THE SUSTAINABLE CAMPUS

by

DANIEL EUGENE SNIFF

(Under the Direction of Erik Ness)

ABSTRACT

Institutions of higher learning are dynamic and ever changing places. My thesis states that higher education is experiencing change similar to the changes that took place after other historical events such as the pedagogical shift from the Socratic Method to the elective curriculum, the industrial revolution, the GI Bill or the introduction of computers. Campuses are vehicles of change. The current change agent to impact to college buildings, grounds, and curriculum is the sustainability movement. The adoption of sustainable development principles to the curriculum and facilities is becoming increasingly accepted throughout college campuses across the country and world. This study looks at the planning efforts of Zamorano University and Eckerd College that resulted in a redirection of these institutions to ecologically informed planning and decision making processes that transformed the campuses. I interviewed key decision makers to better understand the process that brought them to except the sustainable principles that are now guiding their institutions of higher learning.

INDEX WORDS: Sustainable, Sustainability, Sustainable Principles, Bioregionalism, Leadership, Campus, Sustainable Campuses, Changes Agents

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DEDICATION

I dedicate this dissertation to my loving wife Joyce! She is so much more than a wife and companion, she is life worth living. She reminds me of the joys of life, our children, our experiences, and being mindful of how good our lives are together. We are two bonded together in love, making one stronger than two apart. You should be walking across the stage with me and in front.

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CHAPTER ONE

INTRODUCTION

The American campus is not a static plot of land, nor an unchanged collection of buildings, but rather an ebbing pallet that is adaptable to the needs of the user. Just like the pedagogical change from the Socratic Method to the elective curriculum of the mid-nineteenth century and the demands of the industrial revolution, campuses have morphed to accommodate change. Whether it was social demand, like the introduction of women in the early twentieth century, or the World War II GI Bill, which spurred a building boom during the mid-twentieth century, colleges have been instruments of change. The current vehicle that is promising a fundamental impact to college buildings, grounds, and curriculum is the sustainability movement. Campus leaders are becoming aware of the facts and are adopting environmental sustainability practices that will change almost every aspect of campus life. The adoption of sustainable development principles to the curriculum and facilities is becoming increasingly accepted throughout college campuses across the country and world. One major component under the larger decision of sustainability that could significantly altar the course of higher education is the concept of bioregionalism. Bioregionalism is a movement and a philosophy that looks at regions that are not defined by dotted lines on maps or legislation, but by natural systems. These natural systems have commonality of climate, geology, hydrology, species and land forms that dictate the "carrying capacity" or amount of life that can be supported in a given region. This dissertation will explore in general the concept of bioregionalism as

applied to higher education and the sustainability movement. Using bioregionalism as the theoretical limits of a sustainable campus, how and in what areas is higher education shifting to a more sustainable endeavor? What is the role of higher education in the sustainable movement? Can a campus achieve an ecologically neutral, no carbon producing entity in a modern industrialized society? What will that academy look like and how will it function? What is the nature of the decision that drove administrators to embrace the change to a sustainable campus? These and other questions will be explored in the analysis of two cases.

The two case studies for my research are Eckerd College in St. Petersburg, Florida and The Zamorano Pan-American Agricultural School (Zamorano University) in Honduras. These two universities were selected because both have made fundamental shifts in their strategic directions to embrace sustainable changes to their operations, buildings and grounds. The shift from traditional operations to a sustainable direction came about through a strategic, academic and facilities planning effort. Both institutions started the process without a sustainability mandate, but gravitated to principles of sustainability for a number of reasons. This study will look at the process the two campuses took in planning and will try to understand why both campuses developed sustainable directives that have the potential of achieving sustainable equilibrium operations. Specifically, what occurred during the process, and why the change?

A review of the literature revealed that higher education is just beginning to understand what operating in a sustainable manner entails. Many institutions are struggling with what are the limits of a sustainable university. The literature review reflects analysis of broad issues such as changes to core curriculum, governance,

buildings and grounds, but there are many gaps. These gaps represent the fact that the movement to sustainable principles and operations in higher education is in its infancy. There are still larger gaps in studying comprehensive planning initiatives and their outcomes. The purpose of this study is to address this gap in research by exploring what convinced the committees, presidents and trustees to redirect the institution towards a sustainable university and when during the planning process those decisions were made. The study will be guided by the following questions:

1) What is possible in designing and building a sustainable campus? Can the principles of bioregionalism be applied to a college campus?

2) How do you achieve buy-in to collective ecological based strategic planning, master planning and academic planning initiatives?

3) What external forces help or hurt achieving sustainable goals?

This study will seek to understand when during the planning process decision makers embraced sustainable principles and how that shaped the future decision making process. Additionally, how did this decision shape the campus after the choice was made to move in a sustainable direction? Interviewing the presidents, trustees, planners, designers and other decision makers involved in the planning process should lead to how and when the direction was chosen. I will also review planning documents, meeting minutes and abandoned concepts to help determine the direction.

This study will also utilize an historical base for higher education's role in society. With an understanding of how campuses have been altered and have adapted themselves to social change, this study will attempt to show that higher education has and

can be a world leader in sustainability. In *A History of American Higher Education*, Thelin (2004) states that "Colleges and universities are historical institutions. They may suffer amnesia or may have selective recall, but ultimately heritage is the life blood of our campuses" (p.1). Historically universities in America were set in the wilderness. This setting necessitated that all sustenance be grown locally; and therefore, university growth was bound by the region's ecological carrying capacity. This is the definition of bioregionalism. In The University of Georgia: A Bicentennial History, 1787-1985, Dyer (1985) writes that the buildings and grounds of the University of Georgia did not have running water, heat or indoor plumbing until 1903. Food, milk and other products were grown on campus farms until the 1990's. This illustrates that many universities have the capacity to quickly change to a lighter carbon footprint and more regionally centric principals. As Thelin points out, "history matters" (2004, p.1).

This study will help define the pivotal decision point or points during a major strategic planning process. It will add both to the body of research and practice of the study of higher education. Design professionals, campus planners, strategic planners, policy planners and many other fields will be added to with this study.

Background Issues in Sustainability

Sustainability encompasses an array of topics and issues. As a foundation for a broader understanding of some of the issues surrounding the sustainability dialog, it is important to have a familiarity with some of the issues. In Chapter Two there are several established definitions of sustainability and sustainable development. Like the definition itself, issues within or effecting the sustainability movement can vary and be expanded to

include almost any topic. This section attempts to give the reader information I feel is relevant to understanding the study.

The idea of an American college campus conjures up the image of buildings set within a green space. This archetype has provided a special place and meaning to our society. The term "campus" itself is derived from the Latin root meaning 'of field,' which was first coined to describe Princeton's campus in the eighteenth century (Turner, 1984, p. 4). This term has evolved into a more complex definition, which encompasses the larger context of the buildings and grounds that represent the modern university we know today. Beyond the buildings and grounds, colleges have a greater significance in society. Higher education can be a vehicle to obtain better status within the population. College degrees provide prestige for its citizens and with this prestige the academy can influence the public. Furthermore, campuses, public and private, are perceived as civic domains and therefore, have a particular place in our society. Campuses as part of the civic realm and civic buildings within the designed cityscape project a symbolic meaning. Government's notion that, "civic architecture confirms that monumental buildings contributed to the articulation of the value projected by government. Monumental architecture is used to express political authority and power. Their aim is to create ordered design as a reflection of a well-organized society" (Thames & Hudson, 1983, p. 23). In Thomas Vickery's book, *The Meaning of the Lawn*, Vickery writes, "A tenet of modern thought states that architectural form reflects the cultural aspirations of society. Nowhere is this reflection more recognizable than in the architecture of the American college and university campus" (Vickery, 1982, p. 7). If this statement is true, then what is the role of the American college campus in society? What lasting effect will the

development of a sustainable campus have on society? What ethical responsibility do higher education planners have to the students, faculty and citizens? If the function of higher education is to enhance the intellectual climate and to educate, then isn't it also the role of higher education to provide academic scholars with policies, curriculum, administrative structures, and buildings and grounds that do the same? If the soil and grounds of a campus are the foundation, and the buildings are the structural bones, then the skin and fabric that wrap and hold it together are the faculty, staff and students. Colleges and universities are in a unique position to reshape the thinking of a new generation with every freshmen class. By presenting a curriculum that fundamentally teaches a sustainable way of living that protects our natural resources, universities are instilling environmentally conscious values with each new policy. The application of sustainable principles in policies, buildings and grounds could be a valuable learning tool. These lessons ingrained over many years could alter the next generation's outlook on our limited natural resources.

Sustainability as applied to higher education must be cost effective and operationally efficient, reduce the carbon impact of our population on the planet, and support the educational mission. Sustainable principles must meet the demands of an ever growing intellectual climate, societal expectations and educational philosophies.

With our society rapidly depleting the natural resources that sustain our planet, higher education administrators and planners have the responsibility to incorporate into the design of the curriculums, buildings and grounds methods of protecting nonrenewable resources. Higher education administrators should establish principles, guidelines and

policies of sustainable design with the expressed goal of conserving, protecting and restoring the earth's natural systems.

Establishing and adopting sustainable policies that require an integrated and holistic approach to higher education planning exhibit not only good stewardship to the environment, but also a good economic strategy. Additionally, in the realm of college and university architecture, sustainable design can serve a dual role. This role manifests itself first in a broader role of environmental responsibility, and second as an educational tool for future generations. Demonstrating new construction practices, storm water and ground management approaches, and the study of the research of efficient technologies can become an important education experience for future policy makers.

Issues within the Environmental Movement

As the definitions of sustainability can vary, so can the opinions within the general population as to whether or not the environment is in trouble of collapsing or close to a tipping point of no return. Many people use different types of data to support their point of view on this subject matter. This analysis is not intended to establish that the planet is in peril or to represent a particular side of this divisive issue. However, by presenting a brief study of some of the research, one can gain a better understanding of some of the reasons many universities are adopting sustainable campus standards.

The move away from the concept of bioregionalism and adopting policies that would stop growth when the population reaches the carrying capacity of the region are often linked to modern societies. The most common explanation for this current ideology was the onset of the Industrial Revolution. Environmentalists assert that this is when large quantities of carbon dioxide, sulfur dioxide, methane and other greenhouse gas

emissions began to be dispensed into the environment. Research from this time period also provides fuel to the argument that human kind is slowly changing our planet's ability to sustain life. Other factors cited are deforestation, global dimming and an endless human dependency on carbon based fuels. Environmentalists claim that if mankind does not change its dependency on fossil fuel, then the environment could be altered in ways that will create a destiny defined by catastrophic consequences.

Others assert that alterations in the environment have had disastrous consequences, the results of which have been the annihilation of entire civilizations. In Charles Mann's book, *1491 New Revelations of the Americas before Columbus* (2005), Mann theorizes that dozens of cultures in both North and South America experienced declines that were brought on by environmental changes, climate change or over-population. This theory is supported by a growing number of cultural anthropologists and archaeologists who have researched the history of the indigenous peoples of the Americas. Mann writes that the city of Cahokians (900-1490 AD), where the largest Cahokia Mound in the state of Illinois still exists, holds evidence of a rapid and massive decline. The city of Cahokians has been estimated to have supported over 15,000 people; this population is equivalent to cities in Europe during the same era. Citing work from different archaeologists, such as Dr. Joe Sunders, whose work has been published in *Journal Science*, Mann theorizes that the Cahokians, the Hopewell, and the Adena cultures all collapsed because of environmental destruction, over-population and dependence on one food substance. Mann theorizes that these indigenous peoples cultivated large areas with only one crop, corn. This dependency on a singular crop, overpopulation and a prolonged change in weather patterns was the cause behind the

sudden failure of the Cahokians' civilization. Mann compares the Cahokians' dependency on corn to the 1840's potato famine of Ireland. Other archeologists extol the theory of rapid decline brought on by western diseases and warring factions, not climate changes. Dr. Mann cites other indigenous peoples and cultures whose demise was brought on by over harvesting the land or environmental degradation (Mann, 2005, pp. 254-262).

Many people who advocate bioregionalism point to the loss of these whole cultures as proof that there is a limit to a region's ability to sustain large populations that do not observe sustainable and regenerative practices. The fact that the Cahokians, the Hopewell, and the Adena cultures lived in the richest farm land in North America provides further evidence that nutrients in the soil have limits. These arguments are presented to illustrate catastrophic environmental consequences that could result today from global warming, over-population, ocean currents slowing and freezing parts of northern Europe to glaciers melting and large sheets of ice melting and raising the sea levels.

What about modern society? Can a technologically advanced society develop solutions to the problems that brought about the demise of peoples like the Cahokians, the Hopewell, and the Adena? The answer is that modern society must and will develop solutions to the problems of global warming and the inevitable decline of fossil fuels. However, many individuals continue to be in denial of the negative impact that humankind is making upon the planet. None-the-less, as the argument for sustainability is presented to different venues around the country, many such locations are moving to adopt policies to limit or stop growth all together.

The Oregon Experiment

The Oregon Experiment started in 1973 with Governor Paul Ehrlich's support to create a land use-law with the intent to manage urban growth (Jacobson, 1997, p. 27). The law set up a "Land Conservation and Development Commission" whose mandate was to develop a growth management standard for Oregon. Oregon became the first state to dramatically limit urban growth and to preserve forests and rural areas from urban development. The goals were to create urban boundaries and green belts that would limit the growth of the cities. Areas outside these growth boundaries would be limited to single detached housing units on plots no smaller than 40 acres, later changed to ten acres in some locations (Thoreau, 2007, p. 102). Cities like Portland expanded to their limits within one decade and held firm to the plans. Between 1980 and 1990 Portland experienced a modest 2% growth where other cities across the west expanded and sprawled into their neighboring counties with the results being percentage growths of Los Angeles 12%, Phoenix 23%, Las Vegas 29%, and Salt Lake City, which experienced the largest growth in the ten year period, at 40% (Thoreau, 2007, p. 127). Land values within these zones increased. The urban growth boundary around Portland, Oregon aided in creating the reputation that it was a state that did not tolerate polluting industries, but rather opened its borders to "clean" businesses. The Governor was fond of saying, "We want tourists to visit, but not to stay" (Thoreau, 2007, p. 102). The urban growth boundary was not intended to be static and since 1973 has been modified several times. Each of these expansions was small and resulted in 26,159 acres added to the Portland area since 1973 (McLennan, 2004).

Oregon's law was tested numerous times and in almost all cases the law was upheld. A case that was tested by the United States Court of Appeals and upheld for the State was *Dobbs vs. the State of Oregon*. This case concerned Tom and Doris Dobbs' 40 acres of land just outside of Mt. Hood Oregon. The Dobbs wanted to build a house on the land that they had owned for years, but with the introduction of a 1984 rezoning of the area around Mt. Hood, such construction was now prevented. In 1988 the Dobbs' were informed that they could not build their house under the new rezoned law. They filed suit and in 1995 the case went to the Court of Appeals where the Dobbs' lost their case. In 1998 the case was further denied by the United States Supreme Court (Fitzgerald, 2005, pp. 298-310).

Oregon may be the largest and best known state for controlling growth, but many other cities have adopted what is known as Urban Growth Boundary (UGB) regulations. Cities like Boulder, Colorado; Virginia Beach, Virginia; Lexington, Kentucky; San Jose, California; Miami-Dade County, Florida; and the Twin Cities, Minnesota all are attempting limited growth with restrictive rezoning (Alexander, 2007, pp. 374-384). Cities and municipalities may have different reasons to control or stop growth within their region, but case law is upholding the desire to implement these limitations. In the context of sustainability and bioregionalism, where many people believe their region has been harmed by urban sprawl, such limitations are well received.

Higher Education and Bioregionalism

With restrictions on growth becoming more common and environmental awareness becoming an integral part of our society as well as higher education, environmental awareness and higher education are inevitably going to intersect. A

question confronting higher education administrators presents itself as follows: Does higher education's moral obligation to the region's environment supersede its innate educational mission? Over the past ten years the southeast region of the United States has experienced a severe drought. This drought, combined with an increase in population, has brought to the forefront the question of bioregionalism. The question most asked during the drought was, have we overbuilt the region and out-stripped the water supply? If bioregionalism becomes set policy or if it is legislated by the state, will administrators turn students away? This would be counterintuitive to the premise that higher education should be open to the masses.

How will a university that strives to achieve equilibrium look and function? In some locations, like the Pacific Northwest the university will not be very different, Evergreen University in Washington claims they will shortly become a 100% sustainable campus. According to Maine's Unity College's web site they, "derive 100% of energy from renewable energy sources." In locations like Los Angeles, it's hard to imagine how UCLA could achieve such a balance. Los Angeles has already sprawled beyond the original geographic region of its watersheds, and the population is beyond a regionally sustainable level (Pelkonen, 2004, p. 126) Additionally, Los Angeles is incapable of producing enough local foods to feed its population. Large megalopolises have developed alongside the automobile and the issues confronting these institutions may not be completely solved with achievement of the current goal of 100% balanced. But, regardless of the location, universities can benefit from enacting administrative policies and constructing buildings and grounds to a higher standard with the goal being the reduction of energy consumption and cost savings. Regional building materials can be

used to decrease the cost of transporting materials while concurrently decreasing the environmental impact. Using indigenous materials and designing buildings as they were conceived to be designed previous to the elaborate transportation system implemented now will help restore regional vernacular quality to the architecture. The vast majority of buildings built today disregard the regional environment and use materials transported from hundreds and thousands of miles away (Ausubel, 1997).

The food distribution system and the supply chain within the United States is notorious for transporting food long distances, in most cases 1,500 miles or more (Schreiner, 1995, p. 3). This system uses large amounts of fossil fuels and many nutrients are lost from the region where the food is produced as the food is transported to other regions. Many universities are starting to grow a variety of foods on their campuses or have begun buying food within their region. The University of Georgia has just implemented a food community garden. Emory University has committed to buying all foods for their dining halls within 300 miles of Emory by 2012. In 2005, Yale University launched *The Yale Sustainable Food Project,* which combines local food production with community gardens and educational outreach outlining these goals. Dozens of other universities are shifting to local food procurement and production (www.sustainable@yale.edu).

Food production on campuses is nothing new to higher education. The history and evolution of American institutions of higher learning are intimately tied to the land and visions of a Utopian landscape. This is in direct contrast to its European counterpart. Oxford University in England was established around 1096 and is the oldest English speaking university. The University of Georgia, which is the oldest state chartered

University in the United States, was chartered in 1785. By contrast, Oxford is considered ancient. Despite the desire to achieve similar missions of providing advanced education for some of its citizens, the physical growth of the European campus developed with strong ties to the city; its American counterparts typically developed at a distance from urban centers. "The founders of early colleges argued that the corrupting influences of alcohol, gambling, and other vices associated with the city could be avoided by locating universities in rural locations" (Kelly, 1997, p. 1). Additionally, it was surmised that the fresh air and plentiful land found in the wilderness would insulate against disease while providing natural resources for the maintenance of the institution (Kelly, 1997, p. 2).

Many of today's most prestigious institutions had humble beginnings. The frontier proved to be an ideal location for schools such as Dartmouth College, the University of Notre Dame, the University of North Carolina at Chapel Hill, the University of Virginia and the University of Georgia. At the University of Georgia, the first building commissioned by Josiah Meigs in 1801 was "an indigenous log structure twenty feet square and one and one-half stories high" (Bowen, 1990, p. 2). Along with potable water the land provided sustenance for the students and faculty. The University of Georgia's land was planted with fruit and pecan orchards. Now some two hundred years later universities are replanting and harvesting food for their respective use.

Administrative Structure and Bioregionalism

The basic components for sustainable development start with instructional strategic directives which will guide all other activities. These strategic planning imperatives are intended to point the institution in a direction that can be obtained within

a defined time period, usually five to ten years. Under the umbrella of these strategic directives, the academic plan is formed. A comprehensive academic plan that includes classes in sustainable philosophy, practices, outreach, research, majors, and degrees can support the institution's sustainable direction. Finally, a complete shift in business functions will be required to support sustainability in as many areas as possible. (http://www.evergreen.edu/sustainability/interimreport.htm)

Scholars like Leith Sharp of Harvard, believe the transformation of higher education will be all inclusive. He writes that tenure, faculty governance, research and new degrees will all result for a fully sustainable university. Sharp believes the current "mission conflicts" that stifle cross disciplinary work will disappear and this will "free universities to become learning organizations of the highest caliber (Sharp, 2002, p. 140). Academic departments will shift from different colleges to a new alignment that supports the sustainable strategic mission. Arizona State University established in 2007 a *School of Sustainability* where 60 faculty from 40 different departments offer trans-disciplinary degrees. These areas of study concentrate on social and economic issues in a sustainable framework. The cross discipline approach uses resources and expertise to pull together academic offerings (Princeton, 2009, p. 1). Evergreen College in Washington State has a curriculum that is focused on solving regional issues, which is a true bioregionalism approach to education. At the University of California-Santa Barbara, all undergraduates will soon be required to complete sustainable general education requirements to graduate (Princeton, 2009).

Higher education leaders will learn to see the university as a living organism; this includes what the organism takes in, how much energy is consumed and the waste

byproducts. This view of the functional operations of the university may guide academic decisions. Universities may decide some of their departments are no longer upholding their sustainable mission. The professional administrator whose ranks have swelled over the past fifty years may be minimized. Administrative positions may evolve to encompass a variety of duties, for example, that of teaching and of being a resident faculty in dormitories. Similar to the students living in residence halls, universities might return to the day when they have faculty living on campus in faculty housing units.

The sustainable university of the future would not have a limit of students who could attend based on high school grade point average and college boards like the Standardized Aptitude Test (SAT) score, but based on the ecological limit of a given region. The buildings and grounds will all have to be working to produce energy, not simply consume electricity from a power plant hundreds of miles away. The buildings will work more like a living organism, producing oxygen, cleaning the waste produced by its inhabitants, self regulating its body temperature, producing food and energy. The college campus of the future will also be the testing ground for social change. College campuses are a microcosm of a city. Lessons learned on college campuses will be telegraphed throughout society bringing about an awareness to live our lives differently than the wasteful generations of the past hundred years. This role of the college campus is not new. What the sustainable campus will be, as it has been, is an innovative change agent for the world.

CHAPTER TWO

LITERATURE REVIEW

The field of study relating to sustainability is a new and burgeoning discipline. Relatively speaking little scholarly work has been done in this area; yet, higher education is moving inextricably toward sustainable policies and directives. The concept of a sustainable campus presents far reaching challenges to the physical plant and the pedagogy of the academy. In time, far more research will be conducted into the multifaceted phenomenon that comprises higher education as it relates to sustainable issues.

This literature review includes a review of campus sustainability practices, sustainability issues and changes in higher education, and technological advances in campus buildings and grounds. The literature review is focused on research questions posed on a broader concept of the campus sustainability movement towards the ultimate end goal of: "Is it possible to achieve ecological equilibrium?" At this point in time ecological equilibrium within a complex campus system is in many people's opinion an unachievable goal; yet, some colleges are striving toward this end.

Overview

Given the fact that scholarly work in this study area is new and there are gaps in the research, the first part of the literature review relies on information related to campus sustainability initiatives obtained from web pages of colleges and universities. This information provides current and first hand information on what policies and directives

higher education administrators have agreed their universities are adopting. The web pages offer not only a philosophical view into the institution's thoughts, but also organizational alignments and to some degree the tactical direction institutions are moving towards in the implementation of policies.

The second stream of relevant literature relates to studies of sustainability issues and the changes taking place in higher education. Although studies directly related to higher education are limited and vary considerably in analytic methods and rigor, the body of work has been growing over the past decade. Kemp, Parto, and Gibson's (2005) writings chronicle the impact of post World War II industrialization, international conferences on the conservation of the environment and the ultimate influences these conferences have on higher education. Kemp, Parto and Gibson track the different university's adoption of sustainable principles starting in Europe and the migration to Canada, Australia, South East Asia and the United States. In reviewing the level of adoption and integration of these principles, Cameron (1984) looks at successful adoption and reasons for resistance to change. Cameron explores the theory that the more complex the organization, the more resistant it is to change. Sharp studies the bottom up and top down approaches at The University of Waterloo as two different methods to adopting sustainable principles.

Given how few higher education studies exist, this stream also relies on a large body of literature that is supportive to the argument that mankind's industrialization is having a negative impact on the environment. The field of literature is written primarily by ecologists. This area of research deals with such broad reaching issues as climate change, global environmental crisis, acid rain, soil erosion, toxic buildup in ecosystems,

deforestation, land, air, and water pollution, natural habitat loss and degradation. The importance of this literature is it supports so much of the work cited by researchers writing on the changes to higher education. The sustainable movement's foundation is the ecologists' research. This body of work almost always has reference to the moral and ethical responsibility of our society and other scholars. The moral and ethical theme is echoed in the sustainability movement's writing.

A third stream of relevant literature includes studies by design professionals for architects, landscape architects, contractors, and higher education consultants. This body of work primarily concerns high energy efficient building systems, passive and active solar design, indigent plant material, green roofing technology and general theory about sustainable design. The relevance of this literature is common language used in the sustainability movement is found in this writing. The design profession is learning a different way to practice. This new methodology has swept multiple fields. This change will have profound impact on higher education.

Definitions of Sustainability and Bioregionalism

A review of the literature revealed that there is no one or agreed upon definition for sustainability or bioregionalism. The following are definitions of sustain, sustainable development and bioregionalism from various sources. The term sustainability is used frequently and has many different meanings depending on the context or subject area in which it is being utilized. In order to help establish a clear understanding of sustainability and bioregionalism within the context of this document, the following are some accurate definitions:

Sustain: 1.To keep in existence; maintain. 2. To supply with necessities or nourishment; provide for. 3. To support from below; prop. 4. To support the spirits, vitality, or resolution of; encourage. 5. To endure or withstand; bear up under: *sustain hardships.* 6. To experience or suffer (loss or injury) 7. To affirm the validity or justice of: *sustain an object*. (The American Heritage Dictionary of the English Language, Copyright 1992).

Sustainable Development: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (United Nation World Commission on Environment and Development (The Brundtland Commission), Our Common Future, 1987).

Sustainable Development: a process in which qualitative development is maintained and prolonged while quantitative growth in the scale of the economy becomes increasingly constrained by the capacity of the (eco) system to perform over the long-run two essential functions: to regenerate the raw material inputs and to absorb the waste outputs of the human economy. (Herman Daly, World Bank).

Our vision is of a life sustaining earth. A sustainable United States will have a growing economy that provides equitable opportunities for satisfying livelihoods and safe, healthy, high quality of life for current and future generations. Our nation will protect its environment, its natural resource base, and the function and viability of natural systems on which all life depends. (The President's Council on Sustainable Development, 1996).

Bioregionalism is the theory that within regions, all processes are meant to cyclically arise from and return to the region in which they are naturally based. (The Center for Advancement of Sustainable Living, The University of Oregon).

A Bioregion is defined in terms of the unique overall pattern of natural characteristics that are found in a specific place. The main features are generally found throughout a continuous geographic terrain and include a particular climate, local aspects of seasons, landforms, watersheds, soils, and native plants and animals. People are also counted as an integral aspect of a place's life, as can be seen in the ecologically adaptive cultures of early inhabitants, and in the activities of present day re-inhabitants who attempt to harmonize in a sustainable way with the place where they live. (Peter Berg, America Society of Planners Journal, 2002).

Ecologists define 'carrying capacity' as the population of a given species that can be supported indefinitely in a defined habitat without permanently damaging the ecosystem upon which it is dependent. However, because of our culturally variable technology, different consumption patterns, and trade, a simple territorially-bounded head-count cannot apply to human beings. Human carrying capacity must be interpreted as the maximum rate of resource consumption and waste discharge that can be sustained indefinitely without progressively impairing the functional integrity and productivity of relevant ecosystems wherever the latter may be. The corresponding human population is a function of per capita rates of material consumption and waste output or net productivity divided by per capita demand (Rees, 1990). This formulation is a simple restatement of Hardin's

(1991) 'Third Law of Human Ecology': (Total human impact on the ecosphere) = (Population) x (Per capita impact). (The International Society for Ecological Economics, 2003).

These definitions can be a base line for understanding this area of research and establishing a beginning point for common language within the area of sustainability.

Review of Campus Sustainability Practices

The first area of review was a selection of the estimated three hundred major college and university published web pages referencing sustainably practices (AASHE, 2008). A review of the web sites' information included three major areas of commonality: the school's philosophical position concerning sustainability, the university's approved national and international sustainability agreements and the college's sustainability action points. (Appendix A contains a complete list of web sites reviewed.)

