep, Coyote, Gray Fox, Red Fox, Beaver, Moose, Black Bear, American Elk, Mule Deer, White-tailed Deer, Bushy-tailed Woodrat, Mexican Woodrat, Muskrat, Porcupine, Mountain Lion, Bobcat, Northern Pocket Gopher, Snowshoe Hare, White-tailed Jackrabbit, Nuttall's Cottontail, Wolverine, River Otter, Marten, Striped Skunk, Ermine, Long-tailed Weasel, Mink, Western Spotted Skunk, Badger, Pika, Raccoon, Yellow-bellied Marmot, three species of mice, three species of chipmunks, five species of squirrels, five species of voles, six species of shrews, and eight species of bats.
Birds: Over 280 species
Bald Eagle, Black Swift, Peregrine Falcon, White-tailed Ptarmigan, Clark's Nutcracker, Williamson's Sapsucker, Townsend's Solitare, Three-toed Woodpecker, Mountain Chickadee, Pygmy Nuthatch, American Dipper, Western Tanager, Pine Grosbeak, Blue Grouse, Gray Jay, Red Crossbill, Brown-capped Rosy Finch, Northern Pygmy Owl, and three species of warblers.
Reptiles and Amphibians: 6 species
Boreal toad, Tiger salamander, Western chorus frog, Wood frog, Western terrestrial garter snake, and Northern Leopard frog.
Fish: 11 species
Greenback cutthroat trout, Brown trout, Colorado speckled dace, Colorado River cutthroat trout, Western longnose sucker, Western white sucker, Mountain sucker, Mottled sculpin, Yellowstone cutthroat trout, Rainbow trout, and Eastern brook trout.

("Rocky mountain national," 2011)

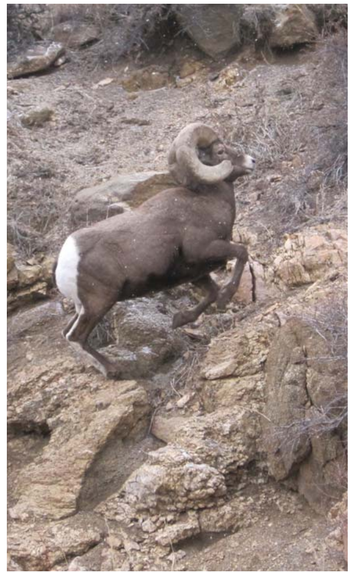
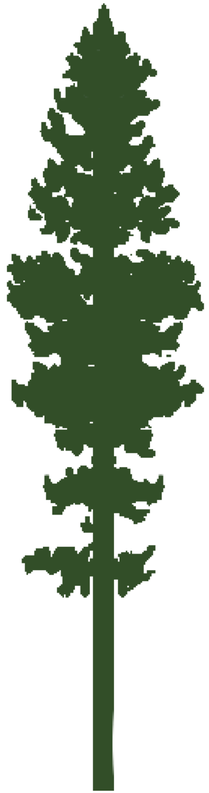


FIGURE 73 **Bighorn Sheep** (*Sean Murphy*)



site analysis

site character

The site has been in continual change due to its accessible location. While forces such as erosion play a minimal role on the site, plant life is constantly changing. Exotic species such as Canada and Musk thistle are constantly encroaching on the area. These species require constant management to protect native species in the west end of Horseshoe Park. Lodgepole pine at the site and throughout the park are also facing massive die-offs in the next five to fifteen years due to the mountain pine beetle epidemic. This will result in significant changes to the area's flora and fauna in the coming years. Having a site located near dead and dying trees poses a fire and safety hazard in nearby areas and should be considered and would also hurt aesthetically.

FIGURE 74 **Trees Dying from Mountain Pine Beetles** (*Considering Democracy*)

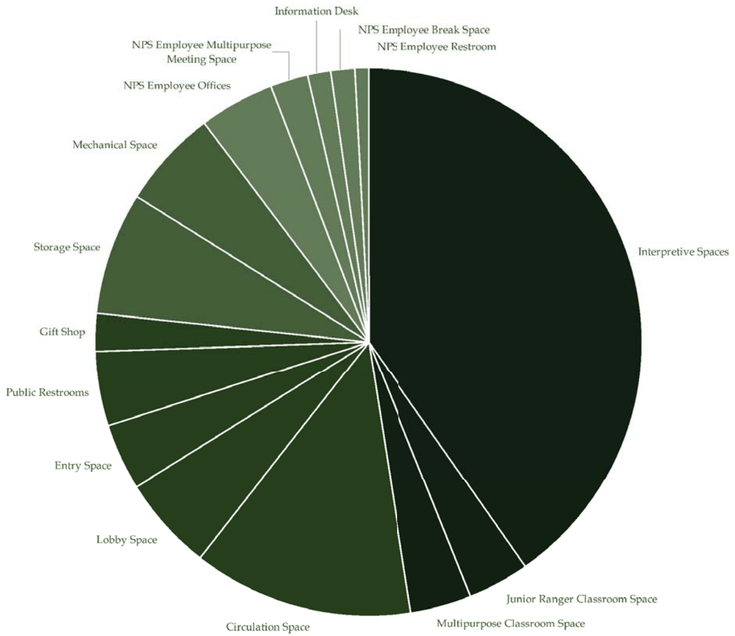


FIGURE 75 **Interior Space Chart** (*Sean Murphy*)

programmatic requirements

interior spaces – 13450 sq. feet

Learning - 6400 sq. feet

Interpretive Spaces (3) - 5400 sq. feet
- Geology and Climate Space - 1800 sq. feet
- Flora, Fauna, & Ecosystems Space - 1800 sq. feet
- History and People Space - 1800 sq. feet

Junior Ranger Classroom Space - 500 sq. feet
Multipurpose Classroom Space - 500 sq. feet

Public - 3900 sq. feet

Circulation Space - 1750 sq. feet
Lobby Space - 750 sq. feet
Entry Space - 500 sq. feet
Public Restrooms (2) - 600 sq. feet
- Mens - 300 sq. feet
- Womens - 300 sq. feet

