CAMPUS DEMONSTRATION SITES

FOR SUSTAINABLE SYSTEMS AND DESIGN:

FIVE “CREATION” STORIES

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METHODS AND ACKNOWLEDGEMENT

This paper is a summary of information gathered almost entirely from personal telephone and e-mail interviews, conducted with key people in the development and management of the reviewed sites. I am grateful to those who took time out of their busy schedules to answer many questions.

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I would also like to acknowledge Robert Macoskey and John T. Lyle, two people whose lives’ work has pioneered hope and opportunity for a new generation of designers, and David Orr for his continued work to create a sustainable paradigm.

Since writing this paper, I have continued to hear of inspiring examples of campus ecological design. This paper is an examination of a handful of successful examples. I am sure that I have left some wonderful projects unrepresented.

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INTRODUCTION

John T. Lyle, architect and pioneer of sustainable design, said that "Sustainability depends primarily on environmental design (Lyle 10)." Design that seeks to create human settlements in harmony with natural systems, and to meet current human needs without compromising the ability of future generations to do the same (Bruntland in Van der Ryn 63), has emerged as the language of a new paradigm. For most people, living with sustainable systems, or what Robert Rodale calls "regenerative" systems (Safford 1 Dec), requires new ways of thinking and behaving. When people can experience a regenerative landscape, community, economy, etc., they have the ability to create and participate in such systems. Models of regenerative systems become powerful catalysts for a sustainable future, by exposing and empowering people to choose life-enhancing methods for meeting their needs.

University and college campuses, which have historically birthed social, philosophical and even national revolutions, are a natural setting for modeling regenerative systems. This paper will look at five successful university and college campus sites that have been created in the United States over the past couple of decades:

- California State Polytechnic University at Pomona's John T. Lyle Center for Regenerative Studies
- Oberlin College's Adam Joseph Lewis Center for Environmental Studies
- Northland College's McLean Environmental Living and Learning Center
- Slippery Rock University's Robert A. Macoskey Center for Sustainable Systems Education and Research
- Humboldt State University's Campus Center for Appropriate Technology.

The sites vary in scope and scale. For each site, I will give an overview of the design and systems, describe the project development and design process, and summarize student involvement and site management. Key elements are listed in Table 1, at the end of the paper. Examining the processes by which these sites have grown and developed in a variety of locations, may contribute to the success of similar efforts in other locations. It is not within the scope of this paper to address the historical and complex socio-political developments which may have originally inspired such projects, but to look at the processes by which motivated campus bodies have proceeded to create unconventional models within institutions that can be characterized as conventional.

THE SITES

THE JOHN T. LYLE CENTER FOR REGENERATIVE STUDIES

California State Polytechnic Institute. Pomona, California

SITE AND SYSTEMS OVERVIEW

Since 1994, The John T. Lyle Center for Regenerative Studies (CRS) at California State Polytechnic Institute (CalPoly), Pomona, has provided a "university-based setting for education, demonstration and research in regenerative and sustainable systems (www.csupomona.edu/~crs)." The 16-acre site models "passive solar designed buildings, renewable energy capture, water recycling, nutrient recycling, food growing systems, aquaculture...,native habitat and human communities (www.csupomona.edu/~crs)."

This project seeks not only to "model" sustainable design and technical systems, but also emphasizes the need to incorporate social systems at the community scale, into a "regenerative" system.

The entire lifestyle for student and faculty residents, is a study and exploration into "life-support" systems, processes and practices that "function in the self-renewing ways of natural ecosystems (The Center for Regenerative Studies 3)." The center was designed for 90 residents, a number considered "large enough to accomplish the necessary supporting tasks, but small enough to form a cohesive social unit (Lyle 16-18)." Currently, The first and second phases have opened, housing "20 students, two visiting scholars, and a resident advisor (Lyle 18)."

Phase one and two primarily focus on the 2.2 acre high-use zone, including: residential units for 20; dining and common facilities; academic facilities with classrooms, seminar space, and a laboratory; offices; a straw-bale greenhouse; small-scale agriculture systems, including 6 aquaculture ponds; and a small degree of renewable energy systems (materials (The Center for Regenerative Studies 7). The final phase will include additional housing, a library, further landscaping, completed sewage treatment systems, and more extensive use of renewables (The Center for Regenerative Studies 7).

The CRS buildings use "non-toxic renewable building materials", passive solar features, and are designed to blend into the landscape with a minimal footprint (The Center for Regenerative Studies 1).

Gas and electricity for the Center is primarily provided by public utilities. The Center plans to experiment with a variety of renewable technologies and to "wean" (Lyle 80) themselves from the utilities over time. Currently, they have developed a "solar park" which showcases a variety of solar technologies for educational purposes, including two solar tracking photovoltaic systems, and a wind generator.

The Center has allotted roughly 12 acres for practicing and evaluating a variety of soil enhancing, polyculture systems for food, fodder, fiber, and medicinal plant production. During the early phases, most agricultral development has been to build the soil and develop the aquaculture ponds. Students have discovered that it can be difficult to balance school work with the amount of time and effort it requires to grow a significant portion of one's own food (www.csupomona.edu/~crs).

Currently, the water needs on site are met with a combination of city water, and "tertiary reclaimed wastewater from a nearby wastewater treatment plant (www.csupomona.edu/~crs)." Plumbing for existing buildings was laid to enable the eventual diversion of greywater and sewage for on-site treatment. The biological wastewater treatment system, planned for phase three, will require additional permits that the Center is working to obtain. The design calls for a three part natural processing system for their sewage treatment. The three technologies to be used, "the aquaculture system, the surface flow wetland system…and the rootzone system", will be able to function in series (one after another), in parallel (separately), and in combination for experimental purposes (Lyle 258).