The majority of the web site pages opened with an expressed philosophy of the institution's sustainable mission. Brown University in Providence, Rhode Island is typical:

> Brown is Green (BIG)
>
> Welcome to information on Brown's efforts to create a more sustainable environment. This site charts the University's progress toward greenhouse gas reduction and includes updates about related courses, initiatives, research, community projects and the work of student groups. As an educational institution Brown offers a unique role in contributing research, fostering innovation, and providing a model for environmental sustainability to the

community and beyond. Teaching environmental stewardship both by example and through concrete learning will ensure Brown's contribution to a cleaner, sounder global environment. (brownisgreen@brown.edu)

With all web pages, the institution is projecting an agreed upon policy. This conscious public policy statement is intended for a focused audience. In Dr. Sehwan Yoo and Dr. Jongdae Jin's article *Evaluation of the Home Page of the Top 100 University Websites,* Yoo and Jongdae write that "The university home page is usually the first point for anybody who seeks information about the campus" (2004, p. 57). They also write that homepages inform, educate and attract students to the campus, so the best homepages "should be succinct, informative and significant" (p. 57). In Dave Mulder's research on homepages, he writes "…college homepages are the first impression prospective students have of the school. The portal must express the school's culture/philosophy or risk losing potential students. In this day and time electronic marketing is far more important that written marketing" (Mulder, 2004, p. 2).

A study conducted by the Association for the Advancement of Sustainability in Higher Education (AASHE) found that of their three hundred and sixty-nine members, ninety percent of sustainability offices or officer positions were created in the last ten years and seventy-four percent of these were created in the past five years. This survey was conducted and reported in an AASHE 2008 report titled: *Higher Education Sustainability Officer Position and Salary Survey, January 2008.* The study reported that sustainability officers spent 28.7% of their time working with students and student groups, 9.6% with energy management, 5.8 % with outreach, 6.0% with data collection

and only 5.4% with building design. Despite the small percentage of building related workload, over 63.2% of the sustainability officers reported to facilities planning departments. Various academic departments accounted for 11% and only 3% were in student affairs. One interesting point was that 67% of the sustainability officers have joint reporting lines. The joint reporting lines are a "…way to bridge the gap between academic and operational sectors of the campus and to enable the officers to be effective in both spheres" (AASHE, January 2008). This information is reflective of the newness of the sustainability movement in higher education. In Birnbaum's *How Higher Education Works,* Birnbaum writes that in new ventures such as sustainability, locating the most efficient position or office is not always the place that works the best or will ultimately reside. Birnbaum (1988) refers to seeking the most efficient location as "cyber-institutions". The self correcting course that higher education often utilizes will help sort out the future full realized function of sustainability in higher education. Many cynics of sustainability would suggest that the current move to embrace sustainability is isomorphism and that would explain the joint appointments.

The second predominate area web pages espouse is what the institution's tactical action points are and implemented sustainable directives. Institutions have a broad range of directives that include topics such as recycling programs, green building standards, water reuse, waste reduction, alternative transportation systems, institution wide sustainable purchasing, wildlife habitat, wind, solar, geo-thermal and other renewable energy systems, greenhouse gas inventory, organic farming, farmers markets, academic curriculum reform, graduate and undergraduate research initiatives, green cleaning products, revised energy standards for laboratories, sustainable academic positions,

campus planning in a sustainable way, green roofs, porous paving, heat plumes, biodegradable product use, etc. The categories encompass the full spectrum of the academy. The web pages are reflecting the institution's initiatives as well as their aspired strategic directives. This not only further adds to branding the university, but also projects the cultural aspirations of institutions as a progressive educator within society.

Sustainability Issues and Changes in Higher Education

Institutional Management Theory

The institutional web page tells only one part of the story, that being what the institution wants the virtual browser to experience about the institution's sustainable directives and its sustainable philosophy. This second stream of thought explores the extent of the dialogue within the institution and what next steps the institution should or must take to reorganize itself to transition to the next level of a sustainable university.

Birnbaum's (1988) cybernetic systems institutional theory can be seen in this body of the literature. Prevalent theories amongst professionals who have been studying and following the transitions to a sustainable university believe that universities are at a critical intersection in the transition. The threshold many universities are about to cross involves changing the culture of the teaching and operational mission of the institution. Journal articles, more than web pages and traditional books, explore the decision and policy changes within this shifting field. Birnbaum's cybernetic institutional theory states universities are self-correcting and have their own autodidact procedures when evolving and accepting new processes (pp 177-179). Institutional discussions revolve around statements like:

> "No institutions in modern society are better situated and none more obliged to facilitate the transition to a sustainable future than colleges and universities" (Orr, 2002, p. 96).
>
> "At the heart of a learning organization is a shift of mind from seeing ourselves as separate from the world to connected to the world, from seeing problems as caused by someone or something out there, to seeing our own actions create the problems we experience" (Senge, 1990, p. 243).
>
> "The institutions that claim the position of the premier and most advanced knowledge producers in society frustrate learning and social change in most of their internal processes and their articulation with the surrounding society" (Levin and Greenwood, 2001, p. 96).

Much of this literature studies the potential of institutional reorganization that would fundamentally change all aspects of the academy. Concepts studied in these journals such as "rethinking the curriculum" to "learning infrastructures" and "balancing ecology economy and community to provide a positive future" are being debated or implemented and have the possibility of reinventing higher education and transforming the pedagogy and the academy.

Institutional Transformation

Outside the United States other countries have been embracing change quicker than American universities. Rene Kemp, Saeed Parto and Robert Gibson chronicle the evolution of sustainable development in a journal article titled *Governance for Sustainable Development: moving from theory to practice.* Kemp, Parto and Gibson write that post World War II development coupled with economic disparities and vast

increases in material wealth resulted in global ecological degradation (2005, p. 13). Although many different organizations, usually unconnected and often working separately, were aware of this degradation, the United Nations finally acted by appointing a World Commission on Environment and Development (WCED) to address them jointly. The WCED concluded that "the ecological and social failures had common causes and demanded a common response" (Kemp, Parto and Gibson, 2005, p.14). In 1987 the WCED published a report titled *Our Common Future.* Suddenly, sustainable development was a term being used on the worldwide stage. International conferences on the environment brought scientists, politicians, activists and world leaders together to address global environmental issues. At one of the first and largest international conferences held in 1992 at Rio de Janeiro, Brazil, a *Statement of Principles for the Sustainable Management of Forests* was signed by over 178 governments. Also *Agenda 21, The Rio Declaration on Environment and Development* was a sentinel agreement. The Rio conference propelled the discussion of industrial destruction of the planet to the forefront of the world's agenda (Kemp, Parto and Gibson, 2005, pp. 13-14).

Kemp, Parto and Gibson write that universities started becoming aware that they could play a significant role in the worldwide sustainability conversation. They also noted there were major impediments that must be overcome before higher education could be a leader in this emerging movement. Kemp, Parto and Gibson point out that in early literature about sustainability, writers depicted sustainability with drawings of circles intersecting with captions that included social, economic and ecological qualities. According to Mebratu (1998) the "pillars based approach" was far too simple of an explanation and could not capture the complexity of universities.

Areas of change touched almost every aspect of the institution not just intersections in a simple diagram. Kemp, Parto and Gibson's paper focuses on Europe where there was a heightened awareness about environmental issues. One of the first places where change occurred was within the Netherlands, specifically The University of Amsterdam, which gave rise to a concept of transition management within higher education. European and Canadian universities are adopting goals and milestones for achieving sustainable campuses faster than their American counterparts. In Canada's higher education system there is a process underway to change the traditional organizational structure and curriculum of higher education. This effort is based on two agreements called the Halifax Declaration and the Talloires Declaration. The Halifax Declaration was a result of a 1991 international conference for university presidents that attempted to address the challenges of environmentally sustainable development. The Talloires, France conference of 1990 was the basis for many of the agreements ratified in Halifax. These two declarations were sponsored by an organization named University Presidents for a Sustainable Future, which has over three hundred signatories world-wide (Dunn, 2000, p. 72). One of the stated goals of the University Presidents for a Sustainable Future is posed in the form of a question that asks "how can organizations that purport to advance learning learn to recalibrate their mission, operations and curricula to reflect a larger commitment to building a sustainable future?" Referred to as policy number 5, five of Canada's major universities have started to implement these changes.

Several studies have chronicled Canadian universities' progress toward a fully integrated sustainable university. For example, Gudz (2004) writes about the process the

University of British Columbia, which in 1997 resolved to educate all students about sustainability, is using to transform itself and its place in society from a "knowing institution" to a "learning institution." (p.156) Gudz defines a "knowing institution" as one that has separate teaching, research, operations and relations with communities where "learning institutions" have model integrated systems where the content, context and process of learning reflect principles of sustainability. According to Gudz, in 1999 at the University of British Columbia, a committee that was charged with implementing policy number 5 found that the traditional silo departmentalization that typifies higher education needed to fundamentally change to an interdisciplinary sustainability based curriculum. The committee recommended that an environmental education be the basis for all students attending the university. The committee also found or recommended over two hundred courses, as well as numerous interdisciplinary degree programs that could be the foundation of this environmentally refocused curriculum. The problem associated with implementation was lack of coordination between colleges or even departments. This kept the university from working as one cohesive unit, i.e. the siloed university. The committee recommended the formulation of a College of Sustainability to work across standard university lines. The newly proposed college would work in three areas: first, offer first year students mandatory classes in environmental issues; second, develop research projects and programs for undergraduates; and third, work across college lines to develop outreach programs for community based sustainability initiatives. The College of Sustainability was not approved, but an interdisciplinary degree based in sustainability, a minor option in sustainability studies and a "guerilla teaching" module on sustainability taught in the first two years was adopted. Also noted in the research was the

establishment of the Office of Sustainability to promote the concepts of environmental literacy and ethics among faculty, staff, students and stakeholders. Gudz writes that the compromises of the committee's recommendations were primarily due to resistance from senior administrators and faculty (p. 161). Gudz concludes that the biggest obstacle behind change in higher education is the fact that higher education is a risk-averse industry and slow to change, but she ends by saying "UBC is off to a good start" (p. 167).

The importance of the University of British Columbia's adoption of policy number 5 was that they were the first major university in Canada to attempt to implement the Halifax Declaration. They became the model and leader. The University of Waterloo and McGill University patterned their efforts to accomplish the Halifax Declaration after the University of British Columbia (Moore, 2005, p. 68). Moore writes that another result from this effort was the conversations that took place after the implementation of the sustainable initiatives. These conversations took place on the University of British Columbia's campus and across the country. What started as a "how do" universities implement the ambitious goals of agreements like the Talloires Declaration and Halifax Declaration is now witnessing the implementation process of these agreements, for example, at the University of British Columbia.

"Greening" the University

The University of British Columbia may have started the trend in how universities move into the realm of widespread campus environmental instructional transformation, but in the United States within higher education similar topics were being studied. The literature reflects a "top down" and "bottom up" transformation process (Sharp, 2002, p.129). Sharp writes that in the late nineteen-nineties social debate centered around such

issues as “global warming, climate disturbances, acid rain, deforestation, species extinction, fisheries deletion, soil erosion, toxic buildup in ecosystems, land, air and water pollution, ozone depletion that are forming a web of destruction around the world” (p. 129). These issues were so ubiquitous that universities were drawn into the debate by students demanding that universities address the environmental issues and make changes; this is the bottom up approach. The top down approach occurred by faculty within the institution pressuring the administration to adopt sustainability policies. Sharp asserts that progress has not been as swift in American universities as compared to European, Canadian and Australian universities because of several factors:

- Complex organizations are harder to change
- Tendency towards “satisfying”
- Fragmentation of problem and solution elements
- Faculty and staff being “controlled by the senior administration.”

This last point Sharp made is based on sociological research conducted by Somoan Asch. Asch’s studies concluded that less that 20% of any group acted independently when given freedom to act outside the group (Edwards, 1995, p 202).

Change and Resistance to Change

Sharp contends that resistance is one of the biggest impediments to sweeping changes to universities accepting a sustainable management system. This theory is also supported by Kim Cameron’s article, “Organizational Adaptation and Higher Education,*”* which considers established organizational structures and changes to the organization. He says that heavily structured “environments are so powerful and pervasive force that do not adapt unless radical change is imposed or the organizational

forms die out" (Cameron, 1984, p. 125). In *Reframing Organizations* by Bolman and Deal (2008), achieving change in organizations can take many forms, but change is often slow and requires a lot of effort on the change agent's part. Bolman and Deal reference *Who Moved My Cheese?* as a book that explains how change will always leave some people behind. Higher education in America, in Sharp's opinion, is slow to change to a sustainable green campus structure because American universities have the most to lose if they choose the wrong structure or the trend is just a fad (Sharp, 2002).

Ecological Studies and the Moral Imperative

Another area of literature is ecological studies. This literature has as its basis scientific analysis of impaired natural systems. A common thread within this writing is a moral and ethical imperative to live in a more of sustainable ecology. John Ehrenfeld is typical when he writes "I am the possibility that human life and all other life will flourish on the Planet forever" (2008, p. 1). Ehrenfeld has written on the subject of sustainability for over thirty years, and he says a scientist is trained to not use "I" in any writings. He changed this position in his book *Sustainability by Design*, where he wants scientists and other intellectuals to "ring the bell of truth…." and take note that "...central to the notion of sustainability is that the human species is merely a single species amongst millions that support a vastly complex ecosystem that support one another" (Ehrenfeld, 2008, p.55). Ehrenfeld writes that once this is understood, humans have an "ethical obligation to acknowledge the invented notion of rights or superiority" (Ehrenfeld, 2008, p. 56). The tenor of Ehrenfeld is found in almost all ecological literature. The concept is if you're educated then you must work towards a more sustainable planet. Dr. Bruce Hull writes about faith and sustainability. He notes movements like *God's Greens, Earth and Faith*

and C*reation Care,* are all conservative evangelical Christian movements that use scripture to promote Christian based sustainable behavior. He also points out that this is a far cry from Lynn White's 1967 article in *Journal Science* titled "Historical Roots of Our Ecological Crisis" where White blamed Christians for the ecological crisis. Hull writes it is "hard to find a Christian based organization that does have a stance on the sustainable challenges facing our society" (Hull, 2008, p 124).

In July 2009, Pope Benedict XVI issued an encyclical titled *Love and Truth Caritas in Vritate.* In chapter four Pope Benedict addresses environmental issues directly. Among the arguments the Pope makes is one for "creation care." Hull summarizes a few of the Pope's points. For example, "'The environment is God's gift to everyone…' Benedict argues for a sustainable approach to the use of natural resources, claiming that human use of nature carries 'a responsibility towards the poor, towards future generations and towards humanity as a whole.'" Also, "'Nature expresses a design of love and truth.' In this section, the Pope carefully lays out a scriptural argument for creation care… but also makes clear that he's in no way presenting a case for 'neo-paganism or a new pantheism…'" And again, "'The Church has a responsibility towards creation…': Benedict argues for the concept of 'human ecology' — that environmental challenges directly affect not only human prosperity, but the prospects for human survival" (Hull, 2008, p.12).

Many people who were undecided about environmental issues were suddenly talking about the Vatican's encyclical. According to Catholic Online, along with the encyclical the Vatican installed photovoltaic solar collectors and pledged to be the first carbon neutral sovereign state in the world.

Newton (2011) contends that all humans have a moral and ethical responsibility to live in a sustainable way. She writes that at the core of human nature humans want to live in harmony with nature. Her thoughts tie together the idea that "doing the right thing in one's life means not putting yourself above other species" (p. 87). "Living a balanced life resolves conflicts with our body, mind and our spiritual existence" (p. 91). This type of approach and thinking ten or twenty years ago would have been considered "new age" or "hippy speak," but by reading online college blogs and listening to college students, this thinking is acceptable and common and has become part of the lexicon of this generation.

What is ethical and moral about sustainable development? The field of ecology is a relatively new field of science that was founded with a philosophy that ecosystems are a complex web of living and non-living components that have a hierarchy, a pattern and a process that sustains life on our planet. Ecologists are studying ecosystems from the molecular level to global ecological systems. Early ecologists such as Haeclkel, Darwin, Warming and Linnaeus wrote about man's negative impact on the ecosystems. In ecological literature, the moral and ethical theme of a humanity role in stopping and revering the destruction is ubiquitous. D. B. Vredenburg, who studies species extinction, writes "Human activities are associated directly or indirectly with every aspect of the current extinction spasm" (2008, p. 239). Similar to Lisa Newton's writings and the views of religion, this vein of thinking is affecting popular opinion. The moral and ethical components of sustainable development are a significant force in the literature.

Technological Advancements in Buildings and Grounds

The third stream of thought originates from studies conducted by design professionals and manufacturers of building products. The literature within the design profession is replete with sustainable design methods. The literature is in many ways teaching the design profession to use techniques and methods that are very different than how buildings were built just a few years earlier. Additionally, there is an underlying philosophy that the design professional has to train the client to accept a sustainable design approach. With building efficiency focused on sustainability, use and functionality will significantly change. Campuses may not build new buildings at all, but rather will renovate for more efficient uses while even others will strive to make buildings and grounds produce more energy than they consume.

Architects and engineers have become aware that their professions contributed significantly to the environmental degradation of the post World War II era. Building design professionals were caught up in the exuberance of the modern age. The great optimism of post 1945 was reflected in the cities; great edifices sprouted up in cities around the world. Glass clad steel and technological wonders were a symbol of man's prowess and dominance over nature. Design professionals are now realizing the ecological ramifications of this type of construction. The profession understands that we all live in a finite world and construction does not have to have a negative effect on the biosphere. The literature reflects this awareness. The U. S. Green Building Council (USGBC) has over twenty-two countries as members. USGBC is the largest organization in the world that promotes green building and design principles. The training includes architects, engineers, landscape architects, interior designers, product manufacturers,

product representatives, construction professionals and other people associated with sustainable development in green building practices. Many towns, cities, state governments and federally funded entities require USGBC certification for new and renovated buildings. Millions of professionals have been accredited through the training and testing process called Leadership in Energy and Environmental Design or LEED (www.usgbc.org).

Building product manufacturers are striving to obtain "green labels" so their products can be specified in LEED certified buildings or environmentally friendly construction. The trend has passed the tipping point and future buildings will all have a smaller environmental impact than buildings built a few years ago.

The concept behind bioregionalism dictates that once a region has reached a balance of human habitation and nature's ability to sustain that population, then equilibrium is obtained. Knowing that the campus and overall populations within a given region are finite, how will administrations view academic offerings, growth, buildings and grounds; surely in a very different way than current campus leaders. In public universities, there is always a desire to maximize the building size, because receiving funding for a new building takes about ten years. The overriding factor is constructing the maximum square footage for which the state will appropriate funding. Using new technologies like enthalpy wheels, chill beam cooling, photovoltaic arrays, water cisterns, and living machines, coupled with older design principles such as solar orientation, passive solar design, operable windows, rain gardens, native vegetation, and sun light harvesting, design professionals are designing buildings that are high performing buildings and are far more sustainable than past construction methods. The following

examples are ways building techniques and technologies are being applied to produce environmentally friendly architecture.

Passive solar design principles will drive the design team to study the sun's daily and seasonal movements. Buildings will have minimal western exposure, because the setting sun penetrates deep into windowed spaces and substantially increases solar gain, which taxes the mechanical systems. If western elevations are unavoidable, then the elevation will be required to utilize heavy overhangs, deep inset windows, or solar shading of various types. Northern elevations, for the most part, will be heavily glazed to take advantage of the indirect light and afford the users daylight without turning on lights. Also, occupants who can utilize north light will be clustered on that side of the building. Southern exposures will have double duty. In the summer months, sun light will need to be blocked with solar shading devices. In winter the solar gain from the windows can be utilized to heat the spaces or harnessed to heat the building. By selecting building materials that absorb the solar radiant heat and storing it in thermal mass, architects can balance out the outdoor temperatures. Light shelves can reflect light upward to take advantage of natural light as well as block harsh sun light that enters the space at undesirable angles (Kloppenburg, 2006).

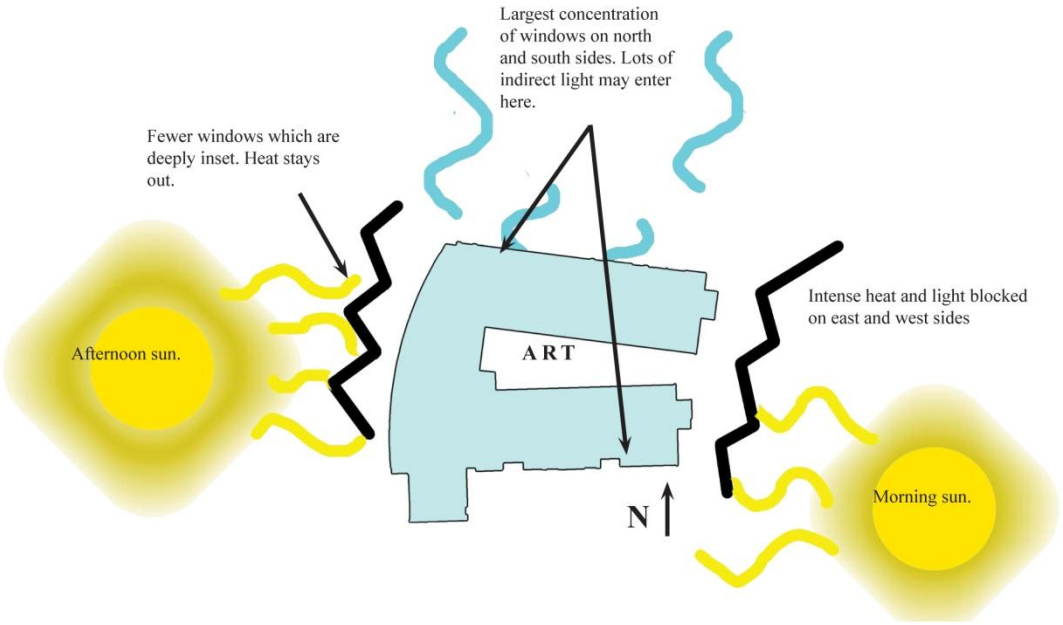


Fig 2-1: Passive Solar Design Principals

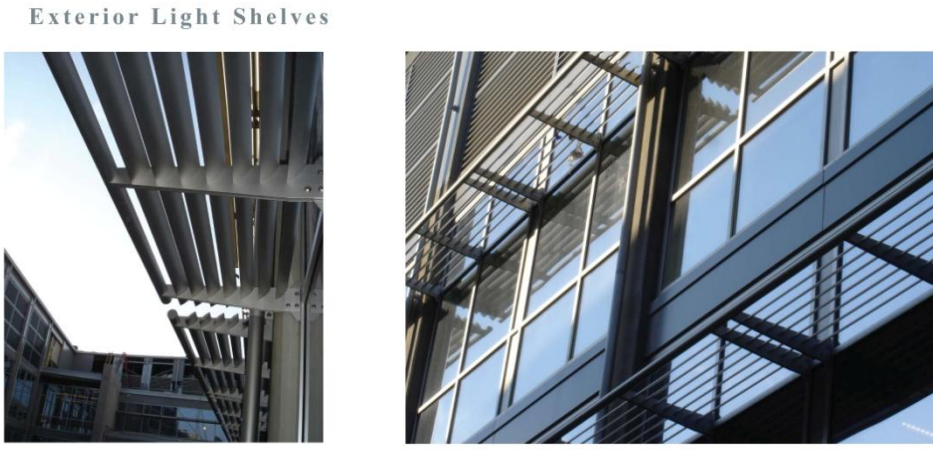
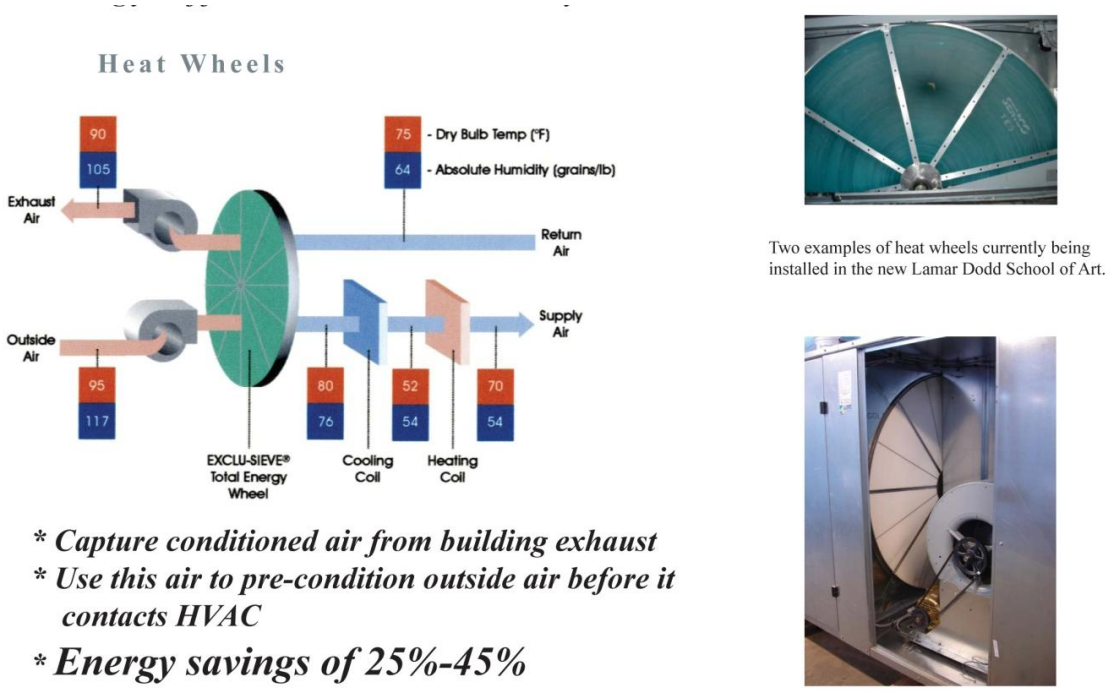


Fig 2-2: Optimized Solar Lighting

Topography is a key factor in sustainable design. Upon the development of heavy equipment to move the earth with little effort, the once formidable hills were disassembled and moved as necessary. The minimization of disturbance to the site character, skyline, vegetation, hydrology and soils should all be principles of sustainable

design. With each sketch, respect for the existing site conditions should be fundamental of the end result (Benynus, 1997, pp. 230-245).

Building systems should be the highest performance systems on the market, and the cost associated with these systems should be included within the budget established. Each region has its own climate and sub-climates. Understanding these climates and designing heating, ventilation, and air conditioning (HVAC) systems that use the minimum amount of energy is vitally important. Most colleges employ chilled water and steam loop systems. These loop systems share the load by looping several buildings together, thereby decreasing the high energy draws during the extreme parts of the heating and cooling cycle. By adding cooling or heat to the loop during peak demand, the buildings operate very efficiently. The loop ensures no single building is drawing excessive amounts of energy, while providing a redundant backup. The air handler machines that service each floor can be sized much smaller, thereby saving even more energy. Even though loop systems are efficient, there are numerous devices that can be added to improve energy efficiency, such as energy wheels, which have proven to replenish their cost in four to five years (Kloppenburg, 2006).



Two examples of heat wheels currently being installed in the new Lamar Dodd School of Art.

Fig 2-3: Energy Efficient Mechanical System using Heat Wheels

The grounds of the sustainable campus will be designed far differently than conventional campus plans. A good starting point is to understand the different watersheds that make up the campus. This includes visual bodies of water as well as water flowing under the ground. Hydrological research will greatly influence the location of the buildings, walkways and infrastructure of the campus. Waterways have been altered in the past - filled in, rerouted through piping systems or any number of different methods. Administrators must decide if they will correct the errors of their predecessors or keep developing with the understanding of doing no further harm. The Georgia Institute of Technology has taken a bold step by mapping the original watersheds, digging out hundreds of yards of dirt and restoring the natural flow. By respecting the watersheds, large parts of the campus will need to be preserved with no-build areas. Buffers, setbacks and restoration will be part of a sustainable plan.

Watersheds are part of larger river basins, which in America, are almost all in decline. The concept of placing buildings intentionally at a low point in the watershed to retain, clean and slow water movement is part of good sustainable design principles. This practice can employ constructed devices such as rain gardens, runnels, or bio-retention areas to clean, store, reuse and filter water run-off that is polluted (www.stewardhip.gatech.edu - Georgia Tech Web Page).