Gift Shop - 300 sq. feet

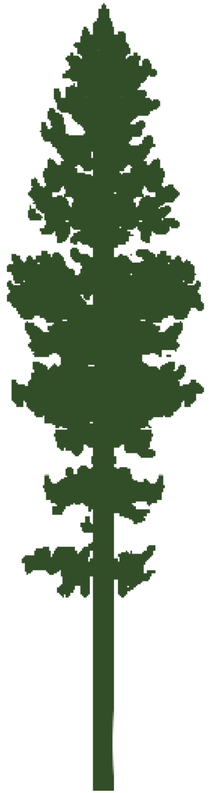
Support - 1750 sq. feet

Storage Space - 1000 sq. feet
Mechanical Space - 750 sq. feet

Administration - 1400 sq. feet

NPS Employee Offices (4) - 600 sq. feet
- Chief Interpretive Ranger Office - 150 sq. feet
- Interpretive Ranger Offices (3) - 450 sq. feet

NPS Employee Multipurpose Meeting Space 300 sq. feet
Information Desk - 200 sq. feet
NPS Employee Break Space - 200 sq. feet
NPS Employee Restroom - 100 sq. feet



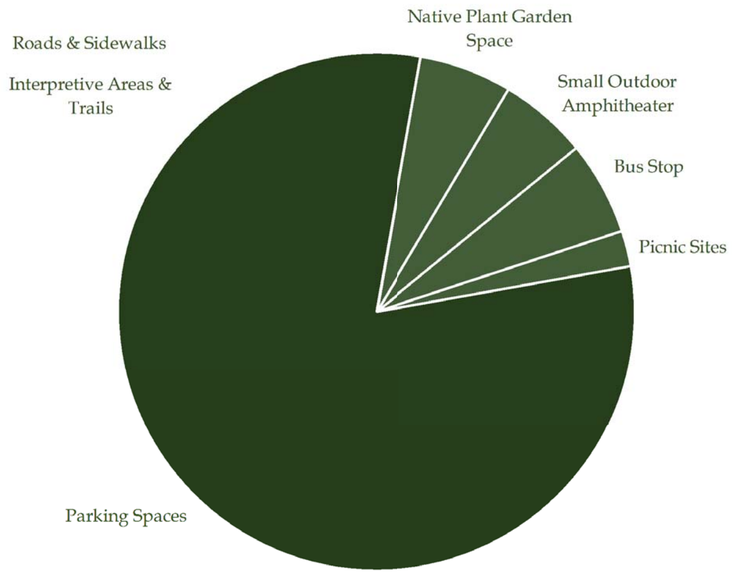


FIGURE 76 **Exterior Space Chart** (*Sean Murphy*)

programmatic requirements

exterior spaces – +17400 sq. feet

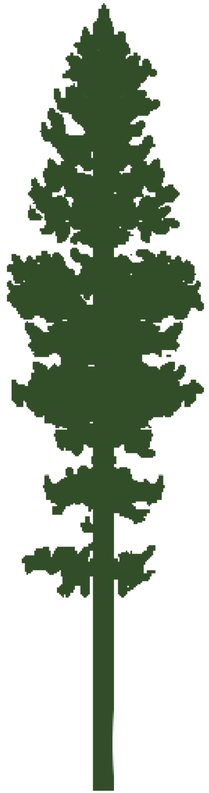
Public - +3400 sq. feet
- Native Plant Garden Space - 1000 sq. feet
- Small Outdoor Amphitheater - 1000 sq. feet
- Bus Stop - 1000 sq. feet
- Picnic Sites (4) - 400 sq. feet
- Interpretive Areas & Trails - Undefined

Movement - +14000 sq. feet
- Parking Spaces (50) - 14000 sq. feet
- Roads and Sidewalks - Undefined

interaction matrix

FIGURE 77 **Interaction Matrix** (*Sean Murphy*)

interaction net



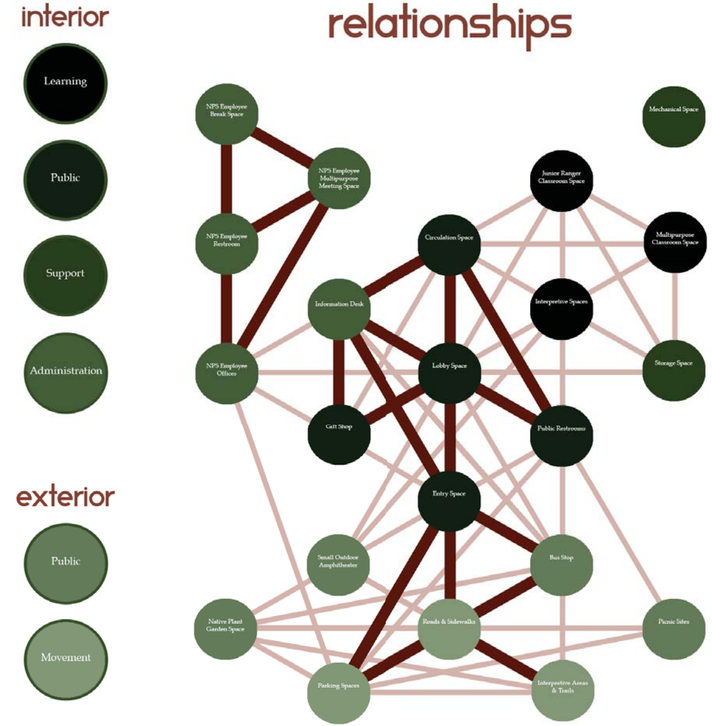


FIGURE 78 **Interaction Net** (*Sean Murphy*)

final project

FIGURE 79 **Horseshoe Park Environmental Learning Center Main Entry Sign** (Sean Murphy)

