Thesis

REGIONALISM AND SUSTAINABLE DESIGN

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INTERIOR DESIGN

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THESIS STATEMENT

This project explores the interaction between regionalism, in particular, local topography and architectural traditions on sustainable design as demonstrated through the design of four middle schools in different geographic locations.

ABSTRACT

Over the past decade, the measurement for sustainable design has become a national standardized point-based system. The U.S. Green Building Council’s (USGBC) measure, Leadership in Energy and Environmental Design (LEED) Rating System, is the leading national standard for evaluating a building’s level of sustainability. Few, if any, studies have explored whether a national standard is a suitable measure across all U.S. regions.

Local topography and architectural traditions influence a region’s sustainable design decisions. This study explored the interaction between regionalism and sustainable design. In addition, the researcher designed elements of two middle schools interiors to highlight regional differences.

To undertake the study, four rural counties, each in a different US geographical regions, were selected. The investigator visited each location, interviewed practitioners, met with students and teachers, and visited various middle schools. In addition, the researcher visited LEED certified schools around the country and interviewed LEED Accredited Professionals who worked on these schools. After the background research for each site was completed a criteria was created to select the specific site for each county.

While the original intent of this study was to explore the effects of regionalism on sustainable design, the conclusion drawn is regionalism effect sustainable design as much as sustainable design effects regionalism.
**Table of Contents**

**Background Information**
- 2 Regionalism
- 3 Sustainable Design
- 4 Middle School Design
- 9 Benefits of Sustainable Schools
- 12 Benefits of Small Schools
- 15 Curriculum
- 17 Typology Studies

**Exploration**
- 26 Site Selection
- 27 Comparison Summaries
- 35 Elmore County
- 43 Lawrence County
- 51 Napa County
- 59 Santa Fe County

**Design**
- 68 Concept
- 70 Program Diagrams
- 75 Schematic Diagrams
- 82 Final Design

**Conclusion**
- 89 Conclusion

**Appendix**
- 92 Bibliography
- 93 Endnotes
- 97 Illustrations Cited
List of Illustrations

2  Image 1: Visual Definition of Region
4  Image 2: Welcome Area
5  Image 3: The Ford Model
5  Image 4: Soft Architectural Divisions
6  Image 5: Small Niche
6  Image 6: “L Shape” Area
7  Image 7: Standing Height Computer Stations
7  Image 8: Dual Windows Walls
8  Image 9: Indoor/Outdoor Connection
9  Image 10: Benefits of Green Facilities
10 Image 11: Productivity Gains
10 Image 12: Health Gains
11 Image 13: Productivity Gains
12 Image 14: Benefits of Small Schools
13 Image 15: Interaction with Community
13 Image 16: Community Connection
17-18 Image 17 - 21: Avon Middle School
19-20 Image 22 - 28: Sue Cleveland High School
21-22 Image 29 - 34: Marin Country Day School
26  Image 40: Region Map of United States
28  Image 41: US Census Data
29  Image 42: Topography Measures
30  Image 43: Comparison Chart
31  Image 44: Temperature and Precipitation
32  Image 45: Wind Power Map
32  Image 46: Solar Radiation Map
32  Image 47: USDA Plant Hardiness Zone
33  Image 48: Elmore County Stacked Images
33  Image 49: Lawrence County Stacked Images
34  Image 50: Napa County Stated Images
Background Information
With such a large geographic country, the United States (US) is broken down into various regions. These division can be based on various similarity categories, such as culture, politics, religion, physical geographic similarities, and climate. A region, according to the dictionary, means, “a part of the earth’s surface (land or sea) of considerable and usually indefinite extent.”

In short, a region is an area often linked by similar physical and/or humanistic characteristics. Physical characteristics usually refer to the environment within a defined area, such as mountain ranges, climate, soil types, ecosystems, and bodies of water. Human characteristics refer to population within a defined area, such as culture, history, politics, and religion.

The application of the term region is not based on a ridged definition, but rather on the relative physical and/or human characteristics within the defined area. For example, within the United States various large regions can be created, such as Northwest, Northeast, Southwest, and Southeast. Furthermore, within these regions, smaller sub-regions can be created. For example, Alabama, Georgia, and Mississippi (all in the southeast) are more culturally linked together than Florida. While the Appalachian area is physically connected by the mountain range. As demonstrated, as long as the metric is clearly defined, a region can be almost anywhere.
Since the Industrial Revolution human kind has attempted to control the natural world and its environment, which can certainly be seen in the shift of building design. Prior to the Industrial Revolution, people built structures based on the local culture, climate, and materials.\(^2\)

With the advent of the Industrial Revolution technology was able to mass-produce materials and transport them to far distances. No longer was the climate inside affected by the climate outside.

Today, building design continues to try to control the environment resulting in negative by-product such as pollution, ozone depletion, global warming, and serious health problems for human.

With this standardization, design no longer needs to take location into account. As a result buildings in the US consume thirty percent of the world’s total energy and sixty percent of the world’s electricity. And every day the US consumes five billion gallons of fresh or potable water to flush toilets.\(^3\)

In reaction to the modern building practices a new approach – sustainable design – was born. Sustainable design is “a design philosophy that seeks to maximize the quality of the built environment, while minimizing or eliminating the negative impact to the natural environment.”\(^4\)

In the United States, the U.S. Green Building Council (USGBC) was created as a guide for sustainable building practices. In 1999, the USGBC created a rating system called Leadership in Energy and Environmental Design (LEED) to classify the sustainability level of a building.\(^5\)

However, while the LEED rating system allows for accountability, it creates a check sheet based on discrete measurements. It is important to remember that sustainable design is not about various unrelated design decisions, but instead a holistic approach to design.\(^6\)

As Jason McClennan wrote, “Sustainable Design helps instill a sense of responsibility and higher purpose back into design. Designers who adhere to the philosophy are not merely providing a product or commodity, but they are providing a service that goes beyond the immediate client to other people, to other species and even to future generations.”\(^7\)
Flexibility of Space

A middle school is mostly comprised of students ranging in age from 11 to 14 years old. While the students might have the majority, administrators, teachers, staff, the community, and visitors all use the space as well. Throughout the design of the school, flexibility should be taken into account to ensure all users can benefit from the space. The following pages will explore possible solutions to address flexibility in the various areas of the school.

Welcome Area

The welcome area is the main entrance into the building. It is also the contact point between the school and the community. With these two things in mind, placing the school office in the welcome area allows for guests to be welcomed into the space, and to ensure security within the building.

