

Human's Offense - Nature's Defense

North Shore Research and Interactive Visitor Center

Stoney Point - North Shore, Minnesota



Craig Michael Cusick

Human's Offense - Nature's Defense

North Shore Research and
Interpretive Visitor Center

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

By

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

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Abstract

How Can Design Influence the Way we View, Understand, and Interact With a Powerfully Dynamic Natural Setting?

This project focuses on the vegetation, wildlife, and geology of the North Shore of Lake Superior. This stretch of land is a popular destination for visitors and locals alike, but many of those visitors lack an understanding of how the north shore has become what it is today. An interactive visitor center and multi-disciplinary research facility is proposed in order to provide an immersive experience for visitors to understand the importance of natural preservation. This thesis, located between Duluth and Two Harbors, Minnesota, will bridge the gap between nature and society to inform and inspire residents of urban cities about the natural world, its cultural and historical significance, and what they can do to preserve and protect it.

Narrative of the Theoretical Aspect of the Thesis

This thesis is based on the broad unifying idea of the preservation and protection of the natural world. A closer relationship needs to be made between the professional research community and the general public and the public needs to be more aware of the issues involving the wildlife, vegetation, geology, and cultural significance of a specific geographic location; specifically the north shore of Lake Superior.

Research will focus on specific topics that this building will showcase. A large part of research that will be conducted will involve participating in professional interviews with experts in their field of study, such as Geologists, Zoologists, and Biologists.

This topic is important for study because the protection of nature is what will keep the world in tact for future generations. Nature plays a large part in what makes the world beautiful and it needs to be protected. This topic is also important for society because humans started out on earth living amongst the land. The protection and understanding of nature is important for society to understand. To keep a connection with nature, it is also important to inform the public about the negative impacts they can have on the world, as well as the positive impacts that nature has on society. It is especially important for the people of Minnesota to be informed on these issues because there are countless opportunities for the people of the area to be closer to nature by simply traveling a few miles north along the north shore of Lake Superior.

How Can Design Influence the Way we View, Understand, and Interact With the Natural World?

The typology of this building is a multi-disciplinary research facility paired with an interpretive visitor center. This is designed in order to bridge the gap between society and nature and to inform and inspire the residents of urban cities about the natural world and how to sustain it.

This site, located at the eastern tip of Stoney Point, was chosen based on the proximity it has to Duluth, MN, Two Harbors, MN, Lake Superior, and the north shore. It is also important that the site has a close proximity to the many state parks located along the lake. The North Shore is visited by people of all walks of life from all around the world, and this site is accessible to all people.

Project Typology



Figure 1 - Split Rock Lighthouse State Park

The typology of this design thesis combines the two disciplines of research and education. The building will have an interpretive and interactive learning center for the public to enjoy and be more involved on the issues related to various research topics. It will also have a multi-disciplinary research facility that will focus on the Vegetation, Wildlife, and Geology of the north shore of Lake Superior. By combining these two disciplines, a closer relationship will form, giving the public a better understanding of the cultural and historical significance of the region propelling them to act in a positive manner toward the natural world.

This particular type of project most closely relates to visitor centers located at historic sites, state parks, and national parks. This building's main priority is to inform and educate the public. In order to do so, a multi-disciplinary research facility will be very useful, especially one that is directly on site. This will make the research that is performed more easily accessible to those who want to learn more about the natural world and how to preserve and protect it.

Case Studies

Tamarac Wildlife Refuge Visitor Center

Rochert, MN

Architect: ADG (Architects Design Group)

Year: 2012

Typology: Visitor/Nature Center



Figure 2 - Tamarac Wildlife Refuge Visitor Center Entrance



Figure 3 - Tamarac Wildlife Refuge Visitor Center Exhibit Space

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Case Studies

Tamarac Wildlife Refuge Visitor Center

Rochert, MN



Figure 4 - Tamarac Wildlife Refuge Visitor Center Exhibit Space

The Tamarac Wildlife Refuge Visitor Center is visited by many hikers, outdoors-men, wildlife enthusiasts, and students of local schools every year. This case study is of relative size to the others that are being studied for this thesis. The building contains an exhibition hall, lobby, reception area/gift shop, offices, conference rooms, an auditorium, mechanical and storage spaces, and an outdoor balcony. This program has many overlapping characteristics to spaces that will be in this thesis. The public is allowed in the reception/gift shop area, the exhibit space and balcony, and the auditorium, while the offices, conference rooms, and support spaces are left to those who work within the building privately. The most important spaces in this building are the exhibit hall, the balcony, and the outdoor spaces surrounding the building, which are the spaces that will be focused on the most heavily for this thesis.

Case Studies

Tamarac Wildlife Refuge Visitor Center Rochert, MN

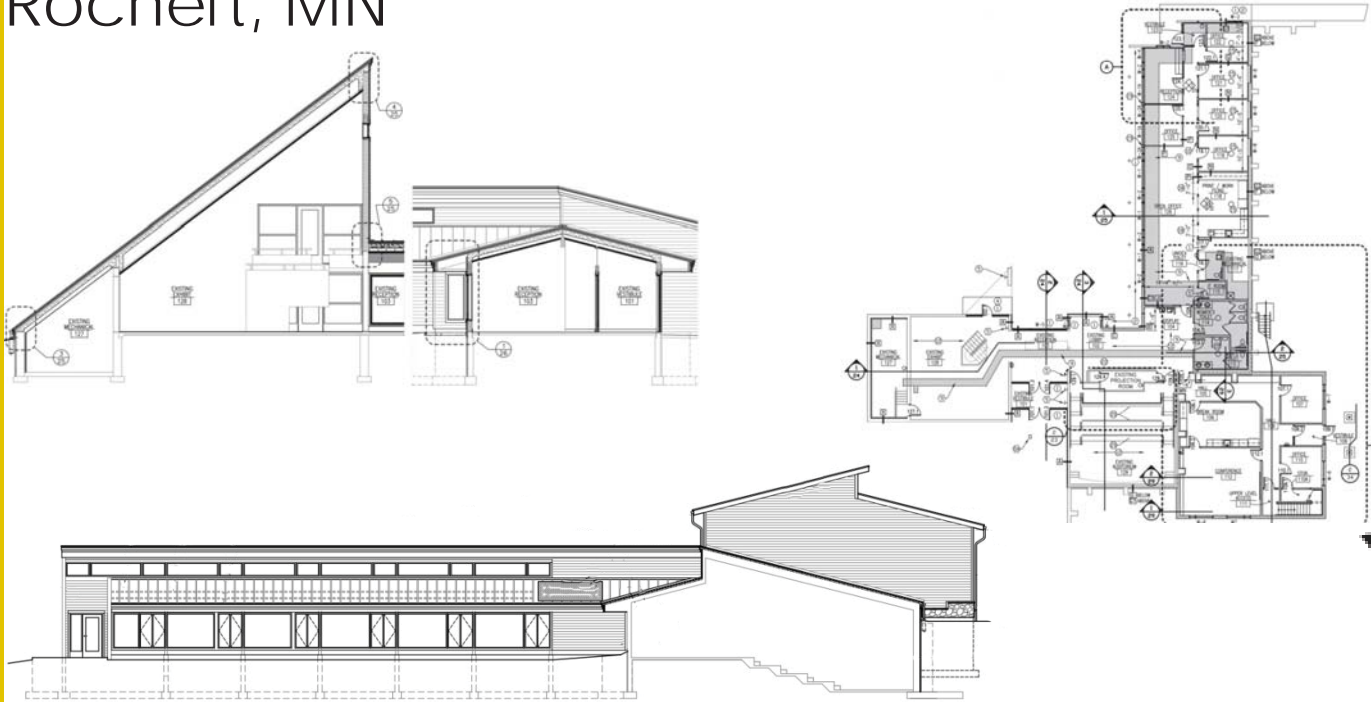


Figure 5 - Tamarac Wildlife Refuge Visitor Center Architectural Drawings

The building responds to its site in a very successful manner in respects to its materiality, color scheme, overall layout, and environmentally friendly actions. The building is laid out in an 'L' shape which works well for separating public and private spaces. The circulation is located at the edges of the building, giving the public views of the outdoors. This particular building is best understood through its elevations and sections when the sloped roofs take precedent over the rectilinear form of the floor plan. It collects and uses solar power on its south-facing roof, which runs water off into a rain garden at its base. The use of glass is also successful in this case study because it is placed in very strategic locations, which maximizes views and daylighting.

Case Studies

Tamarac Wildlife Refuge Visitor Center Rochert, MN



Figure 6 - Tamarac Wildlife Refuge Visitor Center Roof

This building makes a great contribution to the theoretical premise of this thesis because the typologies of the two buildings are very similar, with the exception that the Tamarac Visitor Center does not house laboratory spaces. One of the main underlying ideas of this thesis is the preservation and protection of the natural world. This case study parallels well with this idea because of its response to the natural world and its use of renewable energy. Because this case study is a successful one, the unifying idea behind this thesis remains unchanged.

Case Studies

Red Rock Canyon Visitor Center

Las Vegas, NV

Architect: Line and Space ,LLC

Year: 2011

Typology: Interpretive Visitor Center



Figure 7 - Red Rock Canyon Visitor Center Entrance



Figure 8 - Red Rock Canyon Visitor Center Exhibit Space

Case Studies

Red Rock Canyon Visitor Center

Las Vegas, NV

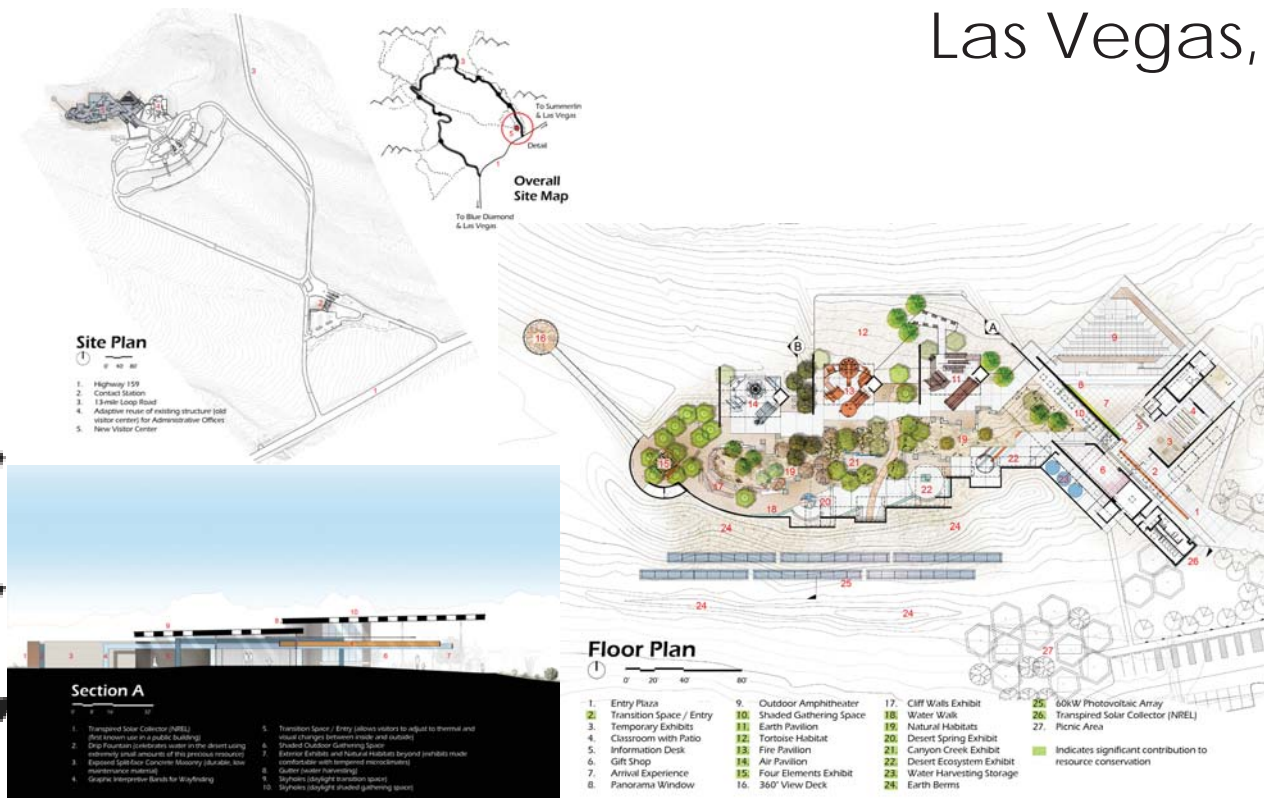


Figure 9 - Red Rock Canyon Visitor Center Architectural Drawings

The Red Rock Canyon Visitor Center is visited by many scientists, nature lovers, families, and students from local schools every year. This visitor center is slightly larger than the others being studied for this thesis, but is relative to the size that this thesis will be, with the addition of scientific laboratories. It is complete with an entry plaza, indoor and outdoor exhibit spaces, classrooms, information/reception area, gift shop, panoramic views, a picnic area, and an outdoor amphitheater, many of which hold a significant contribution to resource conservation. The spaces within this case study closely relate to the spaces that this thesis calls for. The visitors of this building are free to roam through almost every space and from indoors to outdoors almost seamlessly. This thesis focuses heavily on natural conservation, which is why the spaces within this case study (labeled above) will be the main focus. These spaces include the entry space, solar collection areas, water harvesting storage, earth berms, and every exhibit space throughout the complex.

Case Studies

Red Rock Canyon Visitor Center Las Vegas, NV

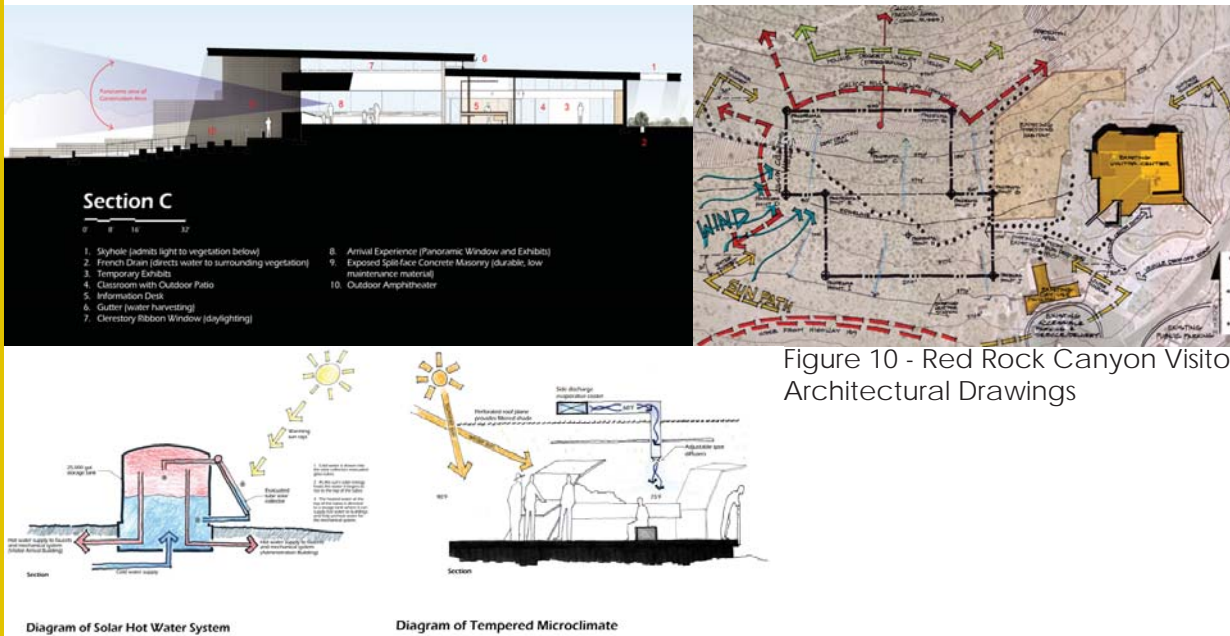


Figure 10 - Red Rock Canyon Visitor Center
Architectural Drawings

This building blends in with its surroundings, creating a very successful experience for visitors. The materials chosen, overall layout of the complex, color scheme used throughout, and the positive environmental impact that this building employs are all reasons that this case study is important for this thesis. The floor plan of this building takes on an organic form which allows visitors to roam freely throughout the spaces. In section, this building reads as very horizontal, which is one reason the building is able to blend in with its natural landscape so well. The most important part of this project is its relationship to the landscape, which was kept sacred through its construction and use. Glass is used strategically throughout the building in order to provide visitors with panoramic views of the Red Rock Canyon in the surrounding desert. The environmentally friendly strategies that Red Rock Canyon Visitor Center employs can be easily understood through the diagrams provided. The building collects and uses solar energy with its 60kW photovoltaic panels and also collects and stores rain water for future use.

Case Studies

Red Rock Canyon Visitor Center Las Vegas, NV



Figure 11 - Red Rock Canyon Visitor Center Common Space (Interior)



Figure 12 - Red Rock Canyon Visitor Center Common Space (Exterior)

This visitor center is very successful and many ideas employed within it will find their way into this thesis project. The difference between this thesis and the constructed case study is the fact that the Red Rock Canyon Visitor Center does not house any laboratory spaces and is located in a very different climate zone. That being the case, many ideas will still be able to be conveyed within this thesis. The importance of environmental conservation is made clear, which will keep the unifying idea behind this thesis unchanged.

Case Studies

Gooseberry Falls State Park Visitor Center Two Harbors, MN



Figure 13 - Gooseberry Falls Visitor Center Entry Sequence



Figure 14 - Gooseberry Falls Visitor Center Entry Sequence



Case Studies

Gooseberry Falls State Park Visitor Center Two Harbors, MN

Figure 15 - Gooseberry Falls Visitor Center Exhibit Space



Figure 16 - Gooseberry Falls Visitor Center Common Space

relate well with the north shore and its natural beauty. Overall, the building is simple and elegant which intentionally does not draw attention to itself. This allows visitors to embrace the natural beauty of the surrounding landscape and forest.

Every year, visitors from all over the world visit the north shore of Lake Superior to see Gooseberry Falls. Its visitor center houses employee offices, an exhibition space, gift shop gathering space with a fire place, circulation throughout, and support spaces. These are spaces that will find a place within the program of this thesis and are essential for its success. The Gooseberry Falls Visitor Center is filled with useful information for visitors to learn more about the falls nearby and the surrounding landscape, wildlife and vegetation. The exhibit space focuses on the conservation and protection of the area.

The building is laid out in a linear fashion, creating a long, straight hallway lined with large glass windows. This being on the south side of the building creates views for the visitors out to the state park and Lake Superior in the distance. The building is constructed with natural materials throughout, which helps it blend nicely with its surrounding landscape. The heavy timber construction and rough stone accents

Case Studies

Gooseberry Falls State Park Visitor Center Two Harbors, MN



Figure 17 - Gooseberry Falls Visitor Center Exhibit Space



Figure 18 - Gooseberry Falls Visitor Center Exterior Experience



Case Studies

Gooseberry Falls State Park Visitor Center Two Harbors, MN



Figure 19 - Gooseberry Falls Visitor Center
Exterior Construction

Although the building does not employ active environmentally sustainable methods such as photovoltaic panels, wind turbines, and water collection systems, it does employ passive strategies within its overall design. The building is oriented in such a way that the spaces where visitors spend most of their time are facing southward. The roof also overhangs the exterior walls of the building so that the interior may be protected from the high, hot summer sun and gain the heat from the low winter sun. As an added bonus, the visitors are also able to learn more about the land from carvings and etchings marked on the columns used to hold up the roof.

The Gooseberry Falls State Park Visitor Center is the only case study being analyzed that is along the north shore of Lake Superior, making it a very important case for this thesis. The use of materials, its construction, and its interaction with the natural world are elements of this building that will be conveyed within the thesis project. Although, no research spaces are found in this case study, the most important parts of this building are what will be used to inspire the thesis project. The protection and conservation of the natural world is the most important part of this project and relates back to the unifying idea of this thesis, leaving it unchanged.