PROJECT ORIGINS

Several faculty members at CalPoly, were influenced and inspired by the emerging design philosophies of the 60's and 70's, which took interdisciplinary holistic approaches to design for physical and social systems

(Safford 1 Dec). John T. Lyle, a professor of Landscape Architecture and Architecture at CalPoly until his death in 1998, was one of these inspired faculty members. His efforts were key to the Center's creation. In his 1994 book, Regenerative Design for Sustainable Development, John Lyle offers a clear and thorough synthesis of "regenerative" design, using the Center for Regenerative Studies as a case study. He discusses in detail, how the Center grew from a "idea" in 1976, through ten years of discussions and extensive research with other faculty and students, into the first phases of development.

PROPOSAL, PRELIMINARY DESIGN, & FUNDING

In 1986, the informal group discussions developed into a highly interdisciplinary design team with the focus of creating a campus "institute" (Lyle 274). The envisioned institute would offer a holistic and cooperative model of community development, within the "rigidly organized….hierarchical administrative technostructure" of the university setting (Lyle 273). The design team that developed the "schematic design for the Center for Regernative Studies included a core group of twelve people: two architects, two landscape architects, two agronomists (one of whom emphasizes third-world agriculture), an anthropologist, an aquaculturist, an energy analyst, a geologist-hydrologist, an agricultural economist, and two graduate assistants (Lyle 31)."

Many other specialists and a number of students also participated. Building upon ten years of research, and "drawing on the knowledge of a wide range of people scattered all over the United States and in other countries (Lyle 274)," the team published a proposal and a preliminary design for the Center in 1987. With this proposal, the group approached private foundations for funding, and raised $4.3 million for Phase 1 of the Center.

POLITICS & THE DESIGN PROCESS

According to Lyle, the process became highly political and bureaucratic as outside funding came into the project (274). The university president at the time, dismissed the original design team and appointed a new design committee. He also put the university provost in charge of curriculum development for the Center, effectively separating curriculum and design development, which had thus far been evolving together.

The new design team, composed of six university administrators and Lyle, was to answer directly to the president. Funding for further design and development was withheld from the committee, and the president decided that the final design and construction drawings would be done by private consultants (Lyle 274). In his book, Lyle describes the new team and consultants as competent, professional, and largely supportive of the process. Yet, he also expresses that the design process was hindered by the new team's lack of historical participation with the project, as well as by the design committee's hierarchical management approach (273-275).

Curriculum development followed a path more in line with the original spirit of the project. According to Lyle, the university provost maintained the cooperative nature characteristic of earlier project development. He assembled a team of five faculty members, chosen "for their knowledge of and commitment to the subject matter (275)," to shape the curriculum. Two members had been a part of the original project design team. This committee began a highly participatory process for developing the curriculum, and incorporated a great deal of student feedback into the seminars. The courses and programs emerging from this process are highly interdisciplinary, and are available to both residents and nonresidents of the Center.

Coordination between the design and curriculum development committees was not smooth. During this period in the process, characterized by "disagreement" and "struggling" (Lyle 276), a new president took office. A request was made, * to assemble a new design team that would again reflect the spirit of the project. The new president approved this request, and a new, smaller, design committee was assembled bringing in another member of the original design team (Lyle 276). Periodic 1-2 hour meetings were replaced by 1/2 day work sessions in conjunction with the consultants, and eventually project designs were produced that "followed reasonably closely the original concept design while taking into account conditions added later for various reasons (Lyle 276)."

Lyle points to the lessons learned through the Center's design and curriculum development. The experience of the design committee seems to exemplify the kinds of problems that might be faced by alternatives to the mainstream development: bureaucracy, institutional fears of alternative methods that might create a liability risk, short term cost-based decisions rather than decisions based on the spirit of the project, hierarchical rather than cooperative management.

The hierarchical and bureaucratic nature of the second design committee was seen as cumbersome and limiting to the goals of the project, while the participatory nature of the curriculum development resulted in a series of courses that reflect the highly integrate goals of the center (Lyle 277/. However, Lyle points out that “some argue construction would never have begun had the participatory, networking mode been applied through the contract documents phase (278).” The “administrative hierarchical mode of the design development committee…did eventually succeed in getting construction underway (Lyle 278).”

CONSTRUCTION

Little information was available on the construction process for the Center. In summary, construction has proceeded in stages, depending on funding and efficiency of the planning and design process. Construction was contracted out to professionals, and completed in a timely fashion.

MANAGEMENT

The Center is managed by a combination of non-resident university staff, and resident staff and students. The residents hold regular meetings to organize responsibilities, and shape community and center goals. Student residents are evaluating the balance between student work responsibilities and the work required to sustain a small community (www.csupomona.edu/~crs). According to Joan Safford, Director of the CRS, the Center is in a “regrouping” period, following the death of projects founder and developer, John T. Lyle. Currently, those involved with the Center, are redefining their goals, focus, and operation (Safford 1 Dec).

JOSEPH LEWIS CENTER FOR ENVIRONMENTAL STUDIES

Oberlin College. Oberlin, Ohio

SITE AND SYSTEMS OVERVIEW

From its inception, Oberlin College's Adam J. Lewis Center for Environmental Studies, was envisioned as a "building that would redefine the relationship between humankind and the environment (www.oberlin.edu/newserv/esc)." The two-story 13,600 ft^2 Environmental Studies department facility opened for classes in the spring of 2000. The building's spaces include three classrooms (one larger and two smaller), a 100-seat auditorium, one banquet hall, six offices, one conference room, one kitchen, one bathroom, and a large greenhouse enclosing the Living machine (Wolfe-Cragin 8 Dec).

Ecological considerations were important to the facility's materials selection, layout, and technical systems. Environmentally responsible materials such as "wood from certified-sustainable forests, and paints, adhesives and fabrics that are low in volatile organic compounds (www.oberlin.edu/newserv/esc)," and several recycled content materials were used. Thermal regulation is achieved by "advanced mechanical systems such as closed-loop geothermal wells," radiant coils in the flooring, as well as passive solar design features including substantial thermal mass in concrete floors and masonry walls and highly insolated roof and walls (www.oberlin.edu/newserv/esc).