Outside the welcome area a covered entry is a valuable asset to help distinguish the entry from the rest of the building and to help user during inclement weather. Also, providing a covered (or indoor) bike rack near the entry helps encourage students to bike to school helping to reduce the number of cars on the road.

Student Display Areas

Student display space is not a defined area within the school, but can be anywhere and can be found in many forms, such as electronic media, photos of the students working, final projects, and even school gardens. But most importantly, this space needs to showcase authentic student work for others to appreciate these achievements.
CLASSROOM AREAS

Historically schools used the traditional plan, also known as the Ford Model, to design schools. Basically this design placed several classrooms right next to each other along a long corridor. This design model assumes that every student has the same learning style, learning is passive, and learning happens under the control of the instructor.\(^1\)

Then in the 1970s, in an attempt to break away from the traditional plan and allow for more flexibility, team-teaching with the open classroom movement became popular. This design called for moveable walls between spaces. While it might have had good intentions, the reality was the walls were rarely moved to accommodate the varying situation.\(^2\) As times progressed the emphasis has shifted toward "partial definition," which creates distinct flexible spaces within a room either by furniture clusters or soft architectural divisions. This is a great way to allow teachers flexibility in their classroom without having to move heavy walls.\(^3\)

Today, a typical classroom ranges from 23 to 25 students with a minimum of 770 square feet. Speciality classrooms, such as science, art, and music, range in size and are usually larger because of the speciality needs of the space.\(^4\)

Finally, a middle school is designed to be a transition between the self-contained classrooms in an elementary school and the subject based classrooms in a high school.\(^5\) During this time of transition, it is the first time the students are given a sense of personal responsibility to move around the space. Therefore, it is important to design the space to help the students adjust to this change.
One design solution is to design each classrooms slightly differently. This variety helps the students adjust their minds for the next class or subject, even minor differences can have a major impact.  

**Kitchen and Eating Areas**

Traditionally cafeterias were set up to “feed x number of students in a given period of time.” This type of design makes the most sense from a logical standpoint, but it does not make sense from an educational standpoint. By making the cafeteria only a place to eat, the students are detached from the food process of understanding where the food actually comes from and culturally why a particular food is important.

Many different designs can help to create a learning atmosphere, such as creating spaces for students to help serve the food, prep and cook the food, and help with the clean up. While integrating the students into the functions of the cafeteria is a great learning tool, this type of design is not always possible depending on the programing of the school.

Simple selection and arrangement of furniture can also create a learning environment, such as creating different table sizes and/or booth seating. This helps allow for different size student groups to gather and can help students work on homework and/or other school projects while in the cafeteria. Taking that idea even further, if the cafeteria is open all day it can become a place for the students to gather and work during all times of the day similarly to a traditional school library. Cafeterias no longer need to be used for only one function.

**Small Gathering Areas**

As students get older, creating a feeling of independence and privacy is important for their development. Creating spaces that allow for small groups to gather help to create this feeling within the students while also ensuring they are continually supervised. It is shown that most students do not like to gather or socialize in groups larger then seven. This should be taken into account when deciding the seating within a small gathering space.
Small gathering areas can easily be integrated within the design of the school. For example a small niche or seating area around a doorway of classroom can become a gathering space. These spaces can also be created as easily as placing furniture in an “L shape” creating a sense of an enclosed area for private conversation, while not fully closing off the space from supervision.

**Computer/Technology Areas**

Twenty years ago computer labs were designed as a space where students would go and learn on the computer and was not integrated within the larger building. This type of design constrains the student and result in technical limitations.

Today computer labs are no longer needed. Thanks to lap top computers and wireless, technology can be used anywhere allowing the students flexibility. Another way to integrate computers into the school is to create standing height stations in the hallways or storage unit space with permanent computers allowing students and faculty the ability to use a computer quickly.

**Passive Supervision**

Designing high levels of visibility to all areas of the school, creates a sense of openness, and helps with security. For example (as shown in image 8), by placing windows on both the exterior wall and the interior wall separating the classroom and the hallway, natural light can reach all areas of the school and teachers can observe both the students in their classroom and in the halls.
BATHROOMS

Bathrooms can create a trouble space for many students. They usually feel cramped, dirty, and can be places of trouble. Many times there are few large bathrooms which require students to walk long distances and feel a lack of privacy. This can be particularly important for middle school children when many physical changes are happening and privacy is important. To combat this problem, creating smaller bathrooms that are placed more frequently throughout the school allows for safer more private space. 29

INDOOR/OUTDOOR CONNECTION

Most of a student’s day is spent indoors. Designing a connection between the indoors and outdoors can help greatly with a students education. “Human beings are genetically engineered to be outdoor animals and the need to be connected to the outdoors is never stronger then when we are young.” 30 For example, creating lines of site outside a window allows for tired eyes to readjust and focus on something else for a minute. 31

The outdoors can also create a great learning environment. Outdoor space allow students to participate in learning that cannot happen indoors, such as gardening, running around, messy activities, and nature walks.

INDIVIDUAL STORAGE UNITS

Historically, individual storage units were frequently designed with the traditional metal locker material and placed along the hallways. This trend is changing quickly and new materials that are more durable and quieter are being used. These units are also being design to not only hold the students personal belongings, but also to be a place where the students can go and work alone. 32 It is also important that Individual storage space be an area with constant passive supervision to help control student altercations. 33

TEACHER WORK AREA

Without teachers students cannot learn. Providing teachers what they need is vital to a child’s education. But like children, no two teachers are the same. Designing flexible spaces that provides the needed facilities for any teacher is extremely important 34 because over time, a classroom can hold a progression of teachers. Teachers also need storage and each teacher has a different way to file. Again, designs that are flexible help the teacher properly store the necessities for the class. Art, music, and science classrooms are in particular need of large flexible storage space for the teachers. 35
Benefits of Sustainable Schools

Today, fifty-five million students spend their day in school. Which means these students “typically spend 85% to 90% of their time indoors”. The benefits of sustainable schools is greater then reduced energy loads and a lower carbon footprint. These schools also have a large impact on the learning environments for the students.

Sustainable schools improve student performance, health, and reduce number of student absentees. The health and productivity of students are linked to building attributes, such as indoor air quality, light levels, air flow, and temperature. “Seventeen separate studies all found positive health impacts from improved indoor air-quality, ranging from 13.5% up to 87% improvement.”

Students are not the only ones who benefit. Sustainable schools reduce teacher sick days, reduce operation and maintenance costs, improved power quality and reliability, increase state competitiveness, reduce social inequality, and education enrichment. For example, sustainable schools use an average of 33% less energy than conventional school.
Image 11: Productivity gains from improved temperature control.