Case Studies

DeAnza College Media and Learning Center

Cupertino, CA

Architect: Ratcliff

Year: 2012

Typology: Educational Media and Learning Center



Figure 20 - DeAnza College Media and Learning Center Exterior

The DeAnza College Media and Learning Center located in Cupertino, California, serves as a case study for implementing sustainable design strategies within the building design. The designers focused on the ecological sustainable design in many areas of the building, specifically throughout its exterior envelope. This building has been awarded LEED Platinum status and is complete with a buoyancy-driven natural air ventilation system, more than 6,000 square feet of photovoltaics, vacuum-tube style solar thermal collectors, and it is clad with a terracotta rain screen system, metal wall panels and an aluminum-and-glass curtain wall system. A central atrium includes skylights and clerestory windows, and its steep-sloped roof is clad with a standing-seam metal roof. At the building perimeter, louvers serve as air intakes for the ventilation system. Exterior planting on the south facade serves as student lounge space and a peaceful oasis.

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Case Studies

DeAnza College Media and Learning Center Cupertino, CA



Figure 21 - DeAnza College Media and Learning Center Roof

For this case study, energy consumption is reduced through the use of passive ventilation, natural lighting, building cladding design, photovoltaics integrated into a sloped skylight, rooftop vacuum-tube style solar thermal collectors and standing-seam metal roof, which thereby decrease the demands for mechanically based heating and cooling and reduces annual electrical costs. The energy consumption of this building is reduced by 70% more than higher education buildings on average due to the use of the effects of solar radiation, which are reduced by passive solar shading, by south facing low-emissivity glazing and by 70 percent opaque fritted glass on the sloped skylight. The placement of insulation within the assemblies also has the potential to reduce conductive heat flow, thus lowering heating and cooling demands while minimizing the potential of condensation.

Case Studies

DeAnza College Media and Learning Center Cupertino, CA

Figure 22 - DeAnza College Media and Learning Center Roof



The building is a two story structure and is 66,990 square feet, located on the campus of DeAnza College. It is laid out from east to west, tucked between two streets and has a vegetated courtyard.

This building was used as an important case study because of its highly advanced sustainable technology; some of which will find their way into this thesis project.



Figure 23 - DeAnza College Media and Learning Center Exterior

Case Studies

DeAnza College Media and Learning Center Cupertino, CA



Figure 24 - DeAnza College Media and Learning Center Exterior

The building strives to connect nature and humankind together in one location. It employs ecological sustainable design and connects tenants with nature by way of the ventilation system, natural daylighting and sustainable landscape. Designers can initiate interest in sustaining natural systems and connect tenants to ecological systems by modifying designs to engage a tenant with nature. Ecological sustainable design also holds that designers minimize or eliminate their environmentally destructive effects while promoting the natural environment. As a designer, one must understand the land and its connections to nature, use the surroundings as a guide and create spaces ecologically that will forever meet the needs of people and of the planet.

Case Studies

Case Study Series Summary

In respect to the case studies being analyzed, everything mentioned, with a positive effect on the particular case study, will hold certain significance to the design and inspiration to the thesis project.

The unifying idea behind this thesis project remained unchanged based on the conducted analysis of the case studies chosen. Understanding the importance of the protection and conservation of the natural world is a common theme among the case study projects and is the theoretical premise of this thesis project. All of the cases studied were successful in their own ways, which will help guide the inspiration of the thesis project as the design unfolds and reveals itself.

The unifying idea behind this thesis is closely related to the specific use of the case studies. The case studies were able to reveal an even deeper importance of nature than previously understood, which creates a greater effect on the theoretical premise behind this thesis.

The case studies being analyzed are all located in differing climate regions, which gives them their own unique characteristics. The effect of these various sites on the building creates a new experience for visitors every time they visit one of the case studies. Although the regions each building is located in are different, the typology of a building can remain the same and contain the same principle; to protect the natural world.

One conclusion that can be made, is that all the case studies are smaller than they currently need to be. These buildings were designed for the time that they were built with no intent for future growth. It will be important for this thesis project to take future growth in to mind so that the building can support its visitors for generations to come. The overall spatial relationships within the case studies are similar in respects to which spaces are adjacent to one another. This speaks to the importance of how visitors make their way through a visitor center for a positive experience.

Case Studies

Case Study Series Summary



Figure 26 - Red Rock Canyon Visitor Center



Figure 25 - Gooseberry Falls Visitor Center



Figure 28 - DeAnza College Learning and Media Center



Figure 27 - Tamarac Wildlife Refuge Visitor Center

Activity Spatial Analysis

The major architectural spaces within this project...

- Entrance/Gathering Hall
- Visitor Center/Exhibition Hall
- Research Laboratory(ies)
- Small Research Library
- Offices
- Storage Spaces/Loading Dock
- Staff Spaces
- Gift Shop
- Restrooms
- Outdoor Patio
- Short Hiking Trails
- Circulation Throughout

These spaces are necessary and functional for this type of project.

A further description of the specialized elements of the project:

The Entrance/Gathering Hall will serve as a space for people visiting this building to freely roam, have access to the outdoors, provide views of the lake, and have access to other adjacent spaces available.

The Visitor Center/Exhibition Hall will display research findings and images for visitors to wander and learn about issues pertaining to the research studies being conducted.

Research Laboratories are necessary for scientists to conduct accurate, in-depth studies in order to further the body of knowledge in the fields of wildlife, vegetation and geology. These are located directly on site in order to create a direct relationship between the field of science and the general public.

A Small Research Library will be a beneficial space for the scientists to conduct research, learn more about what they are studying, and even archive their own findings for later biologists, geologists, zoologists, and other professionals to learn from.



User/Client Description

This building will be designed for a variety of users. They vary from scientists, students from universities and high schools from around the area, visitors from all around the world, those who frequent the north shore, the staff of the building, and quite possibly, a variety of animals that find their homes nearby.

This project is planned to be owned by the city of Duluth, Minnesota. The city would own and maintain it, with the building used by others who need it or are interested in it.

Scientists

Various scientists ranging from zoologists, biologists, historians and geologists will find this facility useful for different studies they wish to conduct regarding the North Shore of Lake Superior. The scientists will use this facility because the spaces made available to them suit their unique and individual needs.

Students

Students will come from high schools for field trips and from universities with professors and professionals to conduct research studies. Depending on the type of visit the various students plan on making, this facility will be able to accommodate those needs.

General Visitors

These people could range from locals who live in nearby cities to those who live on the other end of the world. The building will be able to accommodate various spaces for general visitors to spend time, roam freely, take pictures, have conversations, and learn about the natural environment.

Staff

The staff of the building would include custodial staff, retailers, and environmental advocates. Many of the people who work in this building will be fully versed on the exhibits that are shown and the studies being done in the laboratories and throughout the surrounding area.

The number of people occupying this building will vary greatly depending on when schools conduct visits, when scientists are conducting studies, and the time of year that tourism is high. The summer months are a busier time of year because that is when wildlife and vegetation flourish. It is also the time of year when travel by the public is higher. Because of this, the building will need to be staffed higher. The building will still be in operation throughout the winter months. Any person with a disability will find comfort at this building by the strategies of integrated design being employed throughout the building (handrails, ramps, etc.). The parking accommodation will be able to serve both the professional staff and the general public, providing sufficient parking based on the needs of those who will be visiting the facility.

Site Information

The site chosen for this project is located near Duluth, Minnesota at the southwestern tip of Lake Superior. This has many advantages for this particular project and will be easily accessed by many people.



Region Map



Figure 29 City Map

Figure 30



Site Location Map

Figure 31

Site Information



Figure 32

Site Boundary Lines

This site is of particular interest for this project because its location serves itself well for the building's unique needs. The site is easily accessible to visitors and locals alike. The site also has views of Lake Superior.

The site is located amongst the natural world that the researchers working in this building will be studying and the visitors of this building will be learning about. Many different kinds of wildlife, vegetation, and geographic landmarks are within the boundaries of this site, which benefits the researchers and visitors alike.



Figure 33

Views From the Site to the Lake

Site Area: About 35,000 square feet

Views: There are major views on the south east side of the site, which span out towards the lake

Site Information

Figure 34 - Facing East



Figure 35 - Facing South



Site Information

Figure 36 - Facing North East



Figure 37 - Facing South West



Goals of the Thesis Project

There are many different goals I would like to achieve as a result of this project. The overarching goal of this project is to create a valuable, educational, and enjoyable experience for many visitors from all around the world. It is also a goal that this project create a conversation that has to do with conservation of the environment and education of things that can be done in order to protect the natural world.

The three environments in which this thesis project exists are the Academic, Professional, and Personal Realms. Through these environments, several steps have been set in place to achieve the following goals.

Academic

My education over the previous 5 years has brought me to where I am today. I have achieved the first step of my academic goals, which was to obtain a Bachelor of Science Degree in Architecture from North Dakota State University. The next step in that series of academic goals is to obtain my Master of Architecture Degree from North Dakota State University.

I hope to learn as much as I possibly can from completing this project with the guidance of my thesis advisor and other professors I am able to seek guidance from. I also plan on taking concepts I have learned from previous years in specialized classes to make this project as holistic as possible.

Goals of the Thesis Project

Professional

I have had professional experience in the past, which propels me to complete this project to its fullest and take pride in my achievements. I do plan to utilize this project in the future in order to showcase the skills I have learned through my years in the Architecture Program at North Dakota State University. It will help me obtain a job during my career in architecture and I will, to the best of my abilities, design a project that my future employers and I will be proud of.

The skills I have learned in the field of architecture will be placed within this project. A major goal of mine is to be able to utilize not just some, but all of my skills, while I am in the field as a practicing architect. This project will allow me to do just that.

Personal

My personal goals do not differ greatly from my academic and professional goals, however I do plan on gaining a large amount of knowledge in the various fields of study that my project focuses on. Environmental protection has been a passion of mine for many years, which is why this project is so important to me. I hope to gain much more knowledge in the field as the project progresses.

The completion of this project is also a goal of mine that will certainly not get overlooked in any way. By completing this project, I plan to showcase it proudly when given the opportunity. My goal for this project is to further my architectural career where I can start to truly make an impact on preserving the natural world and advocating for others to preserve it as well.

Project Emphasis

Simply put, the emphasis of this project is the nature surrounding it. This project lends itself to focus on multiple areas of study. Because of this, there are a few different areas of this project that will hold particular emphasis. The main purpose for this project is to inform the public about the natural landscape and wildlife of the north shore of Lake Superior, which means that the open exhibition hall will be of particular importance.

In order to educate the public, there will be professionals conducting research which means that the multi-disciplinary laboratories will also hold importance, making the project successful.

These spaces are placed in the order of importance. Although it would seem that the professional laboratories would take precedence, it is just the first step in educating the public about the north shore and its natural landscape.



Figure 38 - Tettegouche State Park

Plan for Proceeding Research Direction

Theoretical Premise and Unifying Idea

- How Design Influences the Way We View, Understand, and Interact With the Natural World.
- The Significance of the protection and conservation of the natural world.
- Identifying Problems Relating to the Protection of the North Shore of Lake Superior.
- How Sustainable Strategies Can be Utilized Within the Design of a Building and be Integrated into the Natural Landscape of the Site.

How - Regional Site Visits, Documentation

Project Typology

- Combining the Disciplines of Research and Education
- Identify Goals and Values of the Client

How - Case Studies, Information and Opinions from Scientific Interviews

Historical Context

- How Cultural/Social Issues Affect Visitor Center Usage.
- How Community Has Contributed to the Success of Visitor Centers.
- Have Populations Always Had a Care For Natural Conservation.
- How Sustainable Strategies Have Evolved Over Time.

How - Country/State/Local History, Advances in Technology, Sustainable Methods

Site Analysis

- Opportunities Available For Sustainable Strategies Related to Sun, Wind, and Light Based on Existing Site Conditions.
- How a Research and Interpretive Visitor Center Impacts the Natural Landscape of the North Shore.

How - Climate Data, Sun/Wind/Light Analysis, Sustainable Design Methods, Site Visit Information

Programmatic Requirements

- Types of Spaces that Encourage the Interaction Between Visitors and the Exhibits.
- How the Building Will Interact With the Natural Environment.

How - Personal Experience Visits, Case Study Research/Analysis,
Environmental Impact

Plan for Proceeding

Methodology of Design

A System of Methods Used to Arrive at a Research Conclusion

- Unifying Idea
- Topic Research Leading to Discovery of New Ideas and Tools to Help Answer Related Questions
- Testing New Ideas and Tools
- Formulation of Design Opinions
- Formulate Opinions into Proposed Project

How Do We Know It Is A Good Design?

How Will Decisions Be Made?

How Was The Project Completed?

Qualitative Analysis

- Interpret Data/Information Through Relative Research Investigation
- Interpret Analysis to Inform Design Decisions

Quantitative Analysis

- Meet the Goals and Values of the Client and Community

Graphic Alanlysis

- Realize Potential of Project Through Sketches and Diagrams

Digital Analysis

- Realize Potential of Project Through Videos and Images

Single Person Interviews

- Interpret Answers of Interviewees as Informative and Worth While
- Ask Questions Relative to the Project at Hand



Plan for Proceeding

Methodology of Design

Documentation of Design Process

Documentation Creation:

Medium for Design Investigation

- Hand Sketching
- Hand Modeling
- Computer Modeling

Software For Investigation

- Autodesk AutoCAD
- Autodesk Revit
- SketchUp
- Google Cardboard/Virtual Reality

Software for Representation

- Adobe Acrobat
- Adobe InDesign
- Adobe Photoshop
- 3D Animation
- Google Cardboard

Design Presentation Methods

- Scanned Hand Drawn Elements
- Photographs of Models
- Feedback from Advisor(s)
- Research Materials Documented
- Computer Files Backed Up Regularly
- Thesis Book Updated Regularly

Publication of Material

- NDSU Institutional Repository
- Finished Book Format

Plan for Proceeding

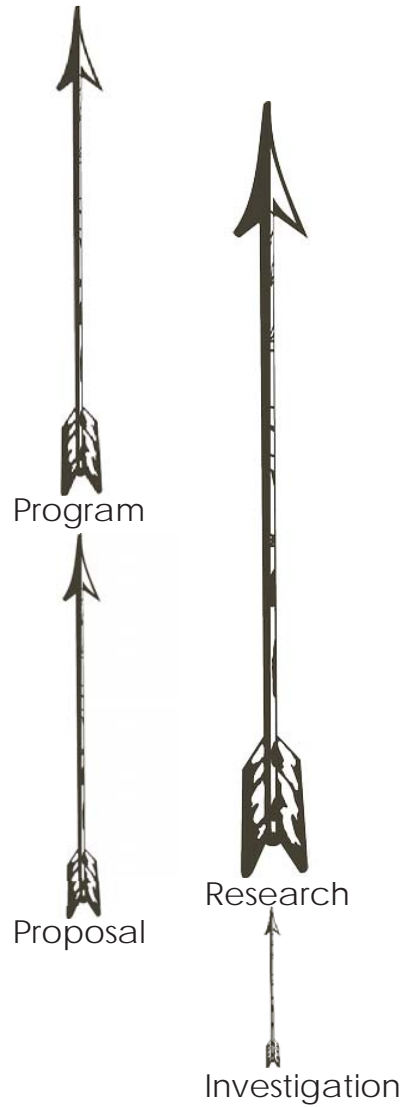
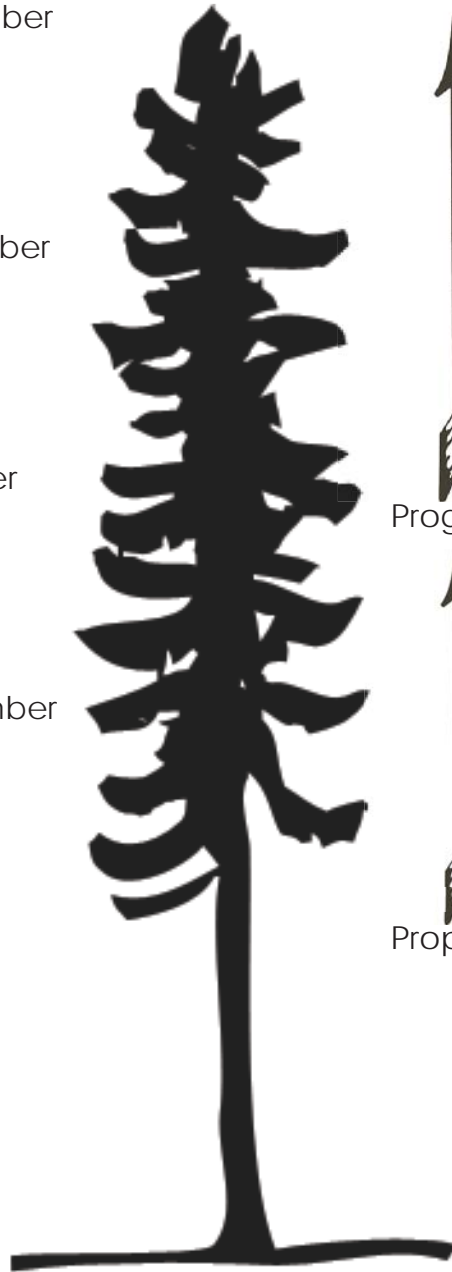
December

November

October

September

August



Plan for Proceeding

May

Reviews 5/2-13
 Exhibition Installed 4/25
 Production 4/21
 Rendering/Printing 4/20
 Model Building 4/14
 Details 4/10
 MEP Systems 4/5

April

Production/
 Presentation

Section Studies 3/30
 Structure 3/24
 Materials 3/10
 Elevation Studies 3/4

March

Design
 Development

Additive Elements 2/20
 Finalize Floor Plans 2/16
 Sustainable Design 2/8
 Character Defining 2/4

February

Features
 Sun/Wind/Light 1/30
 Massing 1/27
 Spatial Organization 1/24
 Context 1/20
 Schematic Design 1/16

January

Analysis



Programmatic Requirements

The spaces within this Interpretive Research and Visitor Center are as follows:

- Entrance
- Gathering Space/Lobby
- Small Research Library
- Staff Offices
- Staff Break Room
- Staff Restrooms
- Multipurpose Meeting Space
- Classroom/Conference Room
- Gift Shop
- Reception Area
- Storage and Loading Dock
- Mechanical
- Public Restrooms
- Outdoor Patio
- Short Hiking Trails
- Circulation Throughout
- Amphitheater
- Parking
- Exhibits
 - Wildlife
 - Vegetation
 - Geology
 - History of the North Shore
 - Lake Superior

Interior Spaces

- Entrance
- Gathering Space/Lobby
- Research Laboratory
- Small Library
- Staff Offices
- Staff Break Room
- Staff Restrooms
- Multipurpose Meeting Space
- Classroom/Conference Room
- Reception Area
- Gift Shop
- Public Restrooms
- Storage/Loading Dock
- Mechanical
- Circulation
- Exhibits
 - Wildlife
 - Vegetation
 - Geology
 - History of North Shore

Exterior Spaces

- Entrance
- Outdoor Patio
- Short Hiking Trails
- Amphitheater
- Parking
- Exhibit
 - Lake Superior



Programmatic Requirements

Interior Spaces

Public

- Entrance
- Gathering Space/Lobby
- Reception Area
- Circulation Throughout
- Gift Shop
- Public Restrooms
- 50 Square Feet
- 750 Square Feet
- 50 Square Feet
- Undefined
- 350 Square Feet
- [2] 600 Square Feet Total

Administration

- Staff Offices
- Staff Break Room
- Staff Restrooms
- Multipurpose Meeting Space
- [5] 6000 Square Feet Total
- 200 Square Feet
- 100 Square Feet
- 250 Square Feet

Learning

- Classroom/Conference Room
- Research Laboratory
- Small Library
- Exhibits
 - Wildlife
 - Vegetation
 - Geology
 - History of North Shore
- 500 Square Feet
- 500 Square Feet
- 300 Square Feet
- Exhibits
 - 750 Square Feet
 - 750 Square Feet
 - 750 Square Feet
 - 750 Square Feet

Support

- Storage/Loading Dock
- Mechanical
- 800 Square Feet
- 800 Square Feet

Exterior Spaces

Public

- Entrance
- Outdoor Patio
- Short Hiking Trails
- Amphitheater
- Parking

Learning

- Exhibit
 - Lake Superior

Public

- 50 Square Feet
- 400 Square Feet
- Undefined
- 1500 Square Feet
- 1250 Square Feet

Learning

- Exhibit
 - 750 Square Feet

Spatial Descriptions

Entrance

The entrance of the building is a very important part of the project because it is the first constructed space visitors will come in contact with. Entry ways are spaces that give visitors a first impression of the building. First impressions can only be made once, and are often what people remember the most, which is why making a good first impression is so important, and why entry ways should never be overlooked in any building typology.