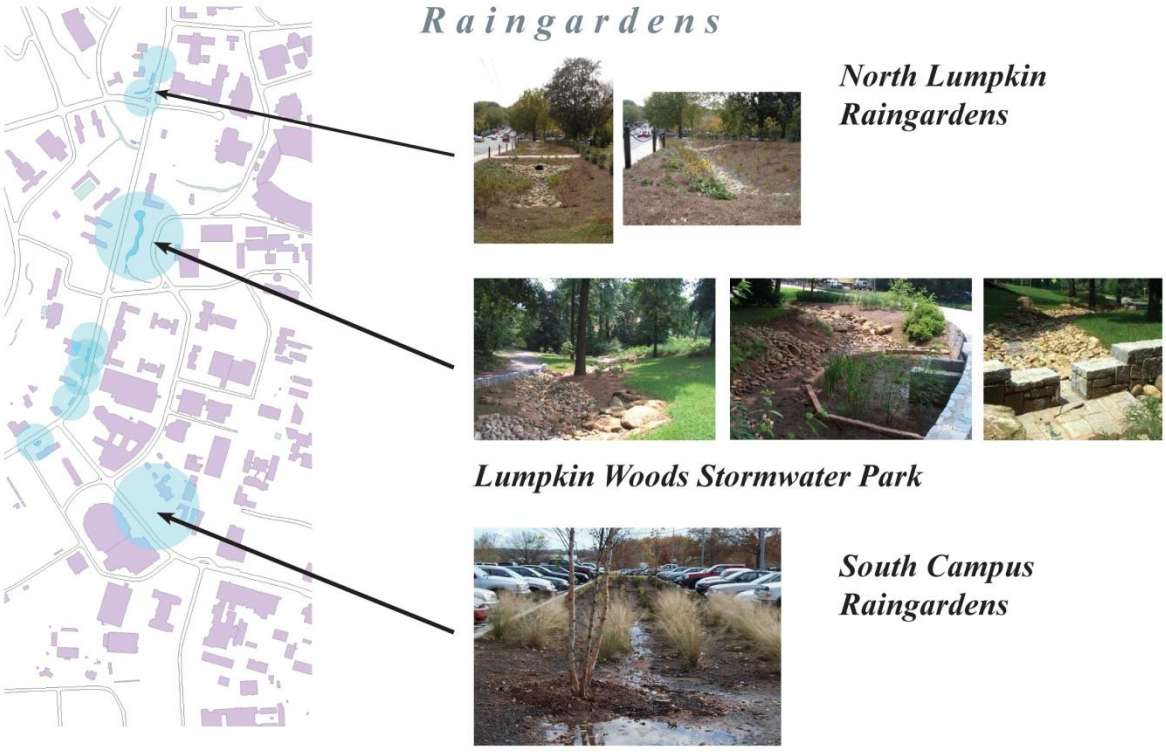
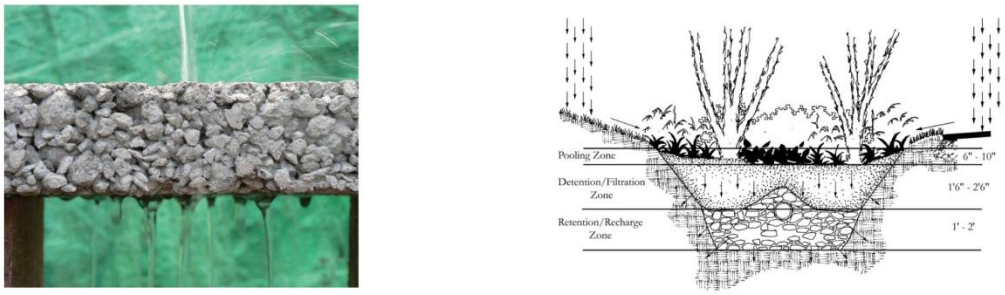


Fig 2-4: Raingardens installed on The University of Georgia Campus



cross sections of porous concrete and a typical raingarden

Fig 2-5: Infiltration and Retention

Plant materials should be indigenous to the region and planted in locations where the plants will grow and adapt to the environment naturally. Like so many parts of sustainable design, concepts like these seem obvious, but in fact they are not. In most regions of the country there is a battle being waged against invasive plants. Plants that are not native to the region often thrive, proliferate and eventually take over, killing the indigenous plant life. In addition to harming native plant life, they change the landscape and often create numerous problems for wildlife.

Less watering

Less need for fertilizers

Less need for pesticides

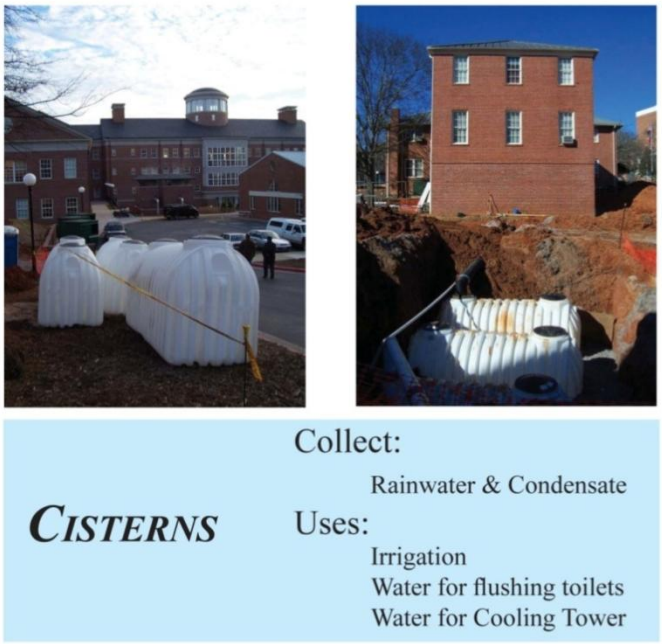
Better suited for native fauna

Sense of place

Fig 2-6: Benefits of Native Plants

Cisterns are part of the overall options for water reuse. Cisterns can store water collected from the site, roof, air conditioning condensate, parking, sidewalks and other water sources that are not sanitary. This water can then be used a second time for flushing plumbing devices, watering plants and grass, etc. The capture and reuse of this

precious resource is critical in all regions of the country. Below are some examples of cisterns being installed on the University of Georgia campus (www.camplan.uga.edu – University of Georgia Office of University Architect Web Page).



Left: Cisterns during installation at Memorial Garden.

Below: Cisterns during installation at Coverdell.

Fig 2-7: Cisterns

The rules of planning for a sustainable campus are the new paradigm. The new paradigm will change how we interact with the environment, making the user change from traditionally accepted ideas to working with the environment. Confronted with the fact that construction and its companion industries account for 25 percent of the global wood harvested, 40 percent of materials entering the global economy, 35 percent of the total energy used, 5 percent of landfill space, and a billion tons of raw materials and generate half the global output of greenhouse gases and agents of acid rain, the design professional is responsible to provide their client with the best possible product and design to meet the needs established by the client. The built environment has a significant impact to both the natural surroundings and users of the building. Design

professionals like architects, engineers and landscape architects are starting to learn and embrace sustainable design principles. The building industry is also providing leadership in sustainable building methods. And product manufacturers are producing building components that are more environmentally sensitive. Design professional associations are also challenging their membership to design buildings that consume less energy. The American Institute of Architects (AIA) has set a goal for all architects to design buildings that use 20% less energy by 2020 than used in 2010. This reduction will increase by 10% each decade until 2050. This challenge is being proposed to other design professionals with the end goal of reducing of our country's carbon footprint.

Conclusion

Physical planning is of great significance to the quality of the environment at and around universities. New methods of learning, new creative work environments and new approaches to higher education are being explored around the world. Higher education should be a leader in the sustainable movement. Higher education can play a pivotal role in a new sustainable society. The very nature of higher education lends itself to innovation. Students can be taught a different way to live and work; a way that is less damaging to the environment. Higher education can provide research, products and technologies that power a new future. Higher education has an ethical and moral responsibility to shape this new direction.

CHAPTER THREE

RESEARCH DESIGN

This chapter outlines my research methodology. I chose to use a qualitative case study model in which I interviewed major participants in the strategic and campus planning design process. My goal was to discover when major decision makers came to the realization that their campus should and would shift to a more sustainable campus direction and just how far can or will these leaders take their campuses in a sustainable direction. The qualitative design process is the best approach for answering this and other related questions. Conducting interviews with the main decision makers allowed me to understand the participants' perspectives, their roles during the process, the context and finally, why they reshaped their institutions directive (Merriam, 1998).

The bulk of my research used a holistic double case study approach (Yin, 2009) with the outcome of answering the following questions:

1) What is possible in designing and building a sustainable campus? How have the principles of bioregionalism been applied to a college campus?
2) How do you achieve buy-in to collective ecological based strategic planning, master planning and academic planning initiatives?
3) What external forces help or hurt achieving sustainable goals?

The nature of these questions could necessitate a different response depending on the participant's perspectives and their role in the process. Qualitative research as

outlined by Yin (2009) will yield "the meaning people have constructed and understand the context." Additionally, "understanding the setting in which the participants in a study address a problem or issue" (Creswell, 2004, p. 73) can help in understanding why a decision or direction was made. Only with qualitative design can I find the critical and salient points that turn the institution toward the sustainable direction. The persons interviewed were those involved both within the institution and those consultants hired to help guide the process. Since the nature of a strategic and facilities planning process is one of collective decision making that builds on agreed ideology, it was important that my interviewees had been involved in the majority of the process. If any person was absent for a significant period of time during the process, critical decision points might have been missed. At the same time, persons absent during several meetings where critical decisions were made could come back into the process and, by the nature of their expertise, contribute none-the-less, with their contributions still being valid and helpful. A participant that falls into this category would be a consultant with narrow expertise. Qualitative research is dynamic and allows for such a scenario. Qualitative methods provide an approach where participants can come and go throughout the design process but still provide useable data. I employed a holistic double case study that explored administrators, trustees and consultants. I expected to find similar experiences and common stories. I also expected to find different points of view during the analysis of the interviews. Yin points out that this is an important finding.

Campuses Selected

I first narrowed down campuses that had made substantial strides with their strategic guiding principles and decisions along with embracing a direction of ecological

neutrality as part of the campus culture. This narrowing or culling out of campuses who have not fully embraced the philosophic tenet of bioregionalism focused my research on my question of how far can a campus go in achieving neutral net energy use within a given region or ecosystem. Additionally, these campuses provided a setting for a case study that can serve as a leading edge benchmark for future analysis. How I selected these campuses is twofold: first, through a literature review of published articles, web page reviews of different campuses that advertise themselves as a green campus and professional journals; and second, by consulting with colleagues in various professional organizations such as The Association for the Advancement of Sustainability in Higher Education, The Society of College and University Planners and The Association of University Architects. I selected two campuses that have established goals of ever improving their physical plant and pedagogy to accomplish their strategic goals of ecological neutrality.

During my literature review I studied over 120 college and university web pages on sustainability and read over forty sustainability plans. There were many notable campuses and universities that have embraced sustainability principles. I chose two small campuses, because through their planning process they changed from conventional plans to sustainable plans. What happened? How can other campuses, higher education scholars and professional planners learn from their processes or decision making outcomes? The two campuses are Eckerd College and Zamorano University.

My case study institutions were selected because both colleges had a change in leadership that instigated a comprehensive planning process. The planning processes included a strategic, academic and physical plan that would guide the institution for at

least ten years. Both Eckerd and Zamorano are small private colleges with a relatively flat management structure. In other words, the president could very easily receive feedback from students, staff, faculty, trustees or other constituents quickly. The lack of a rigid or heavily layered system may make far afield ideas more easily acceptable by the president. The selected campuses also brought in first-time presidents. Both presidents might have been familiar with green or sustainable principles; however, neither came into their position with a "green" mandate. Both universities needed a master plan for accreditation, and both institutions were growing and had space demand problems. Both had supportive boards and donors who were looking for the presidents to advance the institution, even though the boards did not have a coalesced opinion on an overarching direction for the institutions. Both schools had strong local reputations, but both institutions wanted to broaden their school's brands and international reputations. The planning process afforded a moment in time for a new or different direction or identity. The two universities, being small and private, provided the president a great deal of latitude that a large public university may not have. At the end of the comprehensive planning process both universities directed their colleges toward a more sustainable future and in a very different direction than their predecessors. I worked with both campuses during the planning process as an unpaid consultant advising the president directly. This position allowed me insight into decisions which not only helped me gain a quicker understanding of the process but also the results of the decision.

Selection of Interviewees

As important as selection of the campus to be studied, the selection of key personnel to interview was critical in obtaining useable data for analysis (Merriam, year).

The use of a purposeful sampling to gain insight into discovering and understanding the most from the sampled group so I can best be positioned to answer to my research question was the object of a selected sample (Yin, 2009; Toma, 2005). I wanted to learn when the decision was made to turn the campus direction to sustainable principles. In order to accomplish this objective, my interview list included the presidents, provosts, board of trustees, members of the Building and Grounds Committee, campus facilities directors, consulting architects and other professional team members who were substantially involved in the process. I obtained these names and verified their participation through meeting minutes and acknowledgements in published data. The published data included web pages, master planning, strategic and other related documents (Merriam, 2009).

My access had already been established with a personal association with both case study college presidents and members of the design teams. This association created a bias that will be disclosed both during the interviews and in my research footnotes. The interview process included a set of questions asked to the subjects. I used snowball sampling, and if a story or personal philosophy is told then I utilized narrative study to add to the data. This process outlined is based on established case studies methods from scholars such as Yin (2009).

Interview Process, Questions and Data Collection

I conducted personal interviews with the two college presidents that oversaw the planning process, members of the board of trustees and key professional design team members. These interviews served as my primary source of data and analysis. Interviewing is the main method of conducting qualitative research (Toma, 2005). Yin

(2009) advises that researchers must possess or acquire the following skills: the ability to ask good questions and to interpret the responses, be a good listener, be adaptive and flexible so as to react to various situations, have a firm grasp of issues being studied, and be unbiased by preconceived notions. The investigator must be able to function as a "senior" investigator (Tellis, 2006, p. 4).

The interview protocol included the eleven questions below, but I also utilized a semi-structured interview that allowed the interviewee to respond in a more opened direction. If this occurred I followed the train of thought. I also used a snowballing technique by asking the interviewee to recommend others who were instrumental in the decision making process. I asked the interviewees to elaborate on any comments or stories that may lead to further exploration beyond the bounds of my question (Yin, 2009).

1) Could you tell me from your perspective the story of the strategic / master planning process? (for the presidents) What motivated you to conduct a plan?

2) What outcomes were you anticipating? Did you have any preconceived sustainable outcomes?

3) What kind of support did you have from your board or staff?

4) How or who first proposed the sustainable principles that became the cornerstone of the planning effort?

5) How did you foresee implementing the change to a sustainable university?

6) How has the sustainable campus changed how your college is perceived?

7) Do you think sustainable principles will or have changed your university's position in the market place?

8) What part of the plan was the first to be implemented?

9) Can you see your college moving closer to a bioregional philosophy? If so, do you believe this concept is achievable?

10) What if any outcomes were unexpected?

11) What advice would you give to another campus exploring such a leap into sustainable principles?

I anticipated each interview would take approximately one hour. These questions are intended to probe and explore, but I was flexible so I could elicit further responses. I anticipated candor since I have a working relationship with several of the people I interviewed. Since most of the people I interviewed are academic, I expected to receive advice and guidance. This candor may have biases that I disclosed.

I interviewed several key people who were directly involved in the master planning and strategic planning process at both campuses. All of my interviews, except Dr. Donald Eastman and Dr. John Crowley, were conducted via phone conversations and transcribed by a paid service. Dr. Eastman's interview took place at his house in Highlands, North Carolina. Dr. Eastman's interview lasted almost three hours. Dr. Crowley's interview was conducted at his office in Athens, Georgia. The following lists the participants interviewed and their position at the time of the planning process:

Dr. Kenneth Hoadley, President of Zamorano University. Dr. Hoadley is currently retired.

Dr. John Crowley, Dean Emeritus College of Environment and Design, University of Georgia. Dr. Crowley is currently Director of the Master of

Environmental Planning program at the University of Georgia and Chair of the Buildings and Grounds Committee at Zamorano University.

Mr. Berkley Cone, Zamorano University Board of Trustees. Mr. Cone is no longer serving at Zamorano.

Mr. Mario Gomez, Campus Architect, Zamorano University during the master plan and currently the Campus Architect.

Dr. Donald Eastman, President of Eckerd College. Dr. Eastman is currently still the President of Eckerd College.

Mr. Adam Gross, FAIA, Partner at Ayers Saint Gross Architects, Baltimore Maryland. Mr. Gross is a partner of the firm and was the partner in charge of the Eckerd master plan. Mr. Gross is still practicing architecture at Ayers Saint Gross.

Mr. Christopher Rice, Project Architect for Ayers Saint Gross during the Eckerd master plan. Mr. Rice currently works for Broaddus and Associates in Austin, Texas.

Mr. William McKenna, President of McKenna Associates. Mr. McKenna was and still is a construction expert hired by Eckerd to advise Eckerd's administration on design and construction matters. Mr. McKenna has over forty years experience in the construction field and over twenty years serving Eckerd.

Ms. Anna Wu, FAIA, Campus Architect at University of North Carolina at Chapel Hill, Chapel Hill,, North Carolina. Ms. Wu served as an outside expert and was recommended by Adam Gross to take part in this dissertation study.

Actual campus visits took place during the planning processes, but the interviews were conducted in the summer of 2011 for the purpose of this study. I used a digital

recording device and also took hand written notes. All interviewees signed a release form and were told they could review the transcripts for accuracy (Toma, 2005). I paid a professional transcriber to write up the digital recording. I was consistent with all people interviewed and kept the semi-structured interview format. After the interview I recorded my impressions and folded this into my research findings (Toma, 2005).

Data Analysis

The analysis of the data adhered to Yin's social research which insures trustworthiness through: credibility of data and peer review scrutiny, transferability of data and findings with complete description of context of the case study, confirmability to established and reliable sources and dependability with data and methodology that has an audit trail. This approach assured scholarly rigor protocol was followed so that research and findings would have legitimacy in peer review.

I started the interview process with professional consultants. By starting with consultants I gained insight into the process that I might not have received by interviewing institutional employees. I used these first interviews to look for themes and sub-themes that might appear. I also used these first series of interviews as a way to refine my questions. If I needed to change my questions or sharpen my questions for the presidents or trustees, then this gave me the opportunity. Merriam refers to this as constant comparative method of data analysis. I coded the transcripts for themes and sub-themes. During the coding process I looked for the intersection of themes and dates when major themes occurred. If the dates and themes coincided with adoption of sustainable principles, this indicated when the shift occurred from traditional planning and operation to a direction in sustainable planning.

My research reflected that the two campus case studies had similar although slightly different themes. At Zamorano University the major themes were:

1) Problem solving through the planning process

2) Acceptance of sustainable principles and institutional support

3) Institutional change towards sustainable practices and how the Board perceives these changes to be beneficial to the institution.

At Eckerd College the major themes were:

1) A new direction for Eckerd emerged from the planning process

2) Acceptance of sustainable principles and institutional support

3) Institutional change towards sustainable practices

4) Sustainable directives reshape Eckerd and benefit the institution.

These themes developed by analyzing interview transcripts with major decision makers at the respective universities. I coded the transcripts using key phrases or terms. Often the interviewees expressed what they thought were pivotal moments or major turning points in the planning process. Both of the presidents I interviewed were well prepared before I interviewed them. Both refreshed their memory by either reviewing the master plan document or, in the case of Dr. Eastman, reviewing his notes. Both presidents expressed a deep understanding of the planning process, what the planning process did for their institution and what a change the process meant for the future of their institutions.

Trustworthiness

Trustworthiness of data as defined by Lincoln and Guga (1985) is through credibility, transferability, dependability and confirmability. Trustworthiness has developed in quantitative research methodology as a way to achieve sound research "within a criteria or cannons for good research practice" (Marshall, Rossman, 2011, p. 39). Trustworthiness has developed as a response to qualitative research as soundness to this research methodology. Trustworthiness is the trust in the research, so Lincoln and Guga set out a protocol of validity / credibility, triangulation and peer debriefing (Marshall, Rossman).

In my research study I followed Lincoln and Guba's protocol: validity / credibility by being in the setting for a prolonged period. My working knowledge of the participants and their campuses as well as their familiarity with me helped candor and built on established trust. I made available my research, transcripts and findings. I triangulated my research by using different sources and with different perspectives. My study benefited by using various types of research data including minutes to meetings, document reviews of designs, conceptual design documents, current design thinking in documents, field observations, and photographic documentation of the campuses. I anticipated the president would have a very different perspective than a trustee. The design professional added a different layer and so on, thereby providing me with a multiple source view on the same process. I also tested different theoretical lenses to sustainable principles. I used the concept of bioregionalism as the outer edge of a sustainable campus and the region it occupies. Bioregionalism is for many people an unobtainable goal, and others view bioregionalism as purely a subject for academic

discourse. The participants in my study had the opportunity to apply their own theoretical limits. The conversation had the potential of yielding multiple theoretical lenses. Peer debriefing happened at several stages, first with the different design professionals who worked on the planning process. These professional teams were comprised of different fields, but all had in-depth knowledge of sustainability principles and their application. These fields included architects, landscape architects, ecologists, hydrologists, biologists, horticulturists, etc. The campus members also had different levels of responsibilities and diverse backgrounds. I also interviewed Steve McDowell, the "father of the green build movement" as a peer reviewer. Steve gave insight into the theoretical limits of a bioregional campus and verified my thesis. He has over forty years of experience in sustainable architecture and design. Steve is an independent expert and provided another level of peer scrutiny that Marshall suggests achieves trustworthiness.

Dependability

Dependability in hard sciences research is reliability; can the research be replicated? Can other researchers follow the data and produce the same results (Merriam, 1998). This is the cornerstone of quantitative studies. In qualitative studies dealing with interviews and in some cases fading memories, researchers are attempting to understand a person's experiences and understanding of events (Merriam, 1998). Dependability is obtained with consistent results. Toma outlined a process that attempts to be consistent yet evolves over the course of the data gathering process. (Toma, 2005)

Toma advises the following for dependability: 1) A study congruent with clear research questions; 2) An explicit explanation of the status and role of the researcher within the site; 3) Findings showing meaningful parallelism across data sources; 4)

Specifying basic theoretical constructs and analytical frameworks; 5) collecting data across a full range of settings, respondents, periods and the like; 6) Parallel approaches among researchers on a given team collecting analyzing data; 7) Presence of peer or colleague review.

In my study I interviewed key decision makers, transcribed the interviews, made notes of my observations and impressions and coded the transcripts. The coding yielded themes, sub-themes and common wording. The use of common phrases, technological terms, metaphors and common cadences in talking about themes showed a common thread of thought. All of this needs to be done, as Toma writes, consistently. The consistencies along with a documentable research trail will assure dependability (Maxwell, 2007). The sharing of data collected allows the interviewee to know that the interview will add to the collective research of the field.

Confirmability

Confirmability, as defined by Marshall, "is showing ways by which researchers plan to account for changing conditions in the phenomenon chosen for the study and changes in the design created by an increasingly refined understanding of the setting" (Marshal, Rossman, 2011, p. 253). My study of Eckerd College's planning process was conducted in 2000 through 2003. Given that eight years have passed since Eckerd's planning process, there may be recall errors with the subjects. I reviewed meeting minutes which were taken during the planning process before I interviewed the subjects. I made these minutes available if the subject wanted to review them as this may help them if their memory needed refreshing. I also used the record of events to clarify any misinterpretations, if this occurred. Zamorano University in contrast completed their

planning process in 2009. Sustainability and the myriad of issues under the umbrella of sustainability have changed greatly in ten years. I needed to account for the time span and the relevancy of issues proposed ten years ago. The time gap provided an interesting comparison and contrast in attitudes among senior administrators. Additionally, Toma cautions researchers to admit their biases because there is a fine line between researcher bias and interviewee subjectivity. Toma points out that it becomes easy for the researcher to impose his or her bias on the participants. This could become a significant issue for a plan like Eckerd College, which took place ten years ago.

In conclusion, research should be controlled and systematic, recorded and observable. This leads to general principles or theories and then outcomes that are credible, measurable and stand up to peer review. My plan to study and interview the main players in the development plans for Zamorano University and Eckerd College coupled with a study of their progress will show if the concepts of green building are obtainable. If they are, then are the goals of bioregionalism obtainable within these two campuses? If so these learned principles, those of ecologically informed physical, strategic and academic planning processes, can change the American college campus just like so many other social changes.

Bias and Research Identity

This stated goal has one large issue that must be disclosed, my bias. Bias is understood as an acceptable part of any research study. Stake writes that "bias is ubiquitous and sometimes undesirable" (Stake, 2010, p. 164). The literature tells every new researcher to acknowledge the fact that bias exists and work to minimize personal bias in the interview and data collection of the study (Stake). Merriam states that since

the researcher is a human and a human is the primary instrument in collecting the data and interpretation, bias will be part of the study. All new researchers should take comfort in Merriam when he writes that with more experience the researcher will learn to put aside his biases, although not entirely (Merriam,1998). Stake's answer to minimizing the bias is "with better designs, triangulation, and skepticism." "We try to recognize and constrain our biases but going further to check the data gathering and analyses with validation, particularly with reviews by critical friends, making some of the important things more explicit than before" (Stake, 2010, p. 166).

My biases begin with my architectural training. The curriculum was heavily weighted towards sustainable design. I started architecture school a few years after the oil shortages of the 1970's. Shortly after graduating and working in private firms, I witnessed the environmental destruction of developer driven projects. As an architect, I was a party to the asphalting of hundreds of acres of green fields. I was in essence the instrument of the loss of habitat, and I added to sprawling of our cities. I tried to influence the developers for which our firms worked, but to no end. I looked for something else in the field of architecture and found campus planning. On American college campuses I found a more receptive and open minded client. Over the last twenty-three years I have worked toward a sustainable campus. I consult on campuses that are open to different ways of planning, the sustainable approach. As the Associate Vice President of Planning at The University of Georgia, I have even hired people with similar philosophical outlooks. I directed the first comprehensive master plan for the Athens campus since 1906, and I wove into the plan sustainable principles. I have a vested and professional interest in the subject.

My Master of Landscape Architecture thesis was on sustainability. I have given dozens of presentations to local, state and national audiences on sustainable design. I believe, as an architect, I have an obligation to society to design built spaces that are as sustainable as possible. I was also part of both the Eckerd College and Zamorano University's planning process. It is with these biases that I undertook this study. Even though I was part of the process, I still cannot pinpoint when and how decisions were made that altered the course of the universities. Even the simplest design process is dynamic and complex. When something as large and complex as a campus decides to instigate a master plan, the complexity becomes a multiplier.

This is one reason I believe a study of this nature is important. To study the process as a researcher and also as one that was a participant added a new and different perspective to this field. My understanding of the issues and my knowledge of the participants allowed me to ask questions that were deeper and more insightful than someone researching without my first hand knowledge. I was an unpaid consultant for both of these campuses, but I have made every effort to maximize the trustworthiness of my study and to guard against my potential bias. Even though the actual campus visits took place during the planning processes, the interviews were conducted primarily by phone in the summer of 2011 and solely for the purpose of this study. Because of my deep understanding of the master planning process, I was able to take the questions into areas that other researchers may never understand.

As an architect who has worked the majority of his life in higher education campus planning and design, I should have a broader perspective than other researchers who are not architects or have not practiced in the field of higher education. All of this

background and work experience worked to my advantage. Having just disclosed my bias, I do not see myself as not being objective. I remained as neutral as needed to insure my qualitative research objectives were met. I truly wanted to hear and learn what different professionals and higher education administrator's opinions were during the design process. What were the defining moments that caused the president and trustees to act in such a different direction? If I stayed objective, neutral and unbiased I knew I had a better chance of discovering what I wanted to learn.

CHAPTER FOUR

RESULTS - ZAMORANO

Chapters four and five reflect the findings and results from my research, which were gathered using qualitative case study model methodology. I interviewed major participants in the strategic and campus planning design process at their respective colleges with a goal to discover when major decision makers came to the realization that their campus should and would shift to a more sustainable campus direction and just how far can or will these leaders take their campuses in a sustainable direction. The two campuses studied are Zamorano Pan-American Agricultural School in Honduras and Eckerd College in St. Petersburg, Florida. In this chapter I will focus on Zamorano University and chapter five will reflect the findings from Eckerd College.