Image 12: Health gains from improved indoor air quality.
Image 13: Productivity gains from high performance lighting systems.
Regionalism and Sustainable Design

Benefits of Small Schools

Large vs. Small

To help build “strong school communities means fighting the social trend of bigger everything, the trend of super-stores and massive shopping malls” by creating smaller more intimate schools.

Many studies show that students in smaller school are more academically successful, have a higher graduation rate, are more likely to take advanced level courses, and are more likely to participate in extra-curricular activities. With a more intimate setting, teachers understand and know each student individually and can adjust to each students needs and learning styles more easily.

In smaller schools, a larger percentage of the students can participate in extracurricular activities because of the small student population. Extracurricular activities are associated with many positive outcomes, such as students have a more positive experience and feeling towards their school, helps create higher self-esteem, and higher expectations of attending college. Further along those lines, extra-curricular activities have been linked with higher grade-point averages, higher standardized test scores, and better attendance rates.

Smaller schools also create stronger relationships between the students and teachers, as well as, the students to other students. This in turn creates a sense of mutual respect for each other and a feeling of less alienation and isolation helping to lower the violent incident rate.

Many times smaller schools mix different age groups and different grades in the same classroom because smaller schools usually have less resources. Research shows a positive impact on students because teachers focus on each students as individuals because of the varying academic levels. Furthermore, the additional focus of the teachers
on each student helps to reduces the achievement gap between rich and poor communities.\textsuperscript{48}

The students are not the only ones to benefit from smaller schools. Teachers report a greater job satisfaction and a stronger professional community.\textsuperscript{49} And finally, a smaller administration allows teachers to have more control of operation, and feel like their voices are heard more often.\textsuperscript{50}

**Integration of Community**

The trend today is not only to build larger schools, but also to build these schools on the outskirts of an existing town or city center, called “school sprawl”.\textsuperscript{51} The reasoning behind building schools further out is because of the availability of large pieces of land. Moving the school out of the center creates a physical disconnect between the schools and the community.

The consolidation of smaller schools to much larger schools on the outskirts of town are a major threat to rural areas effecting both the community and the students. The long bus rides for the students and the disassociation of the school to the community\textsuperscript{52} helps create student anonymity and social alienation.\textsuperscript{53} Further along these lines, when a school is out of site, it is out of mind shrinking the pool of adult role models and volunteers for the school and students.\textsuperscript{54}

Many time small schools act as the social and economic hub that binds small communities.\textsuperscript{55} These “school buildings are symbols and landmarks. They can and should be a source of pride and a symbol of the community, as well as a center of the community”.\textsuperscript{56}
Schools play a huge role in the life of a neighborhood by becoming a place for the community to gather for all generations helping to integrate the students and the entire community into the pride of the school. When schools are perceived as a resource for the community-at-large, value is created for the school which helps communities realize added vitality.

Many times, especially in rural communities, which do not always have the same resources, schools may be the only public facility near by creating the need to have the building used by the entire community.

Finally, adaptive re-use can do more for the community then just creating a good new school. It creates a community resource from a previously abandon or unproductive property, it can help reduce construction costs and land acquisition, revitalize existing neighborhoods, and help combat the current sprawling trend (as discussed previously).

**Shared Spaces**

One problem with smaller schools is the reduced number of specialized professionals and a smaller building footprint creating difficulty to provide all the needed facilities on the actual school site. But when a small school is situated within the community, other non-school sites can be used to provide the needed programs and facilities. Sharing spaces and facilities with the community helps “puts the public back into public education.”

Shared spaces also expands the learning opportunity for students that may not exist within a school building. These student come in contact with others who may be a specialist in a particular field. For example, sharing a facility with a professional theater or museum integrates the students with professional actors and directors giving them an opportunity to work with experts.

These spaces can also grow the physical resources for the school and the community. For example, sharing space with a city or county library helps greatly expand the range of books, computers and other resources available to both the students and community.

And finally, sharing space not only benefit the students, but educators and other individuals within the community. Through shared resources everyone can gain a wider range of programs and services.

**Walkability**

Smaller schools serve a smaller geographic area. By serving smaller geographic areas there is more opportunities for the students to walk and/or bike to school. When children walk or bike to school instead of their parents driving them a sense of independence is fostered. Additionally an added benefit is the daily physical activity twice a day for the students.

Many programs today encourage walking to school. One being The Walking School Bus. This is an organized walk to school with many children and one or more adults, who can be either a parent or someone from the community. And finally, schools benefits greatly by the reduced traffic congestion, the reduced or lack of bus service, and helping to have students arrive to school on time.
Integrated Curriculum

While the design of a building can contribute greatly to the success of the school’s programs, a building does not determine whether students learn. As mentioned earlier, no two students are alike. Designing multiple learning paths help ensure all students retain the information.

“In a 2008 survey by the UK group, Campaign for Learning, it was revealed that 52% of the average student’s time is spent copying notes from a book or whiteboard. The same survey revealed that what children want more of is to learn in groups, to learn in a hands-on manner, and to learn with computers”.71

Today, “children experience a dearth of activity, not information. They need more opportunities to touch, to construct and to test the information that inundates them”.72 Experiential learning and integrated curriculum help improve student motivation and student effort by giving students opportunities to touch, construct, and test information.73

For example, a school greenhouse or garden is a great place for active engagement. Currently, at Santa Fe Prep in Santa Fe, New Mexico the school garden connects students with their food and provides time to reflect on the day.75

Problems with school gardens are the upkeep and maintenance over the summer. During the summer months most schools are closed. At Santa Fe Prep, the school’s summer camp offers a daily activity of working in the school garden helping to ensure its survival.76

Gardens are just one way to have experiential learning. The school buildings can also be a great learning tool. George Ellory Hale at the GreenBuild Conference in Phoenix, Arizona said “campus architecture should be a part of a student’s education.”77 It is something the students can touch, interact with, and see everyday and is a teaching tool right at the teachers finger tips and should be used frequently.

In sum, David Thornburg, who is the founder and director for Global Operations of the Thornburg Center, created a set of metaphors for learning. These metaphors take basic interactions between human and nature to describe places of
These metaphors are great example of how to create different learning environments for the students. The first is the campfire space, which is places to learn from experts or professionals. Thousands of years ago the campfire was where stories were told, and the elders were able to pass down information to the younger generation.

The second is the watering hole space, which is places to learn from your peers. Throughout history every community is centered around water becoming the point where everyone gathered. It was a place where neighbors would share and chat with each other.

The third is the cave space, which is places to learn from yourself. Historically, this was the place where a person would be on their own and come in contact with only him or herself.