All occupied spaces allow for fresh air ventilation. Daylighting and energy-efficient lighting is used in all interior spaces (www.oberlin.edu/newserv/esc/esc.html). Electricity is currently provided by the electric "grid". However, the 690 photovoltaic modules that have been mounted on 3700 ft^2 of the building's rooftop, are in their final stages of testing. They will soon provide 59 kilowatts of power to the building, with a grid-intertie system (Wolfe-Cragin 8 Dec).

Construction of a Living Machine, technology developed by John Todd & associates that uses small-scale densely constructed aquatic ecosystems to purify wastewater, was completed in February. Once installed, the system took 5-6 months to mature (Wolfe-Cragin 8 Dec). This system, which includes a final dissinfection with uv light, purifies all wastewater generated within the building and circulates this water to flush the toilets. Currently the excess water in the system is discharged into the public sewer system. However, the plan is to one day discharge this water into outdoor purification wetlands (Masi 11 Dec). The Living Machine is seen by students and faculty, as an important research and teaching tool (Wolfe-Cragin 8 Dec).

Future system additions include a data display monitor that will be installed in the atrium, and some additional landscaping (www.oberlin.edu/newserv/esc).

PROJECT ORIGINS

Since the 1980's, faculty and staff at Oberlin's Environmental Studies program, had discussed the need for a dedicated department facility (Masi 11 Dec). They considered converting an existing structure, as well as building a facility from scratch. The department was interested in creating a place where alternative technical systems were accessible for research and educational purposes, while being functional (Masi 11 Dec). In 1990, David Orr was hired to head the Environmental Studies Department. His experience in the field of ecological design was seen as valuable to the development of a new department building (Masi 11 Dec).

In 1992, Orr created a course, called "Ecological Architecture". Funding from a local foundation, allowed hime to bring experts in the field of green building and design to speak to the class. The students were asked to develop design criteria for a conceptual Environmental Studies building, based on the information presented throughout the semester. Two students, Brad Masi ('93) and Deirdre Holmes ('93), were hired to write a report summarizing the class findings. Many of these finding were included in the final design of the Lewis Center (Masi 11 Dec).

PROPOSAL

In 1995, the department decided to start a more formal information gathering process. Orr and other faculty members involved with the project, knew they would need help conducing a thorough planning and design process (Wolfe-Cragin 8 Dec). Orr received private funding to hire Holmes and Masi to coordinate the planning and design process for one year. At this point, he presented the Center concept to the new Oberlin College president, Nancy Dye. In April of 1995, she authorized him to take a partial leave of absence to begin a fundraising campaign.

Over the next year and a half, Orr raised over 6 million dollars (www.oberlin.edu/newserv/esc). A large portion of this funding came from Adam J. Lewis and his family, who shared the Center's vision. As Orr's fundraising proved successful, the college gained some confidence in the project. According to Cheryl Wolfe-Cragin, Facilities Manager for the Lewis Center, the administration was cautious about such an alternative project did, and did "throw up some obstacles" to the process (8 Dec). However, several members of the administration, as well as the Board of Trustees, were excited about the project.

DESIGN PROCESS

Masi and Holmes began work in August of 1995, to coordinate the design process. Masi describes this process, as one of "invention (11 Dec)." Wolfe-Cragin praised the two, saying that they "learned very quickly" and were quite effective and "professional" at arranging and facilitating meetings and charrettes (8 Dec). The design process was very thorough, while also being time efficient. The public planning process was completed in for four months. The design team was also put together during this period.

Masi and Holmes organized 10 brainstorming sessions from September to October of 1995. Each session was geared to one specific "user group", to solicit their input as potential users of the site (Masi 11 Dec). For example, separate brainstorming sessions were held for students, faculty, community residents, and community business-owners. The information gathered at these sessions laid the foundation for the three design charettes. The intention of the charette process was to unify the needs and goals of the user-groups into a functional design (Masi 11 Dec).

John Lyle, founder of CalPoly's Center for Regenerative Studies, was brought in to facilitate the charette process (Wolfe-Cragin 8 Dec). Each of the two-day charrettes, was attended by students, faculty, community members, city officials, and people who traveled from around the region to participate .The first charette, held in November 1995, focused on uses, function, and educational mission of the building. The second, held in December 1995, focused on quality of spaces, and the third focused on site selection (Massi 11 Dec).

Between the second and third charette, Masi and Holmes mailed the design program summarizing the criteria of Orr's 1992-93 Ecological Architecture class to 25 architects. Several firms responded to the program, and in January of 1996, 5 firms were interviewed for the project. William McDonough and Associates were hired in February 1996 (Masi 11 Dec). The architects incorporated public input from the charettes into the designs and presented initial designs at the final charette.

One of the most important benefits gained from the public participation process, was the relative ease with which the building's alternative systems were accepted by college administrators and city officials. Officials and administrators were able to become familiar with the unconventional design elements such as the Living Machine, and the design team was also able to discover early in the process, what kinds of concerns and issues were important to address for city officials (Wolfe-Cragin 8 Dec).

Once the architects came on board, the design process shifted from a public process to a more technical design process, guided by a professional design team. John Lyle was the lead landscape deisgner, and Andropogon Inc was also hired for landscape design. John Todd and Living Technologies designed and built the Living Machine. Energy and design consultation and was provided by Amory Lovins and Bill Browning from Rocky Mountain Institute, and NASA's Lewis Research. Kevin Burke was project engineer and also offered energy consultation. Bill Mc Donough brought in other specialists throughout the process.

CONSTRUCTION

Ground was broken for the Lewis Center, in the Fall of 1998 (Wolfe-Cragin 8 Dec). Construction lasted for about a year, with a few "punch list" items to be completed after the building opened for use. The department moved into the building in January 2000, and the building opened for classes in February (Wolfe-Cragin 8 Dec).

Living Machine installation began in January of 2000. Environmental Studies majors were invited to return early from their winter break to participate with members of the Living Technologies design team who had been contracted to install the system. Twelve students came back prior to the Spring semester, to participate in classes on the Living Machine technology, and to begin installation (Wolfe-Cragin 8 Dec). Wolfe-Cragin said that student involvement was crucial to the Living Machine's development (8 Dec). The system took from 5 to 6 months to mature, during which time the trained student staff "nurtured" the system (Wolfe-Cragin 8 Dec).