Campus Context

Zamorano Pan-American Agricultural School or Zamorano University was founded in 1941 by Samuel Zemurray (1877-1961) an American and president of United Fruit Company. After years of working and profiting in Central America, Mr. Zemurray wanted to "give back to the people of Central America and provide a chance to educate young people in a college forum equal to what young people in the United States have access to" (Malo, 1999, p. 202). Samuel Zemurray's generous philanthropy gift procured a thirty-five hundred acre estate owned by the Zamorano family. Located fifteen miles east of Tegucigalpa, the capital of Honduras, in the Yeguare Valley, Zamorano University is today one of the preeminent post secondary educational institutions in

Central and South America. Samuel Zemurray hired renowned botanist and horticulturist Dr. Wilson Popenoe to be Zamorano's founding rector. Popenoe designed and constructed the campus buildings and grounds to reflect the Spanish Colonial style of architecture that is synonymous with the region. Popenoe's established pedagogy was rooted in a "learning by doing" philosophy (Malo, p. 124) of work in the fields in the morning "getting their hands dirty" and then afternoon classes. This balance of applied work with theory is the cornerstone of the Zamorano education. Popenoe believed "Work, honesty, punctuality and dedication to the gospel of farming efficiency" rounded out a young student's education (Malo, pp. 125-130). The architecture referred to as the "Zamorano Style" is essentially a minimalistic Spanish Colonial design using indigenous materials without ornamental detailing. The Zamorano style of simple, utilitarian form follows function architecture that complements the teaching method of learning by doing. Understanding the significance of how the campus architecture works as a reciprocal player to the pedagogy was lost on many architects who practiced on the campus as well as the rectors after Popenoe.

Zamorano today is a co-educational institution with 1,214 undergraduate students enrolled in academic year 2011. The population is 68 percent male and 32 percent female. Students attend from countries primarily within Central and South America, but also outside the hemisphere: **s**tudent body in 2010 - 24% Ecuadorian, 23% Honduran, 14% Guatemalan, 13% Panamanian, 24% other Latin-American countries, 1.5% Caribbean, 0.5% European. The academic calendar is a trimester forty-five weeks per year. Students attend year round with short breaks every fifteen weeks. The four year program has produced 6,462 alumni who work in twenty-nine different countries.

Tuition is $14,800 dollars per year with 75% of the students receiving some form of financial assistance. The student faculty ratio is 1:12 with degrees granted in Agribusiness Management, Agricultural Science and Production, Food Science and Technology and Agro- Environmental. The campus is currently comprised of 12,606 acres or 5,104 hectares of land (http://www.zamorano.edu/english/explore-zamorano/about-us/our-mission/).

The Impetuses for the Zamorano's Master Plan

Dr. Kenneth Hoadley was Zamorano's fourth rector and initiated a comprehensive physical master plan in parallel with a strategic plan effort. This work began in 2007 under the direction of Dr. Hoadley. The reasons for undertaking these plans included, in part, a history of haphazard building placement and dysfunctional building designs. Dr. Hoadley recognized that he did not have planning expertise on his Board, and reached out to Dr. Jack Crowley, Dean of the College of Environment and Design at the University of Georgia. Dr. Cowley, upon visiting the Zamorano campus, made several observations. One of the major issues was the fact that each of the previous rectors constructed buildings during their tenure as rector in different sections of the campus. These different phases resulted in a disconnected and dysfunctional operation. Dr. Crowley notes some of the issues:

> Wilson Popenoe was the first president. At that time the grant was made, the ideas or the vision were created largely by Popenoe, and a plan was done. And it's very clear; the first buildings of the campus were laid out in a campus-like fashion, modeled after universities elsewhere. And so, typically, the fits and starts would be that you go through a series of presidents, more students come to the

> university, it matures, its reputation expands, and another president, Simon Malo, comes on board, and he creates a different part of the campus with his own vision. So, you can see the campus, you can actually even understand it, its intersecting types of grids with different orientations represent different periods of growth on the campus.

Other reasons included the threat of urban intrusion from Tegucigalpa and the fact that the Pan-American Highway (CA6) had bifurcated the campus. Other Board members that were part of the Building and Grounds Committee had similar observations to some of the problems at Zamorano. During my interviews, I often found that the issue the board member felt was the biggest problem came at the beginning of their response to my questions. As Zamorano board member Berkley Cone points out, the Pan-American Highway (CA6) is an ongoing and serious problem:

> The Board felt the number one thing that was a problem was we have a road that goes through campus, and that has been a nemesis of the school and remains a nemesis. The decision was made by the Board to really take a long, deep look at how could we plan for the future, and what did we want to be. How do we use this enormous piece of property that we have? And, we needed help to do it. We did not have on-site resources to do that.

Dr. Hoadley had a vague idea of what a master plan entailed, but he knew he wanted a plan that provided a clear direction of growth that would guide Zamorano for the next fifty years.

> I had a very active and involved Board that wanted resolutions to problems on Zamorano's campus that frankly predated me and had never been resolved. We

had a donor that gave money, a lot of money for Zamorano, for a new classroom building, and the design frankly didn't work, and I was unclear as to how the building would fit, looks wise, on our campus. I understood many of the problems confronting Zamorano, but needed professional help, help not in Honduras, I wasn't getting it there. Architects in Honduras are not as professional as in the States. My Board was giving me suggestions, but their suggestions were often just isolated solutions. I needed someone who could give me and the Board a professional opinion and help solve big problems on the campus.

Dr. Hoadley also charged the design team with looking for ways to reduce cost of operations and deferred maintenance. The design team was given little direction and quite a bit of discretion in accomplishing its mission. The team was an all volunteer staff lead by Daniel Sniff, architect; Paul Cassilly, architect; Kevin Kersche, landscape architect and Ben Liverman, intern landscape architect. The team developed a process that followed a seven phased approach to master planning:

1) History
2) Goal Formation
3) Existing Conditions
4) Future Campus Requirements
5) Preliminary Physical Mater Plan (three different plans)
6) Physical Master Plan
7) Implementation

The flexibility given by Dr. Hoadley allowed the team to develop this process and gave the team the ability to talk to faculty and staff exploring additional problems that the team knew would surface once they got on site. A flexible process also provided the opportunity to use innovative problem-solving that would not have been possible for Zamorano administrators due to their proximity to the problems themselves. This process served as a framework for understanding Zamorano's development over the past seventy years and to help guide the team and Board to logical conclusions that once vetted could form a plan for the future of Zamorano.

Observations

The design team spent three days in Honduras conducting field observations and information gathering. In addition to understanding the physical and natural environment the team observed that Dr. Popenoe's original design for Zamorano was virtually environmentally self-sustaining. The Spanish Colonial style of architecture utilized natural materials. The construction of the first buildings started less than four months after the attack on Pearl Harbor. Despite the lack of building materials, like screws and nails, Popenoe's knowledge of local building methods and processes allowed him to start construction in March 1942. The builders of Zamorano were very resourceful. For example, when the designs called for several thousand red clay roofing tiles, Popenoe built kilns and made them on site (Malo, 1999, pp. 183-184).

Figure 4-1: Placing the red clay roofing tiles, which were created on site using kilns

The material for the wall construction was also local. Piedra Canteada or a rusticated square edged hand cut stone was quarried on a hill over looking the valley north of the campus. The geological name is intensely silicified rhyolite ignimbrite of Miocene origin or tuff. (Malo, p. 188) The soft stone is predominately white with vines of light pink streaks. The quarrymen cut the stone from the cliff sides by hand with steel chisels, squaring the blocks with long steel adzes. The work still goes on today as it did seventy years ago and five thousand years before then. The ancient Mayans used the stone in their buildings. This approach of providing building material that is hand cut with a thousand plus year life span is as sustainable a method as can be devised.

Figure 4-2: Doris Z. Stone at the initiation of the construction in May 1943

The roof framing material was constructed with local pine timbers. In the early years, before the local saw mill, the wood came from Tegucigalpa. After the school acquired a saw mill local trees were harvested.

Figure 4-3: Front of the Administration Building constructed from volcanic tuff

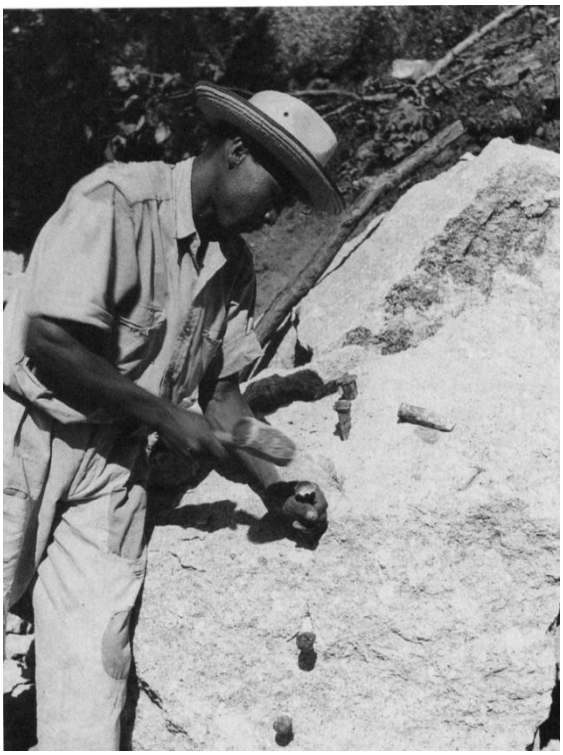


Figure 4-4: Worker splitting large chunks of tuffstone to be used in construction

Figure 4-5: Construction of the administration building

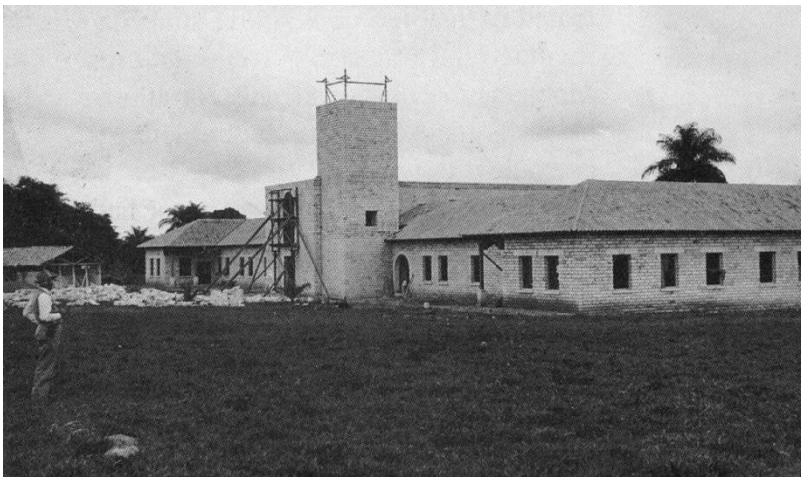


Figure 4-6: The administration building is almost complete in January 1944

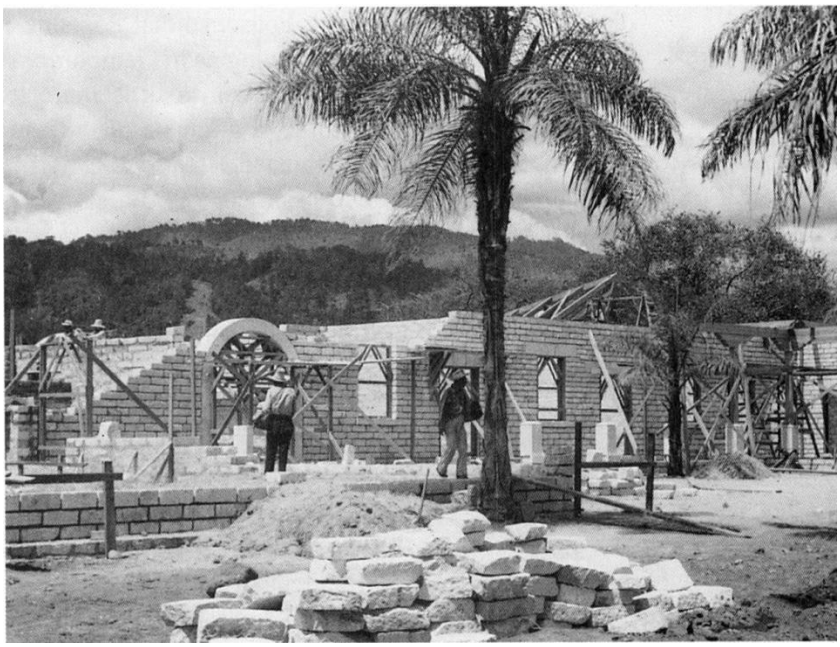


Figure 4-7: View of the main administration building and what would become the large assembly hall, classrooms, and offices for personnel and accounting

The team observed that the basic tenets of architecture (proper proportions, size, scale, use of natural light, good ventilation) were all present within the architecture of Popenoe's design or the Zamorano Style. Popenoe's indigenous architecture held the secrets of hundreds of years of what worked in the Honduran environment and what

failed. Popenoe's designs utilized high ceilings, at least 11' 6", with large windows to take advantage of cross-ventilation. The stone walls slowed heat gain in the hot months and served the opposite function in winter. The result is the architecture of the campus is timeless and functional.

The team also saw renovation and new construction that utilized Popenoe's designs and construction techniques. In sustainable terms, these campus buildings were very close to being 100% carbon neutral in their construction. The campus also had at one time an extensive rain water collection system with runnels and storage areas. This system was not being used, but the backbone was still intact. Zamorano potable water was being collected from a rain forest watershed that the university owned and maintained. The sewer system was a campus owned and maintained system which had problems, but for the most part worked. Zamorano also produced its own food, both plants and animals, in quantities large enough to sustain the population and sell food at a local store and make a profit. On the first trip the design team formulated a plan to include a sustainability component that would be the solution to energy dependency, thereby reducing the cost of operations and deferred maintenance. This campus had all the systems in place to become environmentally neutral, the team saw the possibilities. In *A History of American Higher Education*, Thelin (2004) states that "Colleges and universities are historical institutions. They may suffer amnesia or may have selective recall, but ultimately heritage is the life blood of our campuses" (p.1). Popenoe's selection of the Yeguare Valley necessitated that all sustenance be grown locally, and therefore, until recently Zamorano's growth was bound by the region's ecological

carrying capacity. The design team was proposing to develop a plan that at its core would be the definition of bioregionalism.

Findings

As Thelin points out, "history matters" (Thelin , 2004, p.1). Using the reverence for Dr. Popenoe's commitment to Zamorano, the team used the Zamorano Style as the model for all future buildings. The team used the meetings with Dr. Hoadley and the members of the Board's Buildings and Grounds Committee to examine sustainable design and building solutions to Zamorano's problems. Along with producing a conventional master plan the team introduced sustainable principles and solutions to problems mostly caused by motorization and ignoring environmentally destructive practices. (Appendix C) The master plan recommendations included the following:

1) A constructed wetland using existing water storage sites and the use of phytoremediation techniques to clean the polluted water systems. The water upstream from Zamorano is an open sewer and contains waterborne pollutants such as coria. (Phytoremediation describes the treatment of environmental problems (bioremediation) through the use of plants that mitigate the environmental problem). (Appendix C-page 179)
2) Restore the biodiversity of the Yeguare Valley. Over the past several decades most of Central America has been deforested, the Yeguare Valley has not been immune. By using student labor, large sections could be replanted with plants grown at the college then transported to restoration sites. (Appendix C-pages 182-183)

3) "No degree without a tree" program. Graduates would give ten dollars at graduation that would fund a tree planting program. (Appendix C-page 183)
4) Establish a valley restoration program that replaces the monioplant pine tree environment with a sustainable forest that produces sellable products not just trees for fires. (Appendix C-pages 183, 186, 188-192)
5) Construct a system of cisterns on all houses and buildings to collect water. Pipe this water to a newly constructed reservoir for use primarily during the annual three month drought. This will lessen the strain in the taxed watershed. (Appendix C-pages 178-184, 187)
6) Establish a second water collection system on the western watershed owned by Zamorano. (Appendix C-pages 187-192)
7) Build solar hot water systems and stop heating water with costly electricity. Honduras' cost for electricity is four times the rate in the States. (Appendix C-page 193)
8) Conduct an energy audit and prioritize energy reduction through installing photovoltaic panels. (Appendix C-page 193)
9) Set a goal to be 100% off the electric energy grid by 2017. (Appendix C-page 193)
10) Install impellers and a slurry pump in the existing gravity fed water system to produce electrical energy. (Slurry pump: the physics principle that increases the pressure of liquid and solid particle mixture (aka slurry) through centrifugal force (a rotating impeller) and converts electrical energy into slurry potential and kinetic energy). (Appendix C-page 193)

11) Build a regional market place where food can be sold to local residents and users of the Pan-American Highway (CA6). (Appendix C-pages 182-183)
12) Provide solutions to the economical and health problems for the local villages by using Zamorano's vast land holdings for communal farms. (Appendix C-pages 179-183)
13) Clean the local streams of garbage and teach local school children about the water cycle and importance of clean water. (Appendix C-pages 179-183)

I used the qualitative design process established in Chapter Three as being the best approach for answering my research questions. Conducting interviews with the main decision makers allows me to understand the participants' perspective, their role during the process, the context, and finally, why they reshaped their institution's directive (Merriam, 1998).

The bulk of my research is the case study approach (Yin, 2009) with the outcome of answering the following questions:

1) What is possible in designing and building a sustainable campus? How have the principals of bioregionalism been applied to a college campus?
2) How do you achieve buy-in to collective ecological based strategic planning, master planning and academic planning initiative?
3) What external forces help or hurt achieving sustainable goals?

The semi-structured interviews yielded rich and descriptive data that were analyzed using the comparative method. The three research questions guided the process from which several major themes emerged. Three major categories were constructed by

sorting and blocking the themes into outcomes that resulted from the two year planning process. These three categories were derived by an analysis of answers from eleven questions asked during the interview process. All interviewees were directly involved in the process and helped shape decisions or made decisions regarding Zamorano's master plan. My findings are supported by long quotations. I have chosen to use long sections of the interviews because of the substance and nature of the many different and complex issues the speaker is describing. The length of the quotations also provides the reader with insight into the major themes.

Major Themes

1) Problem solving through the planning process
2) Acceptance of sustainable principles and institutional support
3) Institutional change towards sustainable practices and how the Board perceives these changes to be beneficial to the institution.

The first major theme is **problem solving through the planning process**. Problem solving as a category describes the issues confronting the college that are presented by the President, faculty and the Board. The design team works on solutions to these problems and others that arise during the process. According to Jack Crowley the problems at Zamorano were complex and larger issues were on the horizon:

> I got involved when the campus was expanding more and more. The president didn't have an awful lot of personal knowledge or focus on the physical nature of the campus but knew that he had to do something. The campus was a lot of deferred maintenance and a lot of growth. The campus was up around 900 to

> 1,000 students [when I got involved]; it was expanding. It is presently at 1,200. There were even some accidental expansions where more students came than expected. And so, there became a very distinct need for fixing the campus and expanding it—bringing it into a modern context.

Rapid growth is often seen as a reason to commission a master plan, but Zamorano had many other problem**s.** Some problems would not arise until well into the planning process such as those discussed by Dr. Crowley here:

> Technology emerges, and that changes the guts of a lot of the buildings. So even the method for knowledge delivery changes. What's going on is more growth, but another player is entering the fray, and that is the security and the ability of the campus to armor itself. There're two things: one is driving it towards sustainability and the other is driving it toward a physical strategic plan to "armor" the campus against some of the outside influences that are beginning to lean against it—that being the growth of Tegucigalpa and the population growth of the valley itself. The second factor that's driving a lot of the strategic thinking on the campus is the idea that resources will run out given the present patterns of use—water being probably one of the principle ones. Take Jicarito, the adjacent city—which relies on the University for employment, and the university relies on the city for labor—that city is growing. It's a little over 9,000 people. As the town grows, it's growing onto university property. A lot of the developing countries have unique laws that simply recognize that if an institution is not using its land aggressively or appropriately, such as just leaving a pasture as fallow and growing back the forest, oftentimes it becomes available for other people who need it. So,

> invasion is not necessarily endorsed, but it's allowed, and it's recognized. So, there's a whole bunch of factors that are clearly affecting the university.

Issues that Dr. Crowley pointed out, such as the town of Jicarito growth impacting Zamorano and the larger Yeguare Valley, are examples of issues identified during the planning process. These issues led the team to recommend sustainable design solutions to address major water quality problems. The team also believed that by improving the quality of life for the people of Jicarito all the inhabitants of the valley would benefit. One benefit was respecting Zamorano's property line and the intrusion Dr. Crowley pointed out as a major issue.

Board member Cone, like many others interviewed**,** brought up what he believed to be the major issue or concern:

> The Board felt the number one thing was we have a road that goes through campus, and that has been a nemesis of the school and remains a nemesis. And the decision was made by the Board to really take a long look and a deep look at how could we plan for the future, and what did we want to be. How do we use this enormous piece of property that we have? And, we needed help to do it. We did not have on-site resources to do that.

The design team took all of these major issues into consideration during the problems seeking phase of the master planning process. Mr. Cone like many Board members focused in on the Pan-American Highway (CA6) as a major problem because the campus straddled both sides of the highway. The Pan-American Highway (CA6) was not an issue but an asset sixty five years earlier when Zamorano was founded, but in 2006 the highway was a major disruption. The bifurcation of the campus created dozens of

operational issues. The land on the right-of-way was being used by merchants to sell food, drinks and all types of merchandise to the users of the Pan-American Highway (CA6). People even set up houses and were claiming the land that Zamorano owned as their newly homesteaded spot and their own land. This problem coupled with Jicarito's impact to Zamorano drove the team to look at regional issues that were impacting the college.

Dr. Hoadley presented a host of other problems he was facing and was looking for the team to help solve other issues:

> Let me answer that by taking a different tack. I think strategic planning and master planning they're kind of two very similar processes. There's always a hidden agenda with most chief executive officers and depending on his own nature, which he may or may not want to completely be open about the political needs, there's a much more formal process in which people buy-in and strategic planning falls into this more formal process. When I got to Zamorano, Zamorano was in the middle of expansion or increase of students, by say 300, that was in 2003. So, Zamorano had been historically a fairly conservative, rigid, basically glorified vocational school. It started off as a vocational school, and they were very focused on agriculture, very focused on agricultural production. There was very much of a macho mentality, the learning-by-doing philosophy, which half the time is spent in class and half the time is spent working. And by working, it's hard physical work which is really focused on production agriculture and the various crop production activities. But there was an ethos which was based on hard work, on production agriculture and a very masculine approach to all this.

Dr. Hoadley was seeing his issues as the President very differently than the others interviewed. Dr. Hoadley saw Zamorano as a college that needed to change and evolve into a different educational model. He was dealing with what he referred to as a "macho mentality" that was a core tenet of Zamorano's learn-by-doing philosophy. He needed to change this way of thinking and introduce new ideas that were relevant to the twenty-first century. Dr. Hoadley wanted the planning process to be a platform to elevate new and different ideas and at the same time solve problems.

Dr. Hoadley also perceived Zamorano's educational mission as ripe for change:

> Not much consciousness of conservation—any of the things which have characterized a more global environment in the last 20 years. Women had been part of Zamorano since the early 80s, but it was still very much of a he-man, macho environment. And it really was an environment which I felt—and actually my predecessor felt as well—didn't really prepare students for the world—the much more cosmopolitan world in which the students are working. We felt, he felt it, and I shared his beliefs, that students had to be much more conscious of the environment. The educational system had to be dramatically shifted towards the more participatory learning, getting away from the traditional—the professor/student, where the professor lectures and the students take notes and regurgitate the answers on an exam. And so, there's a change process in which we had to put more emphasis on respect for the community, more emphasis on respect for the planet, more emphasis on respect for the students' ability to learn and the students' need to learn on their own and not just be recipients of a knowledge that's transferred by the professors. Now, many of these things are old

hat in the States, but at Zamorano, which still had uniforms, which still had a very rigid daily system, which looked very much like a boy's boarding school to me in the 19th century—these are big changes.

Dr. Hoadley's vision for change was to use sustainable agricultural techniques coupled with the "learn by doing" philosophy, but deemphasize the hard physical labor so students could have more time in the classroom. Later in his interview, Dr. Hoadley voiced his vision for how sustainable agricultural could help the world with many of the challenges facing depleted resources:

> I introduced a number of changes in the curriculum and tried to emphasize much more student-centered learning, and we put a lot more emphasis on the environmental assets—sustainable agriculture. We didn't necessarily go all the way toward organic agriculture but sustainable agriculture. At the same time, we spent a lot more time building the capability of the students in the area of science—basic science—we introduced a number of science courses, got fairly heavily into bio-technology and asked a lot more of the students from an academic perspective, and we tried to change the focus of the learning-by-doing so it would be much more of a "learning" and not just "doing" focus. These were some of the underlying currents, and I felt very strongly that the whole issue of sustainability was going to characterize agriculture and environmental sciences in the future.

In my literature review I cited The University of British Columbia as an example where the catalyst for change towards a more sustainable university was first proposed through a change in curriculum. The forum Dr. Hoadley used was the strategic and

master planning process. He saw this forum as a way Zamorano could confront the many problems and maybe move the institution into a different orbit with higher prestige. Dr. Hoadley goes on to say:

> Well, there was a process. It didn't happen all at once. I joined in 2003. We didn't really get heavily into the strategic planning process until, I would say, late 2004 and really 2005. So, the strategic plan, which I was heavily involved, was the five-year plan 2006-2010, and that was really developed in the year 2005. At the start, about three months into it, I developed a vision which I began to use in my lectures, in my presentations, which were many, in which I emphasized Zamorano's role in an educated student that was focused on the development of sustainable and competitive agriculture—one; two—the conservation and responsible management of natural resources; and three—world transformation and poverty reduction. Those are three inter-related areas of focus, and I put a lot of emphasis on that in all of the various presentations. So, the Board began to get used to hearing me talk about that. I needed a physical master plan that matched what I was saying and the design team from [the University of] Georgia married perfectly with where I thought Zamorano should be heading.

Dr. Hoadley wanted a plan that was a logical strategy that solved many of the physical problems he was dealing with on a daily basis. He also needed this plan to contain visuals that would encourage his Board to support the new direction in which he believed Zamorano needed to evolve. The physical problems that the Board, faculty and staff indentified were then woven into three different planning schemes that were presented to the members of the Building and Grounds Committee. These schemes all

solved the major issues of the Pan-American Highway (CA6), hap-hazard growth, unused sections of campus, re-connecting disparate parts of the campuses academic buildings back to the core, and allowing for growth in an orderly process. The three different schemes also supported Dr. Hoadley's desire for a pedagogical shift to a sustainable agricultural model. The schemes recognized the limitations of the natural resources and proposed different sustainable solutions for managing growth. The plan proposed using the student's research of the Yeguare Valley as the information from which Zamorano would make the decisions. The use of student research, planning and implementation to inform the master plan would accomplish two of Dr. Hoadley's goals. First, by having the students conduct field research and real world problem solving as opposed to manual labor in the field, the student's learning shifts to more of a cerebral college experience. Secondly, the students come to learn that the natural resources have limits and these ecological limits are the drivers to human habitation. These lessons learned will travel with the students when they graduate and go back to their native countries.

The second major theme is **acceptance of sustainable principles and institutional support for these principles**. The planning process opened the door for the institution to look at different ways of operating and even change the perception of Zamorano. The introduction of sustainable principles as a method of solving Zamorano's physical problems allowed the design team to illustrate sustainable methodology that could also support the academic mission.

In that vein of sustainability, how cognizant was the Board about some of the concepts that were thrown forward about sustainability? Berkley Cone answered this way:

> I would say that the Board was totally unaware of this concept. The design team showed the need for the Board to bring forward the concept. The vision of respecting the water, quantifying the amount used and not wasting water caused the Board to look at that resource in a totally different way. It coincided with the school having a shortage of water in March of 09—of drinking, of potable water, which in September of 08, I had actually done some numbers. We realized that the school was short of water, and we went to management with a plan. By then we were down to hours of potable water. So, it helped . . . I'm not sure how much . . . the Board approved budgetary money to obtain more potable water. The team helped them wake the school up to the fact that water was really an issue.

Mr. Cone's story supports a reactive approach that is typical of modern society. Before modern conveniences humans expended a great deal of energy in putting food stuffs up and away from scavengers for long term survival. The Zamorano planning process identified the ecological limits and used this information to inform the growth and development process.

The acceptance of sustainable principles may have been easier for Zamorano. Outside the United States, other countries have been embracing change quicker than American universities. Kemp, Parto and Gibson chronicle the evolution of sustainable development in a journal article titled *Governance for Sustainable Development: moving from theory to practice.* They write that post World War II development coupled with economic disparities and vast increases in material wealth resulted in global ecological degradation (2005, p. 13). First world countries have become dependent on technology and have difficulty embracing a change that they perceive as stepping backwards. The

fact that Honduras is more sustainable than the United States is one reason the sustainable master planning process and its recommendations were seen as being achievable. This was pointed out in my interview with Campus Architect Mario Gomez:

> In Honduras we do not have terms such as sustainable campus, but if you study our campuses and the way Hondurans live, we are largely much more sustainable than most American universities. The adoption of many of the sustainable concepts you and your team proposed was very easy for us; we could see the logic.