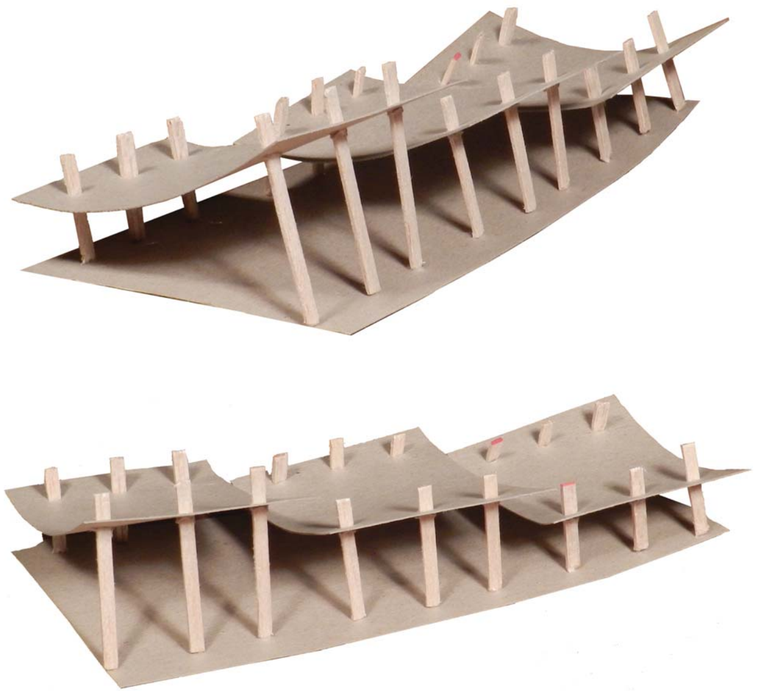


FIGURE 80 **Parti** (*Sean Murphy*)

the process

design idea

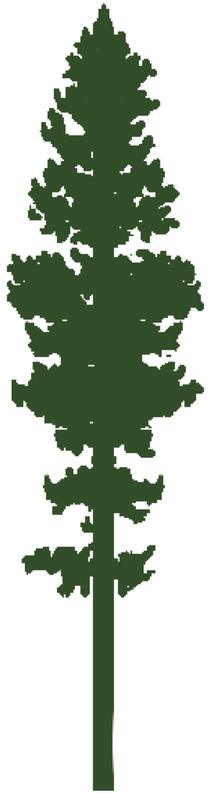
When considering multiple factors behind the design of Horseshoe Park Environmental Learning Center I wanted to create a structure that merged with its site. The four primary factors that drove the original design were as follows:

Create views of Mt. Chapin, Chiquita, and Ypsilon directly to the northwest of the site.
Utilize the southern exposure on the site for lighting and passive solar.
Enter the site and building from the highway on the east end of the site.
Create a building that serves as the hub for Deer Mountain and Lawn Lake trails.

Inspiration for the design arose from multiple sources such as the surrounding mountain topography and the variety of flora that exsists in the park. Lesser influences include Native American dwellings such as tepees and cliff dwellings along with existing NPS “rustic” buildings. Yet the main idea behind the design arose from how we experience a lodgepole pine forest, namely from a trail in the park.

The idea of a lodgepole pine forests arose from the idea of movement on the site. To consider this movement, we have to ask, what do we experience when we walk through one of these forests? Trails flow with the topography making sweeping movements through the landscape, avoiding obstacles and grades. One feels a sense of vertical structure and enclosure. Natural light penetrates horzontally more often than vertically. These ideas have led me to a design that utilizes many of these experiences in its attempt to create harmony between man and nature.

the process



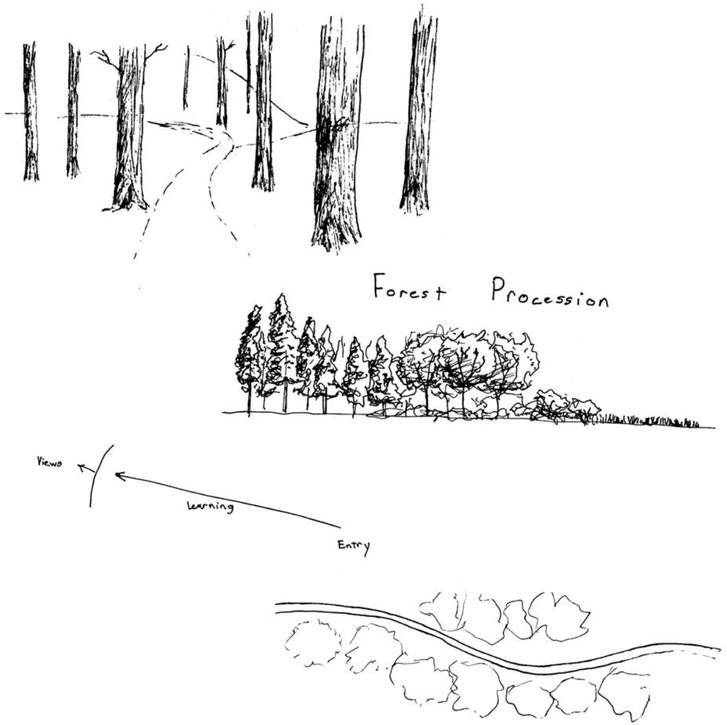


FIGURE 81 **Process Drawings 1** (*Sean Murphy*)

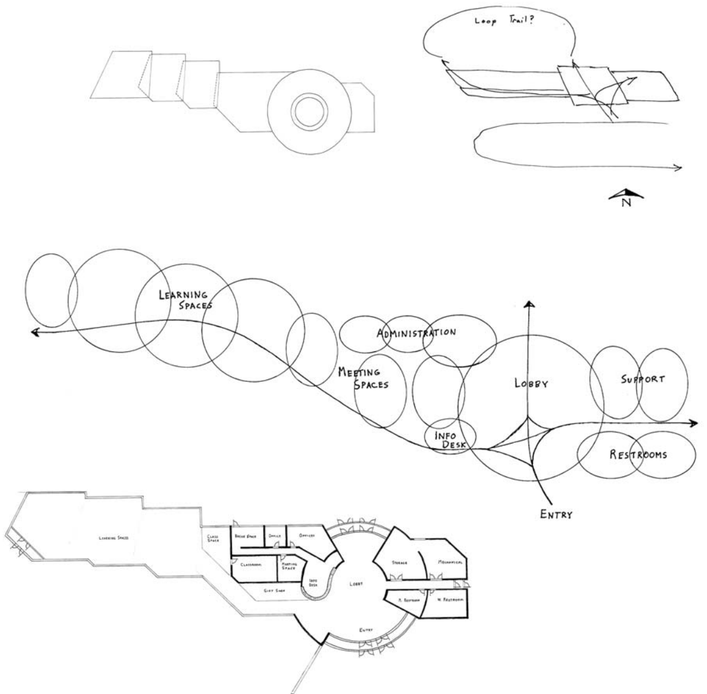
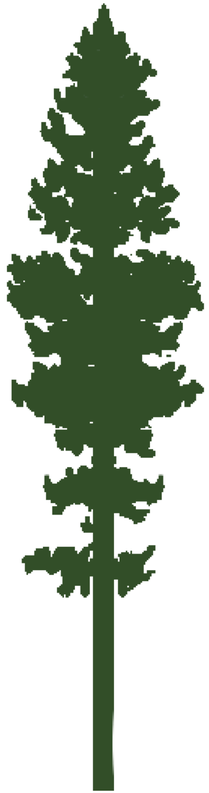