And finally, the fourth space is the life space, which is places where you bring it all together and apply projects in the real world. Even after a full understanding of a topic, subject or idea, one does not know if it works until he or she applies it to real life.

**School Culture**

The school culture is extremely important to a students learning environment. Students want to fit in and be part of what is cool. A strong classroom culture or school culture are very valuable tools to govern the achievement of students. Students will adjust their attitudes and efforts to fit into the culture around them. By cultivating positive peer pressure all students will work harder and produce better work.

One of the first steps in cultivating this type of learning environment is “to have assignments that inspire and challenge students. There’s only so much care and creatively that a student can put into filling in the blanks on a commercially produced worksheet.”

Every town and community is full of history, full of public records that no one reads, full of environmental conditions that no one studies, full of senior citizens, immigrants, and specialists who have all kinds of stories to be told. These basic resources should be used in the classroom.

For example, providing opportunities and spaces to have the students create art by working with professional artists of the area can give the students greater understanding of the craft. Or providing opportunities for the students to conduct environmental statistical research on a need for the community can give them an understanding of the world around them.

A second way to help create a strong leaning environment is to give greater meaning to the work. For example, rather then only having the teachers read the paper or project, make the work public. Allow the students to present to the other student or the community. This form of presentation give the students a “reason to care. The pressure of preparing for this community display, the daily focus on polishing work until it was worthy of presentation to the community” allows the student to shine and be proud of their work.
AVON MIDDLE SCHOOL NORTH

Completed in 2009, Avon Middle School North, located in Avon, Indiana, is seeking LEED Certification. If certified, it will become the first LEED Certified Middle School in Indiana.91

In terms of energy efficiency, the building has a tight building envelope and a white reflective roof helping to reduce the energy load and creating a 25% energy savings.92 The bathrooms all have low flow fixtures and waterless urinals helping to reduce the school’s water need and allowing for a 32% water savings.93

To encourage the students to recycle, through-

Image 17 (above): Large windows in the back of the cafeteria bring in lots of natural light. Image 18 (Below): The front of Avon Middle School North.
out the building recycling bins are placed next to every trash can. In the cafeteria, a sorting section helps divert waste from the landfill. And finally, a recycling storage room is located near the cafeteria to store all recyclables. While the original design had good intentions, the school administration has not ensured the recycling storage room is used properly. Instead today the recycling storage room has still not been cleared out, and is being used for basic storage space.

Other important design features include environmentally friendly materials, such as recycled content and regional materials, carbon dioxide monitoring is installed throughout the building, as well as, individual lighting and thermal comfort controls.

And finally, while many of the natural daylight design features were successful, not all areas of the school have natural daylight, such as some classrooms and large parts of the hallways.
Sue Cleveland High School

Completed in 2009, Sue Cleveland High School, located in Rio Rancho, New Mexico, is currently seeking LEED Silver. A primary design feature incorporated the mountain views throughout the school. For example, a giant glass window is placed behind the theater stage as a backdrop for performances.\(^98\)

In terms of energy efficiency, more than 600 geothermal wells are used, as well as, an abundance of glass to bring in natural light. To ensure the natural light enters the building without compromising the thermal comfort of the occupants, light shelves were placed around the building.\(^99\)

Other important design features include community gathering spaces, recycling bins next to every trash can, outdoor space on campus, and water efficiency through rain collection and low flow fixtures.\(^100\)
Image 24: A recycle bin can be found next to every trash can.

Image 25: Light shelf to help shade the classrooms from the sun's heat while still allowing in lots of light.

Image 26: An outdoor eating space for the students.

Image 27: Close view of the drainage system used to collect the rain water that is used to water the school fields.

Image 28: The gathering space between classrooms.
Marin County Day School

Marin County Day School, located in Marin, California went through two major renovations to enlarge the interior square footage of the school, to create a healthy interior, and to be an environmentally friendly campus. The first half of the renovation received LEED Gold for New Construction. The second half just finished in Fall 2009, and is applying for LEED Platinum for Schools. While it was desired to enlarge the interior square footage, the design team did not want to enlarge the original footprints of the buildings.

In terms of energy efficiency AC is not needed in any of the buildings (with the exception of the server room), thanks to the use of natural ventilation. White or green roofs are placed on all the buildings to also help reduce the energy load. And solar panels heat all hot water in the building and supply 60% of the electrical use at the school.

Various daylight techniques also help to reduce the energy load, as well as, help ensure all spaces in the school receive natural light. Some design

technics are light shelves, tall large windows, and glazed windows. These techniques ensure the classrooms do not heat up like a greenhouse in the summer, but uses the sun in the winter to help warm the room.¹⁰⁴

Water-efficient fixtures are used throughout, such as dual flush toilets and waterless urinals to reduce the water needs for the campus. In the new library and student building, gray water is used for the toilets. Storm-water runoff was also addressed to preserve the environment around the site. For example, a bioswale was installed on campus helping to filter storm-water runoff before it drains to the San Francisco Bay.¹⁰⁵

And finally, clean indoor air quality and eco-friendly materials were used throughout. All the wood used is either FSC Certified or reclaimed wood. The paints and sealants have no Volatile Organic Compounds (VOCs), and the carpets are Carpet and Rug Institute (CRI) Green Label tested carpet. Finally, green cleaning products and a well trained janitorial staff help to ensure a clean indoor air quality.¹⁰⁶

In terms of curriculum, Marin County Day School integrates sustainability into many classes. For example, the 5th grade class is given cameras for a period of time and these students go around the school and photograph what is working in terms of sustainability. One student noticed the soup spoons used were plastic, while the rest of the silverware was reusable. After the student photographed these plastic spoons, the school changed its policy on soup spoons, and changed them to silverware.¹⁰⁷

Image 31 (top left): An example of a green roofs on campus. Image 32 (second left): One of the school garden. Image 33 (third left): Outdoor seating provided for the students. Image 34 (bottom left): The school’s outdoor theater seating with trees planted throughout to help provide shading.
Sidwell Friends located in Washington, DC went through two major renovations - one of the middle school and the other on the lower school. Completed in September 2006, Sidwell Friends Middle School Building received LEED Platinum becoming the first LEED Platinum K-12 School and the first LEED Platinum building in DC. Completed in September 2007, the Sidwell Friends Lower School Groome addition and gym received LEED Gold.108

Today, 60% less energy is used through both energy efficiency and passive solar design, including ventilating and shading, and managing lights with occupancy sensors and photo sensors. Furthermore, photo-voltaic panels on the rooftop supply 5% of the school’s electricity.109