Mr. Gomez's comment is supported by Dr. Crowley's comments that the United States could learn a lot from Central America:

> I think the word sustainability was something that we probably brought down there. They didn't know it. They didn't know what it was. You know, for them it's where is the water going to come from? How do we get electricity? Can we feed the kids? Hurricane Mitch, when it severed Zamorano from the rest of the world, they continued to function. It probably surprised itself, because it was able to continue in an isolated position without any electrical grid or anything. So, they didn't know what they were doing well. I think we went down there and saw what they were doing well, and we also saw their goals and objectives, and basically the word sustainability's a label that stuck on something they were doing and wanted to do more of.

The literature reflects a "top down" and "bottom up" transformation process (Sharp, 2002, p.129). Sharp's research studied North American universities, but at Zamorano the Board quickly accepted sustainable principles. Mr. Cone and a couple

other Board members saw the bigger picture of the planning process and they helped sell the concept of a sustainable Zamorano and Yeguare Valley to other Board members. Mr. Cone recalls his approach during this time:

> I think the Board realizes there're two levels of Zamorano, the operating Zamorano and the Zamorano that young people come to and come away with a lesson. They come away with life lessons and go back to their countries. And I think the Board very much wants these young people to go back to their home country with a number of life lessons. And so I think we approached it from a building and grounds group that wanted to do this because it's the right thing to do, number one, and we presented that to the Board, and as I said there was a fair amount of buy-in. The water was the easiest one, because everyone can relate to it. Electricity was another one. The sustainability on the creeks and also doing the living machine was a little further out, but I think the Board realized there was a huge opportunity to save assets and to be a better neighbor. I think that's also one thing that the team kept bringing up. We are a member of the community in the Yeguare Valley, and we need to respect it as a member of the community. I kept repeating that to the Board, and there is a thing of Zamorano—I kept calling it the Panama Canal—that Zamorano sees itself exclusively. It does not see itself, to some degree, as a member of the Valley—it is the Valley. And I think the design team brought another viewpoint.

The acceptance of any master plan is critical to the successes of a plan in the early stages. Mr. Cone and Dr. Crowley were instrumental in assuring the Board that the

sustainable components of the plan were indeed the direction in which Zamorano should proceed.

The third major theme is **institutional change towards sustainable practices and what benefits does that have on the institution**. The change to Zamorano has a short term and a long term benefit. The short team benefit is a reduction of energy dependence, water usage, and better stewards of resources. In the long term the Master Plan, which has sustainable imbedded in all aspects of the plan, is intended and designed to guide Zamorano for fifty years. This being said, as long as the Master Plan is used as a living document, then Zamorano will grow in a far more sustainable way than before the plan. Zamorano has already started to implement the plan. A significant move to consummate the Master Plan was the hiring of Mario Gomez as the campus architect. Mario was hired by Dr. Hoadley half way through the master planning process. Mario embraced the master planning process and the sustainable undergirding. Tangible outcomes of the master planning process include the adoption of the "Zamorano Style" for all future buildings. This method of construction is more costly than other types of construction in Honduras and was being heavily questioned by both Dr. Hoadley and the Board. The design team argued the merits of the Zamorano Style that in part was highly sustainable in many aspects including participating in the regional economy. The later reasoning also works toward bioregionalism principles and has ecological neutral beliefs. Since the beginning of the master plan process three new buildings have been constructed and an existing classroom was renovated and expanded. Plans have been accepted by the Board to move students out of buildings that were far away from the core of campus and relocate them into buildings close to the core. The densification of the core adds more

vitality to the campus, reduces energy and maintenance costs and solves the major problem identified to the team in the beginning of the design process, the haphazard growth that over time created disparate parts of campus. These buildings housed students in their fourth year and those groups of student mentors were cut off from the rest of campus.

A potable water study, an energy audit and a sanitary sewer analysis have been completed and are awaiting funding and action. The most significant part of the master planning process was getting the Board to understand the importance of the Yeguare Valley and how Zamorano could be good neighbors to the towns that occupy the land above the valley**.** Mr. Cone quickly grasped the concept of what effected Zamorano affected the whole Valley:

> Outside influences are beginning to lean against it—that being the growth of Tegucigalpa and the population growth of the valley itself. The second factor that's driving a lot of the strategic thinking on the campus is the idea that resources will run out given the present patterns of use—water being probably one of the principle ones. We're actually intervening and doing a plan for the town with the idea of assisting the university in its ability to deal with the resources of the valley.

Mr. Cone also understood the need to expand the college's sphere to include the valley and even beyond. With a broader understanding of the Valley's limitations Zamorano could better handle the inevitable growth of Tegucigalpa:

> The bio-regional thinking and what could happen in the Valley if Zamorano works as a partner with the larger valley was —not to use Ronald Reagan's term,

> but a shining house on a . . . you know, a shining village on a hill. It really has just a unique thing. The use of phytoremediation was brilliant, and what I wanted to do was have ministers of health and service from all of Latin America come in and say to them, "This can be done in your community. You can eliminate your risk of cholera." So, I really felt it was fantastic and there remains a tremendous opportunity to do it, but it will take a driving force on a Board and within the administration, as you well know, to make these things happen—it just doesn't happen by osmosis. It takes movers and shakers and people that are not willing to take the word no, or "I can't do it."

Mr. Cone is seeing the potential of Zamorano students building constructed wetlands as a way of cleaning the polluted creeks and rivers in the Yeguare Valley. This would serve as a resource for teaching the third world how to eliminate water born disease. The exporting of knowledge is what Dr. Hoadley wanted as a goal for Zamorano.

The Pan-American Highway (CA6) bifurcating the campus was addressed with a multi-year plan to create a bypass that at its western intersection would have a local market. This local market would serve the people of the Yeguare valley with employment and a place to sell their products. The market and bypass also protects Zamorano's land with a road border and security zone that Zamorano could grow towards for dozens of years.

Zamorano built and installed solar hot water heaters on the faculty housing and dining halls. Solar photovoltaic panels have been installed as an experiment to test the life cycle cost benefit. The team suggested changing the light fixtures to high energy efficient fixtures. As Mr. Cone points out, that was an easy choice:

> Ken and I really went over the numbers of sustainability, and we picked, no doubt, the low-hanging fruit first. For example, we changed all the light bulbs in the place—the big lamps, the outdoor lighting. We changed them all, because that was about a 15-month payback, so that cost was around $11,000, and we had a payback in 15 months. The cost per kilowatt hour is five times what is in the United States.

The master plan has many different layers that address different problems identified and observed by the design team. The cost of electricity is a major concern, but the fact that so much of the Valley's ecosystem has been radically changed over the past fifty years is also evident. The design team proposed long range objectives that could be implemented by students that would start returning the Valley back to its natural state.

Invasive plants have been identified and are being targeted for removal. A drought resistant plant palette has been adopted along with the hiring of a landscape architect to manage the grounds. Water intensive plants are being phased out of the campus.

A concept to move the heavy water demand orchard to a section of campus were they can be feed by non-potable water is being considered. This orchard and the other plants that make up the production part of Zamorano were at one time located in this section of the campus. The decision to relocate the orchard was done during a time of haphazard building and site selection. The use of environmental data and metrics in the planning process should guide Zamorano in making good sustainable planning decisions in the future.

Summary of Findings

Several primary findings emerged from my analysis of this data. The fact that Zamorano is an elite university in a third world country with an extremely active hands-on Board translated to a high level of interest in the master planning effort. The Board was open to new and imaginative solutions to its many identified challenges. This, coupled with Dr. Hoadley's vision sessions with key Board members, resulted in a Board receptive to the planning process. The planning process that included the seven phases outlined earlier, allowed the design team to introduce an ecologically based method for planning. The team used the ecological restriction of the carrying capacity of the Yeguare Valley, primarily water, to guide logical planning decisions. The team also used the fact that Zamorano was very sustainable in terms of food production and an abundance of natural resources to build on achievable sustainable goals.

The research question of what is possible in designing and building a sustainable campus is and can be seen at Zamorano with an almost zero carbon footprint method of construction. The fact that the buildings function without air conditioning, using only cross ventilation, in a tropical zone is a testament to Wilson Popenoe's Zamorano Style. The use of electricity from the grid is Zamorano's largest dependency on outside resources. In Honduras, all electricity is hydro- electric. In the United States, this would be considered green. The impetus in Honduras is the cost. The Board wants to reduce this expense, so the master plan calls for a study of installing impellers and generating electric power on site. The master plan also introduced the concept of animal waste collection and capture of methane for running generators. These same generators could

also be run off of bio-diesel from soy beans and other farm waste. Zamorano is very close to being self sustaining and carbon neutral.

The question of how have the principles of bio-regionalism been applied to Zamorano can be seen in their actions. Dr. Hoadley discussed how regionalism has to be relevant to the subject:

> Well, if you take a look at sustainability, if you look at it from a food perspective, Malves said that at a certain population, the world was going to run out of an inclination to continue to grow, because there was a food capacity. But technological solutions to food production—transportation, fertilization, hybridization—things like that expanded that capacity. There is a bio-regional capacity that's out there, but there may be a technological way of increasing the capacity over time. This university is basically dealing with looking at its region. Although it serves the Caribbean Basin from a student perspective—Caribbean Basin, Central America and South America—students come from all over. So, its student region is much larger. Its functional region is probably the Department of Morozan, which is the capital province of Honduras and specifically the Yeguare Valley. So, what it's doing is right now looking at water sources and looking at electrical grid sources and power sources. And it's actually looking at improving its food production and crop production.

Dr. Hoadley took my question of bioregionalism and its application to Zamorano and the Yeguare Valley to a new and different level. As a President with a world vision for sustainable agricultural, he is amplifying the learning outcomes of Zamorano to a much

broader audience. Dr. Hoadley wants Zamorano to lead the way and achieve bioregionalism. In doing so, Zamorano will be the campus to be emulated.

So it seems that Zamorano, in comparison to other institutions, could almost achieve bioregionalism equilibrium. This is a point that Dr. Crowley expands and goes on to point out how it could actually be easier to achieve in developing countries:

> It could and the funny thing is . . . I was at the American Planning Association meeting this spring in Boston, and there was a panel, or a group discussion basically, of how we need to export America's knowledge of sustainable technology that we've developed here in the U.S. We need to extend it to developing nations. My point in the discussion was that we need to go to developing nations to figure out how they're doing sustainability, and they're doing it out of necessity. We're doing it because we know that it is the proper thing to do, and we have to do that to survive. Zamorano is as close as any university I have ever seen—out of necessity—to being sustainable.
>
> I still strongly believe that is something that could be done, and it's going to take work, and the good thing is that Zamorano has a lot of very enthusiastic, smart, young professionals there. It's much better after the master plan development. It's 200% better than it was. But Zamorano could literally run on its own, separate from the grid. It has the potential to do it. It's just getting organized, and it could have virtually a very, very significant impact on the environment. But it's a matter of the Boards of any of these institutions lining things up. We certainly put a good dent in it—let's call it that. But 20 years from now, Zamorano could come really close to having a zero impact.

Dr. Crowley's optimism is fueled by what has been achieved at Zamorano in such a short span of time. What some American universities are working towards, Zamorano has well exceeded. Part is due to Zamorano's traditional agricultural mission, but the master plan gave the institution a goal that if reached would bring fame to the college.

Dr. Hoadley agreed that the environmental focus of the master plan is one of the main reasons he brought the design team to Zamorano. However, in terms of bioregionalism, he feels that there will always be a group of people that will argue that the main focus of any educational institution should be the educational mission. So, according to Hoadley, there is a fine line to be walked between the resources that would be put into the educational mission versus trying to obtain some level of sustainability.

> Having a sustainable campus, having an environment which reflects your value system is very important, and it's really the focus that I was taking. Others might say, "Yes, but there's a limit to what we can do on the campus, and it may be more productive for the education or the formative perspective—it may have more of an impact on the students and on the way they're going to live their lives by not putting so much emphasis on the sustainable campus, on the environment in which the education is taking place, but have more activities in the classroom or have more activities which involve outreach projects beyond the campus."

My third research question was what external forces help or hurt achieving sustainable goals? Dr. Hoadley answered this question more from the perspective of whether there were negative forces on the board or in the local community. Unlike the United States, in Honduras there is no over site of universities or colleges by accreditation boards, therefore Zamorano is autonomous. Dr. Hoadley's first statement

speaks to the completeness of the master plan developed by the team and also the vision of a more sustainable campus and valley. The second comment speaks to the issue that was brought out in the master planning process with regard to bioregionalism, that being better community relations and helping the neighboring towns. He points out that one of the obstacles to obtaining some of the goals of the master plan were the citizens of Jicarito:

> I don't think anybody envisioned adding something quite as complete as the master plan that was developed. Are we ever going to be that big? Are we ever going to need all of this? And, I think that was what was a surprise to see how complete. I don't think any of us really envisioned that it would be that complete and that detailed and that visionary. So, that was a pleasant surprise, which was unexpected. I can't think of any unexpected negative things.
>
> There's was another very unexpected, very positive aspect, and that's of course what the team introduced and what Jack's been working on just this last several months. The relationship with our community . . . and this with all due respect to Jack—Jack started off talking about building an earthen dam, and that was probably not the right approach. Because, especially in a place in Latin America where the inequality is so great. Where you've got this very poor community sitting cheek and jowl next to us and where most of the people work as day laborers at Zamorano. And you're always thinking it's much more like a mining town situation where you've got an awful lot of very poor people who live very close together in very visible situations and then seeing what to them appear to be very rich people—a bunch of foreigners, a bunch of gringos and so forth, with all

> fancy cars and green lawns and nice buildings and so forth. Where people would stand up and they would say I hated Zamorano all of my life with every bone in my body…it was pretty rough. The team had—I forgot the name of it—it was kind of a water treatment idea for the Agayo Creek, and I think what happened was those type ideas, the design team, pushed us to look beyond the property line of Zamorano and look at the valley…and Jack has been following up with…that is the bioregionalism idea.

Dr. Hoadley's comments are interesting. Issues surrounding a university achieving its goals are not always internal. Higher education has enjoyed an elevated status in our society. Sometimes that elevated status can been seen as elitist and arrogant. Dr. Hoadley and many of his Board members discovered that one of the forces that could stop Zamorano's progress is the neighboring towns. The master plan with it bioregional approach shed light on a real problem. Dr. Crowley and a few others are starting to address this problem and progress is being made.

Summary of Results

The three research questions explored the possibilities of designing or re-purposing an existing campus towards a more sustainable campus. The master planning process Zamorano used was a traditional planning process, but with an ecological based approach that uses informed decisions as its underpinning. This approach to master planning could be controversial if key decision makers are not supportive of the philosophy. I was interested in what, if any, buy-in occurred or how readily acceptant were the decision makers to this methodology. The third question explored the external help or hurt in achieving sustainable goals. These questions were being asked because

the master planning process required in-depth investigation of the institution. The process involves meeting with a cross range of academic, staff personal and Board members. It was clear from Dr. Hoadley's interview that he had a philosophy of what and how sustainable farming could be introduced to Zamorano. He also had a vision for how agricultural best practices could be introduced into Zamorano's pedagogy as a way to move the university from a "vocational school" to a true university. His models were universities in the United States, but he knew he had to change a mindset and that would take time and effort to achieve consensus to his vision. The first step he took was a strategic plan beginning in 2004-2005. The master plan followed the strategic plan in 2006. The fact that Dr. Hoadley was receptive to concepts relating to sustainability possibly helped the design team's work in achieving buy-in to a process underpinned by sustainable principles. That being said, no other person interviewed referred to Dr. Hoadley's three philosophical points. Each person interviewed told the story of the planning process from their perspective. Their perspective may not totally align with the president's. Dr. Hoadley said in his interview that presidents who have a vision that changes the institution as dramatically as he was aspiring to change Zamorano, need to be careful and proceed slowly.

Zamorano staff and faculty embraced the planning process and welcomed outside expertise. Sustainable ideas were introduced as ways to reduced cost and improve the quality of life on the campus. Other sustainable concepts were slower to gain acceptance and a definitive answer to the question of what are the limits of a sustainable campus, may require a follow up study in five or ten years. Zamorano has taken a large step in implementing the master plan with the hiring of a campus architect, Mario Gomez.

Mario was hired mid-way through the master plan and is committed to following the plan.

As part of my question about what is possible in designing a sustainable campus, I posed the hypothetical question pertaining to bioregionalism. I asked all the interviewees in their opinion could Zamorano reach an ecological equilibrium? Most felt if any campus could, Zamorano could. This is partially because Zamorano is an agricultural college and food production has been a constant from their inception. The fact that Zamorano owns 15,000 acres and has abundant natural resources adds to the optimism. Several other factors, including students conducting research into the limitations of the natural resources, a work force willing to undertake large tasks, such as reforestation, reduction or elimination of dependency on the electrical grid, willingness to seek professional help, a well-funded and supportive Board, open mindedness to bioregional concepts as a reputation and branding maker, and understanding that living in a country that has a fragile infrastructure, leads one to believe that self-reliance is a real possibility.

CHAPTER FIVE

RESULTS – ECKERD COLLEGE

Chapters four and five reflect my findings and results from my research, which were gathered using qualitative case study model methodology. I interviewed major participants in the strategic and campus planning design process at their respective colleges with a goal to discover when major decision makers came to the realization that their campus should and would shift to a more sustainable campus direction and just how far can or will these leaders take their campuses in a sustainable direction. The two campuses are Zamorano Pan-American Agricultural School in Honduras and Eckerd College in St. Petersburg Florida. In this chapter I will focus on Eckerd College.

Campus Context

Eckerd College was founded in 1958 by The United Presbyterian Church under a charter granted by the State of Florida. The college was originally named Florida Presbyterian College and operated under this name until 1972. To honor Jack Eckerd, a distinguished Presbyterian layman and trustee, and his philanthropic gift of 12.5 million dollars, the college was renamed. There is still a covenant relationship between the Presbyterian Church and Eckerd today. Eckerd College is the only private national liberal arts college in Florida. The four year coeducational college is located at the southernmost tip of St. Petersburg, Florida, in the Tampa Bay metropolitan area. The college is accredited by the Southern Association of Colleges and Schools.

Eckerd College has a suburban 188-acre (0.76 km^2) campus on Frenchman's Creek and Boca Ciega Bay, about 3 miles (4.8 km) from Gulf of Mexico beaches. There are 1,819 full-time degree seeking students and 163 faculty members (109 full-time and 54 part-time). The college's student population represents forty nine states, with about one-quarter from Florida. The gender distribution is 42% male and 58% female. The tuition is $ 29,116 / year with room and board priced at $8,825. The college has a large and extensive "Program for Experienced Learners" which serves about 1,500 non-traditional students, with classes taught largely in the evenings and on weekends. At the May, 2011 commencement, 393 degrees were awarded in the residential program and 139 in the Program for Experienced Learners (http://www.eckerd.edu/).

Figure 5-1 Aerial View of Eckerd College

The Impetuses for Eckerd's Master Plan

Dr. Donald Eastman III was Eckerd's fourth president and initiated a comprehensive physical master plan in 2001 shortly after becoming President of Eckerd. The reason for undertaking a master plan was Dr. Eastman needed a vision and to motivate his Board. Eckerd had just separated from a long term president and was in a deep financial hole. According to President Eastman "the deficit when I went in was not quite, but almost, five percent of the institution's budget."

The budget deficit was projected to take seven years to resolve, but Dr. Eastman motivated the Board to solve it in two. Once Dr. Eastman addressed this issue, he needed to get the Board energized into solving other major issues like the deferred maintenance and out and out neglect of the physical plant. "We have to have not only the money, we have to have the confidence that we can build an institution." "But after about six months of strategizing, it was clear to me that the vision that the Board needed was only going to be accomplished through visuals—the kind of visuals that a master plan creates."

Dr. Eastman wanted the master plan to accomplish several other very tangible objectives. He saw the master plan as a tool to shape Eckerd's next decade, "start to help solve some problems, coalesce the Board towards a direction that wasn't fully clear, but the direction was needed because the Board's support was slipping under the old administration." "It was certainly part of the fact that I was a new leader for the place, looking for ways to articulate the answer to the question, 'Why Eckerd?' And that's the first marketing question. In some ways, it's the first metaphysical question too."

Observations

The design team spent much of their initial visits making field observations and conducting analyses of the natural and built conditions. These observations included an as complete as possible history of the development of the site. One environmental issue that was pointed out on the first day was that half the campus's soil would not drain rain water. This created many problems, one of which was the non-native small thorny plants that thrived in this locale. The thorny plants were so numerous that shoes and long pants were required to walk in the area. It was later discovered that this section of campus was added in the 1960's with fill produced from dredging the bay. The soil was too dense and did not percolate the rain water. The design team was told not to propose building in this area because of the thorny plants. This forlorn introduction of the environmental problems would grow with each visit.

The team collected data on the natural systems such as ecological systems, regional and local topography, hurricane information, flood hazard boundaries, surface hydrology, vegetation characteristics, soil types, plant identification within environmental zones, natural habitats, fauna identification, etc. to inform their planning recommendations. They also took inventory of the built systems such as building uses and ages, pedestrian circulation, walking distance, vehicular circulation, parking lots, organizational grids, human built green spaces, the edges of campus, etc. to understand daily use and aid in the recommendations. As part of the information gathering the team interviewed students, faculty, staff and members of the Saint Petersburg community.

These observations and fact finding became part of the overall master plan. One of the most striking observations was the poorly designed buildings. Dr. Eastman did not

want a local architectural firm to conduct the master plan. The architecture of the campus reflected inexpensive Florida vacation style buildings. The sciences building was typical in that the design of the building lacked any understanding of how a sciences building functioned. The architect designed the building like a drive-in motel. That is to say, the door leading into each classroom went directly outside. There were not interior climate controlled corridors, just doors that open to the outdoor environment. This direct outdoor exposure meant cool or humid air would come into the laboratory and nullify any results of experiments. The researchers and students were working in an uncontrolled environment. The motel design also meant that the fume hoods never could be balanced because air entering the room was never controlled.

The lack of maintenance to any building created roof and pipe leaks and a general sense of buildings past their prime. The low level standard of construction exacerbated the maintenance issues and created a major dilemma for Eckerd. The dilemma was to repair what Eckerd had or plant a flag in the ground with a new building that pointed to a new future. The design team was challenged from the start.

Findings

The students, faculty and Board members knew the buildings and grounds had major issues. The building style of architecture was jokingly referred to as "Polynesian gothic". The term was not a complement and the design team knew that a new standard was required. The college wanted a higher quality standard that was energy efficient, technologically sophisticated, designed for conducting research and constructed to a level that could withstand a major hurricane. The quality level desired would require a major shift in Eckerd's mindset.

The fact that students were aware of the impact of what living and learning does on the buildings and grounds emerged during the planning process and was an area of pride for Dr. Eastman:

> What we are doing today at Eckerd is amazing. The campus is a living laboratory, but our students also take it beyond our campus. For example, they do a lot of study abroad work, say 70 to 80%. A few years ago the students calculated the carbon footprint they used to travel to their destination. The students voluntarily paid to offset the carbon footprint with…say planting trees to offset travel….I am telling you our students are amazing.

Eckerd is now entering its tenth years under the sustainable master plan. By all accounts of the people interviewed this direction has been very successful. Dr. Eastman cited numerous supporting statistics including an increase in student retention from year to year, student population growth, and increased gift giving. Dr. Eastman also said "we are seen as the "green campus" and "it's being effective." Eckerd has charted a course that is guided by sustainable principles and uses the ecology of the campus to inform all of the campus's decisions. The use of these guidelines and the ethos that have developed over the past decade will keep moving Eckerd on an even more sustainable trajectory.

I used the qualitative design process established in Chapter Three as being the best approach for answering my research questions. Conducting interviews with the main decision makers allows me to understand the participants' perspective, their role during the process, the context and finally, why they reshaped their institution's directive (Merriam, 1998).

The bulk of my research is the case study approach (Yin, 2009) with the outcome of answering the following questions:

1) What is possible in designing and building a sustainable campus? How have the principals of bioregionalism been applied to a college campus?
2) How do you achieve buy-in to collective ecological based strategic planning, master planning and academic planning initiative?
3) What external forces help or hurt achieving sustainable goals?

The semi-structured interviews yielded rich and descriptive data that were analyzed using comparative method. The three research questions guided the process from which several major themes emerged. Four major categories were constructed by sorting and blocking the themes into outcomes that resulted from the two year planning process. These four categories were derived by an analysis of answers from eleven questions asked during the interview process. All interviewees were directly involved in the process and helped shape decisions or made decisions regarding Eckerd's master plan. My findings are supported by long quotations. I have chosen to use long sections of the interviews because of the substance and nature of the many different and complex issues the speaker is describing. The length of the quotations also provides the reader with insight into the major themes.

Major Themes

1) A new direction for Eckerd emerged from the planning process
2) Acceptance of sustainable principles and institutional support
3) Institutional change towards sustainable practices
4) Sustainable directives reshape Eckerd and benefit the institution.

The first major theme **is a new direction for Eckerd emerged from the planning process.** Bill McKenna, a contract employee who worked on many different aspects of the facilities for Eckerd, worked at Eckerd before Dr. Eastman came to campus. He expresses his thoughts about those early days in Dr. Eastman's presidency:

> Many people thought Dr. Eastman was crazy to spend money on planning consultants when there were so many other problems. He did not like the placement of the new library. The library was a big deal, but he wanted a second look. I want to tell you a lot of work, time and money went into the placement of that library, and he put it on hold. He asked a lot of questions, but the consultants felt it needed to be moved. Well that signaled to everyone we had new leadership and things weren't going to be the same. The master plan turned this place upside down…I mean it opened eyes, but also got people excited. Dr. Armacost was here twenty years, and Dr. Eastman was like a shot in the arm; it was something we all needed.

Dr. Eastman did not want a consulting firm from Florida; he wanted someone who came to the site with a different perspective. He hired the firm of Ayers Saint Gross out of Baltimore, Maryland. Ayers Saint Gross was a nationally renowned firm that specialized in colleges and university work. Their work just prior to Eckerd was at The

University of North Carolina at Chapel Hill, The University of Georgia, Emory University and The University of Virginia. Adam Gross, Principle of Ayers Saint Gross, and Dr. Eastman worked together on the University of Georgia's master plan, so Dr. Eastman called Mr. Gross to assist in evaluating Eckerd. Dr. Eastman had started a strategic planning process, but he also recognized the need for a master plan as he explained to me in his interviews:

> If you had the right master plan process, it would be just like a strategic planning process is—it would simply be more physical. There would certainly be some things that get left out, but the important point would be: you do the same kind of process for a master plan, if you do it right, that you do for a strategic plan, and that is you get all the important constituencies talking about what their visions are for the institution. And you have them hearing people who have different visions, and you have them involved in the process of coming to a conclusion about what direction the institution is going to go. You know, it can be sufficiently abstract so that the Board perhaps, more likely the administration, fine tunes that direction, but the conversations are essentially the same.
>
> . . . I thought in many ways the very best thing that Ayers Saint Gross did for us in that process were the conversations—were the way they held the conversations. And they had some good drawings, and they had some good visuals, and they had some good views, but their conversations that they had—that then produced drawings and visuals about what those conversations concluded were enormously helpful. It turns out that the directions created by that master plan, that first master plan . . . we had a strategic planning process of quite some consequence a little

> after that—a year or so after that—followed by a fundraising plan. The fund raising plan is, of course, what kind of money we can raise and for what after that we established a financial plan. That's as good a sequence as any.

During my interview, Dr. Eastman indicated he met with all the Board members before he became President. During these sessions Dr. Eastman had discovered that Board members candidly expressed what they saw as problems with Eckerd College. Dr. Eastman wanted to bring positive change to Eckerd and used the three planning processes, strategic, master and financial, to create a dialogue that brought issues into focus so that plans could be made to address the problems.

The new direction and process that Ayers Saint Gross, working in concert with Dr. Eastman and the Board, followed introduced a new term, sustainability. My literature review revealed that sustainability, sustainable development, green building and other terms used and acceptable today were new when the Eckerd plan was being conducted. My interview with Adam Gross reiterated that fact:

> You know, I think to be fair and truthful, when we started Eckerd College, sustainability was just a glimmer in most architects' vocabulary. It wasn't really a core element as much as it is today and LEED—I don't even know if LEED as a nomenclature was even in its vocabulary when we started Eckerd. So I give Eckerd's faculty all the credit because it was really the strong environmental studies program that Eckerd had and their remarkable setting in terms of being on the bay, on a waterfront site and also the education and the wildlife that exists in that part of Florida which drove their faculty to drive us to be very focused on sustainability and kind of regional landscape architecture as a fundamental

principle plan. So a lot of the big ideas—the plans, many of which have now been implemented—were really driven by the environmental studies.