FIGURE 82 **Process Drawings 2** (*Sean Murphy*)



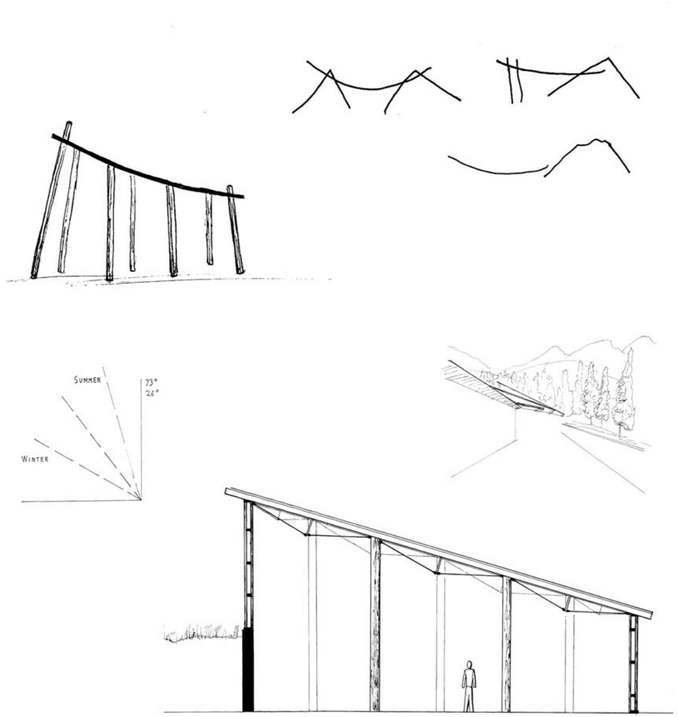


FIGURE 83 **Process Drawings 3** (*Sean Murphy*)

FIGURE 84 **Process Drawings 4** (*Sean Murphy*)

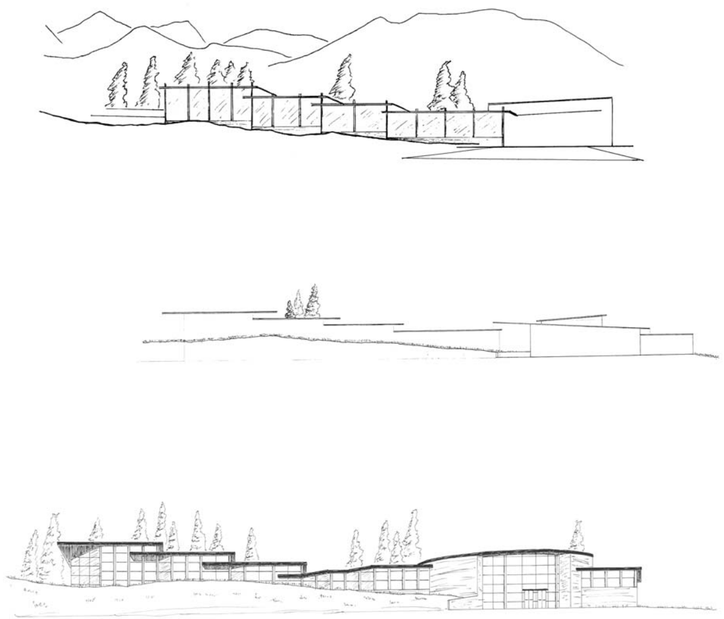


FIGURE 85 **Process Drawings 5** (*Sean Murphy*)

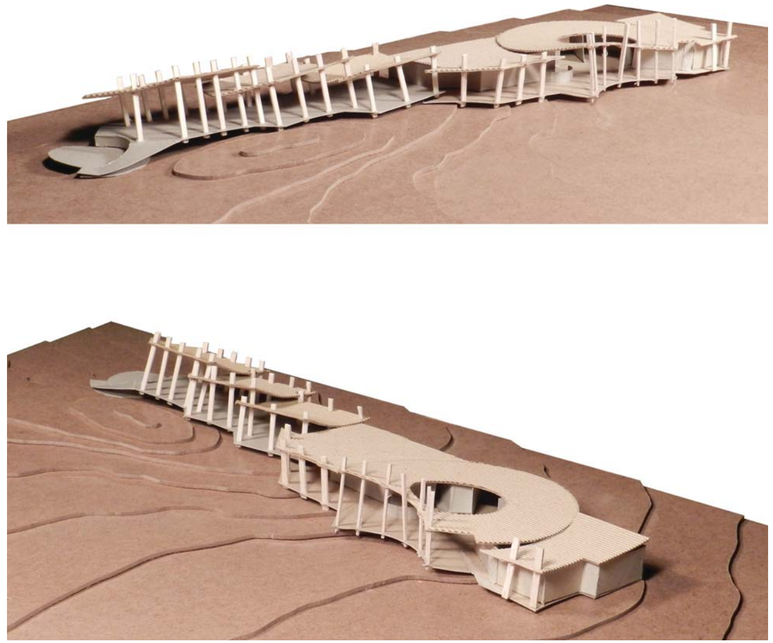


FIGURE 86 **Process Model** (*Sean Murphy*)

the project solution

horseshoe park environmental learning center

rocky mountain national park
estes park, colorado

How can architecture respond to the natural environment?

the natural environment

Rocky Mountain National Park is a land of contrast and diversity. It straddles the Continental Divide in North Central Colorado, covering 415 square miles. From alpine tundra to coniferous forests and open meadows, the park contains several distinct ecosystems. Those distinct landscapes are the reason why Rocky has over 1100 different plant species and 360 animal species.