The entry way of the building will be adjacent to the parking lot and the gathering/lobby space and reception area. Although the entrance is small, at 50 square feet, the true impression of the entry way will be encountered in three dimensions. It will be open during the building's regular hours of operation. The entry way's sequence will begin outdoors because of the project's relationship with the natural world. Its light quality will be positive because portions of it will be located outdoors and large panes of glass will allow light to flood the space.

Gathering Space/Lobby

The gathering space/lobby of the building is very important because it is a space where visitors and employees are able to gather together and gain access to many other spaces of the building. A space to gather and disperse from is important for this typology of building because visitors need a common place to meet before dispersing to the various exhibits and to gather after taking time to visit the facility.

The gathering space/lobby of the building will be directly adjacent to the entrance and the reception area. The gift shop, outdoor patio, and classroom/conference room are spaces that will be indirectly adjacent to the lobby space. The lobby is one of the larger spaces in the building, at 750 square feet. It will be open during the building's regular hours of operation. The lobby space will focus on its relationship to the spaces around it, while at the same time addressing the natural world and its importance. Its light quality will be positive as well because large panes of glass will allow light to flood the space from above.

Spatial Descriptions

Reception Area

The reception area of the building will serve as a “one-stop-shop” for visitors. Visitors can ask questions about the facility, get directions around the building or to places around the area, and learn more about the importance of preserving the natural world. A space like this is important for this building typology because visitors of these types of facilities need a dependable space to go when a particular question arises.

The reception area of the building will be directly adjacent to the entrance and the gathering space/lobby. The gift shop, outdoor patio, and classroom/conference room are spaces that will be indirectly adjacent to the reception area. The lobby, one of the smaller spaces in the building, at 50 square feet, has one of the largest impacts on the building. It will be open during the building’s regular hours of operation and be occupied during those hours by an employee of the facility. Its light quality will be less filled with natural sunlight and more intentionally filled with direct artificial task lighting to create an enticing mood.

Gift Shop

The gift shop of the building will serve as an enjoyable experience for visitors. Visitors can spend time here, buying souvenirs for friends and family. A space like this is important for this building typology because visitors of these types of facilities need a space to pass time in when waiting for a ride or to buy memorabilia for themselves or friends and family. The items sold within the gift shop will focus on preservation and protection of the natural world, further promoting the facility.

The gift shop will be directly adjacent to the gathering space/lobby. The entrance, outdoor patio, and classroom/conference room are spaces that will be indirectly adjacent to the gift shop. The gift shop is 350 square feet. It will be open during the building’s regular hours of operation and be occupied during those hours by employees of the facility. Its light quality will be less filled with natural sunlight and more intentionally filled with direct artificial task lighting. Lighting design is important to retail design because it helps showcase the products being sold in a positive manner.

Spatial Descriptions

Classroom/Conference Room

The classroom/conference room of the building will serve as a learning experience for visitors. Visitors can view presentations and take part in hands on learning activities. A space like this is important for this building typology because the main focus of this building is to learn more about what people can do to preserve the natural environment and a learning classroom will function as a learning space for any type of learning style. The classroom will double as a conference room space for employees of the facility when they need a private space to meet or learn from the scientists' research discoveries.

The classroom/conference room in the building will be directly adjacent to the gathering space/lobby. The gathering space/lobby, outdoor patio, employee spaces, research laboratory, and library spaces will be indirectly adjacent to the classroom. The classroom is 500 square feet. It will be open during the building's regular hours of operation and be occupied during those hours by employees, scientists, and visitors of the facility. Its light quality will be equally filled by artificial and natural light with the capabilities adjust the natural light when presentations are being given.

Research Laboratory

The research laboratory of the building is in place for scientists from around the world to study various topics related to the vegetation, wildlife, geology, and hydrology of the north shore of Lake Superior. Visitors, in general will not be allowed in this space, but under special circumstances, visitors will have the opportunity to tour the facility. The preservation and protection of the natural world is the main focus of this thesis, and in effect, this building. The laboratory will serve its purpose by allowing the scientists conducting research there to learn more about the ecosystem of the north shore and find new ways to protect it.

The research laboratory will be directly adjacent to the classroom/conference room, library and staff offices. The gathering space/lobby, outdoor patio, and employee spaces will be indirectly adjacent to the laboratory. The laboratory is 500 square feet. It will be open during the building's regular hours of operation and be occupied during those hours by employees, and scientists, with visitors of the facility visiting on special occasions. Its light quality will be equally filled by artificial and natural light with the capabilities to close off the natural light when presentations are given. The lab space will be light sensitive. Indirect light from the north will be beneficial, while artificial light will be used to focus light on various locations throughout the lab dependent on where the scientists need it.



Spatial Descriptions

Research Library

The research library in this building will serve as a learning experience for visitors, employees, and scientists. Visitors can look through the library for books about how they can protect the natural world. Scientists are able to have their works published in the library or do their own information gathering based on research they are conducting. Employees will use the library to further their knowledge of best practices to preserve and protect the environment. A space like this is important for this building typology because natural preservation and learning how to do so is the main focus of this thesis project.

The research library will be directly adjacent to the research laboratory and the employee spaces. The gathering space/lobby will be indirectly adjacent to the library. The library is 300 square feet and will be open during the building's regular hours of operation and be occupied during those hours by employees, scientists, and visitors of the facility. Its light quality will mainly be focused on artificial light in an effort to preserve the books, which may be damaged by direct sunlight. Indirect light will find its way into the library through clerestory or north facing windows, but natural sunlight will not be the main focus of this space.

Research Laboratory

The research laboratory of the building is in place for scientists from around the world to study various topics related to the vegetation, wildlife, geology, and hydrology of the north shore of Lake Superior. Visitors, in general, will not be allowed in this space, but under special circumstances. They will have the opportunity to tour the facility. The preservation and protection of the natural world is the main focus of this thesis, and in effect, this building. The laboratory will serve its purpose by allowing the scientists conducting research there to learn more about the ecosystem of the north shore and find new ways to protect it.

The research laboratory will be directly adjacent to the classroom/conference room, library, and staff offices. The gathering space/lobby, outdoor patio, and employee spaces will be indirectly adjacent to the laboratory. The laboratory is 500 square feet. It will be open during the building's regular hours of operation and be occupied during those hours by employees and scientists with visitors on special occasions. Its light quality will be equally filled by artificial and natural light with the capabilities to adjust the natural light when presentations are given. The lab space will be light sensitive and indirect light from the north will be beneficial, while artificial light will be used to focus light on various locations throughout the lab based on where it is needed.

Spatial Descriptions

Employee Offices

The employee offices of this building will serve as a space for the employees of the facility to complete day to day office tasks and plan daily activities for the visitors. There are five offices in this facility, each housing one full time employee who will be in charge of their own various tasks related to the five exhibits that the facility houses. A space like this is important for this building typology because the employees who are in charge of their respective exhibit(s) need to have a private space to get their research done.

The employee offices will be directly adjacent to the multi-purpose meeting space and the employee break room. The gathering space/lobby, outdoor patio, research laboratory, and library are spaces that will be indirectly adjacent to the employee offices. The employees' offices are 150 square feet each, totaling 600 square feet. They will be used during the building's regular hours of operation and be occupied during those hours by employees of the facility. Its light quality will be equally filled by artificial and natural light with the capabilities to adjust the natural light when employees need privacy.

Employee Break Room and Multipurpose Meeting Space

The employee break room of this building will serve as a space for the employees of the facility to retreat from day to day office tasks and planning daily visitor activities. A space like this is important for this building because the employees of this facility will need a space to relax and unwind from the daily challenges a job like theirs might entail.

The employee break room will be directly adjacent to the multi-purpose meeting space, and the employee offices. The employee break room is 200 square feet. It will be used during the building's regular hours of operation and be occupied during those hours by employees of the facility. Its light quality will be equally filled by artificial and natural light with the capabilities to adjust the natural light when the employees need their privacy.

The multipurpose meeting space will serve the employees of the building as a space for them to meet as a team and collaborate on new ideas and tactics to increase interest in the topics the facility focuses on. The meeting space will be located directly adjacent to the employee break room and offices and will be slightly larger than the break room at 250 square feet. This space's light quality will be adequate for the various needs of employees using the space.

Spatial Descriptions

Exhibits

The exhibits are the most important spaces within this building's program. Each of the exhibits are focused on the topics of research that the scientists are conducting in the laboratory. This research and exhibits are focused on the vegetation, wildlife, geology, and history of the north shore, with another exhibit focused on the Lake Superior itself.

The exhibits will serve as a space for the visitors of the facility to interact with and learn more about the beauty of the natural world and how to protect it. Spaces like these are important for this building typology because these are the spaces where the visitors will benefit the most by interacting with the hands-on designs and immersing themselves in the information being presented.

Four of the exhibits this facility will house are located indoors; those being Vegetation, Wildlife, Geology, and History. The fifth exhibit focused on Lake Superior will be located near the lake shore outdoors. Although many of the exhibits will be located indoors, their connection with nature will not be inhibited. Large windows and natural light will highlight the importance of the topics that these exhibits are presenting.

The exhibits located indoors will all find themselves adjacent to one another, which will enable visitors to wander freely from exhibit to exhibit with no trouble, enhancing their learning experience. They will also be located adjacent to the gathering space where visitors have easy access to and from them as soon as they enter the building.

Exhibits - Vegetation

This exhibit will present information in a very hands-on way. Visitors will learn more about the various types of native plants that find their home along the north shore; what they look like, how they smell, how they feel, which ones are safe, those that are potentially harmful, and how to keep them flourishing. The vegetation of a particular geologic area is what keeps the ecosystem in tact and provides the wildlife with shelter and food.

The exhibit will be located indoors due to the location's climate. Many people spend much of the year indoors due to the cold weather months of the geographic location and it is important to keep the exhibit accessible to visitors all year round. In order to keep a strong connection with nature, the exhibit will be flooded with natural light and present views to the exterior through large windows surrounding the exhibit. This exhibit will be open for visitors to interact with during the buildings regular hours of operation and will always have a staff member nearby to answer questions and provide assistance to visitors that encounter the space.

Spatial Descriptions

Exhibits - Wildlife

This exhibit will present information hands-on. Visitors will learn more about the various types of native animals that find their home along the north shore; what they look like, where they move, how they hunt, how they protect themselves, which ones are safe, those that are potentially harmful, and how to keep them flourishing. The wildlife of a particular geologic area keeps the ecosystem healthy and in tact.

In an attempt to keep this exhibit accessible to visitors year round, this exhibit will be located indoors due to the location's climate. In order to keep a strong connection with nature, the wildlife exhibit will be flooded with natural light and present views to the exterior through large windows surrounding the exhibit. The space will be filled with colors that take inspiration from the wildlife that find their home among the area. This exhibit will be open for visitors to interact with during the buildings regular hours of operation and will always have a staff member nearby to answer questions and provide assistance to visitors.

Exhibits - Geology

The Geology exhibit will present information in a way that will be more visual than interactive. This will be a better approach, as geologic events take longer amounts of time to complete, and these events can be better understood in a visual way, rather than a hands-on, interactive approach. Visitors will learn more about the various geologic events that took place in order to give the north shore its natural beauty, how the high rocky cliffs came to be, and how that impacts the natural world, including vegetation, and wildlife.

The exhibit will also be located indoors due to the location's climate, allowing all visitors access all year round. A strong connection with nature is important throughout this exhibit which will be accomplished by flooding the space with natural light through large surrounding windows and provide views to the exterior of the building. This exhibit will be open for visitors to interact with during the buildings regular hours of operation and will always have a staff member near by to answer questions and provide assistance to visitors that encounter the space.

Spatial Descriptions

Exhibits - History & Cultural Significance

This exhibit will present its information to visitors in a visually. Visitors will learn more about the importance of the north shore past and present to their ancestors and the pioneers of the land. Visitors were not able to directly take part in shaping the land, how it looks and how people interact with it, but they are able to take part in understanding its significance and shaping it for the future in a positive way that benefits the wildlife, vegetation, and themselves.

The exhibit will be located indoors due to the location's climate, and it is importance for visitors to be able to access it all year round. In order to keep a strong connection with nature, the exhibit will be flooded with natural light and present views to the exterior through large surrounding windows. This exhibit will be open for visitors to interact with during the buildings regular hours of operation and will always have a staff member near by to answer questions and provide assistance to visitors.

Exhibits - Lake Superior

This exhibit will present its information in a different way than the others. Visitors will learn more about Lake Superior itself in a very immersive way. Lake Superior is a full of rich history and has been shaped by nature in order for the north shore to showcase its beauty along this lake's shore. Visitors will be able to take time to reflect on how the lake has shaped the land and how humans are now shaping the lake.

The exhibit will be located outdoors, very near the water of the lake, on top of the rocky shore line. Although the climate of the location lends itself to keep people indoors for most of the year, this exhibit's importance lies with the lake, which is why it will be located as close to the lake as possible. The exhibit's outdoor location does mean that it will be more difficult to gain access to all year round, but it will have a close connection with nature no matter the season. This exhibit will be open for visitors to interact with during all hours of the day by providing lighting during the night time hours and will have a staff member near by to answer questions and provide assistance to visitors that encounter the space during the building's regular hours of operation.

Spatial Descriptions

Outdoor Patio & Hiking Trails

The outdoor patio will be a secondary gathering/lobby space for visitors. This space will have tables, chairs, an outdoor fire pit, and other seating areas, making it comfortable for visitors. The patio will be used most during the summer months, but will be cleared off in the winter months for use if the visitors so choose.

The outdoor patio will be directly adjacent to the indoor gathering/lobby space and will also serve as a starting point for the short hiking trails that will meander through the site and to the Lake Superior exhibit. The patio will also have a covered area for visitors to cool down in the shade and seek shelter when needed.

The hiking trails that will meander through the site will allow visitors to experience the site in a very hands-on way. The trails will lead visitors to the lake shore, visitor center, and loop through the trees and tall grasses.

Hiking is a popular activity that many people take part in along the north shore and has become an important part of the culture of the north shore. This is why hiking trails are an integral part of the program of this project.

Outdoor Amphitheater

The outdoor amphitheater will be a space for visitors to sit, gather, view presentations by scientists, and relax on a nice day. The space will be used mainly in the summer months when people spend more hours of the day outdoors.

This space will be directly adjacent to the outdoor patio and hiking trails. This will keep the amphitheater easily accessible to all visitors. Many different activities will be able to take place in the amphitheater, such as presentations from scientists about discoveries made and shows/videos displaying tactics on how to preserve the natural world.

Support Spaces

The support spaces in this building include the parking lot, storage space, loading dock, mechanical space, and restrooms. These spaces, although seen the least by visitors and employees alike, serve the building with great importance.

The parking lot will be able to serve as many as 25-30 cars, including space for a school bus.

The loading dock is essential in bringing in laboratory equipment, food, and equipment for the exhibit spaces.



Spatial Descriptions

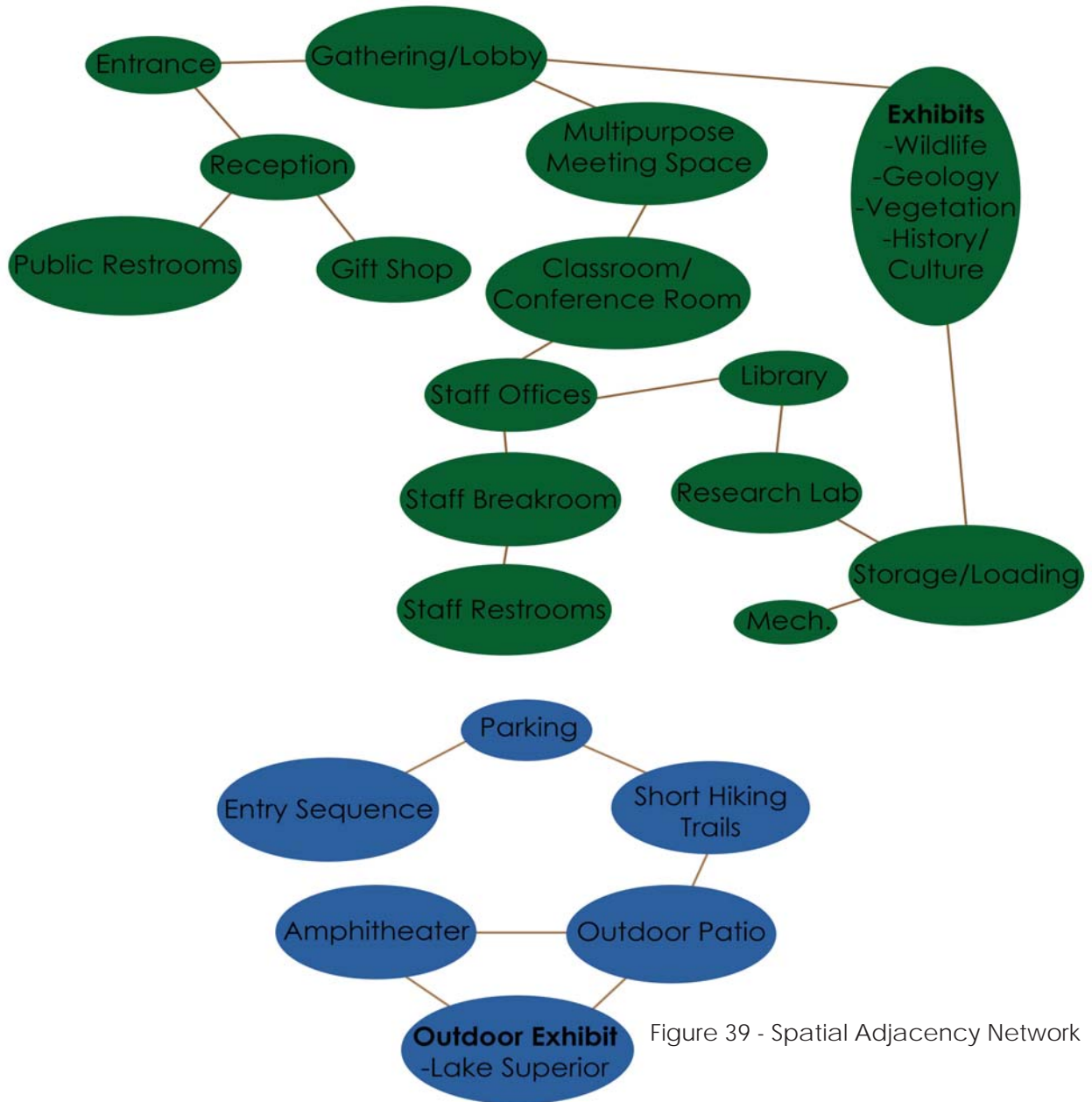


Figure 39 - Spatial Adjacency Network

Project Justification

This topic is important for study because the protection of nature is what will keep the world in tact for future generations. Nature plays a large part in what makes the world beautiful, provides food and resources, and it needs to be protected. This topic is also important for society because humans started out on earth living amongst the land. The protection of nature is important for society to understand. To keep a connection with nature, it is also important to inform the public about the negative impacts they can have on the world, as well as the positive impacts that nature has on society. It is especially important for the people of Minnesota to be informed on these issues because there are countless opportunities for the people of the area to be closer to nature by simply traveling a few miles north along the north shore of Lake Superior.



Figure 40 - Image of Site Facing North



Figure 41 - Lake Superior from Stoney Point

History and Culture

Throughout time, there have been many visitor centers that have been imagined, constructed and visited. There are many reasons why visitor centers are necessary: national parks, state parks, wildlife refuge areas, and historical markers, to name a few. The north shore of Lake Superior is home to many state parks, campgrounds, and wildlife refuge areas, which is why there happens to be many visitor centers in that geographical area.

As time continues to change and technology keeps rising to new heights, updates will become necessary on visitor centers around the world. New events take place in various areas, creating more opportunities for visitors to become educated about the events that have transpired over time in a particular location. The world around us is constantly changing in the areas of climate change, wildlife ecology, vegetation growth, and geological activity and because of these phenomena taking place, more information needs to become available to the public about them.

These anomalies do not only take place on a global scale, but they also take place on a local scale, especially along the north shore of Lake Superior. This is why a visitor center and multi-disciplinary research facility that will focus on these things is necessary in this location.



Figure 42 - Image from Site Facing North West

History and Culture

The area which will be studied by scientists at this facility is the northern shore line and surrounding forests of north-eastern Minnesota. The site is located roughly half way between Duluth, MN, and Two Harbors, MN, which makes it a favorable destination for residents of those two cities, as well as visitors and vacationers making their way up the north shore's scenic drive.