The master planning process brought in students and faculty with backgrounds in environmental studies, water resource management, marine biology, hydrology, botany and many other faculties who articulated the special natural setting that defines Eckerd. As Mr. Gross points out, they informed the process. The first design vignettes and conceptual drawings of the master plan produced by Ayers Saint Gross were wrong, according to Chris Rice, Architect for Ayers Saint Gross, and could have done a lot of ecological damage if accepted without the ecological studies that would follow in time:

> We got started in the traditional way of master planning like we did with so many college campuses. Our first designs based on our observations turned out to be way off the mark. Two young faculty members, I can't remember their names, but they told us we needed to understand the ecology of the place. They said that our designs would do environmental damage. I went back to Baltimore and thought about what they were saying. I went down again, and when I arrived, I started looking more holistically at the site itself. I think everybody's eyes started to open, even mine. I think even for me having worked on the East Coast and the West Coast, this was a real eye-opener even for me in many ways.

What Mr. Rice had learned was the architectural designs conceived without taking into consideration the sensitive environmental aspects of the place were unworkable designs. Dr. Eastman expressed displeasure with local architects because, in his opinion, they designed without a clear understanding of environmental concerns. Dr. Eastman had worked with Ayers Saint Gross Architects before, so he felt they would be more

understanding and develop a plan that was uniquely Eckerd. Chris Rice discussed the importance of understanding the environment as part of the planning process:

> So we initially had started with that kind of standard modus operandi, I guess, if you want to call it that. And it very quickly as I started going through the analysis of place . . . it's interesting because I just pulled out the report here, and I'm looking at one of the original aerial photographs, and I have to say that from a sustainability perspective, Florida just didn't get it—in general.
>
> So anyways, as I started doing analysis for the campus and learning more and more about it, and reporting this back to the campus, one of the consultants that we added to our group working on the master plan—we had a landscape firm but we realized pretty early on that it was going to be important to have a team that understood the ecology and the sustainable nature of what we're doing—came to campus, and they started establishing some of the tree, vegetative part of our analysis phase—the natural habitats and these unique and sensitive resources of which surrounded the campus from mangroves along the edge of the waterfront to portions of an old growth forest to palm hammock, to an early pine grove. And so as they started establishing this diagram of existing conditions and vegetation, of soil and natural habitats, there was kind of two really "aha" moments. And one of those, I think, came from the generation of the diagrams and the analysis of the place.
>
> The advantage of having somebody that really understands the land from an ecological perspective much better than we, as architects, have been trained to think about, is the majority of all of the folks are actually biologists. And so, they

> understand the chemistry, basically, of the soils and the wetlands, and the importance of vegetation from a biological perspective.

Mr. Rice is expressing that his profession was changing and becoming aware that the methodology of campus planning would in the future include some level of ecologically informed data. This data would become the driver to design the buildings and grounds in a completely different direction than previous design approaches. In Chapter Two, my literature review supports Mr. Rice's and Mr. Gross's comments about the emergence of sustainable design in the architectural profession. USGB and LEED were founded in 2000. Many architects were just becoming aware of this new force in the building and design industry when Eckerd was in the master planning phase. Mr. McKenna points out how quickly the design team embraced the importance of the environment on the master plan:

> I would say the team working on the master plan first proposed to embed the environmental principles into the plan after a few months on campus. They studied the campus, they studied the entire ecology of the campus, and they listened to a lot of our faculty and even students about the ecology of the campus and understood what was important to them and what was important in general. And those formed the founding principles that still exist today in the master plan relative to ecology.

Adam Gross also expressed how the team recognized the importance of engaging the faculty and staff in this move toward a new direction:

> But the whole sustainability stuff—there were like three or four—and you hate to use the word young—there were three or four young faculty which showed up to

these meetings in their flip-flops and Hawaiian shirts and long peasant dresses, and they were the ones that really influenced and educated us about the importance of sustainability, which now is very much a core element in everything Eckerd's doing.

The second major theme was the **acceptance of sustainable principles and institutional support.** As McKenna points out, the sustainable principles first proposed in 2002 are still guiding Eckerd today, but these principles were abstract and needed defining and acceptance by both the Board and the institution. As pointed out by Adam Gross, the concept of sustainability was a new term in the lexicon of architects. The Eckerd team worked through what these concepts were and used the ecology of the campus to inform the process and guide the master plan. Two parallel planning efforts were starting to emerge, a traditional planning process that was being driven and informed by the ecological master plan and a strategic planning process. The awareness that Eckerd resided in an ecologically special place or site started to underpin every decision. During any master planning process, principles are developed and these principles guide the institution in reaching planning decisions. When Eckerd was developing their principles, Dr. Eastman was thinking how the strategic and master plan could answer his fundamental question of what makes this place special and why would students want to come to Eckerd? During the process, Dr Eastman found the why to his question:

We had environmental sciences majors with very articulate, very smart faculty members who didn't necessarily have a coherent vision of what environmental ought to . . . or sustainable ought to be, but had a lot of ideas about their particular

> piece. And, as I say, because the planning was done the right way, it involved a lot of people in the conversation. We heard a lot from those guys, and we recognized how important they were to us. My line through the whole planning process—all of the planning process—was, particularly at the beginning was, I don't know what the words are; I'm just trying to understand the tune; I'm just trying to hum the tune, and then we'll look for the words. And I said early on, I think in my first month, I'm trying to tell this new group of students and parents that are coming for our new freshman class in August what we stand for. I'm trying to find a draft answer to the question, "Why Eckerd?" I came up with the five core values for the institution. I was trying to do what I think a president needs to do, which is to articulate the spirit and the mission, the values of the place. That taken together both answer the question, "Why Eckerd?", and taken together really reflect and identify the place….and that's how I came up with the personal, spiritual, and environmental, global, and residential . . . and we still have those. . . . everybody said, I got it right off the bat and it's been very useful and environmental is right in the middle. You know, your word—sustainable—is maybe better, in fact.

Dr. Eastman also considered what students were telling him about what issues pertained to their generation or were important to them. He looked at whatever he did in the planning process as needing to take the student into consideration. What is developing over time is many different thought streams flowing into one major outcome, that being using sustainable principles as a platform for answering many different concerns. Dr. Eastman reflects that he wanted to appeal to future Eckerd students:

> I had written a section in the [University of] Georgia plan about a "plan for planning" in which I begin to describe the different kinds of plans that needed to happen even after you have a strategic plan in place. And the strategic plan is a blueprint. At the same time, we've got kids coming out of high school who are much more thoughtful about the fact that the world is a self-contained unit rather than a place where you can just throw stuff. So we have that sort of building consciousness on the one hand. On the other hand, we've got the price of energy going up like crazy and seeing it as a major piece of our budget and trying to figure out how the heck we're going to deal with this thing. What things can we do? Like healthcare costs—what things can we do in the near term, in the long-term, to try to control those costs and maybe turn them around for us? And so those I think are the two big drivers for us. After a few months of seeing prospective students visiting campus, I could pick the Eckerd student from the Stetson student, our main competition. The Eckerd student didn't wear button down shirts and oxford, our student wore flip flops and were just a bit disheveled. Stetson students were bound for law school, our students wanted to walk in the marshes with waders and a net studying invertebrates and such. We needed to craft a mission statement, a strategic plan that fit the place that is Eckerd and the campus.

The Board was much slower in accepting this direction of environmentally based master planning principles. Mr. McKenna describes this slower awareness of Eckerd's direction:

> I think initially it was—the eye opener—I guess would be the right word to use, because many of the Board members were just not sensitive to what this 200-acre campus really had to offer. And so, as it was presented to them both in the form of pictures and, of course, text that described it, not only from the perspective of the design professionals, Ayers Saint Gross, and the rest of the team, but it also came true when the faculty kind of rolled in and supported it and embraced the same concepts and offered additional support. The faculty, frankly, they embraced it very quickly as a result of that. And I think that that whole exercise helped to strengthen the president's vision, and so the trustees began to understand his wisdom in this process, and it continues today.

Adam Gross did a wonderful job further expressing the whole "buy-in" process and the difficulties of the different constituencies:

> I don't think there was an "aha" moment. I think it was more the evolution. I think we were all, including Don, learning about this very unusual and unique climate that exists in that part of Florida. And I think Don probably ramped up faster because he's smarter than any of us, but he was also living there 24/7. So he ramped up very quickly in terms of understanding the uniqueness and importance of that landscape, but I think it was an educational evolution. Again, I think the faculty were helpful in ramping him up. And then there's one trustee Lars and Jim Annarelli who were early supporters. But the overall Eckerd Board took work to get completely sold. Remember back then when we did this, it was new.

When an institution like Eckerd accepts sustainable principles as a core value the implementation phase is critical to setting and maintaining the direction. Eckerd found

that after two years of formulating plans and compiling hundreds of documents, the work towards a more sustainable campus had just begun. **Institutional change towards sustainable practices** became a theme in my research, because everyone I interviewed talked about this next step, after the master plan was accepted, as an important and often over looked phase. In 2003 Eckerd approved the Ayers Saint Gross master plan. The Master Plan booklet which guides all the development on the campus is a 124 page document. Eckerd's fourth guiding principle is:

> EMBODY an environmentally protective and ecologically sound approach to facilities and land use by conserving natural resources with sustainable or renewable materials.

Environmental Goals are placed side by side with the College's Principles. It is clear to the reader that environmental concerns are paramount to Eckerd College. The ecological sections were developed by a sub-consulting firm, Bio-Habitats, a landscape architecture firm that has ecologists, environmental scientists, and water resource specialists on staff. Bio-Habitats developed plans tailored for seven site specific locations on the campus. These ecological zones had ecosystems that required unique design solutions if the campus were to develop these areas. With such a strong document, how easy is it to get the college to implement sustainable principles?

Mr. McKenna was responsible for implementing the master plan and explained some of the difficulties. He expressed the frustration of a massive redirection in how Eckerd had been operating for years, plus voiced issues he saw as pivotal to the day to day operation of the school:

First off, it's been extremely difficult to implement. It's not only do we accept and embrace the concepts proposed, and the ideas generated, and the direction that the master plan takes us, but that has to be balanced against the reality and mostly the fiscal reality. And, Eckerd, like a lot of schools, has always-changing priorities. And so, we've had to amend and modify the plan as time passes to reflect those changing priorities. Not that the goal has changed—it hasn't. But the specifics of how we achieve the goal change a lot. But it's mostly been just finding the financial resources that it takes to implement the plan. The other thing that has become apparent is as good as the master plan is, there are things that a master plan like that does not address, specifically the infrastructure of the campus. You know, the campus is 50 years old. Our infrastructure has shown the signs of decay that exists, but combined with the fact that we're in a salt-water environment, things wear out much faster. Well, over the years, very little effort has gone into the infrastructure, and that has not been a part of the master plan process itself, so far. We're now introducing, in fact Ayers Saint Gross helped us develop a sustainability campus master plan which begins to address some of the infrastructure issues, but also keys in on the environment and energy and behavioral changes that we needed to make. But in answer to the first question, it has been very difficult and time-consuming to implement this, really just based on the funding requirements and ever-changing priorities.

If Eckerd was endowed like Harvard, implementing this type of change would have been easy. Mr. McKenna also was a person who understood the personal energy it

would take to implement a master plan with sustainable underpinnings when very few institutions had attempted such an endeavor.

Dr. Eastman saw an even greater obstacle in members of the Board. Sure, a master plan is great to talk about, but he had every intention of implementing the master plan. This involved changing the way people thought:

> And part of the element is at least a good chunk of my Board is not really interested in saving the world—saving the whale. They're interested if I can show them that I can save money. I mean, the line that they used—the sign they put up in 1960, when they created Eckerd College out there—"Florida Presbyterian College, America's First All-Electric College" or something like that in the opening speech by somebody in the power business I suspect or on the Board or whatever—I've forgotten who it was. And it was used again, and again, and again says, "Energy too cheap to meter." We believed that, and so we got away from thinking about, "What is this costing us? How much can we afford?" To me that was job one, make this sustainable campus, or whatever you want to call it, cheaper to run.

Adam Gross's perspective was on an even larger scale. What effect could the successful implementation of the Eckerd master plan have on the sustainable developments on other college campuses. He saw that sustainability was the wave of the future and had a team that believed that it was imperative that society take it seriously. In that regard, Ayers Saint Gross went above and beyond to help ensure the institutional change toward sustainable practices:

> I think it's very difficult. I think existing, mature campuses are, you know, hard to retrofit. This was a part of the plan we didn't know had so many facets. You know at [the University of] Georgia you have a really sophisticated staff….you have one of the best if not the best, but Eckerd had no one. People will kind of talk the talk, but then do they walk the walk? That is why we did an energy audit kind of report for Eckerd. We did it as a kind of a test case. We did it at almost no cost, because we were trying to develop an internal SWAT team that could come into campuses and do a kind of energy audit and environmental audit. And one of the things that came out at Eckerd was that they were doing a lot of stuff.

The implementation plan started with studying the buildings and grounds to look for ways to show the Board cost savings that translated to a reduction in the carbon footprint. This dual outcome also became a recruitment tool. My literature review illustrated the use of the college's web page expressed philosophy of the institution's sustainable mission. Eckerd was an early user of the web to show perspective students their environmental awareness. The planning document also laid out plans to convert Eckerd. Chris Rice noted that the process was not what they had typically experienced and students played a big role:

> We started by sectioning off the campus into zones. Some zones had no build zones and others we added a lot of density. Some areas we stop mowing altogether and let the native grasses and vegetation come back. We keep the formal historic core as the only place that had a manicured lawn. They started a student invasive plant kill program that got a lot of invasive plants off the campus. The use of LEED for all future building, things like that started the ball rolling.

But the thing about Eckerd, the kids got behind this stuff first. I think Don saw the students really wanted this so he pushed it.

Dr. Eastman also changed with the adoption of the sustainable master plan. His vision of Eckerd as a special environmental place evolved along with the master planning process. Dr. Eastman's view of buildings and grounds also changed to embrace Eckerd's new direction:

> Well, just to choose a sort of gaudy symbol I guess, I assumed that through the master plan, and the strategic plan, and the financial plan, and particularly the fundraising plan--we were going to build a very big student recreation center. Everybody's got them; everybody criticizes the colleges for getting them. The colleges all get them because that's what their customers want. And two things—at least two big things happened. One is, the number was so damn huge, just an enormous amount of money—it was more than the library. And not simply me looking at the balance sheet, trustees saying, "That doesn't seem right in terms of our values—to spend that much money with a college that needs academic facilities that we need as bad as we need them." A second thing is, as you begin to think about Florida and think about sustainability, I said, in particular, "We don't need to build a thing that they would have in Ohio, because we're not in Ohio. We can do all of our stuff outdoors. That's what Florida is about." So we wind up creating our "quote" climbing wall that everybody has to have. It's just sitting out there in the middle of the forest. We've created the GO Pavilion essentially as a substitute for a lot of the things that happen in other student recreation centers, and it celebrates Florida. It has been a smashing success and, of course, we've

repurposed the old library—part of it—into kind of a wellness center and workout space and that kind of thing. So, we've found unique Florida sustainable ways to do . . . more sustainable ways to do things than if we'd just kind of done the sort of routine thinking that I think we started off with.

Eckerd moved forward with the sustainable directive and these new **sustainable directives reshape Eckerd and benefit the institution.** This fourth theme was strong. As a small private school Eckerd was always looking to attract students, students who were willing to pay $30,000 dollars a year in tuition. Eckerd found that the sustainable direction Dr. Eastman and his Board chose gave them a niche in the market. Students were coming to Eckerd to be part of the sustainable campus life. The answers I received to my question "Do you think sustainable principles will or have changed your university's position in the market place?" were very strong and positive. Mr. McKenna expressed his thoughts as follows:

> The short answer to that is absolutely yes. It has been a game-changer for Eckerd. And I'd say that in the early days, looking at the master plan and specifically the sustainability elements of the master plan, sustainability's a big word, but let's focus on sort of the environmental effects of sustainability for a minute. What we discovered was there was a huge disconnect between what our faculty were teaching in the classroom and what was actually happening in the real world on the campus. The faculty were teaching sort of the academic life process, best practices—but we weren't practicing it in reality. The things, simple things like bringing in green cleaning chemicals, were evolving, and so our focus on the environmental aspects of the master plan helped to accelerate that process. And at

> the same time, by working with the faculty, we started to, I think, close the gap between what they were teaching and what the practices were on the campus—protecting the ecology really.

Mr. McKenna's comment reflects how Eckerd started using the buildings and grounds as a laboratory. The data gathered would inform decisions, validate sustainable directives and serve as a recruiting tool for prospective students and faculty. His interview provided examples of how sustainable directives reshaped Eckerd and provided benefits to the institution:

> But a couple of examples were that some of our biologists were concerned that we might make changes to the campus, and we would disrupt what they call critter corridors, which is the ability of the critters of an ecology to move across the campus from one clump of bushes to another clump of bushes and keep on going. It is true that we weren't focused on that initially, but based on their input, we have become very focused on that. So now, when we talk about making changes to the campus, that's one of the elements that we actually put on the table, how do we preserve those critter corridors? Now, students do see this, and so I think that both by changing the appearance of the campus and continuing to stress the sustainability and now having the faculty and the administration working more hand-in-hand, where . . .the faculty is no longer, I'd say, complaining to the extent that they used to about some of the practices that take place on the campus. They are now complimenting a lot of those practices and, in some cases, helping to improve them. We've cut way back on pesticide use, for instance. We've become more sensitive to some of the wildlife. We now build osprey nests to support that.

> So, yes, there's been a dramatic change. Our students do see that. I am convinced that it has increased the interest of Eckerd to many, many students—especially if they have an environmental concern.

Mr. McKenna's comments speak volumes about the transformation of Eckerd in the ten years since implementation of the master plan. His comments also reflect that the planning principles have evolved and grown in ways never envisioned in 2003.

The following quotes are long, but reflect President Eastman's strong feeling that Eckerd changed dramatically from when he took over as president. Dr. Eastman has been implementing this plan for ten years, and what his response shows is unwavering belief that Eckerd is a different college because of its sustainable position:

> Oh, yeah. Oh yeah. I think . . . I guess I would say, not to be too overly dramatic about it, it has strengthened our position in the market. That is, the students that might have looked at us before and moved on have enrolled. They have a clearer sense of the mission of the institution, because we're much more articulate and much more visual about what we say we're trying to do than we used to be. We make a better argument because of that, and I think that it's put us in a different place. Our market also includes and will forever—people who want to support us either by giving us money or by word-of-mouth, talking well about us. We've never had a successful campaign at Eckerd College, and you wouldn't start off at an institution that's 48 years old—starting a campaign. Not to mention in this economic market trying to raise $80 million. You're only able to do that because there are a lot of people that have sort of . . . have drunk the Kool-Aid and believe in the articulated mission, so I have no doubt that that's happening.

> We've drawn 300 students—we've grown 350 students. We've gone from 68 percent students living in our dorms to 82 percent of our students living in our dorms—so much that we're absolutely full. Out SAT score has gone up, our . . . everything has . . . all the numbers have . . . Our retention has gone from 80 percent to 90 percent. You know, our graduation rate has gone up by 14 points. All of those mean you're deepening your brand. We are seen as the "green campus" and that it's being effective.
>
> And I think it's very clear that students these days, more and more and more, are interested in what campuses are doing from a sustainability point of view, and really sometimes it's the audience that is pushing the campus to being more sustainable.
>
> That, you know, I don't want to push saving the whale down the throats of people whose philosophical orientation is less prescriptive, but there are all sorts of reasons, and if the budget's really important to you, you can see in a hurry to be as smart about this stuff as you can be because of the impact on the balance sheet. And it's increasingly clear there are all sorts of reasons that students are more and more interested in places that take the environment and sustainability seriously.

Dr. Eastman's comments sum up how the strategic and master planning process started as a process to solve problems identified by the Board, but through the process, sustainability redirected Eckerd. The redirection saved money and branded Eckerd as a college that is aware of their special environment and used the campus as a laboratory and fully integrated the buildings and grounds as pedagogy.

Summary of Results

Several findings emerged from my analysis of the data. Eckerd was in need of a new leader, but when Dr. Eastman arrived he not only took the leadership reins, he took Eckerd in a new and completely different direction. Dr. Eastman knew that the campus was sited on an environmentally spectacular site. He used his past experiences as a Vice President of External Affairs and Vice President for Strategic Planning to construct a process whereby he could develop a new direction for the institution. This new direction evolved over many months into a sustainable campus plan. The plan was the platform for a new Eckerd philosophy that has given Eckerd an ecological brand. This repositioned Eckerd in the market place and has refocused the faculty whose teaching is now connected to the physical plant.

The merger of pedagogy and the built environment moves Eckerd closer to answering my first research question of what is possible in building and designing a sustainable campus. The fact that students are seeking out Eckerd for Eckerd's sustainable philosophy also reflects that the implementation of the sustainable master planning principles has changed Eckerd.

Eckerd took the strategic and master plan and adopted it as part of their mission. After the planning processes were complete, Eckerd used these documents as a compass not a road map. Implementing any plan is an ebbing and flowing process of operating an institution with smart decisions. Many strategic and master plans fail to get implemented because sometimes it's simply easier not to do all the work to move a sweeping plan forward. The logistics of implementing sustainable principles into all aspects of campus life and then living by these principles is what Eckerd did over the past ten years. What

is possible in designing a sustainable campus? Eckerd is a good case study of what is possible as pointed out by McKenna:

> The common thread here is that because we started with a really good master plan that put so much emphasis on ecology, which—change the word ecology to sustainability. In other words, we put so much emphasis on ecology, it made it a less challenging sell to the administration. And the president was the early adopter, or he embraced the concept very early on, and so it really was his wisdom that said we got to go in this direction. He wanted to attract . . . we already had a good environmental studies program. He wanted it to grow. We knew to get students, we had to be doing the right things. We got to quit saying one thing and doing another thing. So, he was the early impetus to do that. And then from that, it just started to emerge. And then as I started to push a lot on energy savings, and the cost effect of it, because frankly, we can't afford to do otherwise, and it started to merge it together, and that's what's really made it grow across the campus. And then of course, because we are attracting more environmentally-aware and interested students, then there's been this groundswell of student involvement, and then, of course, that then excites and challenges the faculty to kind of stay out ahead of that mob, and make it look like a parade. It's really caught on.

The other questions or parts of the questions: how have the principles of bioregionalism been applied to a college campus? How do you achieve buy-in to collective ecological based strategic planning, master planning and academic planning

initiative? What external forces help or hurt achieving sustainable goals? McKenna pointed out one of the biggest obstacles:

> I think it's certainly a decent goal to subscribe to, and we were one of the early signatories to the climate commitment. My advice was, "This is going to be very difficult and expensive for us to achieve the goals of the University and College Presidents' Climate Commitment requirement. He [Dr. Eastman] understood that, and he said, "But it's the right thing to do." And so, we signed that. Now, it's still true—it is difficult, and it is expensive, but we are working through it. In fact, we were one of the earliest ones to produce our plan.

Dr. Eastman was certainly aware of the restrictions faced when the process can be viewed as too expensive. He points out that the long term benefits are not always enough to overcome the short term resistance:

> Well I think it's certainly achievable, but the threshold issues are how much money you've got, and how much you're willing to invest in this at the beginning. Long-term, it may in fact save you money, but do you have enough money to get into it right off the bat?

Both of these statements are based on ten years of experience with turning their campus into a very sustainable place. With the willingness to take on visionary tasks, Eckerd had the confidence to think big picture ideas. All of the interviewees who had knowledge of what Eckerd has accomplished over the past ten years voiced in some form or fashion their belief that it was a worthy goal. I believe this optimism streams from working through the planning process and seeing the results of the implementation of the

plan. The implementation of the master plan is where Eckerd's skeptical Board members were ultimately won over.

My second research question was what external forces help or hurt achieving sustainable goals? The interviewees noted that many of the decision makers had reservations or needed proof that the new direction Eckerd was heading was a sound direction. As Mr. McKenna pointed out, he was in this category. Over time and with a few projects completed, he was converted. Dr. Eastman said he had Board members who did not want to save the world and had no interest in branding Eckerd "green." These doubters eventually went along with Dr. Eastman's process giving the new president leeway. As Dr. Eastman said, over time his Board members became aware of all of the benefits of Eckerd's new philosophy.

Eckerd is an excellent case study of how to achieve buy-in to a collective ecologically based strategic planning, master planning and academic planning initiative. As Chris Rice said in the interview, "Gather very smart people, put them into a room and talk about what is possible. That's what Don did, and Eckerd is a different place because of that process." The process Dr. Eastman and his Board utilized allowed buy-in to the sustainable principles that Eckerd has implemented. Dr. Eastman went from a Board filled with doubt about his direction to full acceptance of his direction. His second five year contract was signed in 2006 and he was offered a third renewal just this year. This more than anything else signals Board confidence.

CHAPTER SIX

CONCLUSION

Chapter's four and five reflect the findings and results from my research; chapter six includes my analysis of the research. I have included two outside experts that I interviewed to support my literature review and explore my research questions in a broader context. These two experts are architects who practice or implement sustainable architectural design. I will provide recommendations from my findings and will conclude this chapter with future thoughts concerning a sustainable campus.

Research Reviewed

I interviewed major participants in the strategic and campus planning design process at their respective colleges with a goal of discovering when major decision makers came to the realization that their campus should and would shift to a more sustainable campus direction and just how far can or will these leaders take their campuses in a sustainable direction. During my interviews with both of the school presidents, Board members and design teams, I thought I would discover an "aha" moment, a moment where the decision makers would push back from the table and say, "That's it. I understand we need to recast ourselves in this sustainable mold." I found this moment did not exist. What I found was a long arduous process that included self doubt and redirection. Chris Rice, when talking about Dr. Eastman's decision process, commented:

> It seemed like to me there was never an "aha" moment for him. And it was not directed from as much faculty and students and staff at Eckerd as much as it was the planning process that we helped him see that kind of environmental path to take. As you know this was a long process with stops and starts. Don is a really smart guy, and he's opened minded….he put smart people in the room and those smart people got it, I mean with the special place that is Eckerd they understood this was the right thing to do.

I also found in my research that there was a theme that both presidents shared. The theme could best be described as an idea or concept that they themselves did not know could be accomplished, but used the strategic and master planning process to help shape their idea or concept. In the case of Eckerd College, Dr. Eastman was looking for a plan that could answer the question "Why Eckerd?" As he searched for a direction for Eckerd under his new presidency, he was receiving advice from many different sources. His deliberate investigative process before he started as president gave him some information about what was right and what was wrong with Eckerd, but it did not answer the question, "Why Eckerd?" Dr. Eastman found the answer to that question during the planning process:

> I spent my first year at the college—at Eckerd—trying to understand the strengths, the weaknesses, the aspirations, the history so I'd know what to build on, what to avoid. And my first move, actually before I went on the payroll, was to begin to visit individually every single member of the Board of Trustees in their office and/or if possible, home. Get to know them a little bit and try to understand what compelled them to support the college, what ambitions they had

> for it, what they thought its great strengths were and what their version of the history was about which it had led it to the difficulty that required them to go look for a new president. My line through the whole planning process—all of the planning process—was, particularly at the beginning, I don't know what the words are. I'm just trying to understand the tune, I'm just trying to hum the tune, and then we'll look for the words. And I said early on, I think in my first month, I'm trying to tell this new group of students and parents that are coming for our new freshman class in August what we stand for. I'm trying to parse a draft answer to the question, "Why Eckerd?"