Consideration of plant and animal life and the factors affecting them is a very important to all designs that seek to compliment the environment. The Horseshoe Park Environmental Learning Center pursues several sustainable practices in its siting, material choices, active and passive systems, and by giving back to the site. Through these strategies, it strives to have a minimal impact on flora and fauna in the park.

a changing landscape

Rocky Mountain National Park is a place in a state of constant change. Climate change is having a profound impact on a wide variety of species ranging from the lodgepole pine to the pika. Throughout Western North America, the mountain pine beetle epidemic has decimated over 3 million acres of forest in Colorado alone. Wildfires are becoming larger and more frequent from over 100 years of forest management and fire supression. All of these factors are dramatically changing the ecosystems that exist within the park.

The center's design seeks to understand and harness these trends for the benefit of its users and the natural environment.

the mission of the horseshoe park environmental learning center

The Horseshoe Park Environmental Learning Center sets out to tell the story of this changing and diverse natural environment. It seeks to serve visitors of all backgrounds by introducing them to the park and functions as a crossroads between local attractions in the area. It works to utilize the resources and understand the elements that make up the site and region in order to implement them in a design that both compliments and adapts to nature.

north view from site

FIGURE 87 **Thesis Brochure 1** (*Sean Murphy*)

west horseshoe park 1916
Courtesy of W.T. Lee (USGS)

west horseshoe park today

a design adapted to the landscape

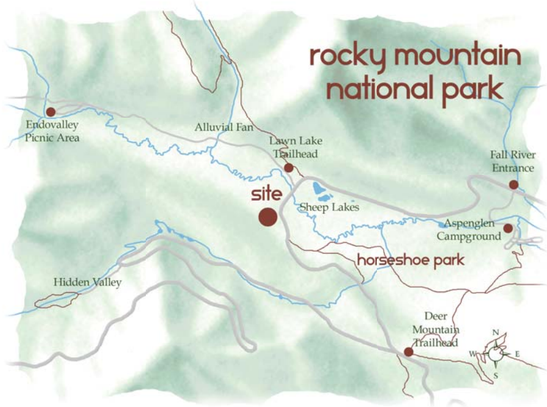
Set in a national park with 95% of the lanc designated wilderness, the Horseshoe Park Environmental Learning Center serves visitors to the park with a minimal impact on the land.

The center is designed to take advantage of a site that has already seen on and off use for the past century and has already been heavily impacted by human activities.

Its aesthetics seek to create a towering interior environment that maintains a connection to the site and the surrounding landscape. At the same time it works to create an exterior with a minimal visual impact on the beauty within the valley.

Its structure and layout addresses the site and regional elements ranging from soil type to daylight hours in order to blend in with the site and embrace its conditions rather than oppose them.

Most of all, the design combines all of the components of the Colorado environment and the building typology to create a sensible solution to the question posed in the thesis.



south view from site

FIGURE 88 **Thesis Brochure 2** (*Sean Murphy*)

adaptive learning center

horseshoe park environmental learning center estes park, colorado

the idea

The Horseshoe Park Environmental Learning Center is a place that seeks to educate visitors to Rocky Mountain National Park. Its primary purpose is to examine the changing ecosystems of the region and explore how we can deal with this altered landscape.

Its design was inspired by the experience of walking down a trail through a pine forest. A meandering path that moves gracefully through a vertical landscape with the topography. It is a design that seeks to adapt to the natural environment surrounding it.

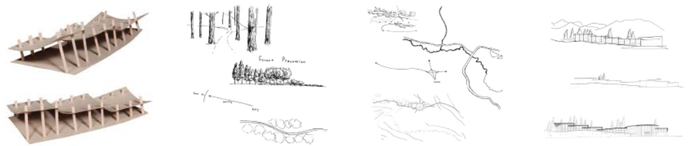
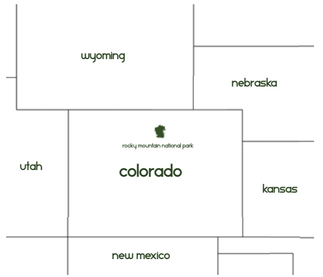


FIGURE 89 **Thesis Board 1** (*Sean Murphy*)

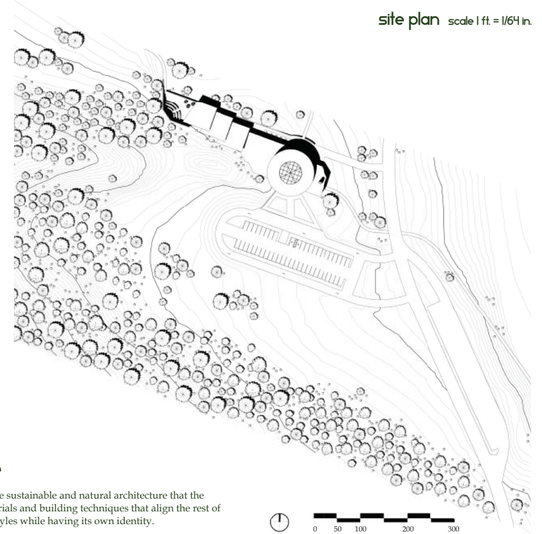
the project solution



site design

The learning center adapts to the site's existing charateristics in a number of ways. Its location on the site takes full advantage of the open space to the south of the center, allowing for unobstructed sunlight throughout the year for daylighting and passive heat. Utilizing the topography of the site, the learning center cuts into the hill to minimize its visual impact on this sensitive site. Finally, it exploits beautiful mountain views to the northwest of the site.

site plan scale 1 ft. = 1/64 in.



natural and historical architecture

The Horseshoe Park ELC and its design can relate directly to much of the sustainable and natural architecture that the National Park Service "Rustic"style abides by. Using natural, local materials and building techniques that align the rest of the park's historic architecture, this modern structure fits in with local styles while having its own identity.