Leo Evans, from the campus construction office, served as the project manager. At the time of writing, the building is transitioning from the hands of the campus construction office, to Cheryl Wolfe-Cragin. "Comissioning–a process of verification ensuring that a building's mechanical, electrical and plumbing systems were installed as designed–began in June (www.oberlin.edu/newserv/esc/esc.html)," although punch list items are still being completed. After the first year of occupation, the systems are being fine-tuned. As mentioned, the PV system is in its final stages of implementation (Wolfe-Cragin 8 Dec).

Wolfe-Cragin emphasizes that the facility was built to serve as a laboratory for studying the systems. Thus, as time passes, students and faculty will continue to learn more about these systems, adapting the systems, and upgrading or replacing elements that may not turn out to be ideal. For example, the geothermal heating is currently supplemented by an electric boiler. This choice had been called into question during the design phase, and is now proving to be highly inefficient. Plans are in the works to replace the electric boiler with a more efficient back-up technology such as natural gas (Wolfe-Cragin 8 Dec). It would be a misstatement to call this living laboratory , "complete." The goal is to have a building that is responsive to the environment and its occupants, an organic building that will evolve over time.

MANAGEMENT AND STUDENT INVOLVEMENT

As stated, the building is in the transition between the campus construction office and the Facilities Manager. Wolfe-Cragin oversees about 10 students involved in a variety of aspects of the Center (Massi 11 Dec). Some are paid interns, while others are simply involved students. Work done by the students includes developing and leading public tours of the building, maintaining and monitoring systems such as energy performance and air quality, and maintaining the Living Machine (Massi 11 Dec). Wolfe-Cragin, along with John Peterson, a Systems Ecology Professor, meet weekly with students maintaining the Living Machine, to offer technical guidance. The students conduct regular water quality analysis and are developing system protocol (Wolfe-Cragin 8 Dec).

Several classes have projects related to the Living Machine, as well as other systems in the building. Classes held within the building include "conservation biology, environment and society, sustainable agriculture, ecological design, environmental education, physical geology, and solar energy (www.oberlin.edu/newserv/esc/esc.html)." Masi, whose office is located in the Lewis center, says the center is always bustling with some activity, whether it be classes, banquets, seminars, non-profit meetings, or Oberlin community activities (11 Dec).

IMPACT/FUTURE GOALS

Those who envisioned the Lewis Center, wanted to create a building which would "expand our sense of ecological possibilities (www.oberlin.edu/newserv/esc/esc.html)." If the success of a demonstration center could be measured by the results of people inspired by their experience with the site, then this center has already had some quantitative success among Oberlin students. In the spring of 2000, a student group emerged with a strong residential design initiative, to improve the overall quality of student life (Wolfe-Cragin 8 Dec). Green design plays a big role in their plans. The students have lobbied the college president, and have invited community members and local business owners to participate in the project. They have already held a series of design charettes to set up the "overriding" criteria for transforming residential housing on campus. Several Board of Trustee members have become interested in their efforts (Wolfe-Cragin 8 Dec).

Orr and Wolfe-Cragin are working to establish a “master policy”, with oversite measures, to coordinate campus wide efforts to “green” energy use, purchasing, materials flow, transport, ground, and structures. They hope to have initial recommendations for such a policy on the president’s desk by January 2001 (Wolfe-Cragin 8 Dec).

THE MCLEAN ENVIRONMENTAL LIVING AND LEARNING CENTER

Northland College. Ashland, Wisconsin

SITE AND SYSTEMS OVERVIEW

Northland College's McLean Environmental Living and Learning Center (ELLC) opened its doors to student residents in the fall of 1998. The ELLC has been heralded as "One of the most environmentally advanced residence halls in the world (www.northland.edu/studentlife/ELLC)," by former deputy executive director of the United Nations Environment Program, William H. Mansfield III. The center incorporates several passive and active design features and systems to achieve energy and water efficiency, building "health", and public education. The two-story 32,374 ft^2 building, houses 114 students at capacity, includes four lounges, four dining and seminar rooms, four kitchens, laundry facilities, a recycling center, storage, and two greenhouses (Environmental Living and Learning Center 1999). The "primary function" of the ELLC is to serve "as a student residence (Bensch 7)," yet the educational potential for the site is evolving.

Heating needs are met by passive solar design, a high efficiency natural gas boiler that provides hot water radiation, and heat-recovery units that are included in the building's ventilation system. Hot water needs are met by high efficiency natural gas, with solar pre-heating. Electricity is provided mainly from the grid, and is supplemented by a 120-foot, 20-kilowatt wind generator and three photovoltaic arrays that provide approximately 3.2 kilowatts of electricity (www.northland.edu/studentlife/ELLC). In total, the renewable systems currently provide about 6% of the building's electricity (Bensch iii), providing more of a visual statement and student learning opportunity than electrical savings at this point (Bensch 11).

The building has standard water and sewer hook ups, incorporates low flow water saving fixtures throughout the building, and includes two waterless composting toilets. Each room has phone, cable TV, and computer network connections. "Green" materials used include organic based linoleum flooring, shakes made from locally harvested timber, cellulose attic insulation, bio-composite countertops, low-emissivity coated glass, and furniture made of recycled materials (Environmental Living and Learning Center 1999). The building's energy performance has been monitored for one year by the Energy Center of Wisconsin, and has exceeded the design team's expectations (Bensch iii).

PROJECT ORIGINS

Since 1971, Northland College has had a strong Environmental and Liberal Arts mission (Wogciechowski 13 Nov). The college has incorporated "green" building dimensions into several campus projects. Northland's Sigurd Olson Environmental Institute, incorporates several passive solar design features. Also, some of the campus townhouses include passive solar design aspects (Wogciechowski 13 Nov). Some inclusion of Green design features into the ELLC, was planned from the beginning. However, the decision to create a building that models such systems, was made after the planning and design processes were already underway (Bensch 11).