I found a very similar theme with Dr. Hoadley's interview, where he had a vision for sustainable agriculture and feeding a world's population with a different way of conducting agricultural farming. He was working toward this direction for Zamorano University but was running into a great deal of resistance from certain Board members and alumni. Dr. Hoadley understood the movement towards a more sustainable way of life that was taking place in the United States and other places around the world. He sought out professionals who could articulate an architectural plan that respected the environmental issues at Zamorano and complement his vision for sustainable agriculture pedagogy. My research reveals that only the presidents knew what their vision was and used the master planning process as a catalyst to validate the feasibility of that vision. Both described their idea as incomplete until the physical master plan process started as pointed out here by Dr. Hoadley:

> I think strategic planning . . . master planning….they're kind of the two processes used. It might be the hidden agenda of the chief executive officer and his own

nature, which he may or may not want to completely be open about the political needs. My predecessor had started the process of changing the Zamorano mindset and made a lot of progress. When you think you're in the middle of a huge change process, you're only at the beginning, and you don't begin to see real change until after about seven years. So, I continued the process of change. We introduced a number of changes in the curriculum and tried to emphasize much more student-centered learning, and we put a lot more emphasis on the environmental assets—sustainable agriculture. We didn't necessarily go all the way toward organic agriculture but sustainable agriculture. At the same time, we spent a lot more time building the capability of the students in the area of science—basic science—we introduced a number of science courses, got fairly heavily into bio-technology and asked a lot more of the students from an academic perspective, and we tried to change the focus of the learning-by-doing so it would be much more of a "learning" and not just "doing" focused. These were some of the underlying currents, and I felt very strongly that the whole issue of sustainability was going to characterize agriculture and environmental sciences in the future. And there were some people on the campus who shared this feeling, but I would say not everybody. There were several people who were still interested in seeing how much milk they can get out of a cow and how much clothing you got out of an acre of land and how fast we can turn chickens into food, your traditional agricultural production focus.

The physical master plan coupled with the strategic plan were the tools both presidents used to set a vision, obtain agreement from their Boards, establish goals and

objectives and point their institutions in a different direction, a different direction that they themselves did not fully understand until the plans were fully formulated. The process itself allowed the buy-in that was necessary for the presidents to accomplish what they intuitively understood.

I also found in my research that the design teams did not always understand where the process would finish. The process was fluid and had to adapt to the special nature of the place, the cultural and the nuances of the students, faculty and Board. In the interviews with design team members from both institutions, there were stops and starts and redirections. For example, at Eckerd the whole process stopped six months into the process and a new team member was added, Bio-Habitats. The new team members were scientists who provided analysis and recommendations to the design team about the special nature of the different habitats that made up the Eckerd campus. This redirection did many things for the design team and the process. Some of the benefits were that the design team crafted criteria specifically suited for the unique environment. The design team won over many of the faculty skeptics that felt Dr. Eastman was wasting money, but also the design team was about to make the same dumb mistakes so many other architects had made in Florida. At Zamorano, the design team did not fully understand the ecosystem that existed before the deforestation of Yeguare Valley, this lack of understanding could have led the team to recommend systems that were not sustainable. This unawareness was not reserved to the design team; most of the faculty did not understand the complex nature of the interwoven ecosystems. An emeritus faculty member who understood the sustainability direction the design team was suggesting for Zamorano took the team to Uyaca Mountain. Uyaca Mountain is a nature preserve about

five miles from the campus that still contained the flora diversity that the Yegure Valley once had. The team understood that the bio-diversity present at Uyaca Mountain versus the singular pine tree that now covers the valley was the root cause of so many of the sustainable issues at Zamorano, most notably water. This key piece of information completely redirected the team and its recommendations. This information and the plans that developed opened the door to the possibility of Zamorano achieving ecological equilibrium or moving toward bio-regionalism. These are two examples of how the process moved and changed to be acceptable to the institution and the environment during the process. I associate this type of change to that fact that sustainable design is still relatively new, and the sustainable planning process is an overlay to an existing process. The existing process described by Chris Rice in chapter four.

Literature Review and Findings

My literature review supports my findings in many respects. Just like the sustainable planning process was not completely understood or fully integrated into a traditional planning process, my literature pointed out just how new the concept of sustainability is to higher education. As Adams Gross pointed out in his interview:

> You know, I think to be fair and truthful, when we started Eckerd College, sustainability was just a glimmer in most architects' vocabulary. It wasn't really a core element as much as it is today and LEED—I don't even know if LEED as a nomenclature was even in its vocabulary when we started Eckerd.

My literature review states that although many different organizations, usually unconnected and often working separately, were aware of this degradation, the United Nations finally acted by appointing a World Commission on Environment and

Development (WCED) to address them jointly. The WCED concluded that "the ecological and social failures had common causes and demanded a common response" (Kemp, Parto and Gibson, 2005, p.14). In 1987 the WCED published a report titled *Our Common Future.* Suddenly sustainable development was a term being used on the worldwide stage. International conferences on the environment brought scientists, politicians, activists and world leaders together to address global environmental issues. At one of the first and largest international conferences held in 1992 at Rio de Janeiro, Brazil, a *Statement of Principles for the Sustainable Management of Forests* was signed by over 178 governments. Also *Agenda 21,* the *Rio Declaration on Environment and Development* was a sentinel agreement. The Rio conference propelled the discussion of industrial destruction of the planet to the forefront of the world's agenda (Kemp, Parto and Gibson, 2005, pp. 13, 14). The Eckerd plan started eight years after that Rio conference and the Halifax Declaration and the Tallories Declaration. The Halifax Declaration was a result of a 1991 international conference for university presidents that attempted to address the challenges of environmentally sustainable development. The Talloires, France conference of 1990 was the basis for many of the agreements ratified in Halifax. These two declarations were sponsored by an organization named University Presidents for a Sustainable Future, which has over three hundred signatories world-wide (Dunn, 2000, p. 72). The awareness about sustainable issues and sustainable direction was present but the details of how to integrate them were still to be worked through. Adam Gross points to Emory, the University of Georgia and the University of North Carolina at Chapel Hill as having influenced his understanding of sustainable issues. In an interview with Anna Wu, Campus Architect at the University of North Carolina at

Chapel Hill, Anna described a process where environmental concerns arose only after many traditional planning processes were used:

> We started our master planning process in 1997. So, in '97 we actually did not have an academic plan that was driving the need for a campus master plan. The 1987 plan had resulted in a recommendation that suggested capping the growth of the university—physical growth—to about 14 million square feet, and we were coming close to that number (in 1997). Their recommendation was that we actually develop outlying parcels to support then the academic needs . . . academic research needs. And what happened . . . and we had done some additional planning of those outlying properties. Well, the bottom line is people really didn't want to rethink campus. They didn't want to de-camp, and so the question that we put to Ayers Saint Gross when we brought them on board was, "Okay, what then is the responsible capacity of main campus? How much can we responsibly grow on the 700-odd acres that are the core or where the historic campus is and where we've grown over the last 200 years?" So, our definition of responsible capacity, when we started, was to look at what you could physically fit, to look at what utilities you would need to support the new growth, what transportation and parking you would need to service the additional growth, and what our physical needs were—a space-needs assessment based on some enrollment target . . . growth target. We actually started working with that as the kind of integrated planning team, I'd say from when we started in earnest in '98, maybe for about 18 months, and then we sort of came to the realization that transportation and parking and utilities alone weren't going to help us define what

> responsible capacity was. That when you looked at the environmental resources of the campus, and the condition of those natural resources and water system, that would probably also yield another important factor that we needed to weigh in our assessment of how you grow . . . or how much more you could grow. We were looking at responsible capacity. Those were the buzzwords; that was what it was all about—is what's the responsible capacity of natural resources. We weren't calling it sustainability back then but were kind of looking at it from this kind of more holistic view of capacity.

Just like Anna's description of Chapel's Hill's process and struggling to create a process, some campus administrators were starting to understand what sustainable design was and how to apply these "new design principles" to their campuses. The literature supports this with different colleges and universities struggling to understand how far to integrate sustainable principles into the academy. The literature reflects a "top down" and "bottom up" transformation process (Sharp, 2002, p.129). Sharp writes that in the late nineteen-nineties social debate centered around such issues as "global warming, climate disturbances, acid rain, deforestation, species extinction, fisheries deletion, soil erosion, toxic buildup in ecosystems, land, air and water pollution, ozone depletion that are forming a web of destruction around the world" (Sharp, p. 129). These issues were so ubiquitous that universities were drawn into the debate by students demanding that universities address the environmental issues and make changes; this is the bottom up approach. In all my interviews associated with Eckerd College, the interviewees expressed that student, faculty and staff opinions about sustainable issues influenced them and were certainly drivers in the process. As was pointed out in Chapter Four,

Eckerd has accepted sustainability to the extent that it has reinvented itself as a place that draws students just because Eckerd is such a sustainable college. Anna Wu also expressed these same thoughts:

> People are always going to be drawn to Chapel Hill because of our reputation, but the whole sustainability thing opened a door. And the master plan was another vehicle for that, but in the end a lot of change happened very quickly, and maybe because we started with looking with our natural systems.
>
> When Chancellor Moeser came on board in 2001, he actually wrapped up the campus plan with Ayers Saint Gross, and he helped advocate for the bond. He made a pledge that he would double the state's investment, so we started out with $1.5 billion, and it essentially almost doubled from that. His support for the sustainable approach of the plan was strong, so he set the values platform for all of us. Dr. Moeser started to say: "We express our values by what we build."

Zamorano is much newer to adopting sustainable principles than Chapel Hill or Eckerd, but in some respects may be far further ahead of the game. One of the ways Dr. Hoadley assured Zamorano would not abandon the seven year planning process after he stepped down as president was to have Dr. Jack Crowley installed on the Board of Visitors. Another step was to create the position of Campus Architect. This position was created approximately half way through the two year master planning process. Mario Leon Gomez was hired and has been implementing the master plan for two years now, which he discusses here:

> The infrastructure chapter concerning the student dormitories was the first to be implemented; four buildings housing two hundred students, and secondly in this same chapter the smart classrooms on the northern part of campus with one remodeled old auditorium to be accommodated as a classroom. Also new criteria set on campus procedures that anything new to be built on campus first needs to be submitted for approval and consensus with the master plan document in order to keep the balance and order with its main directives. We are perceived as an environment friendly University that takes care of the surroundings, natural resources and add to the student's integral professional formation the environment consciousness element.

The views expressed by Mr. Gomez reflect a commitment to applying the master plan principles. Mr. Gomez, Chancellor Moeser and Mrs. Wu are reflective of what the literature review in Chapter Two described as the dialogue that occurs within the institution and what next steps the institution should or must take to reorganize themselves to transition to the next level of a sustainable university. I found in my research that the commitment to sustainable principles has to have the support of institutional leadership. Dr. Hoadley and Dr. Eastman were critical leaders, and without their support the process would have failed.

The second part of my first research question was asking how have the principles of bioregionalism been applied to a college campus. One of the theoretical questions that I asked of respondents dealt with equilibrium. I phrased it this way: "Think of sustainability as this cube, and the cube might have a graph component to it where the graph starts to go up, where the upper end, the theoretical limit of a sustainable campus,

would be utilizing a bio-regional approach. Bio-regional would be that everything within the region—the ecological region in which your campus is situated—has a capacity or limit that would include the energy that's produced there. So, by moving something from a region outside of your ecological region into your ecological region, you're taking the energy from the outside region, and you've now created a deficit in that region and you've just added additional energy to your region. Therefore, what you're trying to strive for is this equilibrium of no more capacity, no less capacity than the environment can handle." This question was attempting to ask participants who were part of a process that dramatically changed the direction of their campus if they could envision taking their campus even further along the sustainability trajectory. This question also expands the first part of the question which asks, what is possible in designing a sustainable campus? I received a range of responses. Adam Gross quickly said:

> I think it's very difficult. I think existing, mature campuses are hard to retrofit. It can only happen if there's an administrative re-tooling. It has to be so embedded in the administrative mindset from purchasing to commitment to changing your curriculum to changing air filters and fixing all your leaky windows and down to the absolute smallest details. I think doing this at large and small campuses, it's very difficult because you're dealing with millions of square feet of existing buildings that are just inherently poor performers from an energy point of view. Even if you're building a new campus from scratch, and you did all LEED Platinum buildings and had green energy source and other renewables, it's still hard to get to a carbon neutral position.

Dr. Eastman and Dr. Hoadley felt you could achieve a much higher level of sustainability than is currently being met on their campuses or others. I believe they looked at this question not from the standpoint of technical achievability, but from a student aspirational frame. Dr. Eastman points to Eckerd students wanting to know as many metrics as possible to devise ways to help offset the carbon foot print:

> Our students look at our campus as a living laboratory that informs and teaches them. They are pushing us. They have voted to tax themselves, a carbon tax to offset air flights to and from school and study abroad trips. They know how much energy is consumed in their dorms and they compete with each other to reduce the energy usage.

Bill McKenna also was optimistic with the given limitation of location and other factors:

> That's a really complex question. I think that to properly address it, you need to factor in location issues. If you took, for instance, a downtown campus location, the answer would be absolutely never. But if you took a rural location—somebody out in Iowa—the answer could be maybe. Eckerd is on the fringes of being urban. We have 200 acres, but we already think, in terms of growing our own food and being self-sustainable, I don't think we have enough land to do that on. We've got about 200 acres; we are consuming slightly more than half of it just with buildings. So, I don't think we could actually grow all of our own food. Our vision, our hope is to be able to reduce our carbon footprint substantially and improve that as well as reducing our energy consumption. But in terms of being ecologically self-dependent—boy, that's a hard one. I don't see Eckerd being able

to do that in the next 50 years. I'm not saying it wouldn't be a good goal to start towards, and we are doing some of that. I mean, we are growing some of our food for the cafeteria. It's a really innovative program we have right now. And it's a cooperative program where the students have gardens, and they're overseen by our food service vendor. We're trying to teach the students what this is all about, and that is a very powerful component. Will we ever achieve neutrality, so to speak, as a result of it? I don't think so. But I think that the steps that we're taking to demonstrate what neutrality could consist of, we are very successful with that.

Chris Rice was like many people who felt hopeful about the prospects but did not have a grasp of all that was required to answer the question definitively:

Good question. . . . I've never been buried into an institution to know how they live and breathe as far as food and utilities and all those things. I kind of get the general planning sense of it, but it seems to me that as far as food production. Of course you think back to Thomas Jefferson and basically they were self-sustaining and grew their own food and all that. Could we ever revert back to that? I think it would be extremely difficult to do—especially for an extremely large institution. I think maybe smaller ones might actually have the ability to do it. Can we completely be sustainable even with our own water supply and capturing it? I don't know. I would like to think that we could. We obviously have the technology to do it. At what point does an institution become too big or too small to actually be able to be fully self-sustained and so-called "off the grid," if you will?

Zamorano is very close to being ecologically balanced in large part because of the large acreage and the fact they produce enough food to feed themselves and export. Not surprisingly Dr. Hoadley's answer was positive:

> I follow it. I don't have enough engineering to really provide a responsible answer to that. But, let me tell you about my last initiative, which I felt a little bit frustrated it didn't quite get the traction which I hoped it would by the time I left. And that was the Green Zamorano initiative. And the idea of the Green Zamorano initiative was to establish some goals, and they're pretty close to what you're talking about. One is carbon neutrality, two is independence from the electricity grid—and that's the big one, and third is better water utilization. Now is it realistic to think that we can get off the electricity grid? Only if we actually harnessed a river and a waterfall, which is on our property. It would cost about, you know, $15 million to do, and I'm not sure I could argue that it's feasible. But, it could happen just because we happen to have a potential source of hydro energy on the campus. And so, in that particular case, yes, we could become energy neutral, we could subsist on the energy available on our campus but that's because we happen to have a potential source of hydroelectric energy. If we did have that, it would be hard for me to imagine, given current technology, how we could. But, you know, in a place like Zamorano, is some ways unique because it is this combination . . . it is this rural community where you have all these different activities going on. It's just an academic community which has the production . . . the cows, and the chickens and the pigs, a dairy operation and so forth, and the forest resource. It would be much harder to think of it as a whole ecosystem, but

in this particular case, because it's got so many resources in place it does have the potential to, as you say, become bio-regionalist. It has the potential to be self-sustaining.

Berkley Cone and Jack Crowley were extremely supportive of the concept and believe in Zamorano it is very achievable. Cone was also realistic about the support and time requirements that were crucial to the process:

I serve or have served on six different university Boards, and I still strongly believe that. I think that that is something that could be done, and it's going to take work, and the good thing that Zamorano has, it has a lot of very enthusiastic, smart, young professionals there. It has the land to do it, and it has the opportunity in the sense of the sewage and not being properly handled. I think it's a fantastic opportunity there to get it done. I really saw a number of things to what you were talking about of water . . . And one of the other things I wanted to see happen was a lot of publishing that would originate because of all this work, and I do think that Zamorano has the potential because it does have so much land. It is unique in that regard, and land that is eminently not well-utilized. It's going to take 20 years, I think, to get it all done with the budgetary limits of any institution. But 20 years from now, Zamorano could come really close to having a zero impact.

Crowley agreed and went on to point out the significance of the driving force behind the movement to a sustainable campus:

It could and the funny thing is they could export their knowledge of sustainable technology developed here in the U.S….they're doing it out of necessity. We're doing it because we know that it is the proper thing to do, and we have to do that

to survive. So, Zamorano is as close as any university I have ever seen—out of necessity—to being 100% sustainable.

Gomez goes even further through his grasp of the impact that Zamorano can have not only on the local region but the large scale implications of being one of the first universities to make the conscious effort to move in the sustainable direction:

> We believe that Zamorano will be the pioneer on bioregional culture in the valley of Yeguare making other close neighbors to acquire the same philosophy regarding natural resources and environment friendly type of renewable energy systems. In essence the region follows an environment friendly culture but only because of the lack of means to exploit it. Maybe this way (starting from scratch) the turning of tables towards bioregional and sustainable way of thinking will be an easier task.

Recommendations for Future Research

My literature review, findings and conclusions suggest that there are numerous avenues for future research within the sustainable movement in higher education and at Eckerd and Zamorano. Specifically, my literature review found that research in the area of higher education is a new and emerging area of study. The fact that the term "sustainable development" first became synonymous with designing and constructing buildings that were more environmentally friendly after the United Nationals sponsored the World Commission on Environment and Development (WCED) in 1987 and 1992 validates the new nature of this field of study in a broader context (Kemp, Parto and Gibson, 2005, pp. 13, 14). My literature review found very few studies of what effect the sustainability movement had on higher education in the decade of the 1990's. What the

literature suggested was higher education was becoming aware that the academia could and should play a pivotal role in embracing a more sustainable way of living. The last ten years saw thousands of articles written on this subject. The subjects range the spectrum from curriculum reform, such as a focus on "green majors," sustainability awareness classes, tenure review that include sustainability as part of the promotion process, university policies that are sustainable in nature, presidents pledging carbon neutrality by 2020, commitment that all new facilities will be built to a LEED standard, to almost any other topic. The exponential growth in the literature over the past ten years also indicates that there is a great deal of avenues to be studied on the topic of sustainability in higher education.

With a closer focus on my research questions, what is possible in designing and building a sustainable campus, a more specific series of questions could easily be asked that could look at different aspects of the sustainable campus. My research at Zamorano reflected a campus and environment that was highly sustainable. The construction techniques as well as designs that use indigenous materials result in a very sustainable collection of buildings. Zamorano also has a desire to be as independent of outside services as possible. This desire coupled with the large land holdings has positioned the university to make the steps necessary to become independent. A closer look at Zamorano could provide several recommendations for achieving total bio-regional equilibrium. The installation of impellers in the water harvesting system would allow Zamorano to be off the grid. Also, the construction of a water reservoir that could be used for both potable water and irrigation would make the university less dependent on the surrounding mountain's watershed. My research at Eckerd indicated that they have made

substantial changes to their existing physical plant. These changes include improving the existing building systems to highly energy efficient systems that meet LEED requirements. They have also substantially changed their student's understanding and awareness of the environmental implications of the physical campus. Even though I have found substantial change in these two areas, that's not to say that there are not many areas where Eckerd could become more sustainable. Some examples include: a more holistic transportation plan with the city of St. Petersburg, becoming less dependent on electricity, or becoming more sustainable with food production.

My research focused on two small private colleges. These colleges hired change agents as presidents and change did occur. A study that focused on a similar college composition where sustainable principles were suggested but never implemented would strengthen and serve my findings as a counterpoint case study. Such a study would provide a better understanding into what factors influence acceptance or rejection of sustainable directive.

Other studies could look at very specific reasons for change, like leadership factors. What role did Dr. Hoadley's or Dr. Eastman's leadership play in swaying Board members, faculty and students? What factors about leadership contributed to the acceptance of sustainable principles? Was there a Board member who championed this cause or was it a driven student leader? Leadership may play a role, but my study focused on what is possible in designing sustainable campuses, not as much on specific factors such as leadership.

Another area of potential study could be what effect has the sustainable movement had on the socialization of our society and how has that affected what is

expected of higher education institutions. This could be coupled with leadership and how leaders are influenced by social issues. Many public institutions of higher learning are greatly affected by social issues, such as illegal immigrants being accepted to public schools. My literature review showed that some college presidents were influenced to sign agreements on sustainable directives based on the World Commission on Environment and Development studies. Further studies exploring the specific reasons could support my findings.

Finally, Eckerd has made many substantive changes by implementing sustainable principles. These changes have taken place over the ten years since Dr. Eastman was selected as President. My study was a qualitative case study. My findings were solely based on interviews and review of written data. Because Eckerd has been implementing sustainable principles for such a long time, a mix methods approach could serve to address some of the statements made during the interview. Statements to questions such as "Do you think sustainable principles will or have changed your university's position in the market place?" I received a very strong and positive yes as indicated by McKenna, "The short answer to that is absolutely yes. It has been a game-changer for Eckerd." Dr Eastman further supported this position:

> Oh yeah. I would say, not to be too overly dramatic about it, it has strengthened our position in the market. That is, the students that might have looked at us before and moved on have enrolled. They have a clearer sense of the mission of the institution, because we're much more articulate and much more visual about what we say we're trying to do than we used to be.

This perceived position change could be validated with a quantitative and qualitative case study such as outlined in Howard's book, *Using Mixed Methods in Institutional Research.* A quantitative study of perspective students and students who chose Eckerd coupled with a questionnaire asking why certain choices were made could add to my study. Other quantitative analysis could be used to support Eckerd's assertion that the direction they have patterned themselves on is returning the institution tangible and intangible benefits. Life cycle cost analysis, carbon foot print studies and environmental studies supporting the seven environmental zones of Eckerd could add information supporting Eckerd's position.

Summary

I started this dissertation with a thesis that higher education is not a static or unchanging institution that is a collection of buildings on a plot of land, but rather a changing and morphing confederation of educators. What is reverently referred to as the academy has a strand of connectedness that date to the beginning of mankind. The teaching and instructing of others to better themselves and our society has always been considered a high calling. The academy is changing itself again to meet the demands of a manmade global environmental decline. The academy has been studying this decline, and it is the academy's scientific community that has reported the data that every species on earth is impacted by man's development and is in decline. The group of scientists, with over 200,000 members, call themselves The Union of Concerned Scientists. Their reports are a collection of studies that paint a pessimistic future. But within the academy change is occurring that is and will affect every corner of higher education. Other impetus for change throughout history were the pedagogical change from the Socratic

Method to the elective curriculum, the industrial revolution, intercollegiate athletics, the coeducation of campuses, the GI Bill, the space race, the advent of computers and the current change is the sustainability movement. The scientific community has sounded the Claxton, and I believe that it will be the academy that will find the solutions to the decline of our natural systems. I believe that within the academy, governmental policies will be formed that will affect the global health of the planet. Within the academic world, young men and woman will learn a different way to live and work on our planet. They will learn this by the examples of the buildings they live in and the grounds they walk. Higher education will produce the solutions and intellectual where with all to slow and even stop the decline.

The relatively short time span of this change is also interesting. Some of the earliest adopters of sustainable principles were presidents of institutions of higher education. The early adopters were mostly European, Canadian and Australians, but within two decades American universities have made great strides in many environmental areas. An indicator of how new the concept of sustainable design is can be seen by the front page article August 26, 1998 in the Wall Street Journal, titled "*Windows That Open Are the Latest Office Amenity."* For architects like myself, the fact that operable windows made news is on one hand a low point, but on the other hand, shows we have turned a corner in what is acceptable. The concept that building inhabitants should be divorced from nature only reinforces our removal from our natural world. This concept was prevalent in architecture starting sometime in the nineteen sixties. The use of operable windows in building designs makes building occupants part of the building's heating and cooling system and this also provides added benefits. Operable windows

save money using less energy and studies also have shown that people who have exposure to natural light and natural ventilation are healthier and more content. Since LEED's inception in 2000, more than 20,000 buildings and over 7.9 billion square feet have been constructed in 50 states and 117 countries in accordance with LEED standards (Christ, Furness, 2011). This standard, which is only one of over fifty standards, has seen a doubling of buildings registered every year since 2007. In 2007 LEED had approximately 10,000 buildings registered (Garda, 2011).

As was reflected in my literature review, the design, construction and building manufacturing professions have reinvented and retooled themselves to a more environmentally sensitive process. Higher education is playing a large role in this transformation. Design professionals are graduating with little or no acceptance of standards other than that of sustainable design principles and methods. Universities are offering degrees based on "green" business practices, and undergraduate curriculums have environmental awareness symposiums that are required on many campuses. Higher education is transforming itself in ways that might not be perceivable to many who even work in the academy. A conversation with a faculty member in a design field would reveal that their curriculum has been radically changed by sustainability where many of their counterparts in non-design fields have not experienced the impact of sustainability. The research enterprise is also embracing green technology and new fields of research opportunities. Often referred to as biomimicry, researchers examine nature, its models, systems, processes, and elements to emulate or take inspiration from in order to solve human problems (Appendix D). One example of biomimicry is the study of Abalone and Conch shells. These animals produce shells as strong as concrete with no carbon

footprint. The human production of concrete is the third largest carbon footprint in the world. Many universities are studying nature for new discoveries and patents. If nature can provide breakthroughs in new materials and less environmentally harmful production methods, then nature can provide inspirations for ways society can live with little or no damage to the environment. I asked this question to my study audience about bioregionalism: Could you see your institution achieving an ecologically neutral position? Architecture and nature's law produce both sustenance and exquisite design. Nature is extraordinarily effective at making food, producing oxygen, filtering water and recycling nutrients and energy. Nature builds structures based on the local environment. Rain, wind, temperature, location, etc. determine the shape and final design. The human built environment builds the same way regardless of the environment. A building in Rangoon would be built with the same methodology as a building in Alaska. Nature has evolved to create structures for the environment; man has not learned this lesson. If we are going to make substantial steps towards a bioregional approach to living in equilibrium with nature, architecture needs to evolve to a design that matches the environment. Many of the people I interviewed were skeptical of achieving this goal. One reason for the skepticism could be that we can see change in the short time we have been moving toward a more sustainable campus, but the quantum change necessary to move to ecological equilibrium is a very different way to living, thinking and conducting society. Nature may lead us to understanding building systems that have yet to be perfected. Others that I interviewed could see our society living closer to equilibrium. The people who could accept a bioregional approach were the two college presidents. They both quickly said yes. Maybe there is something about the fact that they moved

their institution so far in such a short period of time that they could see pushing a theoretical limit.

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APPENDIX A

NOTEWORTHY CAMPUS WEBSITES

Ball State University	http://www.bsu.edu/greening/
Brown University	http://www.brown.edu/Departments/Brown_Is_Green/
Cal State	http://www.calstate.edu/cpdc/
Carnegie Mellon University	http://www.ce.cmu.edu/GreenDesign/
Cornell University	http://www.sustainablecampus.cornell.edu/
Duke University	http://www.duke.edu/sustainability/
Florida Gulf Coast University	http://www.fgcu.edu/greenbuilding/
Georgia Tech	http://www.sustainable.gatech.edu/
Harvard University	http://www.green.harvard.edu/
Michigan State University	http://www.ecofoot.msu.edu/
Mississippi State University	http://www.eco.msstate.edu/
North Carolina State	http://sustainability.ncsu.edu/
Northwestern University	http://www.sustainability.northwestern.edu
Oberlin College	http://www.oberlin.edu/ajlc/ajlcHome.html
Penn State	http://www.upenn.edu/sustainability
Princeton University	http://www.princeton.edu/sustainability
Sonoma State University	http://www.sonoma.edu/ensp/
State University at New York at Buffalo	http://wings.buffalo.edu/ubgreen/
	http://wings.buffalo.edu/services/recycling/

Sustainable Universities Initiative (SUI)	http://www.sc.edu/sustainableu/
-University of South Carolina and Clemson University	
Tulane University	http://green.tulane.edu/
UC Berkeley	http://sustainability.berkeley.edu/
UC Davis	http://www.ormp.ucdavis.edu/environ_review/
UC Santa Barbara	http://www.sustainability.ucsb.edu/
University of British Columbia	http://www.sustain.ubc.ca/
University of Colorado	http://www.colorado.edu/masterplan/
University of Florida	http://www.facilities.ufl.edu/
University of Michigan	http://sustainability.umich.edu/
-green building	http://www.snre.umich.edu/greendana/
University of Minnesota	http://www.uservices.umn.edu/sustainableU/
University of Oregon	http://sustainability.uoregon.edu/
University of Vermont	http://www.uvm.edu/greening/
University of Waterloo, Canada	http://www.adm.uwaterloo.ca/infowast/watgreen/
Virginia Tech	http://www.facilities.vt.edu/sustainability/

APPENDIX B

SUSTAINABLE MILESTONES

1956 Clean Air Act England

1967 Clean Air Act II United States

Fashionable to be into Environmental Causes

1969 National Environmental Policy Act (NEPA)

1970 United States Environmental Protection Agency Founded

1972 Club of Rome

Called for limited growth and acknowledged the global environmental destruction

1972 Earth Summit in Stockholm United Nations

"Paper on Limited Growth"

1979 Berne Convention on Habitat Protection (Council of Europe)

Geneva Convention on Air Pollution

1980 World Conservation Strategy (IUCN)

Global Report (USA)

1983 World Commission on Environment and Development

Helsinki Protocol on Air Quality (UN)

1987 Montreal Protocol on Substances that Deplete the Ozone Layer (UN)

Brundtland Commission (UN) The current rate of consumption could not be sustained. The world must act as one to solve sustainability problems and the use

of the term “sustainable development” was first used. Brundtland developed a paper known as “Our Common Future.”