FIGURE 90 **Thesis Board 2** (*Sean Murphy*)

sustainability

The center focuses on sustainability in a number of ways. Most of the building's materials and structures are from the site and nearby locations. All of the wood components of the structure would be collected locally outside the park, using beetle-killed lodgepole pine that would otherwise rot or be burned. Much of the rammed earth structure would come directly from the site and its excavation during the building process, reusing resources. The center would also implement single stream recycling to reduce waste once the building is in use.

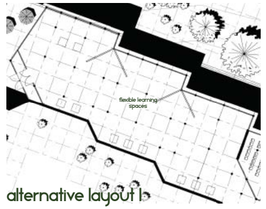
Water is a large concern in Colorado and the building seeks to mitigate its needs utilizing several strategies. The center has a rainwater collection system on much of its roof surface. The site is xeriscaped with native species to reduce runoff and eliminate water demands. Low flow toilets and faucets would reduce water demands even further. Finally, the building's solar orientaion and passive systems will also reduce energy needs to a minimum. All of these qualities make the center an excellent candidate for future LEED certification.

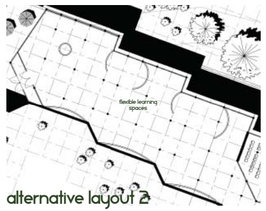
environmental systems

The center utilizes both active and passive systems for it environmental systems. The solar orientation satisfies most of the building's lighting needs and supplements its heating system. An open floor plan and windows offer ventilation throughout the structure. Active heating, ventilation, and air conditioning systems would run primarily through a utilitarian basement below much of the structure to venting locations along the exterior walls. These active systems would only be used as needed.

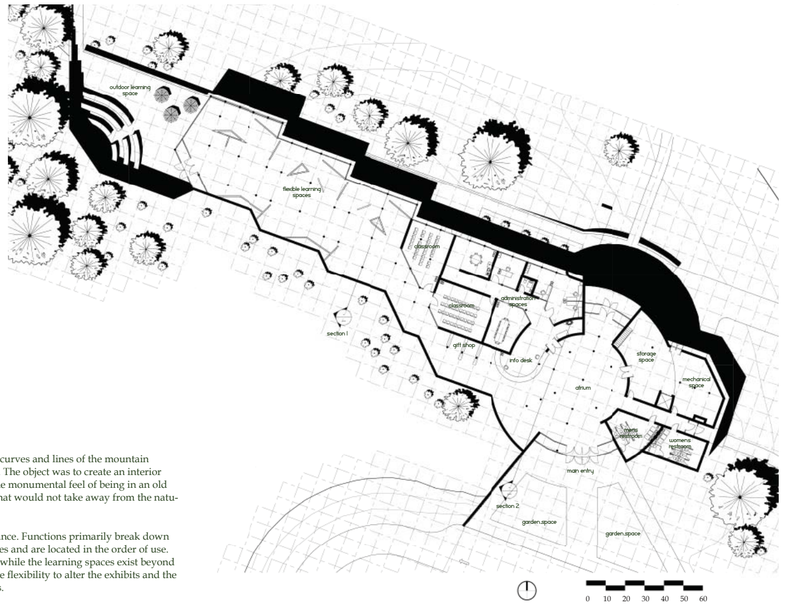
FIGURE 91 **Thesis Board 3** (*Sean Murphy*)

the project solution





floor plan scale | ft. = 1/16 in.



form and spaces

The Horseshoe Park ELC takes form from the inspirational curves and lines of the mountain landscape as well as the vertical lines of the lodgepole pine. The object was to create an interior space that connected with the exterior world and created the monumental feel of being in an old growth forest. At the same time, creating a subdued form that would not take away from the natural environment was also important.

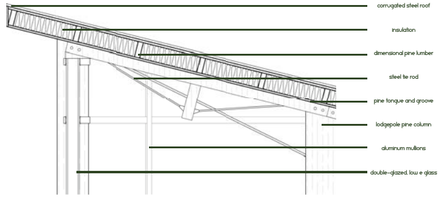
Spaces were designed by fuction and proximity to the entrance. Functions primarily break down between administration, support, public, and learning spaces and are located in the order of use. Heavily used spaces are primarily around the main atrium while the learning spaces exist beyond the core of the building. Its open learning area allows for the flexibility to alter the exhibits and the experience of the Horseshoe Park ELC to the client's wishes.

Movement emerges from following the natural intersection of nearby trails focusing on the atrium as their junction. Spaces fall around this intersection of the exterior and interior environment and enhance them rather than obstruct them.

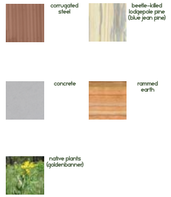
FIGURE 92 **Thesis Board 4** (*Sean Murphy*)

the project solution

roof detail scale I ft. = I in.



selected materials



section I with solar and air circulation scale I ft. = 1/8 in.

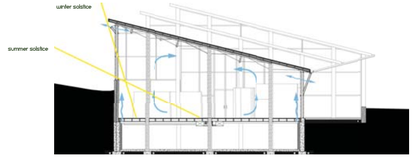
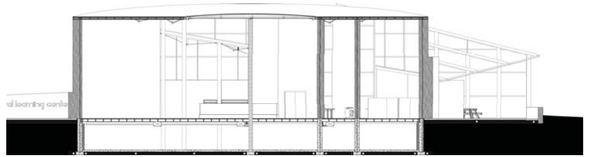


FIGURE 93 **Thesis Board 5** (*Sean Murphy*)

section 2 scale I ft. = 1/8 in.



structural systems

The Horseshoe Park ELC for the most part is a post and beam timber structure based on an 8 ft. grid to simplify construction. Rammed earth, load-bearing walls also support much of the central atrium space and support areas of the building. All of this rests on a concrete foundation.

One of the main components of the structural design was that it was necessary to have an open and light structure that allowed for daylighting and views of the surrounding area. Curtain walls envelope most of the building and allow for a very free and open space that reminds one of the connection they have to the outdoor environment.