This facility has the potential to serve as a final destination spot for visitors or a quick stop for those on their way to another destination. The information that will be portrayed within the exhibits will have the potential to be taken in quickly or be absorbed in depth. In either case, visitors will gain a deeper understanding about the natural world and what they can and should do to protect, preserve, and interact with it.

The site and its surrounding area, which lies on a small peninsula that protrudes into the lake, currently serves as a pull-off stop for visitors to take a break and take in the scenery. A site that is already a natural attraction for visitors will serve as a successful location for this building typology.



Figure 43 - Image from Site Facing South

History and Culture

North Shore Tourism and Recreation

New York Journalist John St. John once stated that, "If you are looking for pleasure, whether lady or gentleman, you can find it in the Lake Superior region, provided you can be pleased with grand scenery, water-falls, lakes and mountains..." This description of the Lake Superior region has truly stood the test of time due to the fact that people have taken those words to heart and have been visiting this region year after year. In 1855, 149 of the finest steamers on the lake started their service to Lake Superior that carried 8,295 passengers and 5,690 tons of cargo. Many of the steamers featured "new and splendid upper cabins" that made "Grand Pleasure Excursions" from Buffalo, Cleveland, Detroit, Collingwood, Ontario, and Chicago for all of the main ports around the Great Lakes on the Canadian and American coasts. There were even some boats in 1870 that traveled down the St. Lawrence River all the way to Montreal. (Labadie, 2015)

The Duluth area has great scenery. Aside from that, attractions such as agate hunting, tenting, "authentic Indian ceremonies," hunting, fishing, and carriage tours were popular for people to take part in. Travelers were offered a variety of gems and minerals, crafts, stereopticon views, and autographed photographs at "bargain prices." Few of the large steamers called at way-ports, but local boats ran up the North Shore, connecting tourists with hunting and fishing camps. Brook trout were caught in great numbers in the streams of the North Shore. The Superior Chronicle, July 24, 1855, advertised, "Mackinaw boats and bark canoes provided with trusty crews, well acquainted with the North and South Shores and all the fishing points on the Lake," are available "for Fishing and Pleasure parties." (Labadie, 2015)

During the 1860s, passenger ships arrived at Duluth on an average of three per day. The number increased during the 1880s and 1890s, while the size and capacity of the ships also grew. The Anchor Line built three 235-foot iron passenger liners in 1871 for the Duluth route. In 1911, the peak year, 80,000 passengers traveled to Lake Superior. After 1920, the number of passenger cruise ships diminished with the advent of "motor-cars." Very few cruise ships were still in service after World War II. (Labadie, 2015)

The resort industry along the north shore started to develop when the small passenger service running out of Duluth started to pick up. A fisherman named Charlie Nelson built a second story addition to his Lutsen home in 1893 to house his frequent guests. Those guests started returning and began paying and before long commercial fishing became rivaled by hotel income in the late 1890s. One fisherman, Ole Brunen from Chicago, also started to gain from the hotel industry and found himself building small cabins and adding on to his house. By 1900, cabins were all over Lutsen, Hovland, and Grand Marais. (Labadie, 2015)



History and Culture

North Shore Tourism and Recreation (Cont.)

In the late 1920s, the North Shore highway completion accompanied the decline of commercial fishing which caused less fortunate fishermen to build cabins and resorts into the early 1930s. When this happened, more and more mid-western Americans began touring them in their private automobiles. In the 1920s, Gooseberry Falls State Park was established by the Civilian Corps personnel and Split Rock Lighthouse became the most visited lighthouse in the nation. The new highway system also helped gain access to Boundary Waters sites such as Kabetogama, Namakan, and Kettle Falls, where major resorts have thrived since the 1920s. North Shore tourism was followed closely by recreational boating. Boating has been a large part of the Lake Superior area recreation ever since the 1960s. (Labadie, 2015)

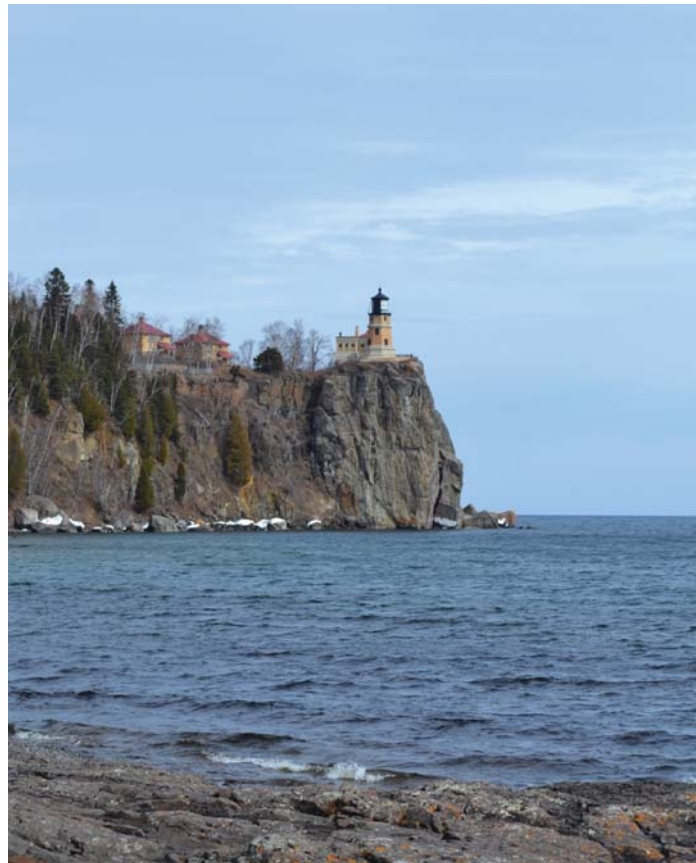


Figure 44 - Split Rock Lighthouse

History and Culture

Sustainable Design

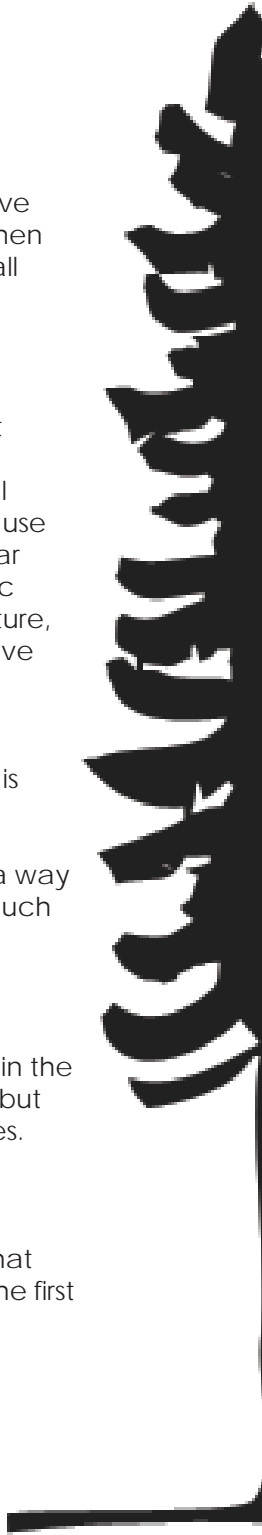
In today's society, a lot of pressure has been put on designers to create a more sustainable world. This idea is very important for this thesis because its main idea is to protect and preserve the natural world. Sustainable design strives to do just that. The second half of the 1960s is when strong feelings started to develop strong consciousness regarding environmental problems all over the world. The term ecology was originally coined in 1873 by a German naturalist, Ernst Heinrich Haeckel, which referred to the study of the relations of living being and the natural environment. (Chust, 2015)

The concern for the environment aligned with when the western world began to realize that human behavior can be damaging to nature. This interest is certainly evident based on the inception of the Clean Water Act, Clean Air Act, Endangered Species Act, and the National Environmental Policy Act. The group known as READ was founded and this group urged the use of renewable energy in construction. Afterwards, many terms were coined having very similar meanings: Sustainable Architecture, Ecological Architecture, Green Architecture, Bioclimatic Architecture, Eco-architecture, Environmentally Conscious Architecture, Intelligent Architecture, Bioconstruction, Bionic Architecture, and Low Energy Architecture. Over the years, there have been many different conferences and conventions dealing with this idea of Sustainable Architecture. (Chust, 2015)

Studies have shown that 50% of the world's energy is being used by domestic activities, 25% is being used by industry, and the other 25% for transport and other activities. This tells us that housing and architectural materials are responsible for more than half of the contaminating gases that are sent into the atmosphere. Today we can define Sustainable Architecture as a way of designating buildings that make maximum use of natural resources and also reduce as much of the environmental impact on the ecosystem and its inhabitants as possible. (Chust, 2015)

There are many different strategies that can help make a building more sustainable: solar orientation, making use of rainwater for various purposes like toilets, clothes washing and watering plants, planting deciduous trees that block the sun in the summer and accept sun in the winter, and planting perennial trees that block winds permanently. More strategies include, but are not limited to: any kind of solar collector, wind generators, and geothermal technologies. Construction materials can also play a role in sustainable design and trombe walls are very impactful in that respect. (Chust, 2015)

One major goal of sustainable design is to not just design buildings, but design entire cities that focus on sustainability. Norman Foster is the designer of Masdar City in Abu Dhabi, which is the first full city to focus and hold true to its sustainable roots. (Chust, 2015)



History and Culture

Sustainable Design (Cont.)

There have been many architects that took the idea of sustainability to heart.

Charles Correa (India, 1930) studied architecture in the United States and used the knowledge he gained to bring the importance of sustainable design to India. His work can be traced back to that of Le Corbusier. (Chust, 2015)

Kenneth Yeang (Malaysia, 1948) earned his education in the United Kingdom and dedicated his career to fighting against the dangers of high-rise architecture and its impact on the environment. This belief is what brought on the idea of the eco-skyscraper which was the first idea to incorporate bioclimatic strategies to the city giants. (Chust, 2015)

Richard Rogers (Italy, 1933) refers to technology as a means for solving social and environmental problems. He used many bioclimatic strategies in the design of airport terminals. These strategies use advanced technology to solve various environmental problems that can be harmful to the regions they are in. (Chust, 2015)

Renzo Piano (Italy, 1937) is a very popular architect known for designing many buildings around the world. One of them is the Shard Glass Tower in London, which represents many aspects of London's past. The building is complete with office space, a hotel, and apartments. Each of the facades is double skinned glass and helps reduce temperatures without the loss of interior light. Each floor is also complete with naturally ventilated greenhouses so users can be in touch with nature. (Chust, 2015)

Norman Foster (United Kingdom, 1935) is the architect behind the Hong Kong & Shanghai Bank which is the first project he carried out as a result of a competition. It is complete with tall curtain walls to allow natural light to flood the large atrium in the interior of the building. The air conditioning system also uses sea water instead of drinking water. Norman Foster is the architect behind the Dome of the Reichstag in Berlin. The dome is constructed of all glass and steel, with mirrors on the interior to bounce light throughout the space. (Chust, 2015)

Jacques Herzog and Pierre de Meuron (Switzerland, 1950) are advocates for the minimalist movement in architecture. Their firm takes on projects of all scopes, sizes, and typologies. Simple geometric shapes often take dominance in their designs, which is compatible with ecological concerns. (Chust, 2015)

History and Culture

State and National Parks

National Parks have been known by many as “America’s Best Idea.” The National Park Service’s number one goal is to preserve and protect the nation’s most incredible monuments and natural landforms, while at the same time, creating inviting places where visitors are able to come and learn about the natural world, its beauty, and its cultural significance. National Parks have been around for over 140 years. The first one being Yellowstone National Park which was established by an act of the United States Congress and signed into law by President Ulysses S. Grant in 1872. The following parks set in motion the preservation and protection of some of the most important natural places in the United States: Mackinac National Park in 1875 and Rock Creek Park, Sequoia, and Yosemite National Park in 1890. In 1916, The Organic Act created the National Park Service “to conserve the scenery and the natural historic objects and 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.” (United, 2015)

The National Park Service has recently been in the social media spotlight by creating Facebook pages for each of the National Parks and starting the *#FindYourPark* Twitter Hashtag that has gained traction over the past few years. The National Park Service has also just released that they will be offering 16 days of free admission in the year 2016 in honor of their 100th year of service to the nations parks. On the most popular shopping day in the United States (Black Friday), the company known as REI, who specializes in selling outdoor gear, has also taken a step forward when thinking in terms of the importance of spending time outdoors. They put forth a Twitter hashtag *#OptOutside*, urging people to opt out on shopping during Black Friday and spend more time outside, deciding to close its doors on Black Friday, to take a stand against the day and the trauma that it brings many shoppers. (United, 2015)



FIND YOUR
PARK

Figure 45 - National Park Campaign Slogan

History and Culture

State and National Parks

There are many reasons that people from all over the world are drawn to the beauty of National Parks in the United States. An article entitled "Parks Are More Exciting" brings forward a few reasons why the parks attract as many people as they do. (As Follows)

"First Dibs At Dawn" - Cadillac Mountain in Acadia National Park in Maine actually contains the land that receives the first rays of sunlight in the entire United States every morning from October-March. (Lewon, 2015)

"They're The Backdrop to the Most Important Events in Our Lives" - Many people get engaged or have had their weddings in National Parks and the pictures speak for themselves. (Lewon, 2015)

"The Gatekeepers" - Park Rangers are some of the most knowledgeable and friendly people visitors will come in contact with when visiting a National Park. (Lewon, 2015)

The article also tries to attract more people by begging the following question about National Parks: "Who knows what you might see - or do, or break, or remember for years to come?" (Lewon, 2015)

This article also states that "Making nature visible and available is a way of reacquainting us with wider communities of life, but it also informs us about the ecological consequences of our activities." (Lewon, 2015)



Figure 46 - National Park Logo

History and Culture

Geological Landforms

The shore line of Lake Superior has been forming for billions of years. The rocks, cliffs, boulders, and crevasses are among some of the oldest in the entire world. The Geology of the north shore creates opportunities for visitors to interact with many different types of landforms. The rock formations are so diverse that, in some areas, they roll out into the lake at water level while in other areas reach hundreds of feet high above the water. With very diverse land formations throughout the area, we need to give the credit to their formation to what we can't see.

The glaciers that once covered this area millions of years ago are the real reason most of the land looks the way it does. Nature is difficult to beat and it does some very impressive things.

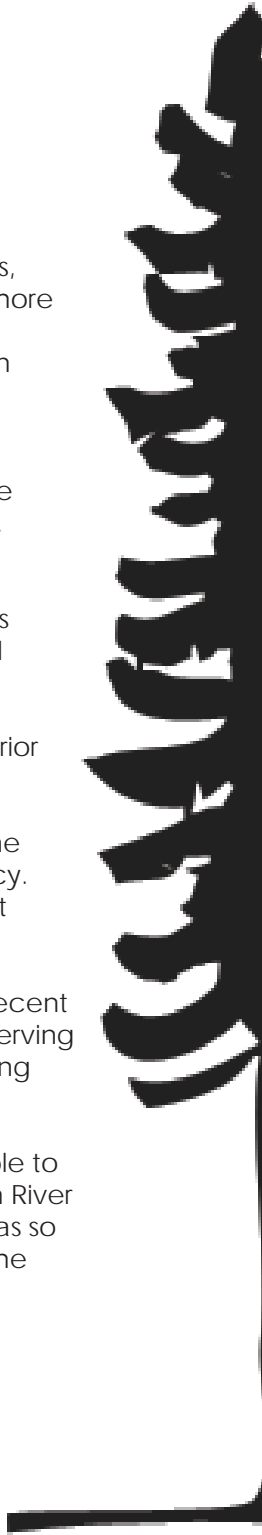
Humans have also had a hand in deciding how the land has taken its shape. Humans have manipulated the landscape in such a way that portrays their own visions. The landscape has been transformed to make way for building foundations, roadways, parking lots, agricultural land, timber extraction, and outdoor recreation such as hiking to name a few.

Below are a few excerpts from the book "North Shore: A Natural History of Minnesota's Superior Coast." These excerpts give us examples of how the land has been transformed over time.

"The shore-edge rocks that are so beloved by picnickers and sunset watchers are among the oldest exposed bedrock on the planet, shaped by ancient forces that date to Earth's infancy. About 2.5 billion years old, these rocks are part of North America's great geologic basement known as the Canadian Shield."

"Much of the credit for this great medley of natural features goes to the glaciers, the most recent of which, the Wisconsin ice sheet, retreated from the area about ten thousand years ago. Serving as rock crusher, backhoe and dump truck, the restless mountains of advancing and retreating ice rearranged everything in their path."

"The amount of timber extracted from the North Shore forests seems almost incomprehensible to today's visitor. In June 1899 the tugboat Gettysburg towed a raft of logs cut from the Pigeon River watershed to the Alger-Smith Company's sawmill in Duluth. Measuring sixty acres, the raft was so enormous that two days after its launch near Hovland the people there could still see it on the lake."



History and Culture

Geological Landforms



Figure 47 - Lake Superior Shoreline from Shovel Point (Tettegouche State Park)



Figure 48 - Gooseberry Falls Waterfalls (Gooseberry Falls State Park)

History and Culture

1855

Fishing parties begin on Lake Superior

1870

Steamers travel St. Lawrence River to Montreal

1893

Charlie Nelson adds addition to home in Lutsen

1855

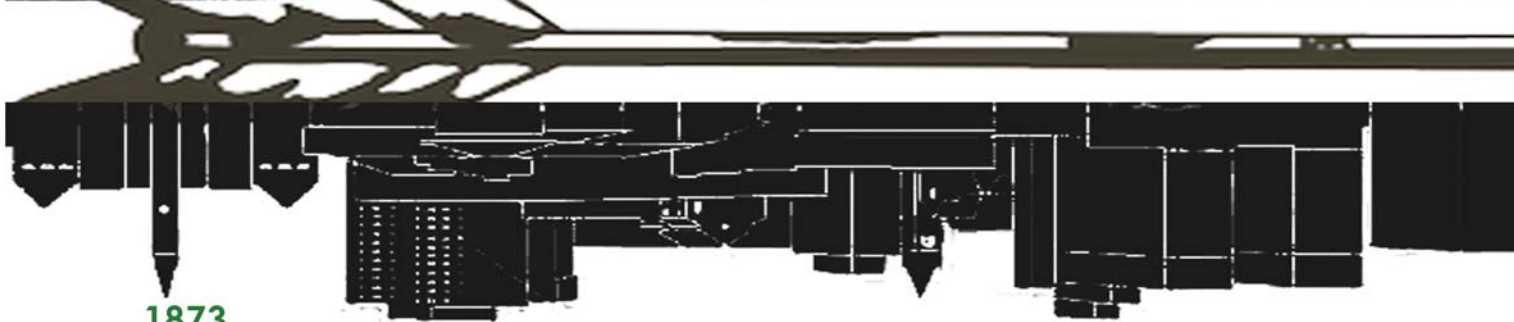
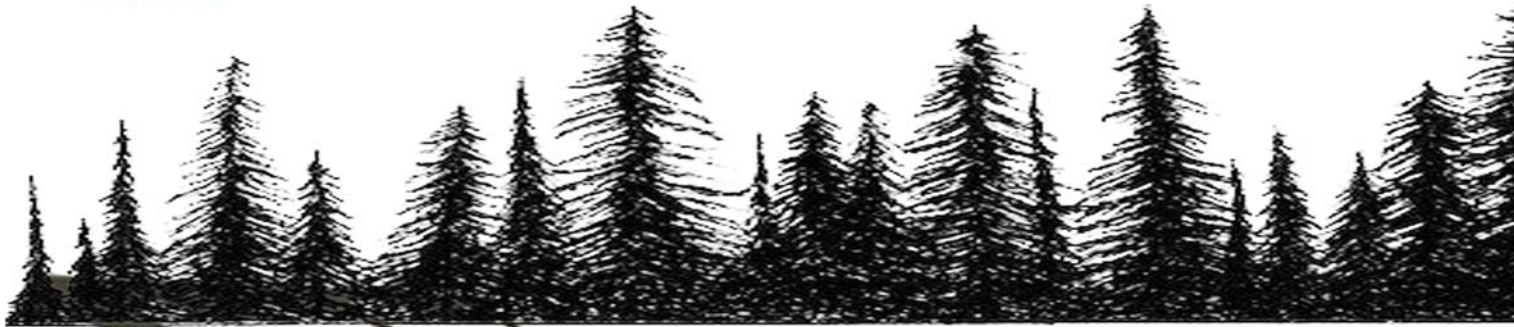
Steamers start service on Lake Superior