On-site, the sewage is treated by a man made constructed wetland allowing the water to be reused. Also, native plants allow for water efficient landscaping. These two design features help the

Image 35 (top): Sidwell Friends Middle School. Image 36 (bottom): Built in light shelves to shade the classrooms while still allowing light to enter.
school use 93% less of DC’s water supply than originally used.\textsuperscript{110}

Regional materials were used through the school reducing the energy need to transport the materials far distances. Around 78% of the materials originated within 500 miles of the campus.\textsuperscript{111}

In the school cafeteria recyclable, renewable, and biodegradable products are used. The school also uses organic products and fair trade coffee in the conference rooms and faculty lounges whenever possible.\textsuperscript{112}

All the cleaning staff are trained in green cleaning prior to and during employment. This ensures the school’s green cleaning program continues and the indoor air quality is maintained. The staff use energy-efficient equipment and Green Seal Certified cleaning products, including all paper products which are made from 100% recycled paper.\textsuperscript{113}

In terms of trash collection, a solar-powered trash compactor is used which operates on 100% solar energy. While its footprint is the same as an ordinary trash can, its capacity is five times greater shrinking the amount taking to the landfill. Also, a composer, which turns food waste into organic fertilizer for the campus garden, is used diverting trash from the landfill.\textsuperscript{114}

And finally, Sidwell Friends ingrates sustainability into the school’s curriculum. For example, the middle school students explores the effects of the campus on the surrounding area. They particularly studied how the stormwater runoff is treated, where the drinking water comes from, and where the trash goes.\textsuperscript{115}
Four regions within the continental United States were selected to demonstrate the influence of regionalism on sustainable design. The MSN Encarta’s Climate Region Map was used to identify the four different regions.

To then narrow the location of the site, a specific county was selected within each region. The primary basis in selecting each county was persons per square mile*. This helped control for differences due to varying population densities and allowed this study to focus on variances which arise from regionalism.

And finally, a specific building and site within each county was selected. To ensure consistency between the four sites, a criteria was designed to evaluate each site. The requirements of the site were:

- Around 9,000 square feet
- Built in the traditional architectural style
- Surrounded by around 2 areas of land
- Located within .5 miles from a neighborhood
- Located within 1 mile of a public library

*To note, all counties have between 100-160 person per square mile with the exception of Santa Fe county which as 60 person per square mile. After researching all the counties within the southwest region, Santa Fe county was the best selection because the other counties were either had much smaller populations or are considered urban.
Comparison Summaries

To demonstrate the initial differences between each of the four counties, the US Census data was then reviewed to gain demographics for each county.

Image 41 demonstrates a quick demographics comparison of the four sites. As stated in site selection each county has similar population densities. Also important to note is that each county has between 20% - 25% of its population under 18 years old demonstrating a large percentage still under the school age.

After reviewing the demographics of each site, thirteen topography categories were analyzed both through statistical data, as well as, through visual maps.

Image 42 shows statistical data of the thirteen topography categories for each county. To note, major differences occur with annual precipitation, elevation, and number of sunny days. For example, Elmore county has an average of 53.3 inches of rain a year while Santa Fe county has an average of 13.8 inches a year.

Using the statistical data, image 43 shows a quick visual comparison of five of the topography categories. This is a quick demonstration of the major differences between the four sites.

After compiling the statistical data for both the demographics and topography of each site, visual maps of varying information were then reviewed to visually demonstrate the statistical findings.

Image 44 is a visual depiction of each state map where the counties reside demonstrating January temperatures, July temperatures, and precipitation patterns. These are extremely helpful to put the site in context with the sounding areas. Image 45, Image 46, and Image 47 are all maps of the United States to demonstrate the site’s natural resources in context of the continental U.S. These maps demonstrate wind power, solar radiation, and USDA Plant Hardiness Zones.

And finally, photos were taken of the exact same spot in each county on the same day five times throughout the exploration - September 17, 2009, November 11, 2009, January 15, 2010, March 15, 2010, and May 15, 2010. These photos visually demonstrate the season changes.
<table>
<thead>
<tr>
<th></th>
<th>Elmore</th>
<th>Lawrence</th>
<th>Napa</th>
<th>Santa Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>78,106</td>
<td>45,913</td>
<td>133,433</td>
<td>143,937</td>
</tr>
<tr>
<td>Persons under 18</td>
<td>24.6%</td>
<td>22.6%</td>
<td>22.5%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Persons 65 years old and older</td>
<td>11.5%</td>
<td>16.4%</td>
<td>14.5%</td>
<td>13.8%</td>
</tr>
<tr>
<td>White Persons</td>
<td>75.9%</td>
<td>97.7%</td>
<td>88.1%</td>
<td>92.4%</td>
</tr>
<tr>
<td>Black Persons</td>
<td>21.9%</td>
<td>0.6%</td>
<td>2.0%</td>
<td>1.3%</td>
</tr>
<tr>
<td>American Indian and Alaska</td>
<td>0.4%</td>
<td>0.3%</td>
<td>1.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Native Persons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian Persons</td>
<td>0.6%</td>
<td>0.5%</td>
<td>6.1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Native Hawaiian and Other</td>
<td>0%</td>
<td>0%</td>
<td>0.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persons reporting two or more</td>
<td>1.2%</td>
<td>0.9%</td>
<td>2.4%</td>
<td>1.5%</td>
</tr>
<tr>
<td>races</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persons of Hispanic or Latino</td>
<td>1.9%</td>
<td>1.1%</td>
<td>30.1%</td>
<td>50.1%</td>
</tr>
<tr>
<td>origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Persons not Hispanic</td>
<td>74.2%</td>
<td>96.7%</td>
<td>59.3%</td>
<td>44.4%</td>
</tr>
<tr>
<td>Housing Units</td>
<td>28,823</td>
<td>21,228</td>
<td>53,127</td>
<td>62,071</td>
</tr>
<tr>
<td>Median Household Income</td>
<td>$49,193</td>
<td>$42,018</td>
<td>$61,988</td>
<td>$51,601</td>
</tr>
<tr>
<td>Land Area (2000 sq mile)</td>
<td>621.26</td>
<td>448.83</td>
<td>753.73</td>
<td>1909.19</td>
</tr>
<tr>
<td>Persons per Sq. Mile</td>
<td>106.1</td>
<td>102.3</td>
<td>164.8</td>
<td>67.7</td>
</tr>
</tbody>
</table>