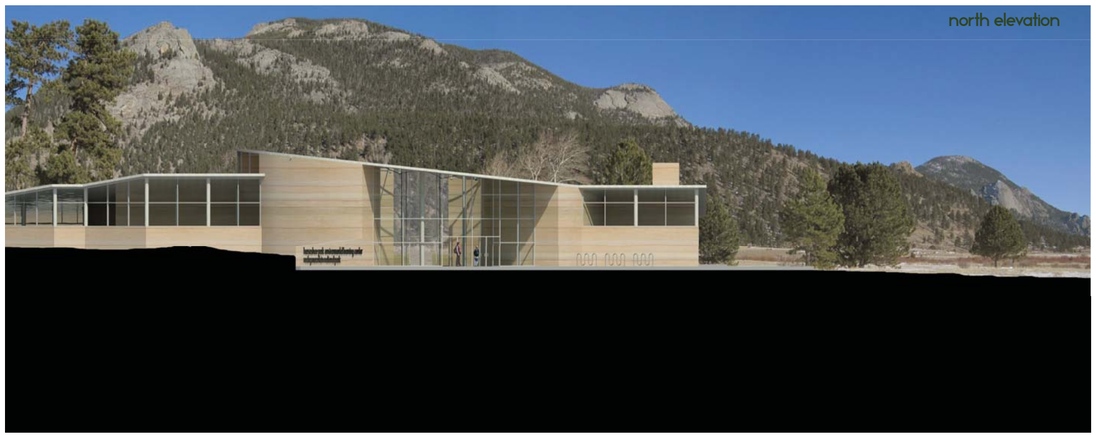


FIGURE 94 **Thesis Board 6** (*Sean Murphy*)

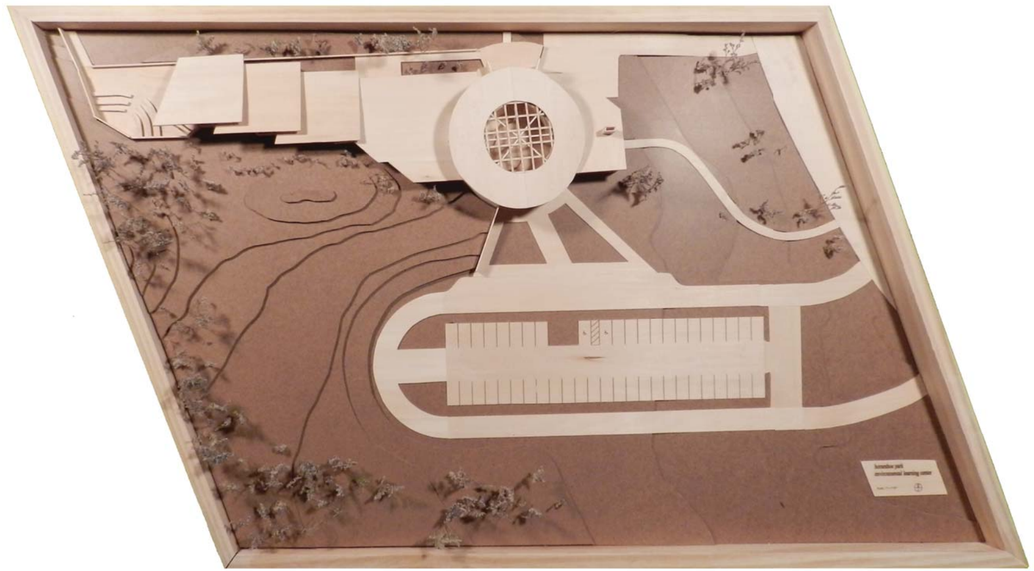


FIGURE 95 **Thesis Model 1** (*Sean Murphy*)

FIGURE 96 **Thesis Model 2** (*Sean Murphy*)

FIGURE 97 **Thesis Model 3** (*Sean Murphy*)

FIGURE 98 **Thesis Model 4** (*Sean Murphy*)

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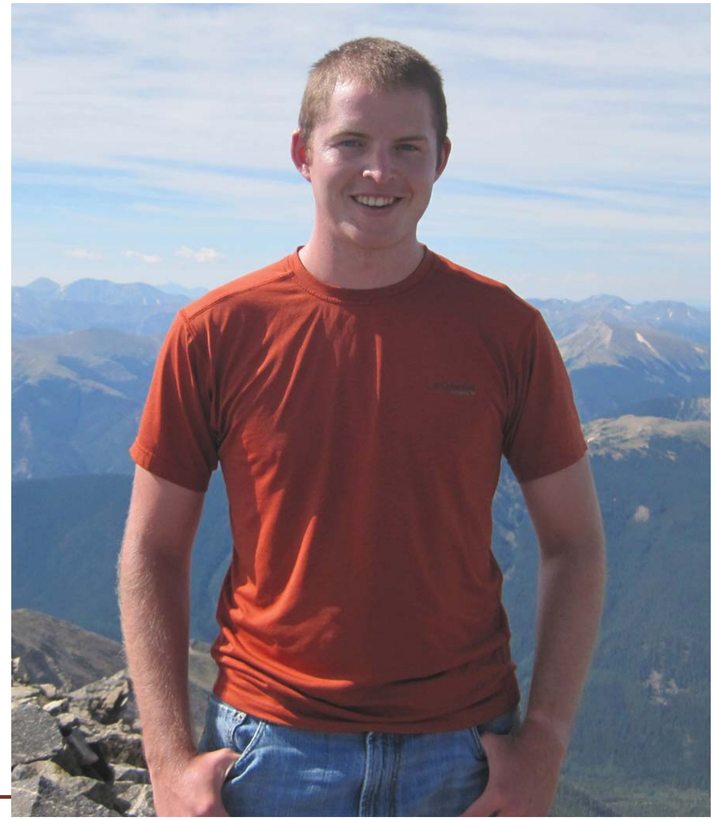