1860s

Passenger ships consistently arrive in Duluth

1871

Larger passenger liners arrive in Duluth



1873

The term ecology officially coined

1890

Rock Creek, Sequoia, and Yellowstone National Parks

1872

First National Park - Yellowstone

1875

Mackinac National Park

1916

National Park Service Created

Lake Superior and The North Shore

Influences in Sustainable Design

National Parks



History and Culture

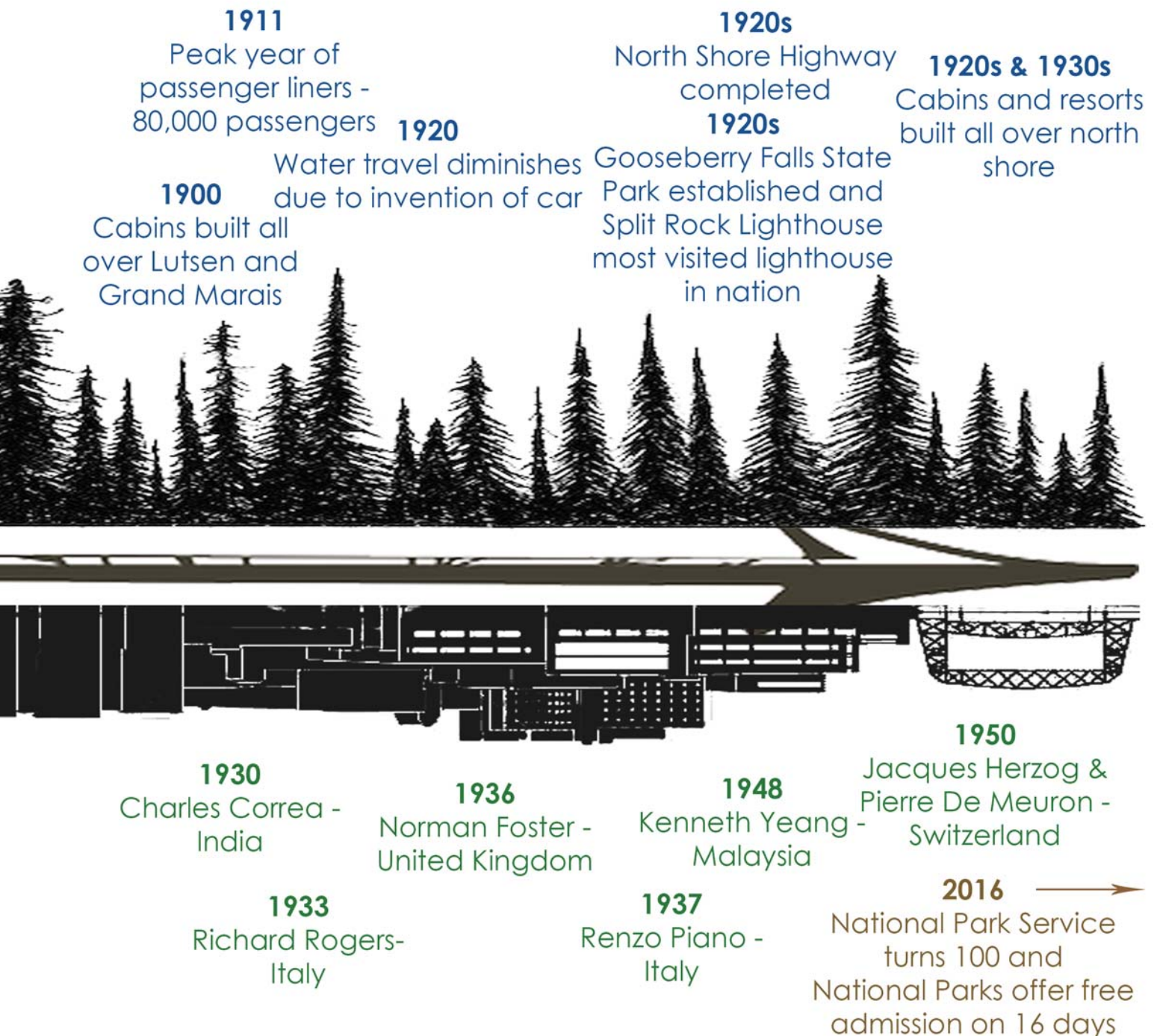


Figure 49 - Timeline Graphic

Site Analysis



Figure 50 - View of Site Facing North East

The site, located between Duluth and Two Harbors, Minnesota, is located at the corner of North Shore Drive and Stoney Point Drive. This area lends itself well for a visitor center and research laboratory for many reasons. The following section will cover many areas showcasing the benefits of this site's geographic location and how the facility being proposed here will benefit the community and its surroundings. The site is a triangle shape and is bordered on two sides by two streets, with the third border being Lake Superior itself.

Site Analysis

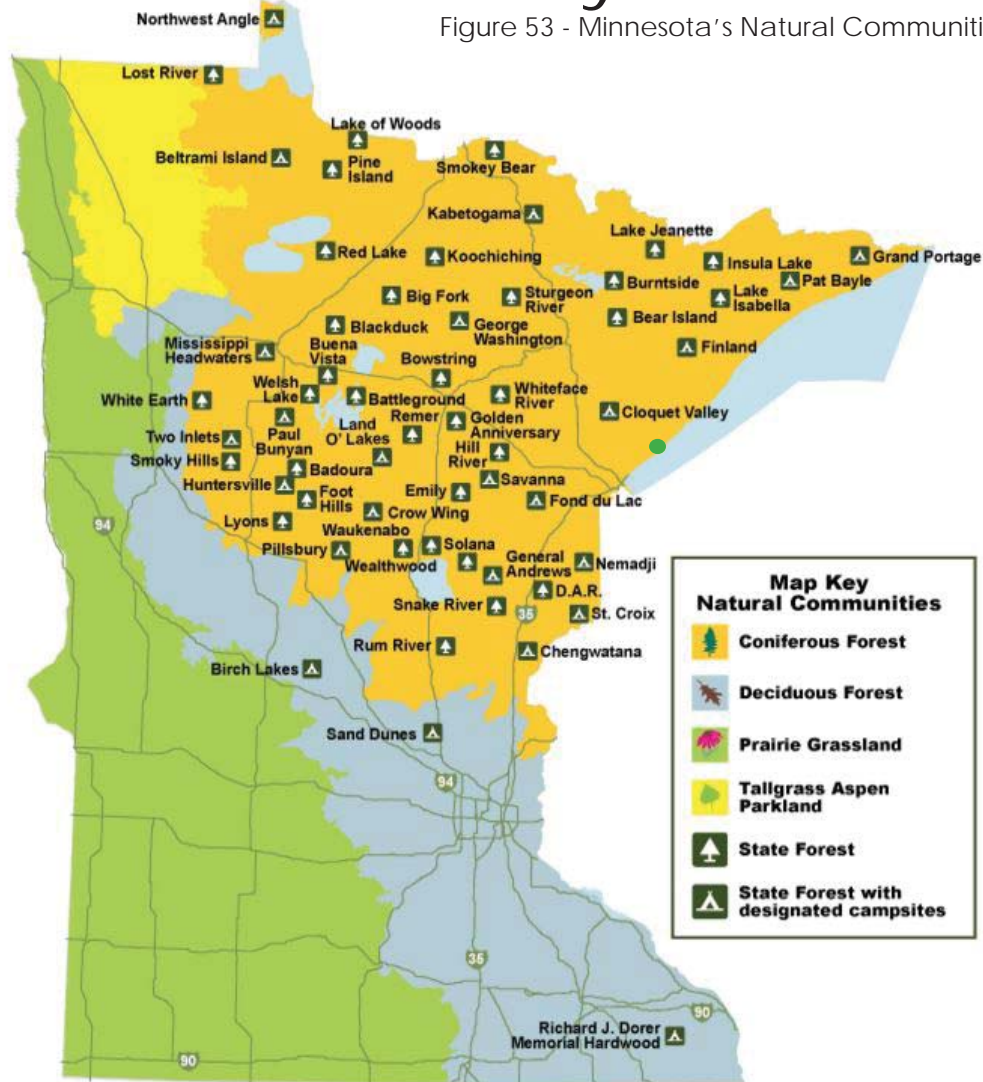


Figure 51 - Aerial View of Site

A peninsula known as “Stoney Point” is the large area that this thesis’ site finds its home. “Stoney Point” gets its name for the rock formations that line the water. What makes this particular area unique is that the rock formations are low enough to the water that people are able to walk out on the rocks and actually interact with the icy water of the lake. This area is beneficial, which creates a lot of traffic along the road encircling the point. North Shore Drive receives heavy traffic due to its scenery. Drivers are able to see the lake from almost every point on the road and there are many pull off areas which give opportunities for breathtaking photographs. Stoney Point Drive is no exception. The stone beach pull off is located just south of the site proposed for this thesis, and it receives heavy human interaction.

Site Analysis

Figure 53 - Minnesota's Natural Communities



The map shown above separates the state into four Natural Communities: Coniferous Forest, Deciduous Forest, Prairie Grassland, and Tallgrass Aspen Parkland. Also located on the map are locations of State Forests and those with designated campsites.

It is clear to see that the northern half of the state is rich with forest land that is protected. The site is located in the Coniferous Forest region of the state and is heavily vegetated with a wide variety of shrubs, grasses, and trees.

Site Analysis

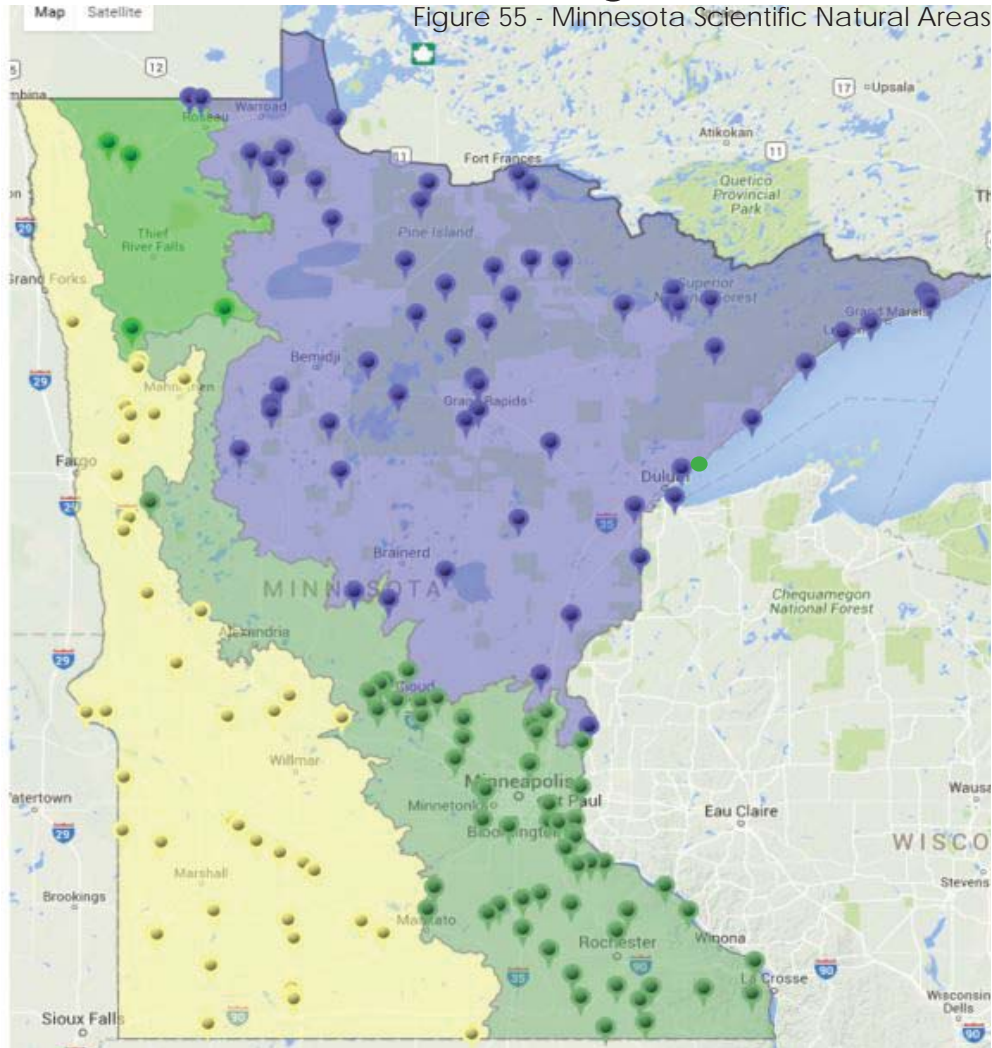
Figure 54 - Minnesota State Trails



Hiking, biking, walking, running, and other outdoor recreation is popular in Minnesota and this map shows the various State Trails that Minnesota has to offer. State Trails are meant to be enjoyed by all people and are typically located in areas highlighting significant parts of the state. No wonder there are a few along the north shore.

The nearest State Trails to the site is the Gitchi-Gami (Native American word for Lake Superior) and the North Shore State Trail; both of which are hiking trails that meander through state parks and along the shore, showcasing the natural beauty of the forests, rivers, waterfalls, and the lake.

Site Analysis

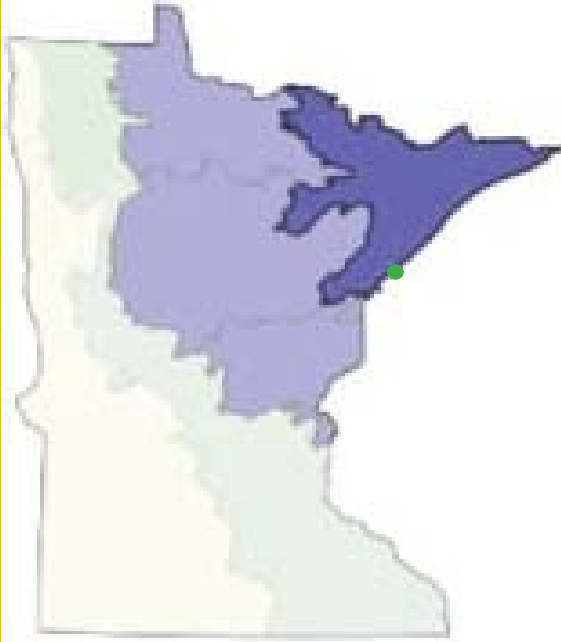


This map is an Ecological Classification System (ECS) for the different Scientific & Natural Areas (SNAs) in the state. This site is located in the Laurentian Mixed Forest SNA (purple area), which is the largest SNA in the state. The landscape ranges from rugged lake terrain over bedrock to large, flat, poorly drained peat lands.

The site being proposed is located on an area of rugged lake shore terrain with bedrock very near the surface. In the following pages, a more in depth description of the Laurentian Mixed Forest SNA is provided.

Site Analysis

Sections and Subsections of the Minnesota Laurentian Mixed Forest SNA



Northern Superior
Uplands Section

Figure 56

North Shore Highlands
Subsection



Figure 57



Site Analysis

Sections and Subsections of the Minnesota Laurentian Mixed Forest SNA

Northern Superior Uplands Section

This section is characterized by its glacial formation, bedrock terrain, and numerous lakes. It also has high relief, which showcases the rugged topography of the bedrock beneath the soil. Most of its precipitation is in the form of snow and it receives more of it than any other section of the state. It has the longest snow cover and shortest growing season. The vegetation is very uniform, consisting mostly of fire-dependent forests and woodlands. The forests are plentiful with aspen and paper birch. Jack pine forests are present on droughty ridges and bedrock exposures, as well as on local sandy out-wash deposits. Forests with red and white pine were widespread in the past, mixed with aspen, paper birch, spruce, and balsam fir; much of the pine was cut in the late 1800s and early 1900s, leaving forests dominated mostly by aspen and paper birch. The climate is heavily moderated and influenced by the lakes that favor forests dominated by sugar maple, some white pine, white cedar, and yellow birch trees. (National, 2015)

North Shore Highlands Subsection

The land formation in this subsection ranges from gently rolling hills to steep rock cliffs. There are many out-wash deposits because of the many rivers finding their ends on the shoreline of the lake. Glacial drift is thick over this section and bedrock is exposed or very near the surface in many areas. Underlying bedrock consists of basalt, rhyolite, gabbro, diabase, anorthosite, granite, sandstone, and shale. Within the glacial drift lies soils that are developed of rocky, red tills of the Superior lobe and range from sands to clays. (National, 2015)

This area's climate is not too different from the rest of the state. The annual precipitation ranges on average from 28 to 30 inches; 40% of that occurs during the warmer part of the year. The winter accounts for 60% of the precipitation. The lake has an impact on the amount of snowfall that occurs in the region. The land on the shore receives about 10 less inches than the land that is 5 miles inland from the lake. (National, 2015)

There are numerous rivers and streams that lead directly from the highland to the shore of Lake Superior; most of which have waterfalls near the shoreline. Almost the entire region is forested, with recreation and forest management as the major land uses. Other land uses include tourism and mining. Mining is not specifically a part of this region, but ports were built to obtain ore from the iron range to steel mills in Indiana and Ohio. Forest fires have been a strong disturbance in this area and that can be seen by the disappearance of natural species. (National, 2015)

Site Analysis

Figure 58 - Minnesota State Water Trails

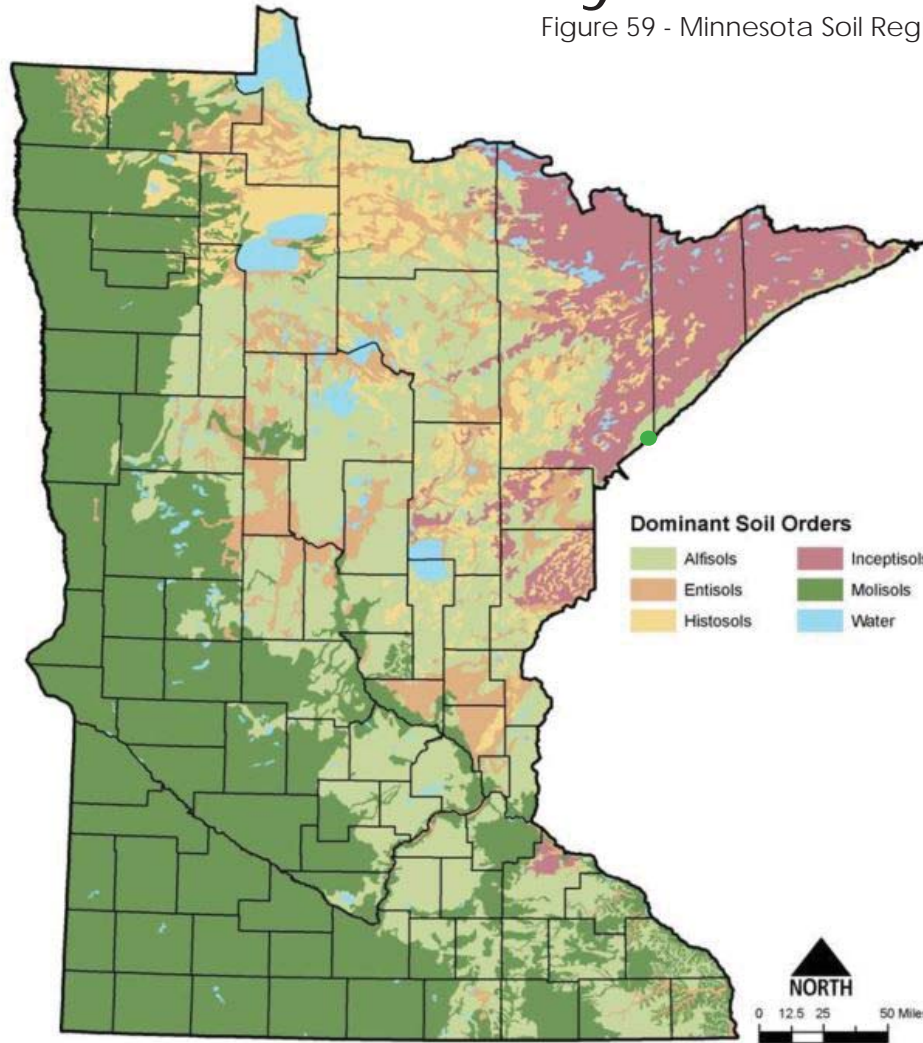


The map above shows the most heavily used state water trails. Most of these water trails are rivers that meander their way throughout the state; many of which connect to the Mississippi River, which has its headwaters in the middle of the state.