In 1995, the Student Development Division of the college recommended that a new residence hall be built. The original plan was to build a low-cost, mostly conventional, building (Bensch 11). The college had conducted an extensive process to select "campus master planners," in 1988 (Wogciechowski 27 Nov). The architecture firm of Hammel Green and Abrahamson (HGA), Inc. was chosen and has since participated in several campus projects.

LHB Engineers & Architects, a local firm that has also worked on campus projects, joined HGA, along with a contractor based in northern Wisconsin, to form the initial design team (Bensch 12). Tom Wojciechowski, Director of Student Development and Student Affairs, was the college's representative on the design team. He had worked with environmental planning and "green design" issues on campus for about 12 years, and was involved with student participation in the design process (Wogciechowski 4 Dec).

During the planning process, the college and design team changed the building location and decided to include some quality upgrades (Bensch 11). It was during this period that the project began its evolution from a low cost conventional dorm, to a building which would model sustainable design.

STUDENT DEMANDS AND A PROPOSAL

“Students are involved at most every level at Northland…they have seats on most committees and have two positions on [Northland’s] board of trustees (Wojciechowsk 1 Dec).” A student committee of 6-8 students met throughout the planning process in 1995. Before the design team was officially assembled, Tom Wojciechowski and residential life staff met with the students to develop the “program statement” (Wogciechowski 27 Nov) for new housing. They assessed what the needs were: how many rooms, beds, common spaces, etc were needed, and what type of building would best meet the needs. They then submitted a brief proposal to the Board of Trustees, summarizing needs and suggested means for meeting these needs.

During the planning process, students pressed for a stronger presence of environmentally conscious design. Seeing a need for Northland college to “walk the talk” (Bensch 11) of their environmental mission, 70 students created a “list of demands (Wojciechowski 13 Nov),” summarizing 60 design features which they believed should be included in an ecologically designed residence hall (Bensch12). Copies of the “demands” were given to the student government, the administration, the architect, and Wojciechowski (Wojciechowski 4 Dec).

DESIGN PROCESS AMENDED

The project architects held regular public discussions, which were widely attended by students. At these meetings, the latest design was presented, and student input and requests were evaluated within the context of budget and practical constraints (Wojciechowski 13 Nov). During this period, several new members were brought on to the design team for their green building and design experience. The Weidt Group was hired for their “expertise in energy analysis and modeling”(Bensch 12).” Great Northern Solar was hired to consult and design the renewable energy systems and composting toilets. LHB was responsible for a great deal of research on green features. After about 6 months, a final design was chosen, and the design team proceeded to solicit bids.

A comissioning agent, Dorgan Associates, Inc, was hired by the Wisconsin Energy Center after the design phase was complete (Bensch V). Their job was to ensure that the building met the stated design goals.

CONSTRUCTION

Construction began in 1997, and “involved the general contractor, the renewable energy contractor, various subcontractors to both the general an renewable energy contractors, Northland college staff, the major design professionals, and the commissioning agent (Bensch 14).” According to an analysis of the design and construction process, conducted by Ingo Bensch of the Energy Center of Wisconsin, “issues encountered during the design process…tended not to be related to the green aspects of the building… However, differing understandings of what it means for a building to be green and differing levels of experience with green construction by those on the construction team became evident during this part of the project (14).”

The construction phase was mostly in the hands of the general contractor and the renewable energy contractor. “The general contractor indicated that the construction process itself did not differ much from that of a conventional building,” except for the construction site recycling program and the additional effort sometimes required to locate “green” materials (Bensch 14). He also stated that green goals of the building were made very clear to him (Bensch14). The use of the green materials “did not require the construction team to deviate from usual construction or installation practices (Bensch 14).” The building was opened for occupancy in late August of 1998, although construction continued for several weeks after occupancy (Bensch 15). The commissioning agent, student residents, and staff all give positive marks to the building (Bensch).

MANAGEMENT AND STUDENT LIFE

The ELLC is managed by the Director of Residential life, who reports to Wojciechowski. A residence hall director, and three student staff live in the building (Wojciechowski 4 Dec). Most of the physical systems are managed by Norhtland’s Director of the Physical Plant; however, some student and staff residents maintain the composting toilet as well as the greenhouse (Wojciechowski 19 Dec). Apparently, many students living at the ELLC are not knowledgeable about sustainable design, but seek to live there because the facility is new and has many amenities (Bensch 7).

The building’s lobby is sometimes used to educate residents and visitors to the center, about the green design features. Educational displays have become more common, and some students are involved with the systems. The residents of one of the center’s apartments are conducting an energy study, and students are responsible for managing the composting toilets. Some would like to see more education and participation of student residents, and this aspect will probably be further developed in the future (Bench iii).

A major educational achievement has been a course created by Wojciechowski, called “Sustainable Living in a College Community”, which has been held for two semesters. The class is held at the center, using the building as a lab. “Architects, builders, renewable energy contractors, power company personnel, and a host of other guests” are brought in to teach students about he design and building process (Wojciechowski 1 Dec). Several other classes have also been held in the building’s seminar rooms, from “English to freshmen seminars (Wojciechowski 1 Dec).” Student organizations and other groups also use the common spaces for meetings.

IMPACT/FUTURE GOALS

In May 2000, Northland’s Board of Trustees passed a “green building policy” which states that Minnesota’s “Sustainable Design Guide” will be used as an assessment tool for future campus buildings costing over $250,000 (Wojciechowsk13 Nov and 19 Dec). It has been noted, however, that little consideration has been given to green design in two upcoming campus projects, due to the perception among some of the administration that green building is more costly than conventional building. This “misconception” is apparently due to changes in the project that had little to do with the “green” features (Bensch 18).