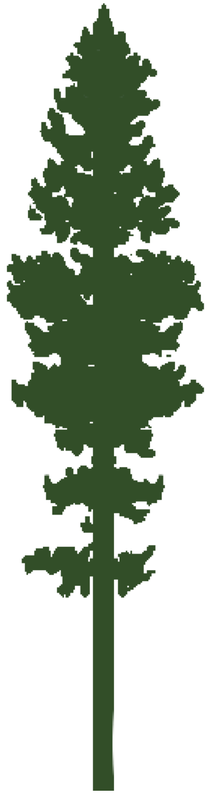

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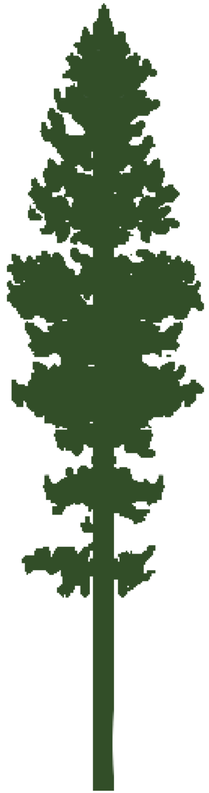

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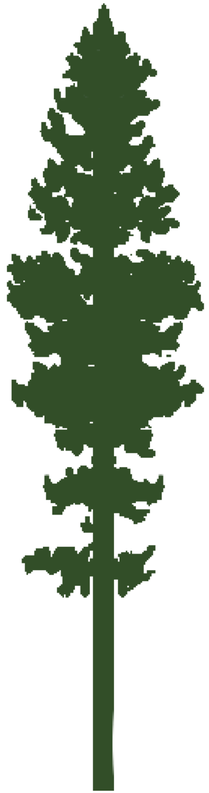

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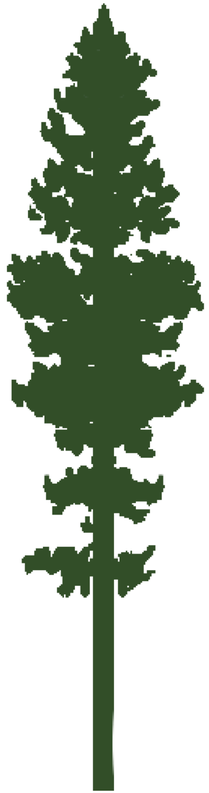

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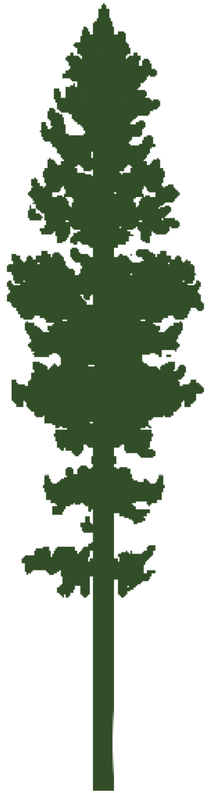

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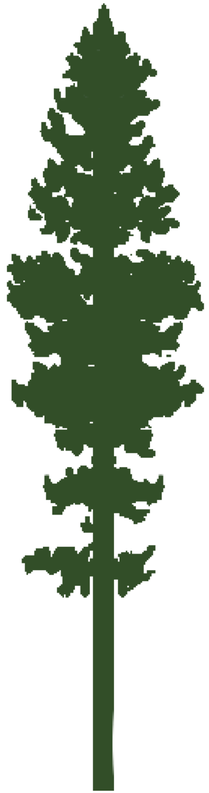

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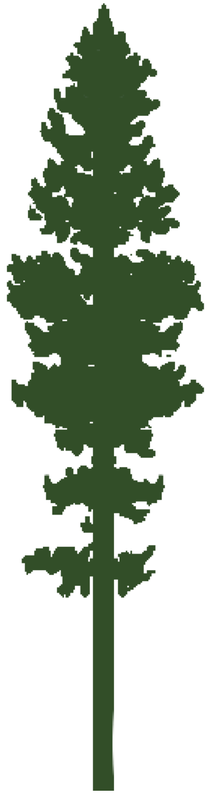

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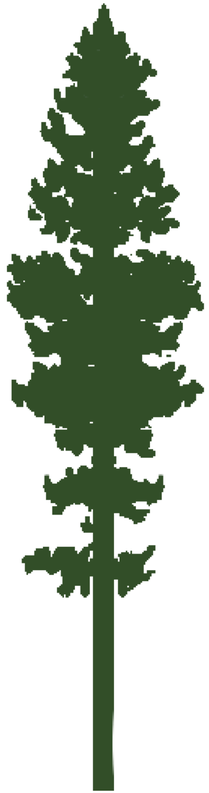

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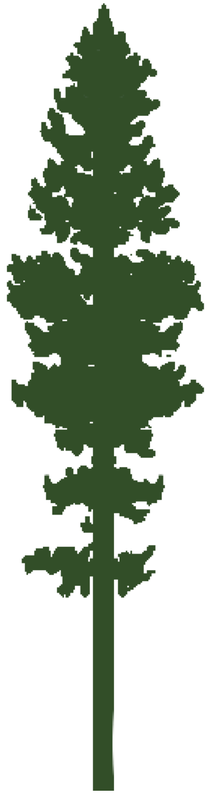

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Fig. 91 Murphy, Sean. 2012. *Thesis Board 3.* [Project Board]

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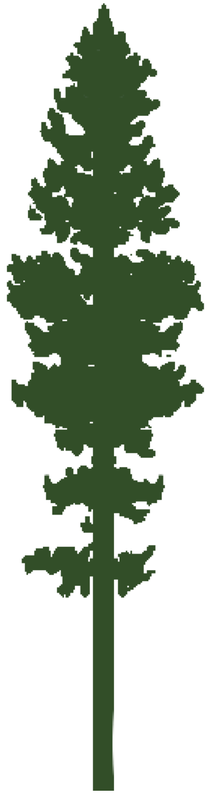

image citations

Fig. 93 Murphy, Sean. 2012. *Thesis Board 5.* [Project Board]

Fig. 94 Murphy, Sean. 2012. *Thesis Board 6.* [Project Board]

Fig. 95 Murphy, Sean. 2012. *Thesis Model 1.* [Photograph]

Fig. 96 Murphy, Sean. 2012. *Thesis Model 2.* [Photograph]

Fig. 97 Murphy, Sean. 2012. *Thesis Model 3.* [Photograph]

Fig. 98 Murphy, Sean. 2012. *Thesis Model 4.* [Photograph]