The only state water trail that is not a river is the Lake Superior Water Trail, which cruises its way directly near the site. This is yet another opportunity for traffic to move toward and around the site.

Site Analysis

Figure 59 - Minnesota Soil Regions



Dominant soil types are shown in this map. Minnesota contains a broad range of soil types. The areas where different soil types lie, directly relate to the way the state is divided up into its natural communities and forested areas.

The dominant soil type found at the site are known as Alfisols. Alfisols typically in semi-arid to humid areas, under a hardwood forest cover, have subsoil that is enriched with clay and are relatively high in fertility. They contain aluminum and iron. The soil is thin and the bedrock is near the surface, making the site beneficial for building.

Site Analysis



Figure 60 - Site Topography Lines

The topography lines of "Stoney Point" are shown in the map above. It is clear to see that the area takes a very diverse shape. It is an area with many hills, steep rock formations, and small flat areas. The overall slope of the land leans toward the lake, where the land disappears. From the lake, up to the scenic North Shore Drive road, the topography reads from 600 up to 630. There is an area within the middle of "Stoney Point" that rises to the point of 640, but that is a small area.

From the farthest point of the peninsula up to North Shore Drive, the slope roughly comes out to 1.25% - A rise of an average of 35 feet and a distance of 2,800 feet, one can determine the slope...

$35 \text{ feet} / 2,800 \text{ feet} = .0125$ and this comes out to a percentage of 1.25%. This is the overall slope of the area directly adjacent to the site.

From the shore of the lake up to the intersection of Stoney Point Road and North Shore Drive, the slope roughly comes out to 7.5% - A rise of 30 feet and a distance of 400 feet, one can determine the slope...

$30 \text{ feet} / 400 \text{ feet} = .075$ and this comes out to a percentage of 7.5%. This is the overall slope of the site for this thesis.

Site Analysis

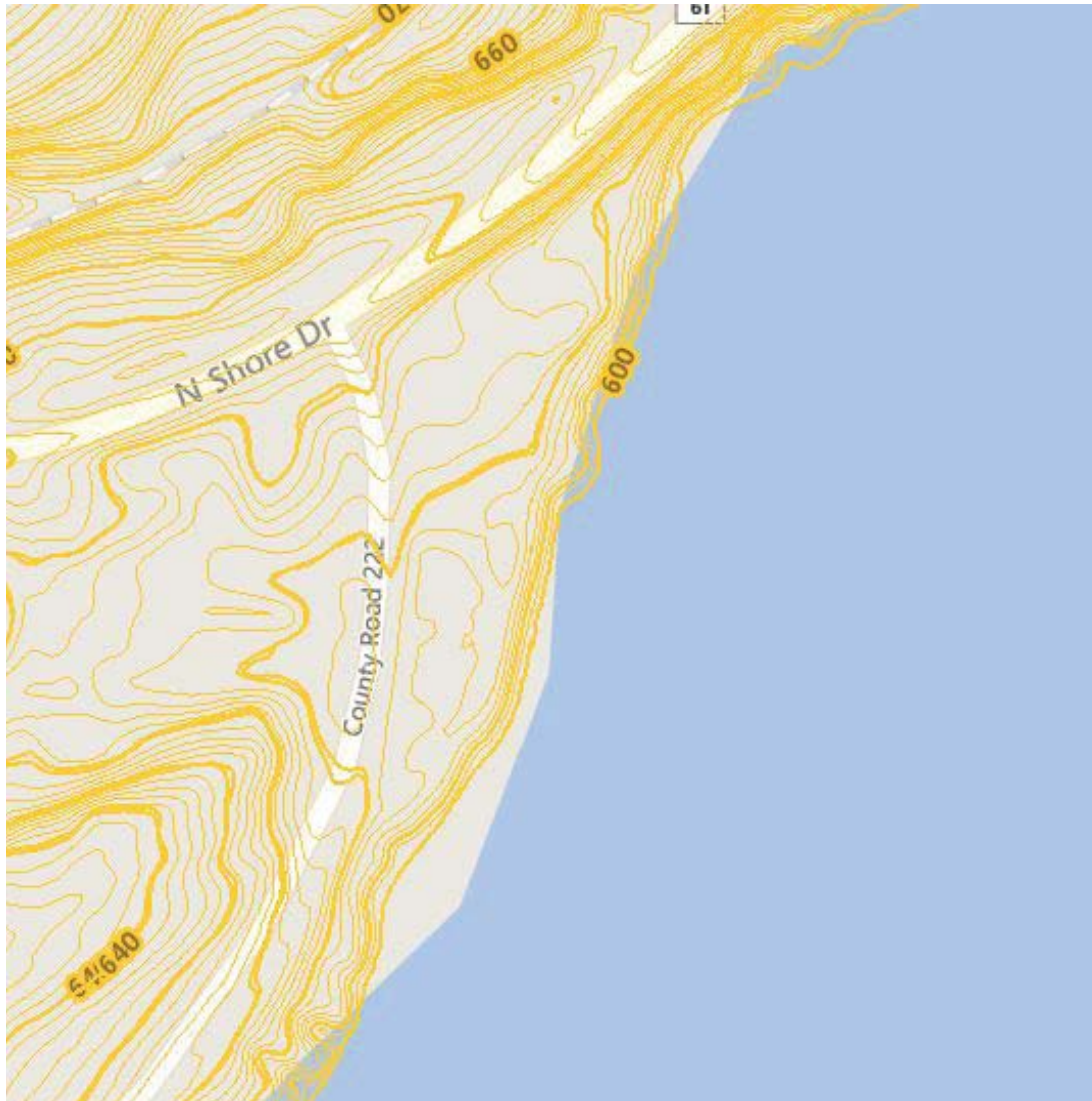


Figure 61 - Site Topography Lines

With a slope like this, particular design decisions will be made regarding how a building can relate to it. Although the site does contain a significant slope, there is an area that is relatively flat directly in the middle, between the roads and shore. This will make for a potentially ideal location for a building.

Site Analysis

Normal Precipitation
Annual
(1981-2010)

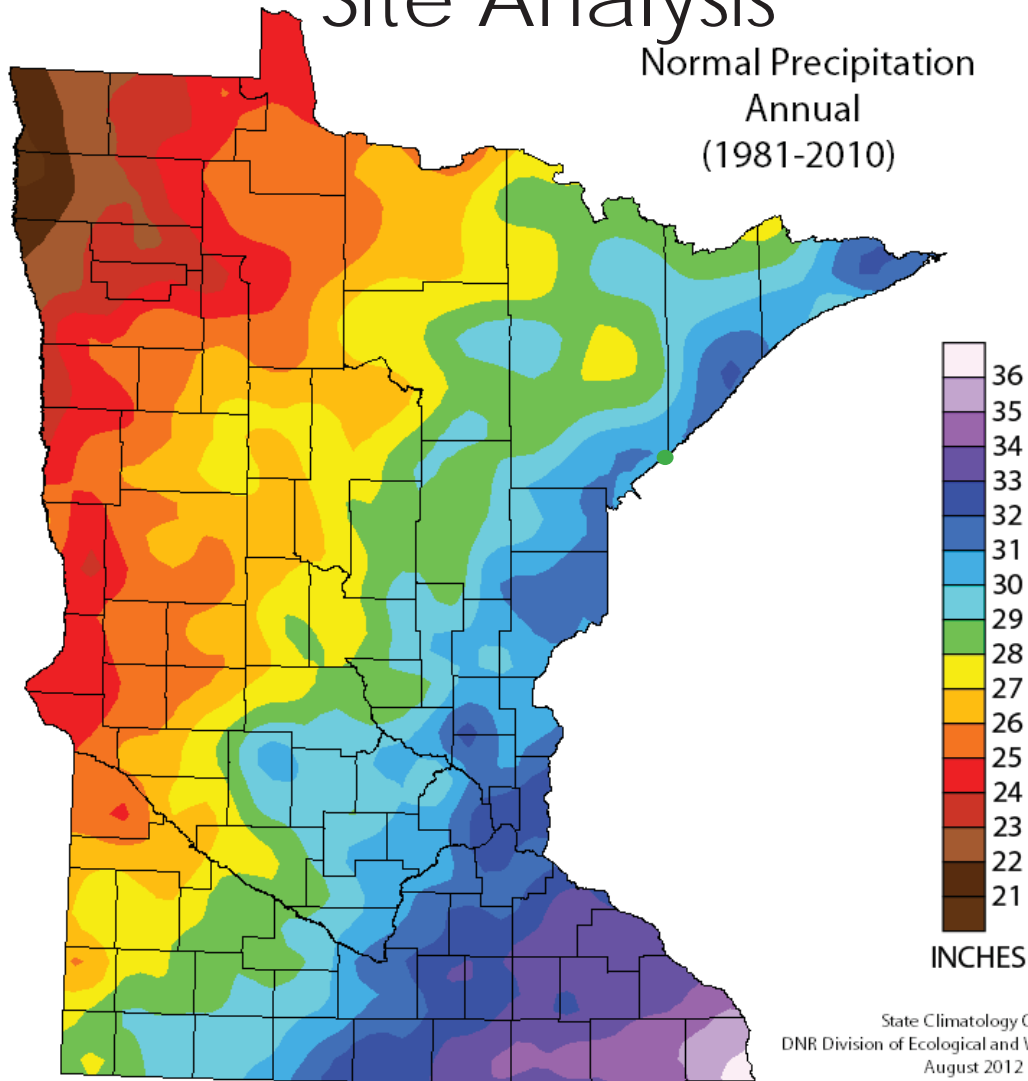


Figure 62 - Minnesota Precipitation Ranges

The map shown above contains information about the annual average precipitation that the state of Minnesota received from the years 1981 up until 2010. The region located along the north shore of Lake Superior, where the site is located, has received an average of 29-31 inches.

The amount of precipitation that a location receives is important to take into consideration because knowing the amount of water or snow a building can handle will keep the building from collapsing.

Site Analysis

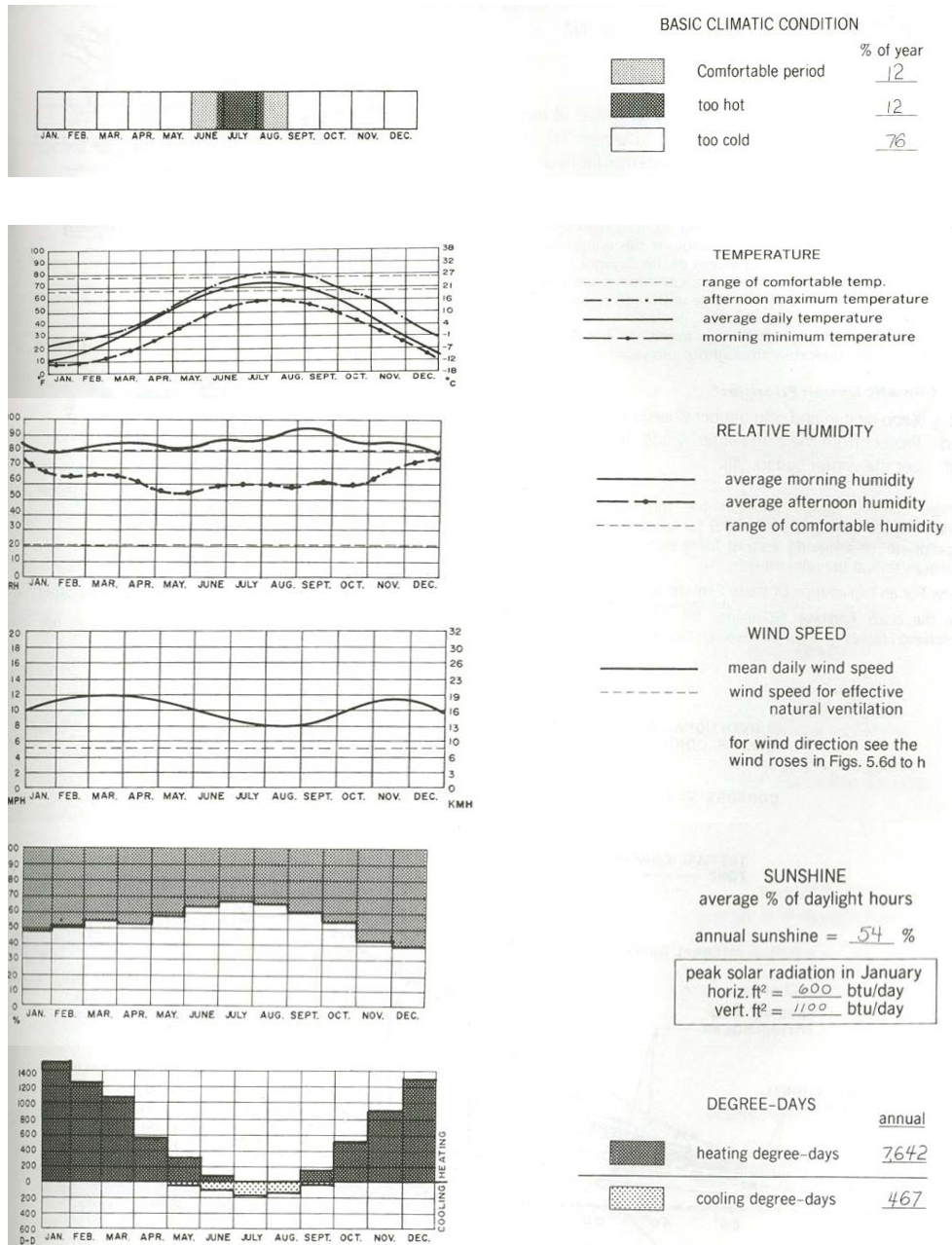


Figure 63 - Region's Climate Data

Site Analysis

Aside from sun issues, there is also the wind to take into consideration. The vast majority of wind blowing through this site will be coming from the lake. The lake is located to the southeast, which means that careful attention must be given to that area of the building.

The wind can be a tougher issue to deal with during the winter months when it is colder and the wind has more of an impact on the human experience. Yet, this can be used to a designers advantage during the summer months when the wind off the lake can be used to cool a space for human comfort.

It is clear to see that the south facade of the building needs to have special attention. With shading devices and energy saving ideas, a pleasant, comfortable interior space can be provided.

In this type of climate region, there are certain design priorities to take into consideration. Such priorities include:

- Keeping heat in and cold temperatures out in the winter
- Protecting from the cold winter winds
- Allowing the winter sun in
- Using thermal mass to reduce day-to-night temperature swings in the summer
- Protecting from the summer sun
- Using natural ventilation for summer cooling