Wojciechowski believes that the two classes he created have played a “strong role” in raising student consciousness about sustainability on campus, and that the building itself has had “modest impact” (Wojciechowski 1 Dec). He says that students are already “looking for more (1 Dec).” Recently, the student association passed a resolution creating a new student fee of $20/ year, to “purchase and install renewable energy systems on campus (Wojciechowski 1 Dec). “

THE ROBERT A. MACOSKEY CENTER FOR SUSTAINABLE SYSTEMS

EDUCATION AND RESEARCH

Slippery Rock University. Slippery Rock, Pennsylvania

SITE AND SYSTEMS OVERVIEW

The Robert A. Macoskey Center for Sustainable Systems Education and Research of Slippery Rock University, is a permaculturally * designed 83 acre site, demonstrating systems and technologies for sustainable agriculture, land management, renewable energy, nutrient recovery and wastewater treatment. The site is host to seminars, workshops, classes, research projects, a municipal composting site, a prairie restoration project, and a community garden.

Over time, students and faculty have renovated a small farmhouse on the site, called Harmony Homestead. Since its inception as a demonstration site in 1990, the house has been occupied by anywhere from one to four students, who are typically students in Slippery Rock University's Master's of Science Sustainable Systems (MS-3) program (Reynolds 22 Nov).

Electricty at Harmony Homestead is provided by a grid-intertie,1.5 kilowatt photovoltaic array. Because of the large electric load on site, this accounts for only about 5-10% of the electricty used. Hot water is heated with electricity. The house has been remodelled to incorporate substantial southern glazing for passive solar heat, and is further heated by a Finnish style masonry stove. Daylighting and fluorescent lights reduce the energy load. The water source is a well. Occupants use a clivus multrum composting toilet, and greywater is treated with a small gravel bed wetland system.

PROJECT ORIGINS

The idea for the Center really began with its namesake, the late Robert A. Macoskey. As a professor of philosophy at Slippery Rock University, he incorporated the issues of global resource equity and environmental impact into his philosophy courses (Reynolds 22 Nov). In 1986, he started a community based group, ALTER (Alternative Living Technologies & Energy Research), a collection of students, professors and community members who investigated the idea of creating a "living laboratory" to research "real world issues" (Reynolds 22 Nov). The idea was to create a center demonstrating "homestead" scale technologies, within a permaculture design framework.

PROPOSAL

Macoskey was considered very dedicated and passionate, and was responsible for "convincing SRU to support the project " (Reynlods 22 Nov). ALTER was able to secure a site for their project on SRU property largely because Macoskey had a good relationship with the president of the university (Reynolds 7 Dec). The 83-acre site had a small1920's farmhouse that was in some disrepair. The plan was to renovate the farmhouse, and to develop the overall site as a living laboratory.

DESIGN, CONSTRUCTION, AND DEVLOPMENT

ALTER acquired the property in 1986, and soon thereafter, brought in local architects and permaculture designers to analyze the siite. The first permaculture course was held on the land in 1987, and courses have continued to be offered regularly at the center (Reynolds 7 Dec). Each course has resulted in detailed design plans for the site (Frey in Reynolds 7 Dec)."), which have been incorporated to varying degrees.

According to Reynolds, the balance between student and faculty input into site design has shifted back and forth over time, depending on the skills and interest of those involved. Early in the process, faculty and professionals had more influence over the design and development. Over time, student involvement has become more prominent. Currently, faculty initiated projects are once again on the rise, and many students continue to be involved with the physical developments on site.

The Center works closely with SRU Facilities, and keeps a balance between offering students the opportunity to be involved with maintenace and remodelling, and avoiding student involvement with projects where "someone might get killed (Reynolds 18 Dec)."

MANAGEMENT AND STUDENT INVOLVEMENT

The original plan was to have Robert Macoskey and his wife reside at Harmony Homestead, and manage the site (Reynlods 22 Nov). With Robert's death in 1990, however, students took over the responsibilities and adventure of further developing the site. Mary Anne King, assistant to the Dean of Health and Human Services, was appointed the director of the Macoskey center. Her background was in management, rather than in sustainable systems. According to Reynolds, she served as a "great manager" for 4-5 years (22 Nov).

Over time, ALTER has become less involved with the Macoskey Center (Reynlods 22 Nov). Currently a full-time director manages the site. Thomas Reynolds, a MS-3 student with a background in Architecture has been director since 1999. He is a full-time director, and with his interest in the sustainable systems, has been able to focus and develop the center's educational aspects.

Currently, Reynolds shares the on-site management responsibilities with another resident, also a MS —3 student. Reynolds has four graduate assistants, who each work 16-20 hours a week. He also manages one work-study student who works 7-14 hours a week (Reynolds 22 Nov). According to Reynolds, there are so many activities and projects going on at the "highly trafficked" center, that the five assistants are still "not enough (22 Nov)."

Several faculty members are involved with the center, and incorporate the center into their classes. Some of the courses that have participated or regularly participate at the center are: Foundations on Sustainability, Sustainable Agriculture Techniques, Design Drawing and Creative Problem Solving, Soils and Resources, Applied Ecology, Alternative Energy and Engineering for Sustainable Systems, Ecosystems Management, Restoration Ecology, Design and Resource Development for Energy Conservation, Fertility Considerations in Regenerative Agriculture, Sustainable Agricultural Practices in Plant and Animal Husbandry, and more (Reynolds 7 Dec).

GOALS/ FUTURE

Reynolds hopes to "see every professor on campus having some interaction" with the center (7 Dec). He also hopes that the center will expand its abilitity to accommodate research projects, and student learning opportunities, as well as "to offer [more] workshops, lectures, and events (7 Dec)."

The Center recieves an annual budget from SRU and "sporatic monies..from private donations or grants (Reynolds 22 Nov). Last year, the Center received $60,000 from SRU, half of which paid the director's salary. Next year, Reynolds hopes to receive three times last year's budget. With a full time director, it seems that the Macoskey Center is rapidly expanding its activities and integration into the SRU curriculum.