1987 Our Common Future (UN)

1992 The European Commission’s Green Paper on Urban Environment (UNCED)

Global Warming and the Decline of the Quality of Urban Life

1992 United nationals Conference on Environmental and Development in Rio de Janeiro

Called the Earth Summit “Biodiversity Treaty” “Forest Principles”

Agenda 21 and Framework Convention on Climate Change International Finances

1994 Copenhagen Social Summit

1994 European Environmental Agency Established

1997 Kyoto Conference on Global Warming

1997 “The Green Campus”

Yale, Stanford, Arizona State, University of Mass Lowell, UMass at Amherst, UMass Boston, University of North Carolina Chapel Hill, University of Alaska Anchorage, George Washington, Columbia, MIT, all signed an international partnership called the “Alliance for Global Sustainability”. The integration within the curricula was referred to as the “green campus”

1999 Dow Jones Lunches Sustainable Index

1999 Johannesburg Summit United Nations

Social Justice and Equal Partnership

2002 United Nations Decade for Education for Sustainable Development

2002 The Association of University Leadership for Sustainable Development

Mission to make sustainability a major focus of teaching, research, operations, and outreach (UNESCO)

APPENDIX C

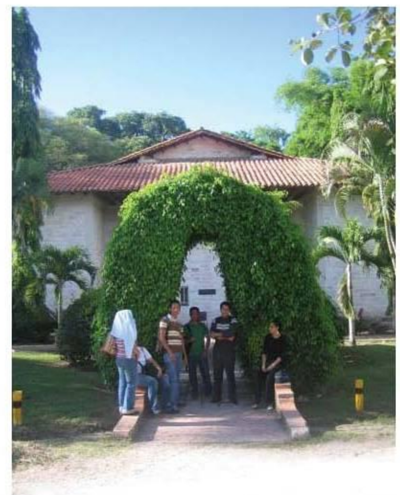
EXCERPTS FROM THE ZAMORANO MASTER PLAN

Developing Planning Principles

A Comprehensive Campus Master Plan envisions a physical form that embodies a University's strategic and academic initiatives. Essential to this is the development of Design Principles. These Design Principles provide a foundation for campus development that embodies the ideals of the university. They must mediate between the Built Environment and the Natural Environment and transfer the principles and ethics of the university to its surroundings. These principles guide not only the master plan, but also the implementation of the plan every step of the way. These must be formed under careful consideration as they affect the physical form of the school and how it relates to its environment, the spirit of the place, and the university's image.

PRINCIPLES
To guide the development of the campus plan, and to inform future decisions about physical planning, the following guiding principles were established:

1. Preserve and enhance the existing cultural and natural heritage of Zamorano
2. Protect, restore, and celebrate natural resources
3. Develop a safe, connected, pedestrian oriented campus
4. Provide for responsible growth to meet current and future facility needs
5. Strive for energy independence and a secure water supply for the campus and community
6. Engage local communities through outreach and education.
7. Serve as a leader in regional efforts and throughout Central and South America that promotes sustainable solutions.
8. Invest in facilities and programs that build entrepreneurship and improve the environmental health of Central and South America.



Sustainability Principles

The consulting team also recommended that Zamorano approach regional issues through the lens of sustainability. Most regional issues, directly or indirectly, could be connected to the ecological health of the Yeguare Valley. The health of local economies and of the campus depend on continued availability of clean water, arable land, and other natural resources. In turn, the health of these resources are directly impacted by the quality of development in the valley.

Primary goals for the ecological master plan are to restore natural habitat, conserve water resources, minimize electricity needs and provide opportunities for on-site renewable energy generation. These goals are to be accomplished by demonstrating commitment to an environmental ethic and sound ecological stewardship through implementation of ecologically sustainable site design and landscape management practices. Goals also include protection of mature vegetation, diversifying the landscape with native plants, reducing maintenance, controlling invasive species, improving water quality, managing existing natural habitat areas, and encouraging appropriate management strategies throughout the campus.

ENVIRONMENTAL GOALS

1. Reducing mowed grass and increasing natural habitat
2. Designating and preserving sensitive resource areas
3. Developing an invasive species control plan
4. Providing storm water quality best management practices
5. Recommending low-maintenance native landscaping
6. Emphasizing recycling, re-use and other "green" practices
7. Advocating sustainable development based on appropriate sustainable design strategies and Leadership in Energy & Environmental Design (LEED) criteria

Regional Challenges

The health of Zamorano is tied to health of the Yeguare Valley. Likewise, many of the challenges that face Zamorano are tied to larger regional issues that stem from, and have bearing on this valley. Given that the Yeguare Valley is a dry valley with limited resources, how can the university increase its capacity and improve the quality of life on campus in a way that is part of a sustainable vision for the entire region? Given increased growth pressures from an expanding capitol and population, how will the campus respond to increased traffic and development pressures at its borders?

Water Supply

Water is a major limiting factor on growth for the valley and greatly influences the quality of life for those who reside in the region. Water quality is also a concern for the school as the cleanliness of water that flows through campus cannot be controlled or determined on the campus grounds alone. As the campus grows it needs to look for long term solutions for ensuring that enough water is available for campus life, campus operations, and surrounding communities. It should also look for solutions for improving the quality of water in the region as well.

Strategies ensuring water supply may include expanding protections at the cloud forests which function as the headwaters of the valley's streams; promoting on-site water collection on both campus and in the surrounding communities; and re-examining operations to determine what kinds of crops the valley can best support. In the end, the university and valley communities may have to make some realistic decisions about the amount and kind of development the valley can support and work to develop a regional plan for growth.

Water Quality

The effects of erosion can greatly and negatively impact water quality. Healthy soils can take thousands of years to form, but improper farming and development practices can lead to erosion and immediate soil loss. Over development can lead to more impervious surfaces and lessen groundwater recharge. Increased impervious surfaces and development encroaching into floodplains can lead to increased storm flows during wet seasons, often resulting in dangerous flash floods. Likewise, building or farming on steep slopes may lead to increased erosion, soil loss, and dangerous mud slides.

To help mitigate this problem, Zamorano should work on campus and with valley communities to create an extensive network of stream buffers. These provide habitat, stabilize banks, limit soil erosion, mitigate increased run-off flows from increased development, and allow streams to meander and change course as natural rivers are want to do. Sufficient buffers will lessen the effects of flooding and create wildlife corridors that will connect the two ends of the valley. They also have the added aesthetic benefit of providing a green edge to frame Zamorano's campus.

Creating stream buffers could be good educational opportunity for students to learn native plant communities and design and implement strategies for native restoration. Furthermore, as the development

world becomes more environmentally conscious, the business of environmental mitigation may offer more job opportunities for graduates. Involving students in hands-on mitigation projects both on campus and in surrounding communities would give them excellent learning experience and preparation for such jobs. Although the industry might not be developed yet in Honduras, Zamorano should explore whether or not its campus streams could become a "mitigation bank" for governments and developers who are seeking variances on other projects.

Stream buffers could also provide recreational opportunities. Space for running trails, bike paths and boardwalks could be found within their expanses. The creation of these buffers and a natural connection between Uyuca and El Volcan could, if properly marketed, aide in the creation of recreational tourism in the valley and provide students with added recreational activities for biking, hiking, and exploring the native flora and fauna of the valley.

The creation of a network of forested stream corridors, although quite an undertaking, could provide a positive physical and academic image for Zamorano, making the campus and the region more attractive and environmentally sustainable and turning out students who are knowledgeable in the fields of environmental restoration and mitigation.

This solution echoes that of an earlier suggestion from a Zamorano student's graduating thesis. Tahia Devisscher's thesis includes well thought out plans for creating a forest corridor network and should be used as a reference for implementing this strategy.

Circulation

Also important to the university, and directly tied to the growth of the valley, is the issue of automobile circulation, specifically along the Pan American Highway. As it currently stands the highway (or CA-6 as it is also called) divides the campus in two. For a variety of reasons the university is concerned that this situation compromises campus safety, sanitation, and security. It also limits future campus growth and potentially allows for development to encroach right up to the doorstep of the main campus.

Because of these concerns, our design team has suggested two alternatives for re-routing CA-6 around campus. Both of these options would seek to keep the campus intact, and create a potential "urban wall" to keep encroaching development off of campus.

Improving Water Quality
through habitat corridors

The Problems

Threats to Water Quality often result from a combination of heavy rain events, poor land practices and inadequate sanitation. The intense agriculture in the Yeguare Valley, the steep topography, inadequate waste water treatment infrastructure in surrounding Villages, and periods of intense rain lead to erosion, water turbidity, and high levels of human and animal waste in the water supply.

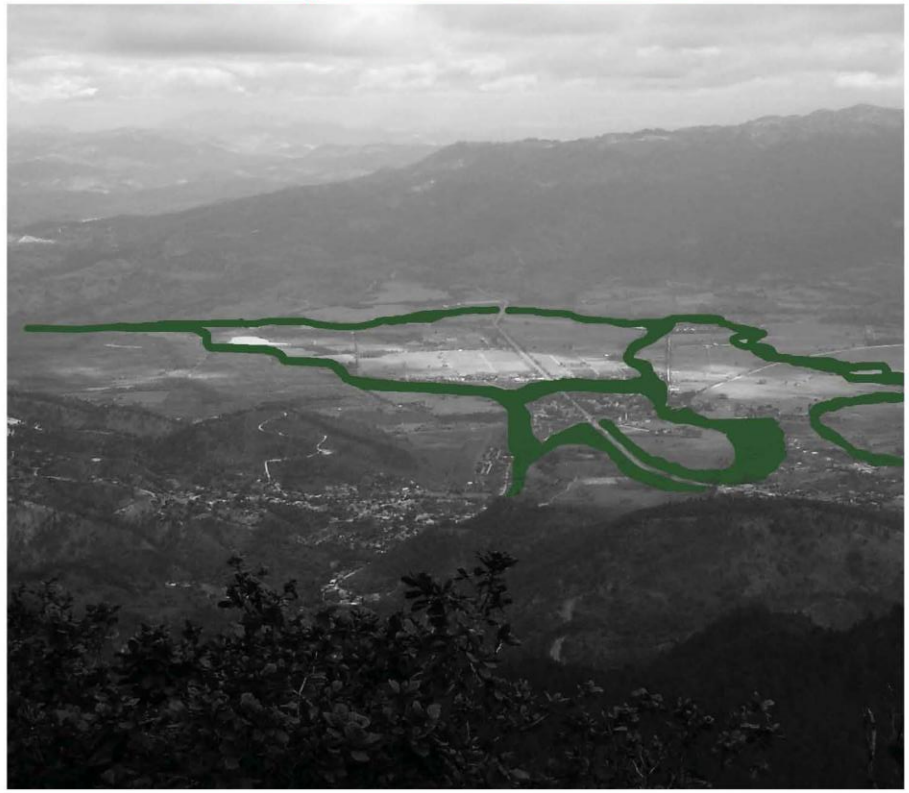
One of the greatest threats to biodiversity is the fracturing of habitats. Disconnecting natural reserves from each other can limit animal movement during times of stress (such as fire) which can reduce species resiliency. This can also limit breeding opportunities which results in a smaller gene pool and a less healthy population.

The Solution

Stream buffers improve both Water Quality and provide corridors for animal movement across the valley.

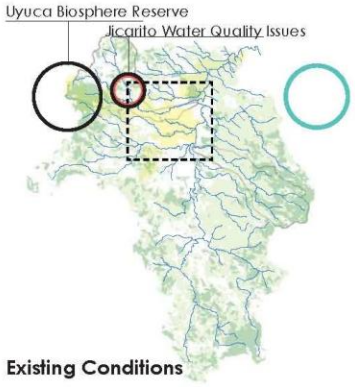
Forests help mitigate the impact of stormwater. Canopies can capture up to 30% of a storm event's "first flush", then slowly release it down to the soil. Plants help Stabilize the soil and slow and filter water before it enters streams. Buffers also provide valuable forage and protection and habitat for animals.

Water Quality is Linked to Habitat Restoration.



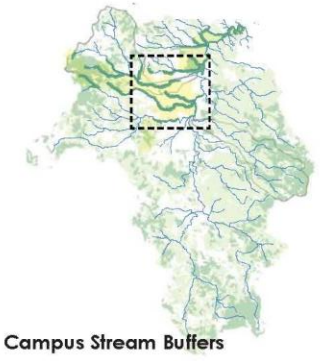
Above: How a network of forested stream buffers could frame campus and link the two ends of the valley

Water Quality & Biodiversity
in the Yeguare Valley



Existing Conditions

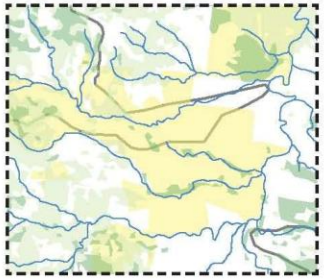
Currently, habitat in the Yeguare Valley is very fragmented. While the Uyuca Biosphere Reserve is managed well to ensure biodiversity and water quality, lower in the valley much of the native habitat is lost to agriculture and human development. Most remaining forested areas are compromised and disconnected. Restoration of forested ecological corridors in the valley could profoundly affect biodiversity.

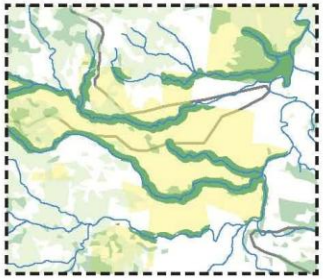


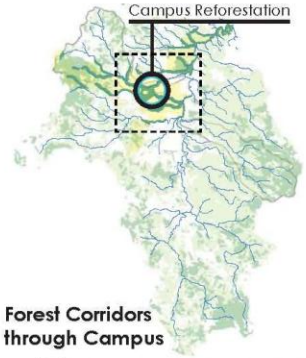
Campus Stream Buffers

Establishing stream buffers of 50 to 100 meters on Zamorano property is the first step to establishing ecological corridors across the valley. These buffers serve as wildlife habitat and migration corridors, improve water quality, provide educational and recreational opportunities, and have the potential to serve as a model within the watershed. At a minimum, new development should respect this buffer, and agriculture activities within the buffer should cease.

Phased Implementation of Ecological Corridors on Zamorano Main Campus

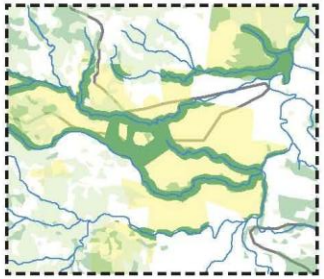


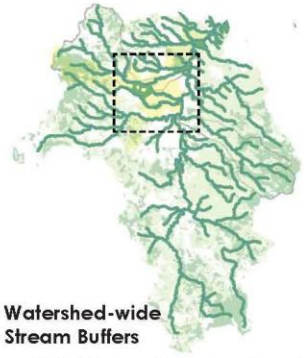




Forest Corridors through Campus

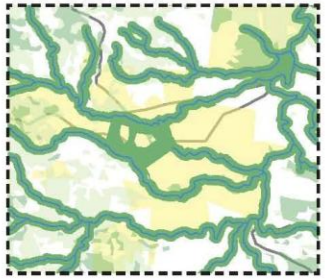
Projects on campus can create connections between smaller watersheds. Rerouting of roads and targeted reforestation efforts can help to reduce fragmentation. Reconnection of forest corridors affords opportunities for "learning by doing" in ecological restoration. The enhanced corridors become living laboratories for environmental education, while providing pathways for pedestrian and bicycle circulation.

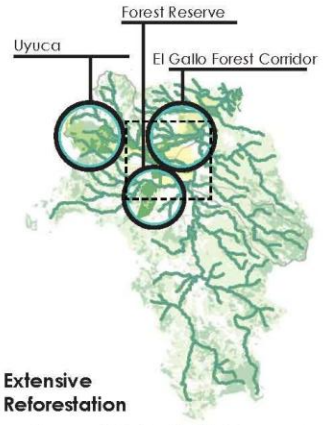




Watershed-wide Stream Buffers

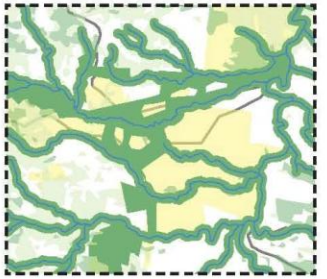
With Zamorano's on campus stream buffers serving as an example, buffers should be created throughout the Yeguare Valley. Although the primary benefit of stream buffers is water quality and erosion control, valley-wide stream buffers will further connect various fragmented habitat and enhance biodiversity throughout the valley.





Extensive Reforestation

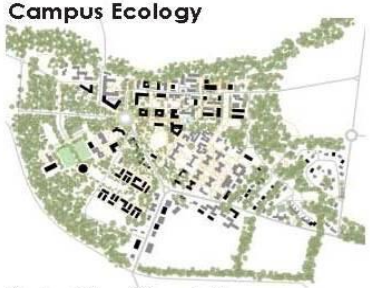
In areas which directly affect Zamorano's water quality, more extensive reforestation projects can expand and merge smaller habitat patches. Native forest restoration will enhance biodiversity while filtering rainwater that makes up the water supply for campus. The Uyuca Biosphere Reserve is an effective model for watershed protection. Similar preservation efforts should be taken along El Gallo and within the Santa Ines Watershed.



Creating Campus Form

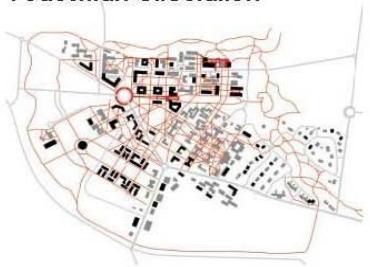
The Master Plan seeks to compliment and improve existing pedestrian circulation. Paths are based on logical routes and are utilized to create and frame future greenspace. A greenway/ passive recreation trail is also recommended to enhance student life and exposure to the natural environment.

Campus Ecology



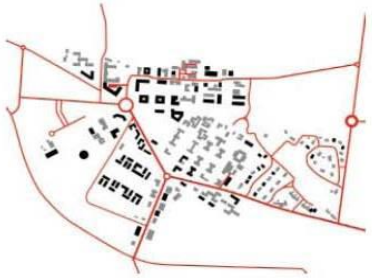
Built around the need to protect, enhance, and expose the campus's valuable natural resources, the Master Plan embodies Zamorano's commitment to the natural environment. Water quality and conservation are of primary concern. The campus is a living laboratory that becomes a daily part of the students' curriculum.

Pedestrian Circulation



The Master Plan creates a cleaner more intuitive vehicular circulation network. The proposed roadways minimize pedestrian conflicts, help create campus gateways, and capitalize on vistas into the heart of campus.

Vehicular Circulation



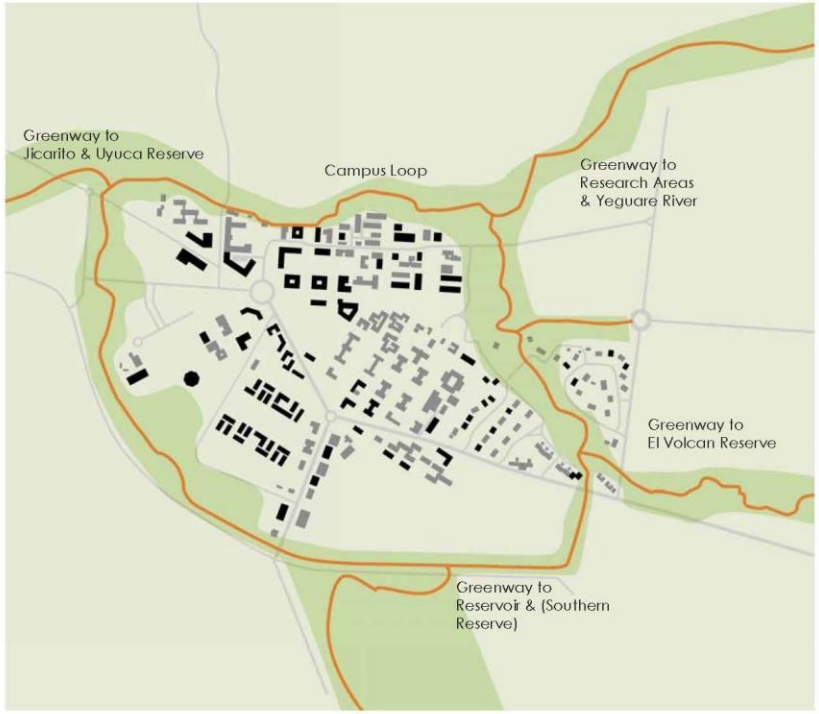
unprogrammed open space

Unprogrammed Space

Unprogrammed open spaces are a natural and necessary part of campus life. Their lack of structure encourages both the creativity and spontaneity that makes a university experience memorable.

Unprogrammed spaces can range from very formal courtyards and quadrangles to wild greenway trails with picturesque, Olmstedian landscapes in between.

The master plan provides ample space for the full range of these types of open spaces.



Master Plan

Reservoir Expansion

Water Quality, Recreation, and Habitat

Reservoir doesn't have to strictly serve one use.

Promoting Best Practices

As with any large planning endeavor, many lessons were learned from the master planning process that will hopefully be included as elements of the plan are implemented. Most pointedly, the need for additional specialists and consultants became clear as more ecological problems were identified and interest grew in creating a campus that closed the loop on much of its waste cycle, harvested its own energy, and could harvest much of its water supply. Though this consulting team was comfortable performing cursory explorations into many of these fields and particularly more comfortable with rain water and condensate harvesting, the actual implementation of many of these strategies will require greater expertise and an intimate knowledge of local environmental conditions and building codes. It is the consulting team's recommendation therefore that Zamorano use the master plan document and guiding principles as a spring board to conduct future studies and explorations of what might be.

That said, Zamorano is in the unique position to be a leading example for environmental stewardship in the Yeguare Valley. The following pages discuss several practices that can be implemented to improve the availability of water, water quality, and energy efficiency.

Securing Sufficient Water

rain water harvesting

Roofs = Rain Harvesting Real Estate

Highlighting roof area demonstrates the rain harvesting potential for Zamorano. At full build-out, the school has the potential to harvest nearly 3 million liters from a one inch rain event.

A one inch rain event could produce

Total Building Roof Area:
116,220 sq m / 1,250,988 sf
Existing Building Roof Area:
65,844 sq m / 708,741 sf
Proposed Building Roof Area:
50,376 sq m / 542,247 sf

779,782 gallons
(2,951,476 liters) of water

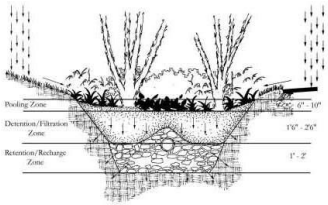
Rain Water Collection makes sense. It turns runoff into an asset. Rain water can be collected in a variety of ways and used for irrigation, toilet flushing, and mechanical water make-up.

Collection could be done at a variety of scales depending on funding and intended use. Above ground options can be attractive amenities. Below ground may be more appropriate in certain locations.

The above photos provide examples of how cisterns could appear on campus.

Managing Stormwater

infiltration

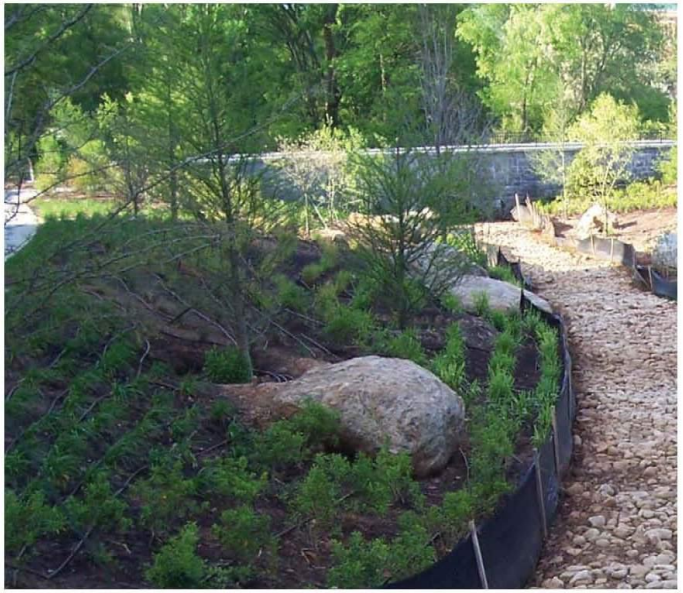


Functional Components

BioRetention

Bioretention zones, or raingardens slow the stormwater velocity, improve water quality and overall stream health, and recharge groundwater supplies. In addition to this, they provide a highly visible and aesthetically pleasing addition to campus.

Plants reduce incoming runoff velocity of stormwater as they flow into the slight depression created by the raingarden. This depression allows for *temporary* ponding as water slowly infiltrates back into the soil. Plant roots and microbes in the soil filter water, and help break down pollutants. A sand and gravel base promotes positive drainage back into the ground supply.



Above: part of the stormwater infiltration system at the University of Georgia' new art school

Above: stormwater gardens at Zamorano provide some of the most striking images of campus.

Celebrating Rain

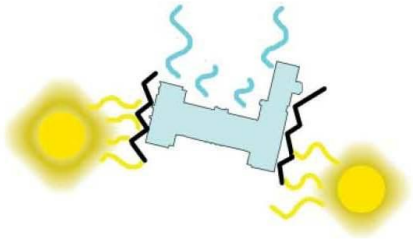
Zamorano already has an excellent system of runnels that add to the architectural character of campus and provide a common fabric that runs through the university.

Zamorano should think of this system as another layer of circulation and part of the living laboratory of campus. Students should be able to logically follow its routes. They should be able to get a sense, even during the dry season of the amount of stormwater generated by the impervious surfaces of the campus and how this can be used as an asset on campus.

Continuing this approach and linking these channels to cisterns or bioretention zones should be a part of any physical master plan the university chooses to pursue.

Energy Efficiency

Strategies for ensuring power



Orientation

Orientation is a powerful tool for securing higher energy efficiency. Buildings that run east to west with the largest window openings to the north allow less solar heat gain into the structure.

Materials and Ventilation

Zamorano should continue to model the existing pattern of stone construction, deep verandas, operable windows and breezeways. These are excellent methods for offering more comfortable buildings without the high energy bill.

Keeping Tabs on Consumption

Buildings should be individually metered. This helps building operators watch out for energy spikes, which could indicate faulty mechanical systems and leaks. Metering can also monitor the effectiveness of any energy saving measures.

APPENDIX D

BIOMIMICRY OR GREEN RESEARCH

Biomimicry is the science of taking inspiration from nature, its models, systems, processes and elements to solve design problems sustainably.

Nature provides us with unending inspiration including photosynthesis, natural selection, self-sustaining ecosystems, and evolution. Biomimicry is the art of consciously recapitulating the genius of 3.8 billion years of trial and error to improve everything we design.

Green Research Products:

Velcro form Burrs

Passive Cooling Systems from Africa Termites Towers

Wind Turbines from Wale Flippers making the turbines 32% less drag

Coated Products that use the Lotus Effect for waterless cleaning (GE is developing coatings)

Natures Golden Ratio is making fans run with 15% less energy

Sharkskin reduces drag

Spider Silk (spider silk is stronger than steel and Kevlar)

Solar Transform Materials

Producing Ceramic Tiles without heat

Fiber Optics from Sea Sponges

Cement from Sea Shells

Manufacturing Computer Chips without Heat