Image 41: A comparison chart of the US Census demographics for each of the four sites.
<table>
<thead>
<tr>
<th></th>
<th>Elmore</th>
<th>Lawrence</th>
<th>Napa</th>
<th>Santa Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Av. Jan. Temp. High (F)</strong></td>
<td>58</td>
<td>37</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td><strong>Av. Jan Temp. Low (F)</strong></td>
<td>35</td>
<td>18</td>
<td>39</td>
<td>15</td>
</tr>
<tr>
<td><strong>Av. July Temp. High (F)</strong></td>
<td>93</td>
<td>86</td>
<td>83</td>
<td>86</td>
</tr>
<tr>
<td><strong>Av. July Temp. Low (F)</strong></td>
<td>71</td>
<td>64</td>
<td>55</td>
<td>54</td>
</tr>
<tr>
<td><strong>Ann. Precip. (In.)</strong></td>
<td>53.3</td>
<td>43.3</td>
<td>23</td>
<td>13.8</td>
</tr>
<tr>
<td><strong>Ann. Snowfall (In.)</strong></td>
<td>0</td>
<td>14.8</td>
<td>0</td>
<td>25.8</td>
</tr>
<tr>
<td><strong>Sunny Days</strong></td>
<td>217</td>
<td>189</td>
<td>260</td>
<td>283</td>
</tr>
<tr>
<td><strong>Precipitation Days</strong></td>
<td>102</td>
<td>108</td>
<td>55</td>
<td>80</td>
</tr>
<tr>
<td><strong>Comfort Index (high=better)</strong></td>
<td>26</td>
<td>20</td>
<td>47</td>
<td>78</td>
</tr>
<tr>
<td><strong>Plant Hardiness Zone</strong></td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>5,6</td>
</tr>
<tr>
<td><strong>Av. Elevation (ft.)</strong></td>
<td>290</td>
<td>660</td>
<td>23</td>
<td>6935</td>
</tr>
<tr>
<td><strong>Wind Power (w/m²)</strong></td>
<td>0</td>
<td>0</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td><strong>Climate Zone Name</strong></td>
<td>Humid</td>
<td>Humid</td>
<td>Marine West</td>
<td>Semiard</td>
</tr>
<tr>
<td></td>
<td>Subtropical</td>
<td>Continental</td>
<td>Coast</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hot Summer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Image 42: A comparison chart of various topography measurements for each of the four sites.*
Image 43: A visual comparison chart of five topography measurements for each of the four sites.
Image 44: Visual comparisons of the temperature and precipitation for each of the four sites.
Regionalism and Sustainable Design

Image 45: United States Annual Average Wind Power Map.


Image 47: USDA Plant Hardiness Zone Map.
Image 48: Elmore County - stacked images.

Image 49: Lawrence County - stacked images.
Image 50: Napa County - stacked images.

Image 51: Santa Fe County - stacked images.
Elmore County, Alabama is located in the east-central part of the state only several miles from Montgomery and is approximately 620 square miles. The Alabama legislature created Elmore County on February 15, 1866 and named it after General John Archer Elmore, who came to Alabama in 1819 and was a veteran of the American Revolution.\textsuperscript{116}

In 1878 the Louisville and Nashville Railroad branch completed the Elmore station. In the 1920s, businesses flourished in Elmore, including a drug store, two cotton gins, a blacksmith, two meat markets, and a movie theater.\textsuperscript{117}

Today, Elmore county is the third fastest growing county in the state of Alabama.\textsuperscript{118} Like other small communities, the schools are a major component of the community. There are two public school systems - Elmore County Schools and Tallasee City Schools - as well as, three private schools.\textsuperscript{119}

Wetumpka holds the county seat and is the economic center for Elmore County. Located on the banks of the Coosa River, downtown Wetumpka has the status of a National Register of Historic Places District with its oldest building dating back to pre-1855. The evolution of Wetumpka’s architecture and development was influenced by both the topography of the region and old territorial road patterns.\textsuperscript{120}

The following three pages, pg. 36-38, document the surrounding areas through images taken during the Fall 2009 of the regional topography, local architecture, and county schools.

The site selected for the proposed school is the old Fain Theatre. This two story brick building was opened in 1913 by Mr. and Mrs. E.C. Fain and closed in 1975.\textsuperscript{121} Currently it is unused and boarded up. Pages 39-42 document the site.
Image 53: Local topography in Elmore County.

Image 54: Local topography in Elmore County.

Image 55: Local topography in Elmore County.

Image 56: Local topography in Elmore County.

Image 57: Local topography in Elmore County.
Image 58: Local architecture in Elmore County.

Image 59: Local architecture in Elmore County.

Image 60: Local architecture in Elmore County.

Image 61: Local architecture in Elmore County.

Image 62: Local architecture in Elmore County.
Image 63: A High School in Elmore County.

Image 64: Outdoor area in Elmore County school.

Image 65: A Middle School in Elmore County.

Image 66: An Elementary School in Elmore County.
Image 67: Location of proposed school site in relations to other key landmarks.
Image 68: Location of Site: 101 East Bridge Street, Wetumpka, AL 36093

Image 69: LEED Projects within 100 Mile Radius of Site
Image 70: Photos of the Proposed site.

Image 71: Proposed Building Site Plan
Image 72: Proposed Building Floor Plans.

FIRST FLOOR

SECOND FLOOR

8750 sq. ft.

1/32 = 1'0"
Lawrence County, Indiana is located in the southern part of the state and is approximately 449 square feet. The Indiana legislature created Lawrence County in 1818 and named it after Captain James Lawrence from the War of 1812. Lawrence County is known as the birthplace of “American Building Stone”, which began quarrying limestone in 1827.

Initially, limestone production was only used as foundations or windowsills. But production increased greatly by the 1880s thanks to the Chicago fire of 1871 where the only buildings left standing were made of Limestone and because of the railroads to Bedford. And by 1920, 80% of the limestone buildings in the United States used Indiana Limestone. For example, both the Empire State Building and the Pentagon are built with Indiana limestone. Today, the quarrying of limestone continues and is sent all over the world.

Bedford holds the county seat of Lawrence County. Surrounded by limestone quarries, Bedford is often referred to as the “Limestone Capital of the World”. Schools, churches, the homes are all made of Indiana limestone, but each with a varying style due to the time period it was built.

The following three pages, pg. 44-46, document the surrounding areas through images taken during the Fall 2009 of the regional topography, local architecture, and county schools.

The site selected for the proposed school is the old Milwaukee Railroad Depot. Designed by John R. Walsh and completed in March 1900, this passenger station is made completely of Bedford stone and the roof made of tiling. Currently, it is unused and boarded up. Pages 47-50 document the site.
Image 74: Local topography of Lawrence County.