THE CAMPUS CENTER FOR APPROPRIATE TECHNOLOGY

Humboldt State University. Arcata, California

SITE AND SYSTEMS OVERVIEW

The Campus Center for Appropriate Technology (CCAT), "is a student initiated, student-run, and student-funded demonstration home at Humboldt state University dedicated to resource and energy-efficient living (CCAT, Campus Center for Apprpriate Self-Guided Tour 1998)." Over time, students, faculty, and community volunteers have transformed a three-bedroom house on campus to incorporate many ingenuitive and appropriate technologies for food production, waste recycling, energy production and conservation. Three student co-directors live in the house and maintain the systems.

Important features include: solar heated greenhouse, organic herb and vegetable gardens, compost and vermiculture sites, solar cookers, pedal power workshop, biodiesel refinery, composting toilet, greywater treatment marsh, rainwater catchment for greenhouse and toilets, insulation retrofit, thermal curtains, wood burning stove, natural and non-toxic household products, cold cabinet for food storage, solar shower, solar hot water panels, 20 photovoltaic panels and a small wind turbine backed up by a biodiesel generator, straw bale shed, yurt, cob demonstration "bench", and many other "home scale" technologies (CCAT, Campus Center for Appropriate Self-Guided Tour 1998)." CCAT offers ongoing workshops on many aspects of sustainable living, hosts regular tours, and has an extensive library open to the community.

PROJECT ORIGINS

In 1978, The Environmental Education club at Humboldt State University hosted a widely attended slideshow by "Net Energy (Armstrong 18 Nov)." Several students, inspired by the slideshow, started a new club, the Campus Center for Appropriate Technology (CCAT), with the intention of creating a demonstration of appropriate technology systems. CCAT was originally housed in the Youth Education Services (YES) house, a campus umbrella organization that aids new programs in getting organized and funded (Armstrong 18 Nov).

In the beginning CCAT members were not sure whether they would attempt to renovate an existing campus building, or pursue their own building (Armstrong 18 Nov). Some HSU staff became involved early in CCAT's development. The YES house director, Pamela Kambur; Peter Lehman, then a new professor in the engineering department; and Don Lawson, head of Physical Plant Services were very supportive (Armstrong 27 Nov). A group of about 15 students investigated a variety of campus buildings, and began regular planning activities in the Fall of 1978 (Armstrong 27 Nov).

MASTER PLAN,SITE SEARCH, AND REMODELLING

Over time, this core group created a very thorough five-year Master Plan for the future CCAT site (Armstrong 18 Nov). This plan addressed budget considerations and design elements considered important to the demonstration of systems and a sustainable retrofit. Most of the physical systems now in place, were included in that original master plan (Armstrong 18 Nov). In the fall of 1979, the Buck House, a small building which housed the HSU "Cluster" interdisciplinary program, became available for CCAT retrofits and demonstrations (Armstrong 10 Dec).

The Master Plan then developed around the Buck house. Around this time, the Cluster program began to dissolve, and Don Lawson recommended that CCAT seek to take over the building, which would otherwise be destroyed (Armstrong 10 Dec). In the spring of 1980, CCAT was given permission to take over the Buck house at the end of the school semester (Armstrong 10 Dec). CCAT members began applying for grants "left and right (Armstrong 10 Dec)," and three students volunteered to move in that summer. They immediately began remodeling the Buck house.

FUNDING

The students themselves raised most of the money that originally came to CCAT. About half of the money came from grants, and the other half came from private donations (Armstrong 19 Oct). HSU initially gave money to CCAT from a variety of sources. The President of the University awarded a $5000 grant, Associated students gave a grant of a “few thousand dollars”, the YES house gave “a few hundred”, and “the rest was raised from the community” totaling around $21,000 in 1980 (Armstrong 27 Nov).

Starting in 1980, and continuing for several years, members of CCAT sold burritos on the campus quad to raise money for projects (Armstrong 27 Nov). They raised money to fix up Buck house, and also received a huge outpouring of materials donations and labor. Shingles, lumber, paint and other materials were donated. The state employed several local CETA (California Employment Training Act) workers to scrape and paint the house in the summer of 1980 (Armstrong 19 Oct).

PGE “was very helpful” during the first 5-6 years of CCAT’s transformation of the Buck house, donating insulation material and instruction for an insulation workshop (Armstrong 18 Dec). It was typical for 100 people to show up on a CCAT workday. CCAT received their first Associated Students budget in the fall of 1981 (Armstrong 19 Oct). For many years, that budget was constant at $1500. Then itwas raised to $2000, then to $11000. Last year CCAT received $28000 from A.S., increasing to $33,000 for this year (2000-2001) (Armstrong 19 Oct).

STUDENT INVOLVEMENT: MANAGEMENT, DESIGN, REMODELLING, EDUCATION

As stated, CCAT is entirely student run. The three co-directors run monthly meetings with the volunteer advisory steering committee, which is composed of supportive faculty members, “retired” CCAT co-directors, and at least one community member not affiliated with HSU (Armstrong 19 Oct). The co-directors also facilitate weekly CCAT member meetings, and bi-monthly employee meetings.

According to Sean Armstrong, an active “ex” co-director of CCAT, employees came about “by necessity (10 Dec).” Except for the CETA workers of 1980, all remodelling, maintenance, and expansion has been done by student, faculty, and community volunteers. For many years, projects were researched and developed by topic-specific committees (Armstrong 19 Oct). There was a composting toilet committee, a greywater committee, a photo-voltaic committee, etc. At some point, the once productive “volunteer” committee system became too unreliaable for the demands placed upon CCAT, and CCAT began requesting more funds to hire employees that would coordinate volunteers.

Currently, CCAT co-directors hire fifteen employees, and half of the annual budget goes to employee salaries. The employees are hired for their “experience, dedication, and willingness to work above and beyond paid hours (Armstrong 19 Oct).” The employees serve as volunteer coordinators.

Many interesting projects, classes, and programs have been birthed by CCAT. The Appropriate Technology minor, the new Environmental Sciences major, and the master’s in International Development Technologies all grew out of CCAT. CCAT is constantly hosting a variety of workshops on topics ranging from biodiesel production, to willow basketry. CCAT employees have also taught accredited gardening, herbalism, and appropriate technology education courses on-site (Armstrong 19 Oct).