Figure 65 - View of Site Facing South West

Site Analysis

Figure 66 - View of Site Facing North



Figure 67 - View of Site Facing North from Shore



Site Analysis

Figure 68 - View of Site Facing North East from Shore



Figure 69 - View of Site Facing South West from Shore



Site Analysis

Figure 70 - View of Site Facing North East from Shore



Figure 71 - View of Site Facing North



Site Analysis

Figure 72 - View of Stoney Point Beach



Figure 73 - View of Stoney Point Beach



The Design Process



Figure 74 - Site and Context Inventory

Figure 75 - Direct Site Inventory



The Design Process

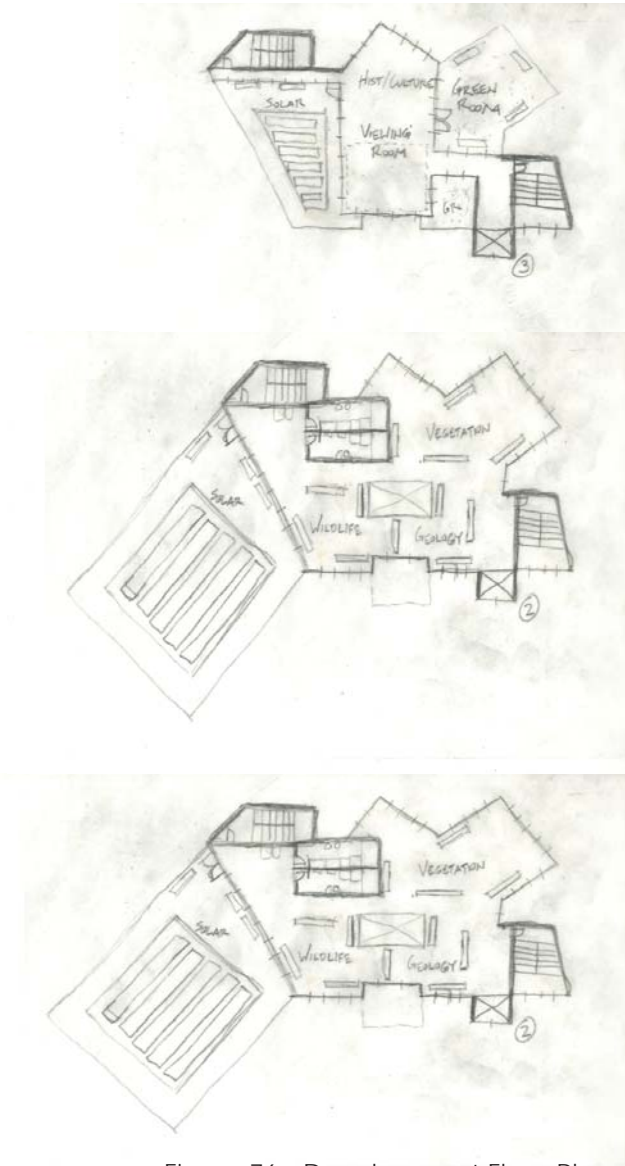


Figure 76 - Development Floor Plans

The Design Process

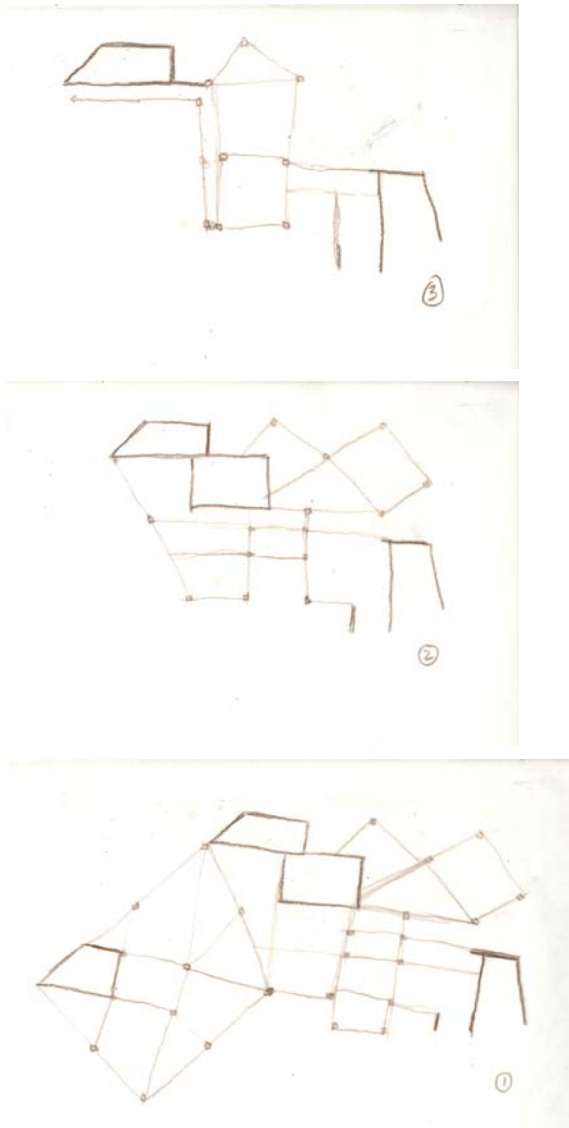


Figure 77 - Development Structural Plans

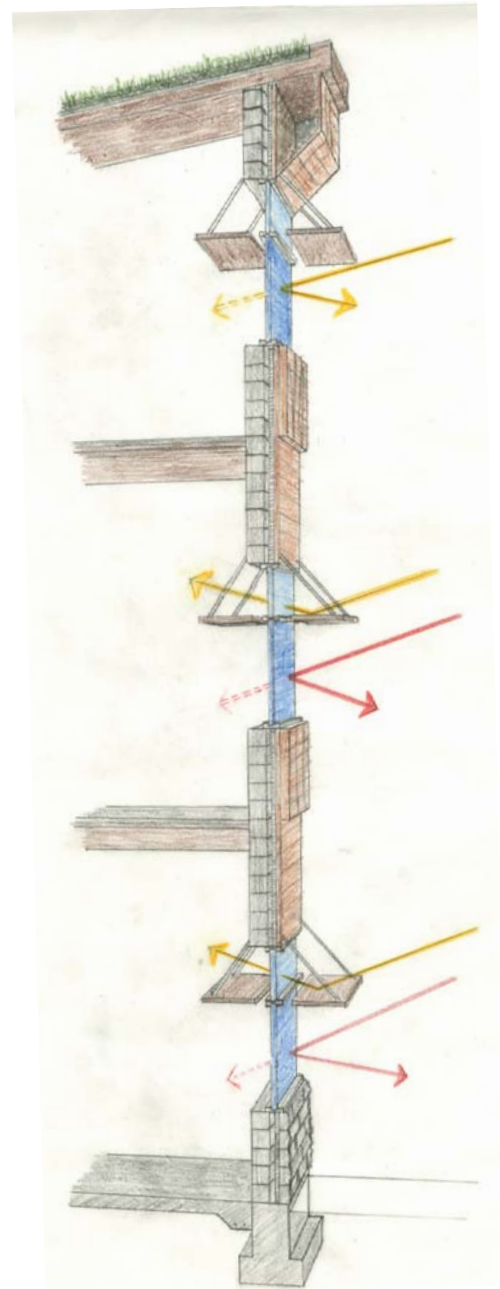
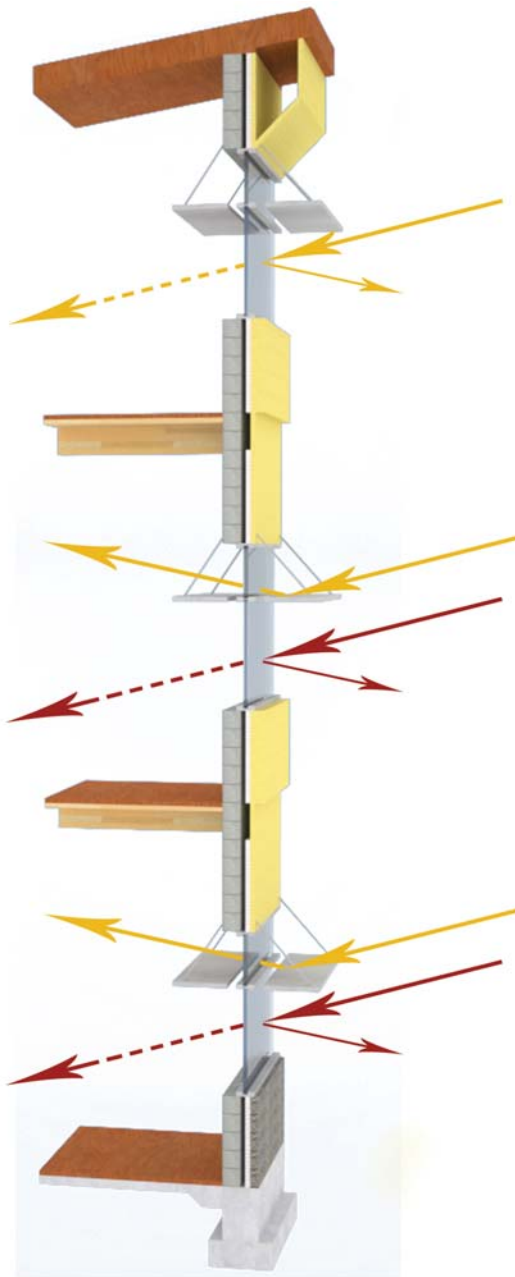


Figure 78 - Wall Section of Building Envelope

The Design Process



SAGE GLASS APPLICATION

- ▶ SUNLIGHT
- ▶ SUN HEAT

Glass gives occupants of a building a visual connection to the outdoors. With natural light filling a space, people are happier, healthier, and more productive. When the heat and glare from the sun are prevented, the quality of life of those occupants increases.

Sage glass significantly reduces the energy consumption needed to heat and cool a building. This product truly gives occupants individual control over how they want a space to feel. The glass can become as opaque or transparent as the users want/need, which creates a space that can be bright and vibrant or dark and intimate.