Image 75: Local topography of Lawrence County.

Image 76: Local topography of Lawrence County.

Image 77: Local topography of Lawrence County.

Image 78: Local topography of Lawrence County.
Image 79: Local architecture of Lawrence County.

Image 80: Local architecture of Lawrence County.

Image 81: Local architecture of Lawrence County.

Image 82: Local architecture of Lawrence County.
Image 83: A Middle School in Lawrence County.

Image 84: An entry to a school in Lawrence County.

Image 85: A High School in Lawrence County.
IMAGE 86: LOCATION OF PROPOSED SCHOOL SITE IN RELATIONS TO OTHER KEY LANDMARKS.
Image 87: Location of Site: 31 I Street, Bedford Indiana 47421

Image 88: LEED Projects within 100 Mile Radius
Image 89: Photos of the Proposed site.

Image 90: Proposed building site plan.
Image 91: Proposed Building Floor Plans.
Napa County, California is located in the northwestern part of the state and is approximately 753 square feet. The California Legislature created Napa County in 1850 and named it after Napa Valley where it is situated.\textsuperscript{127}

During the gold rush in the early 1850s, Napa county grew tremendously. Gold miners found this city to be warm refuge from the cold winters out in the gold fields. There was also plenty of work between the cattle ranches and the lumber industry.\textsuperscript{128}

Today, Napa county is mostly know for its wines. And in 1861, the Riesling cutting was introduced helping to make Napa Valley one of the premier wine-making regions of the world.\textsuperscript{129}

Napa houses the county seat and is one of the two economic centers of Napa County. Located in valley surrounded by rolling hills and at the confluence of two streams, the city of Napa was laid out in 1847 by using a street grid as means of organizing the land. Like many western towns, the buildings mostly had false fronts, which give the impression that a building is much larger then it looks. These large false fronts also provided a great place for signage.\textsuperscript{130}

The following three pages, pg. 52-54, document the surrounding areas through images taken during the Fall 2009 of the regional topography, local architecture, and county schools.

The site selected for the proposed school is the Borreo Building located. This two story rectangular shaped building built of native stone from the Sada Canyon area was constructed in 1887 by grocer Felix Borreo.\textsuperscript{131} Originally used as a grocery store, this building has housed various companies and is currently unused and boarded up. Pages 55-58 document the site.
Image 93: Local topography of Napa County.

Image 94: Local topography of Napa County.

Image 95: Local topography of Napa County.

Image 96: Local topography of Napa County.
Regionalism and Sustainable Design

Image 101: Elementary School in Napa County.

Image 102: Outdoor corridors used in Napa County.

Image 103: Middle School in Napa County.

Image 104: Elementary School in Napa County.
Image 105: Location of proposed school site in relations to other key landmarks.
Image 106: Location of Site: 920 Third Street Napa, CA 94558

Image 107: LEED Projects within 100 Mile Radius
Image 108: Photos of the proposed site.

Image 109: Proposed building site plan.
Regionalism and Sustainable Design

Image 110: Proposed Building Floor Plans.
Santa Fe County, New Mexico is located in the north-central part of the state and approximately 1910 square miles. Santa Fe was founded by conquistador Don Pedro de Peralta in 1609 and naming it the capital for the Spanish “Kingdom of New Mexico”. New Mexico is the oldest capital in the United States and the oldest European community west of the Mississippi.¹³²

Before Don Pedro de Peralta, Santa Fe was originally occupied by several Pueblo Indiana villages. Throughout its time, it has been owned by Spain and Mexico. And then in 1912, Santa Fe became the capital of the newly established State New Mexico making it the first foreign capital taken over by the United States.¹³³

Today, Santa Fe County is a huge tourist destination. With its distinctive architectural style mixing the Spanish and Native American culture of hundreds of low-slung, earth-colored buildings made of adobe. It also houses the oldest public building in America, the Palace of the Governors.¹³⁴

The following three pages, pg. 56-62, document the surrounding areas through images taken during the Fall 2009 of the regional topography, local architecture, and county schools.

The site selection for the proposed school is the Asequia Madre House, located. Known as the “House of the Three Wise women”, these buildings express the three wise women, the grandmother, the mother, and the daughter, who owned this property. Built in 1925 by Eva Scott Muse Fenyes, it has only been owned by these three women. Since 1995, these buildings have been left empty and abandoned.¹³⁵ Pages 63-66 document the site.
Image 112: Local topography of Santa Fe County.

Image 113: Local topography of Santa Fe County.

Image 114: Local topography of Santa Fe County.

Image 115: Local topography of Santa Fe County.
Image 116: LOCAL ARCHITECTURE OF SANTA FE COUNTY.

Image 117: LOCAL ARCHITECTURE OF SANTA FE COUNTY.

Image 118: LOCAL ARCHITECTURE OF SANTA FE COUNTY.

Image 119: LOCAL ARCHITECTURE OF SANTA FE COUNTY.

Image 120: LOCAL ARCHITECTURE OF SANTA FE COUNTY.
Image 121: A Middle School in Santa Fe County.

Image 122: A High School in Santa Fe County.

Image 123: An Elementary School in Santa Fe County.

Image 124: An Outdoor Gathering Space at an Elementary School in Santa Fe County.
Regionalism and Sustainable Design

Image 125: Location of proposed school site in relations to other key landmarks.
Image 126: Location of Site: 614 Acequia Madre, Santa Fe, NM 87505

Image 127: LEED Projects within 100 Mile Radius
Image 128: Photos of the proposed site.

Image 129: Proposed Building Site Plan
Image 130: Proposed Building Floor Plans.

9043 sq. ft.