CCAT members hope to offer more courses through CCAT in the future. Some CCAT members are working on plans for a new Environmental Sciences building, which would model sustainable design and systems on a larger scale.

CCAT’s physical location is not secure, because CCAT is not an official campus program. HSU rents the location to associated students for $1/ year (Manetas 14 Dec). Although, CCAT has a huge support base in the community, plans for the expansion of other HSU buildings are jeopardizing the CCAT site. If forced to relocate, CCAT may have the opportunity to build a model residence from the “ground up.”

CONCLUSIONS

Each of the campus models presented here has a story to tell. The dynamics and processes encountered in the development of these sites, can be educational for students and faculty interested in creating demonstrations of regenerative systems at other campuses. There are some lessons, and common themes to these stories.

• Each project was the result of inspired commitment.

• Each project had the support of at least one dedicated faculty member.

• Four of the five projects were primarily initiated and guided by one passionate faculty member.

• Four of the five sites would clearly not have been developed as demonstration sites without student involvement.

• Four of the sites received most funding from sources other than the college or university, with the three large sites receiving significant funding from private foundations or donors.

• Student involvement in the development process seems linked to project success. i.e. all sites with significant student involvement in the design process are well-received and considered "successful" by students, faculty, and administration.

• The only site which did not have much student involvement in the design process is "struggling". This site also had very little support from the administration.

• Students have more management and maintenance responsibilities in the smaller projects.

• The smaller projects seem to have more student designed and initiated projects ongoingly developed.

For the larger development projects:

• Having general support and understanding of the administration expedites the process.

• Including the larger community in the design process leads to public interest, acceptance and use of the space, and in some instances leads to income from space rental.

• Including administration and community officials in the design process greatly reduces troubles with including "alternative" features.

During the writing of this paper, Second Nature, a non-profit committed to sustainability in higher education, co-hosted a "Meeting of Presidents" at Oberlin College. Thirty college and university presidents, vice presidents, and provosts from around the country converged at the Adam J. Lewis Center, to discuss sustainable curriculum development and the creation of campus models for sustainable design. A future where every college and university campus offers students the opportunity to gain hands-on education in regenerative systems, may be on the horizon.

FEATURE	CALPOLY	OBERLIN	NORTHLAND	SRU	HSU-CCAT
USE	residential	department facility	residential	research/ demonstration	residence for managers
	classes	classes	1 regular course	classes	demonstration/ education
	research	research	periodic classes	residence for managers	classes
		banquets	meetings		meetings
		meetings			

SIZE	16 acres	13,600 ft2	40,000 ft2	83 acres	3 br house
	current buildings: ~2000ft2			small farmhouse	.75 acre
	future buildings: ~13,200ft2				
CAPACITY	90 planned residents	800	114 planned residents	2-4 residents	3 residents
	20 current residents		current residents	land can be utilized by many	projects maintained by as
	density 5.6 peope/ acre				many as interested
ELECTRICITY		690 pv modules, 59 KW	120 ft, 20KW wind generator	1.5 KW pv array	22 panel, 350 W pv array
		grid intertied	3 pv arrays, 3.2 KW	grid intertie	wind backup, mostly demo
	grid intertied	integrated building controls	grid intertied, computer monitors		off grid
			electircity monitored by computers		
EFFICIENT APPLIANCES	NA	energy efficient appliances	NA	NA	Pedal power tv, workshop
		energy efficient motors			sunfrost refidgerator
LIGHTING	daylighting	daylighting	high efficiency light fixtures	fluorescents	compact fluorescents, skylights,
		energy-efficient lighting	motion sensors in common areas	compact fluorescents	a few fluorescent tube lights
		occupancy light sensors			
HEATING/ THERMAL REGULATION	passive solar heating	passive solar	some passive solar	insulation retrofit	passive solar, greenhouse
		geothermal wells, raidant coils	high efficent gas boiler	calking	insulation retrofit
		back-up electric boiler	heat recovery units	low-e double paned windows	thermal curtains
		triple pane glass		Finnnish masonry stove	wood stove
HOT WATER	NA		high efficent natural gas	electric	solar hot water
			solar pre-heating		preheats for “on demand”
WATER SOURCE	utilities	potable &washing -utilities	utilities	well water	utilities
		toilets- living machine	low-flow faucets & fixtures		rooftop- toilets in winter
					rooftop- some to garden
					greywater for ornamentals

					low-flow faucets & flush
WASTEWATER	currently to municipal sewers	Living machine for all wastewater	2 waterless composting toilets	clivus multrum composting toilet	greywater purification marsh
	future 3 stage process	excess waste water to sewers	low-flush toilets	greywater system	low-flush toilet
	inpermit stages	plan to send extra to outdoor marsh			dry composting toilet
FOOD PRODUCTION	12 acres polyculre	NA	herbs & starts in greenhouse	permaculture techniques	vegetable gardens
	aquaculture		near campus gardens	1 acre food production	herb gardens
	on-site composting			on-site composting	on-site composting & vermiculture
BUILDING MATERIALS	Non-toxic	certified sustainable woods	local woods	remodel; farmhouse was wooden	remodelled woods house
		low voc materials	bio-composites	passive solar retrofit	non-toxic paint, cork linoleum
		recycled materials	organic based linoleum		straw bale shed
			furniture from recycled materials		cobb bench
STUDENT INVOLVEMENT	2 students on core design team	design paramenters student created	faculty initiated	faculty and students	student design
IN DESIGN	student input into curriculum	significant student input to design	students involved & greatly determined		
		design process studentcoordinated	degree of green systems included		

STUDENT MANAGEMENT	food systems	managed by director of res. life	run by facilities manager	managed by staff	student run, student funded
		3 resident student staff	students manageLiving Machine, with	current staff is a MS-3 student	
			facultyoversite & technical assist	many other students active on site	
	NA-information not available				

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