Figure 79 - Sage Glass Application Graphic

The Design Process

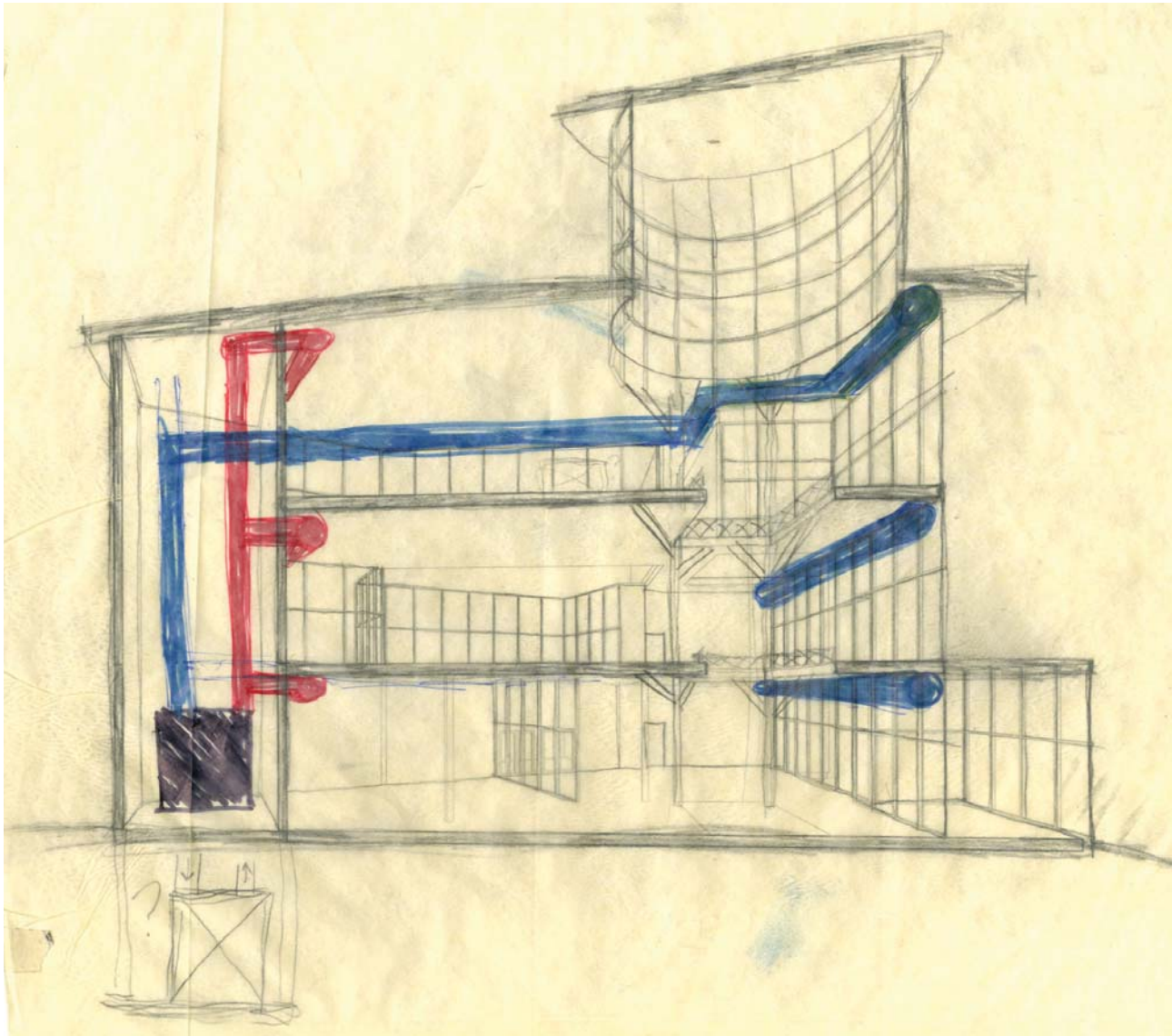


Figure 80 - HVAC Design Development



The Design Process

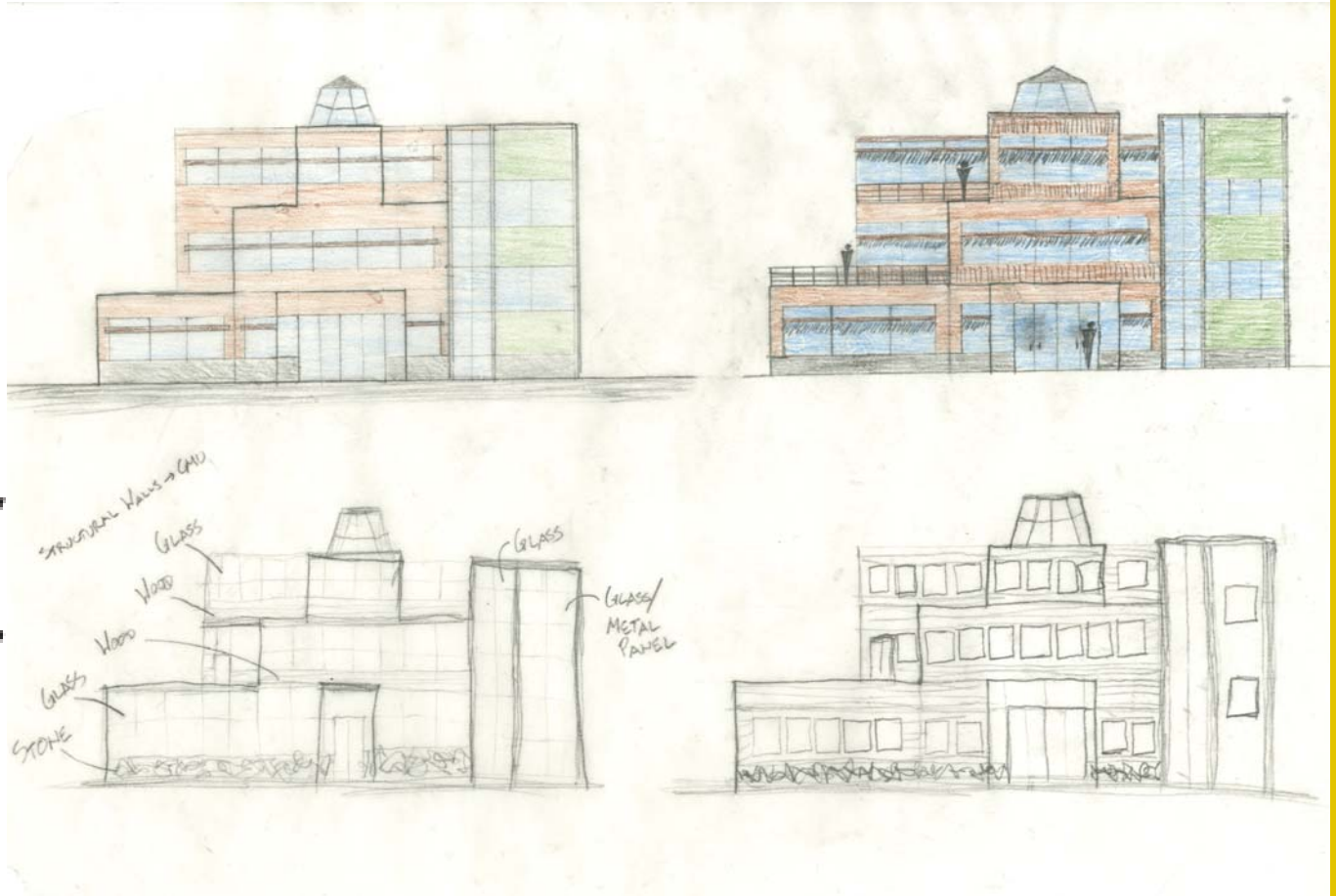


Figure 81 - Elevation Study Development

The Design Process



Figure 82 - Process Structural Model



The Design Process



Figure 83 - Process Atrium Model

The Design Process

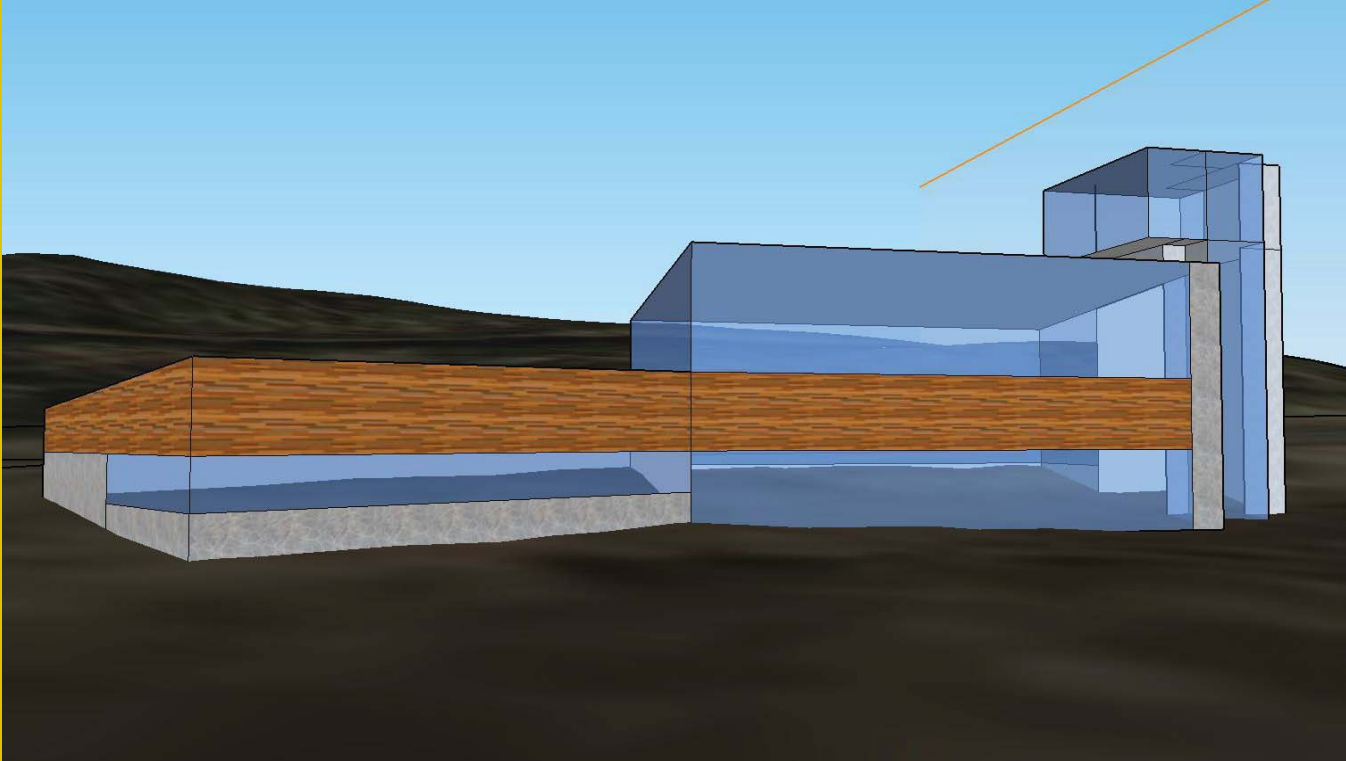


Figure 84 - Process Building Mass

The Design Process



Figure 85 - Process Building Mass

The Design Process



Figure 86 - Process Interior Study

The Design Process

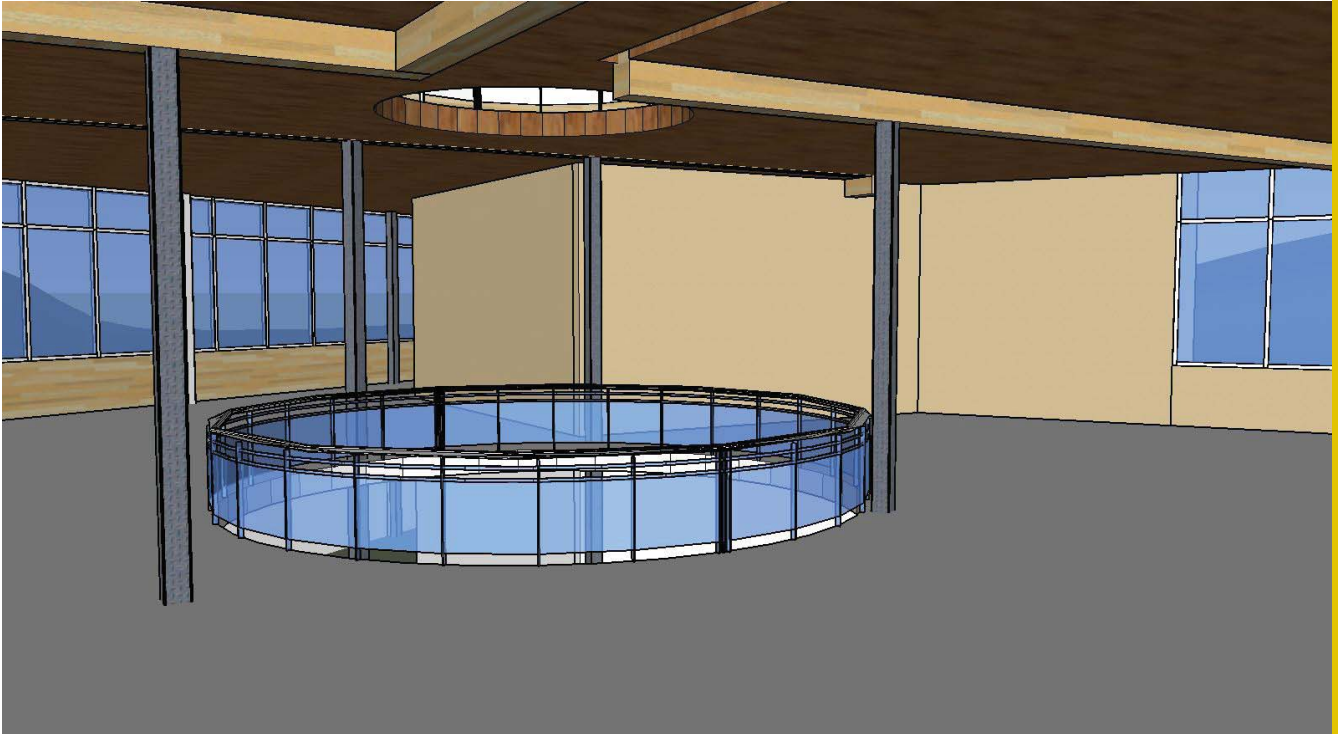


Figure 87 - Process Interior Study

The Final Design



Figure 88 - Final Building Design

The Final Design

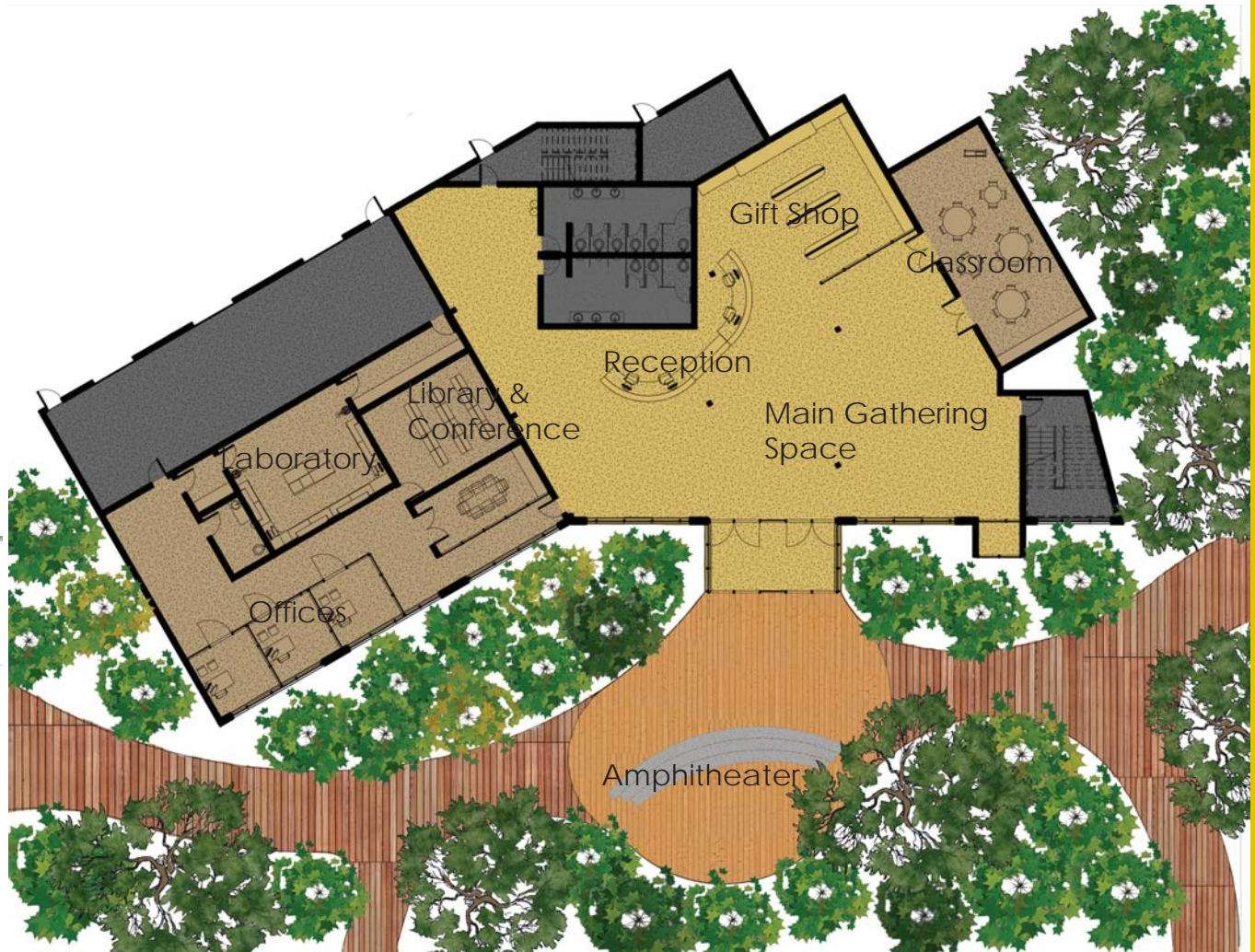


Figure 89 - Ground Level Floor Plan

The Final Design

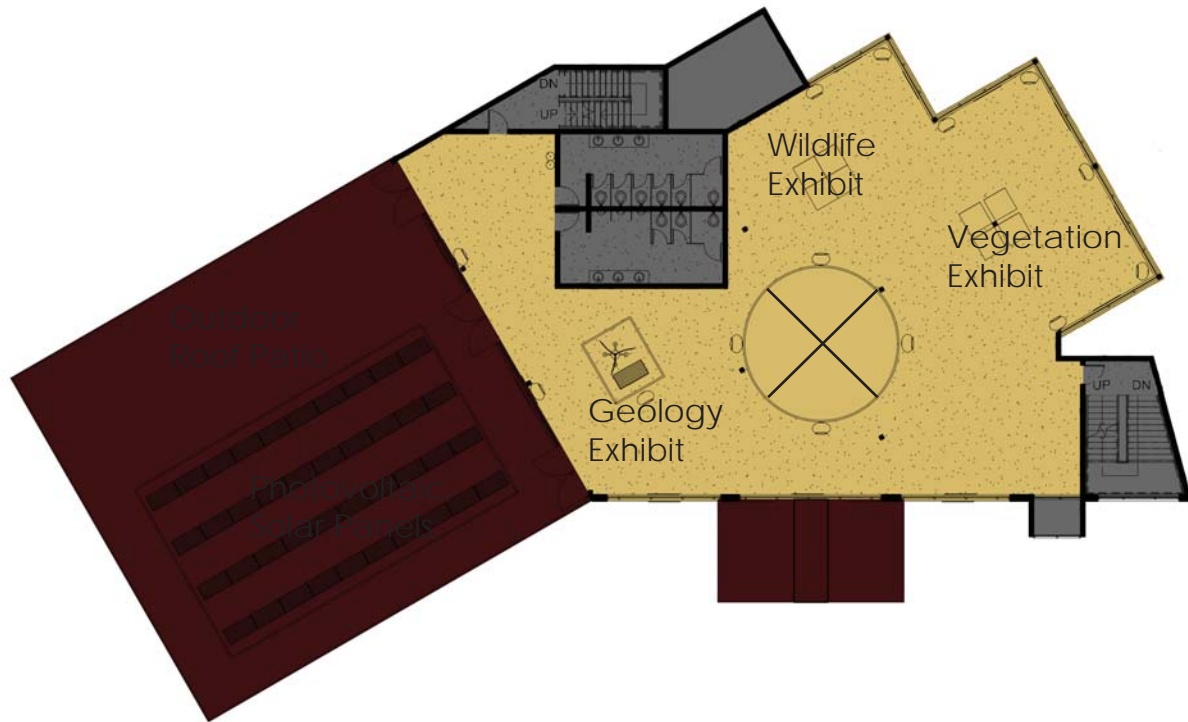


Figure 90 - Level 2 Floor Plan

The Final Design

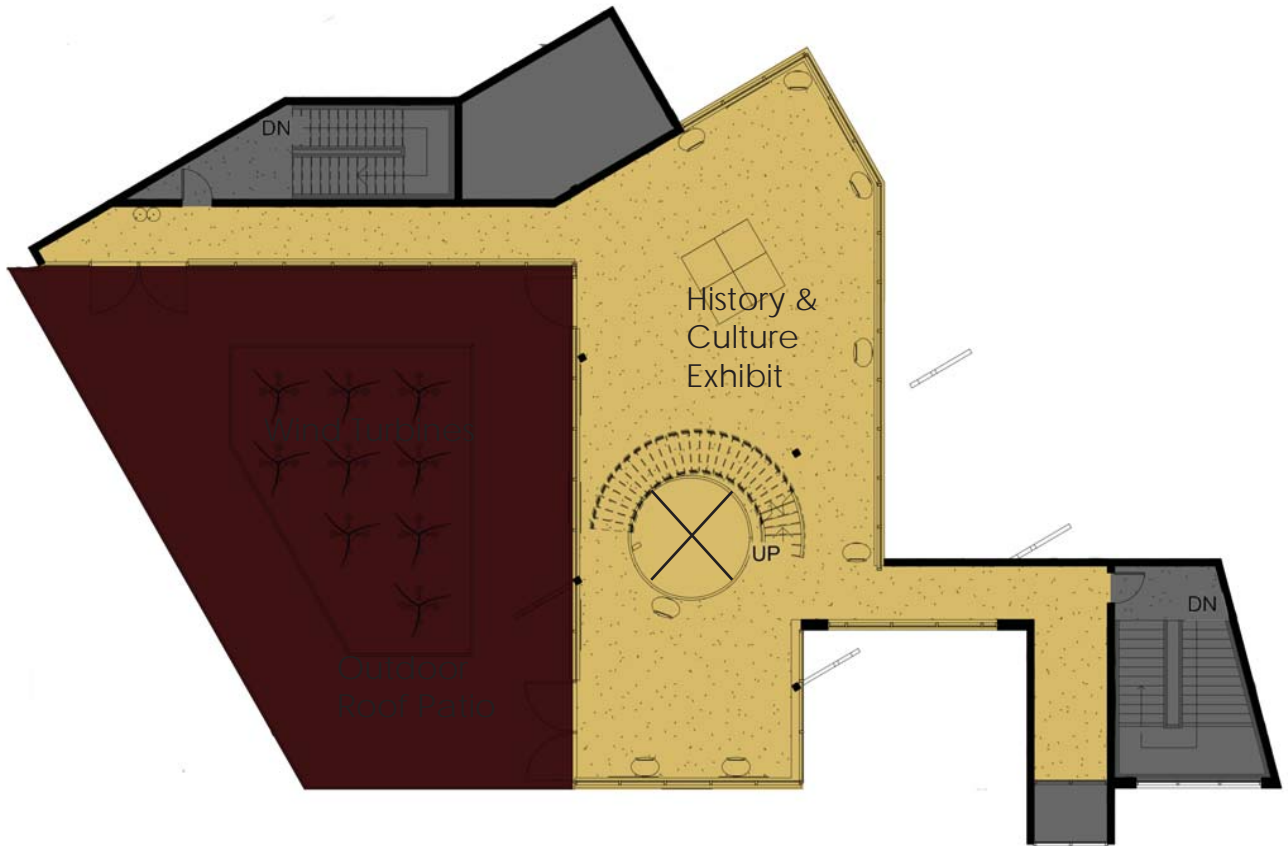


Figure 91 - Level 3 Floor Plan

The Final Design



Figure 92 - View From North Shore Drive

The Final Design



Figure 93 - View of Site Pavilion Along Lake Superior Shoreline

The Final Design



Figure 94 - First Floor Gathering Space

The Final Design



Figure 95 - Second Floor Exhibit Spaces

The Final Design

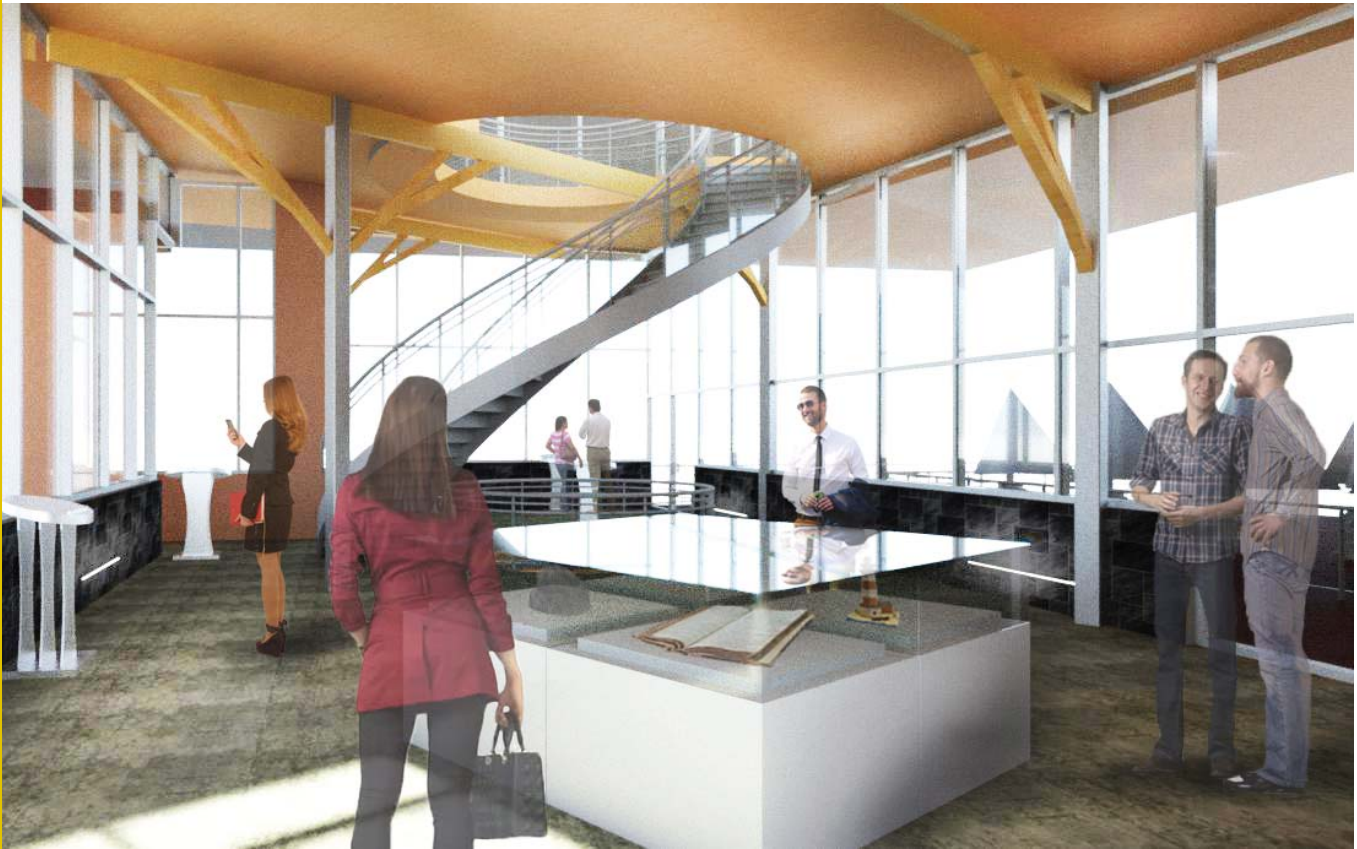


Figure 96 - Third Floor Culture Exhibit

The Final Design



Figure 97 - Laboratory

The Final Design



Figure 98 - Office/Faculty Office Spaces

The Final Design

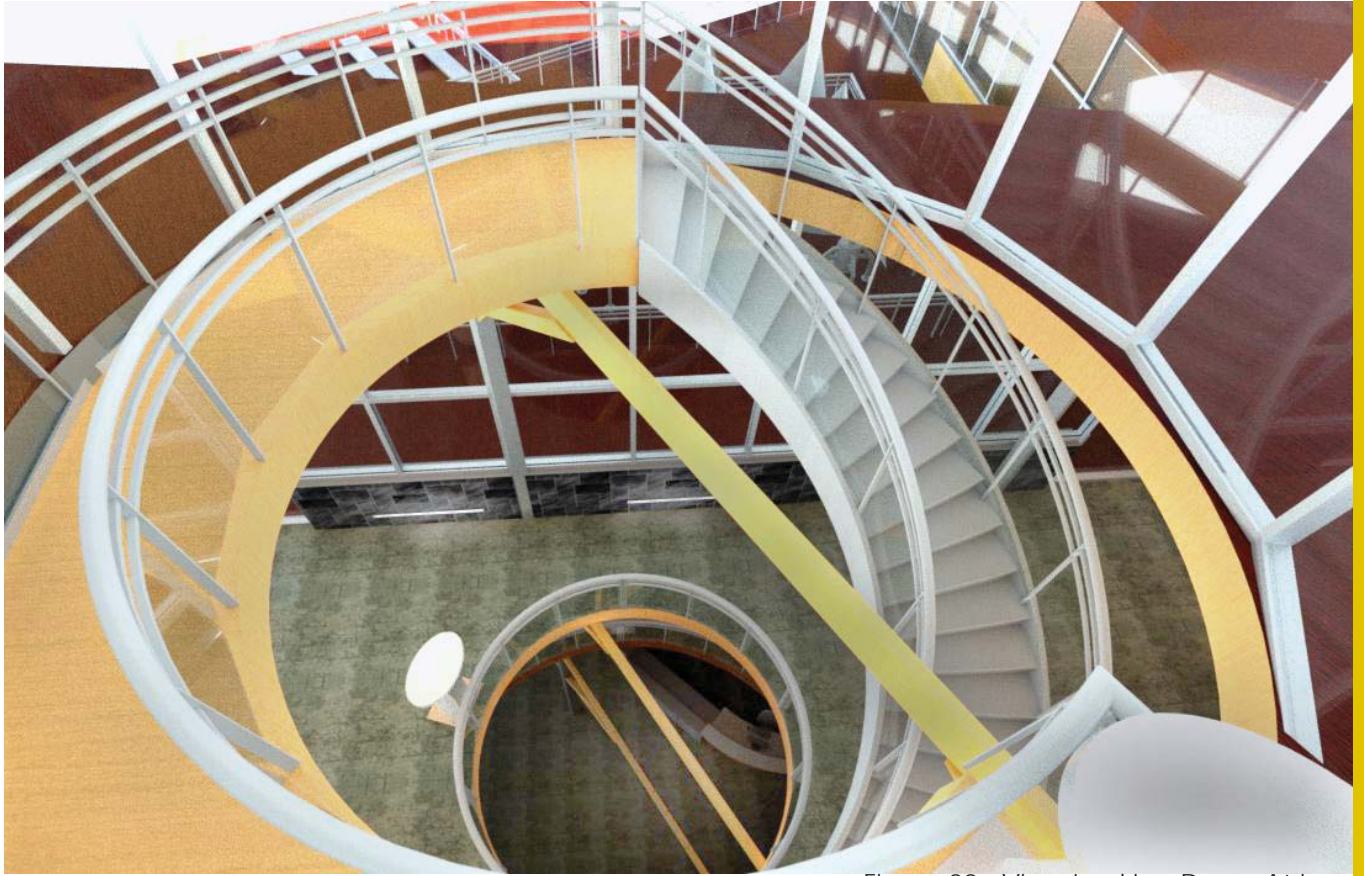


Figure 99 - View Looking Down Atrium

The Final Design



Figure 100 - Section Perspective

Human's Offense - Nature's Defense
North Shore Research and
Interactive Visitor Center
craig.cusick.cc@gmail.com
Craig Cusick [M. Arch Thesis 2016]
p. 110

The Final Design



Figure 101 - Section Perspective

Human's Offense - Nature's Defense
North Shore Research and
Interactive Visitor Center
craig.cusick.cc@gmail.com
Craig Cusick [M. Arch Thesis 2016]
p. 111

The Final Design

Throughout the design process, many challenges presented themselves. This design embodies many characteristics of the North Shore and why it has such a tremendous impact on those who live and visit there. The structure of the building follows suit from the floor plans; spaces were laid out while the structure followed, allowing for a fully integrated interior space.

The structure follows suit of the natural world that surrounds it and embraces the notion that if the structure were the only thing standing, a spacial configuration could be determined. The materials chosen to clad the exterior of the building are local to the area and offer an even deeper connection to the outside world.

The building celebrates a main, central atrium space that recedes as it rises up the respective floors. This receding mimics the outline of a lighthouse, which is yet another celebration of the culture and history of the North Shore. This is further embodied in a clerestory above the atrium, allowing for natural light to flood every visitor-occupied space in the building.

A place along the north shore where professionals and visitors are able to make encounters with the natural world and discover its importance and impact is the purpose of this facility.

As humans, we need to accept the reality that mother nature will eventually take back what she has given us, and design for its eventuality.

Summary

This thesis focuses on the importance of the preservation and protection of the natural world, and how citizens of urban environments can learn to interact with nature in a positive way. The north shore of Lake Superior is one of the most visited places in Minnesota and is rich with a wide variety of vegetation, and wildlife. The region is also complete with some of the oldest cliffs and rock formations on the entire planet.

Through research and information gathering on this subject, it can be concluded that an interpretive visitor center and multi-disciplinary research laboratory that focuses on the issues concerning the wildlife, vegetation, hydrology, and geology of the north shore region of Minnesota will be beneficial for the area. Visitors and locals alike will learn and react to the findings of researchers and scientists. This will help spread the word about the importance of protecting this world that we have been given.

The importance of Lake Superior itself and the historical and cultural significance it has held for the people of the region is also a subject that will be explored and understood through a visit to this facility. The importance of protecting nature can be learned from visits to the various state parks in the north shore region, but only about those specific areas. The more research that was done about these topics, the more it became apparent that a facility that focuses on the protection of the natural world and its ecology is extremely important to have, especially in an area that has undergone an extreme amount of change in the past 100 years; from iron ore shipping ports being developed to high traffic roadways leading visitors up and down the shore line.

Summary

Figure 103 - View of Lake Superior from Shovel Point (Tettegouche State Park)



Figure 104 - Split rock
Lighthouse State Park



Appendix

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Appendix

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Appendix

Previous Studio Experience

2nd Year Fall Instructor-Stephen Wischer
Tea House, Moorhead, MN
Boat House, Minneapolis, MN



2nd Year Spring Instructor-Rhet Fiskness
Dance Studio, Moorhead, MN
Culinary School, Dubai, UAE
Sense Pavilion, Fargo, ND



3rd Year Fall Instructor-Paul Gleye
Pizza Patrol, Moorhead, MN
Scheels Sporting Goods, Moorhead, MN
Streetscape Redesign, Moorhead, MN



3rd Year Spring Instructor-Bakr Aly Ahmed
NDSU Culinary School, Fargo, ND
Border Crossing Station, Al Ain, UAE



4th Year Fall Instructor-David Crutchfield
High Rise, San Francisco



4th Year Spring Instructor-Steve Martens
Historic Preservation, Churchill Hall
NDSU Campus, Fargo, ND



5th Year Fall Instructor - Mark Barnhouse
Wetlands Research Facility, Ulen, MN



The Designer



Craig M. Cusick

Hometown: Lakeville, MN

“North Dakota State University has given me the opportunity to gain a sense of individuality and presented me with challenges that I have been proud to overcome. I am proud to call myself a Bison!”