1/32 = 1’0”
Design
IMAGE 131: A VISUAL CONCEPT OF THE CLIENT MIXING WITH SUSTAINABILITY TO CREATE A SCHOOL HELPING TO GUIDE THE DESIGN PROCESS.
This interactive model represents a school within its specific environment. Each horizontal line represents a measurement (such as rainfall, temperature, etc.) which slides to adjust and reflect the particular measurement at each school’s site. Therefore, the model takes on a different form when the measurements are repositioned to adapt to a particular environment.
Image 134: An Adjacency Matrix for a school with 9000 sq. ft.
<table>
<thead>
<tr>
<th>PROGRAM ELEMENT</th>
<th>TYPICALLY REQUIRED BY CODE</th>
<th>NET SQ. FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHOOL ADMINISTRATION</td>
<td></td>
<td>710</td>
</tr>
<tr>
<td>WELCOME AREA</td>
<td>NO</td>
<td>200</td>
</tr>
<tr>
<td>SECRETARY SPACE</td>
<td>NO</td>
<td>50</td>
</tr>
<tr>
<td>PRINCIPAL'S OFFICE</td>
<td>YES</td>
<td>200</td>
</tr>
<tr>
<td>GUIDANCE OFFICE</td>
<td>YES</td>
<td>120</td>
</tr>
<tr>
<td>NURSE STATION</td>
<td>YES</td>
<td>120</td>
</tr>
<tr>
<td>NURSE BATHROOM</td>
<td>NO</td>
<td>80</td>
</tr>
<tr>
<td>CUSTODIAL SPACE</td>
<td>NO</td>
<td>50</td>
</tr>
<tr>
<td>TEACHER SUPPORT AREAS</td>
<td></td>
<td>280</td>
</tr>
<tr>
<td>TEACHER WORK</td>
<td>NO</td>
<td>200</td>
</tr>
<tr>
<td>ADULT BATHROOMS</td>
<td>NO</td>
<td>40</td>
</tr>
<tr>
<td>STORAGE</td>
<td>NO</td>
<td>40</td>
</tr>
<tr>
<td>STUDENT RESOURCE CENTERS</td>
<td></td>
<td>2,240</td>
</tr>
<tr>
<td>COMPUTER CENTER</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>GYMNASIUM AND AUDITORIUM</td>
<td>YES</td>
<td>2,000</td>
</tr>
<tr>
<td>LIBRARY</td>
<td>YES</td>
<td>0</td>
</tr>
<tr>
<td>EXHIBITION AREA</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>SMALL GROUP SPACES</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>CLASSROOMS</td>
<td></td>
<td>4,620</td>
</tr>
<tr>
<td>ART INSTRUCTION</td>
<td>NO</td>
<td>770</td>
</tr>
<tr>
<td>MUSIC INSTRUCTION</td>
<td>NO</td>
<td>770</td>
</tr>
<tr>
<td>SCIENCE LABORATORY</td>
<td>NO</td>
<td>770</td>
</tr>
<tr>
<td>TYPICAL</td>
<td>YES</td>
<td>770</td>
</tr>
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<td>TYPICAL</td>
<td>YES</td>
<td>770</td>
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<tr>
<td>TYPICAL</td>
<td>YES</td>
<td>770</td>
</tr>
<tr>
<td>SCHOOL FACILITIES</td>
<td></td>
<td>1,150</td>
</tr>
<tr>
<td>BATHROOMS</td>
<td>YES</td>
<td>400</td>
</tr>
<tr>
<td>CAFETERIA</td>
<td>YES</td>
<td>500</td>
</tr>
<tr>
<td>KITCHEN</td>
<td>NO</td>
<td>200</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>9,000</td>
</tr>
</tbody>
</table>

**Image 135: The Allocation of Space for a School with 9000 sq. ft.**
Image 136: Relations of school spaces.
Image 137: Relations of spaces in a typical school without at any particular site.
Image 138: Places these typical relations of space in each of the four sites
Schematic Diagrams

Image 139: Investigating indoor vs. outdoor space for each site.
Image 140: The sun path for each site.

Regionalism and Sustainable Design

Elmore, Alabama

Lawrence, Indiana

Napa, California

Santa Fe, New Mexico
Image 140: The Wind Direction for Each site.
Image 141: Investigation on traffic patterns depending on entrance location for Elmore County site.

Image 142: Relations of spaces based on entrance location for Elmore County site.
Image 143: Investigation on traffic patterns depending on entrance location for Lawrence County site.

Image 144: Relations of spaces based on entrance location for Lawrence County site.
Image 145: Investigation on traffic patterns depending on entrance location for Napa County site.

Image 146: Relations of spaces based on entrance location for Napa County site.
Image 147: Investigation on traffic patterns depending on entrance location for Santa Fe County site.

Image 148: Relations of spaces based on entrance location for Santa Fe County site.
Image 149: PROPOSED SITE PLAN FOR LAWRENCE COUNTY, INDIANA.

Image 150: PROPOSED ENTRANCE FOR LAWRENCE COUNTY, INDIANA.
Image 151: Proposed Interior Tunnel for Lawrence County, Indiana.

Image 152: Proposed Tunnel for Lawrence County, Indiana.

Image 153: Proposed Materials for Lawrence County, Indiana.
Image 154: Proposed Floor Plan for Lawrence County, Indiana.

Image 155: Proposed Building Sections for Lawrence County, Indiana.
Image 156: Proposed Site Plan for Santa Fe County, New Mexico.

Image 157: Proposed Indoor/Outdoor Classroom for Santa Fe County, New Mexico.
Image 158: Proposed Interactive Learning for Santa Fe County, New Mexico.

Image 159: Proposed Rain Water Collection for Santa Fe County, New Mexico.

Image 160: Proposed Materials for Santa Fe County, New Mexico.
Image 161: Proposed Floor Plan for Santa Fe County, New Mexico.
As discussed earlier, before the Industrial Revolution communities looked at their local surroundings for materials, methods, and used the natural resources at hand, such as sun, wind and water. Today, the sustainable design field is looking back at these methods as a way to move forward in the future. Understanding the site or region can greatly effect the sustainable design decisions made. It is important to understand all aspects including environmental, cultural, economical, and social.

While regionalism can effect sustainable design, sustainable design in turn can effect regionalism. It can help maintain, preserve, and rehabilitate many communities and in turn giving back to the region.

In conclusion, not only does regionalism effect sustainable design, but sustainable design effects regionalism. It is a circular relationship in which understanding one can only benefit the other.

Lastly, the follow images are initial thoughts of particular sustainable design decisions best for each of the four sites.
Image 162: Sustainable solutions for Elmore County - green roof, regional materials, geothermal cooling.

Image 163: Sustainable solutions for Lawrence County - regional materials, geothermal heat, solar heating.

Image 164: Sustainable solutions for Napa County - natural ventilation, wind power, school garden.

Image 165: Sustainable solutions for Santa Fe County - rain water collection, window shelves, solar power.
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End Notes


4 Jason F McLennan, Philosophy of Sustainable Design (Kansas City, MO: Ecotone LLC, 2004), 4.


6 Jason F McLennan, Philosophy of Sustainable Design (Kansas City, MO: Ecotone LLC, 2004), 2.

7 Jason F McLennan, Philosophy of Sustainable Design (Kansas City, MO: Ecotone LLC, 2004), 4.


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Regionalism and Sustainable Design 95
Regionalism and Sustainable Design

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Image 46: Stephanie Morris. 8 December 2009.