Guilds for Living:
Creating a Keyline Community in Calera, Alabama.

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“Humanity is part of nature, a species that evolved among other species. The more closely we identify ourselves with the rest of life, the more quickly we will be able to discover the sources of human sensibility and acquire the knowledge on which an enduring ethic, a sense of preferred direction, can be built.”

—Edward O. Wilson
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Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect.”
—Chief Seattle; 1854

Humans do not stand alone on our Earth, we are a part of a much larger, dynamic and complex web of life. We are entwined and are inseparable from the biotic world around us. Because of this, we are biologically programmed to hold deep affiliations with nature, a concept explained by E.O. Wilson in his book, Biophilia. Our current method of living ignores our yearnings; however, and the way we live creates a false divide between ourselves and our environment. We are not in touch with the natural ecologies, systems and processes surrounding us. We live shut off from these systems, ignoring our sense of place and our integration to the rest of the living world.

Our integration with the natural world should be shown by the very sustenance of our bodies. Michael Pollan once said, “The way we eat represents our most profound engagement with the natural world. Daily, our eating turns nature into culture, transforming the body of the world into our bodies and minds.” For something to be so primal to our being, we are paradoxically ignorant of it. We are not aware of our food sources. Not only this, but our current agricultural practices increase air pollution, petroleum reliance, and obesity while decreasing wildlife habitat, social capital, and water quality.

The current model of suburban development also ignores our integration with the natural ecologies, systems and processes surrounding us, and has some of the same effects as our agricultural system. However, over the next few decades, most people in America will still find themselves living in the suburban environment (Mashour 2010). How do we consciously continue to develop in this manner? Achenbach answers this by saying, “The key to modern life is strategic ignorance” (2006). There are so many things we don’t know about our lives, and that we don’t want to know. We are clueless end users in elaborate supply lines. Food comes from a super market shelf, not an animal that’s been raised and for which we have cared. Nature is something to experience on a boy scout camping trip, not something we see inside ourselves. A neighbor is simply a shape we see through our window, not a person with whom we communicate. We live in a world we didn’t make, by rules and customs and laws we didn’t invent, using tools and technologies we don’t understand.

We should open our eyes to these hidden issues through our way of life. We need a living environment that capitalizes ecological systems, food sources, and neighbor relations. It is time to create a place where this way of life is possible.
This research seeks to explore a way for humans to live harmoniously within nature; where man can truly be a part of nature. It intertwines agricultural, ecological and social systems to foster and form a community. To guide the research, Permaculture is used as a design framework. Permaculture principles are interpreted and modified through the project lens. There are four defining ideas which separate this project from other Permaculture communities, and other ecologically designed communities: guilded keylines, derived decisions, designed hierarchy, and community goals.

1. Interpretation of three permaculture principles: Designing from patterns to details, integrating rather than segregating, and catching and storing energy are employed by combining the concepts of guilds and keylines. The guilded keylines are used to physically, socially and metaphorically structure the community and act as the armature for design.

2. Existing ecological systems and conditions aid with all design decisions. The land provides answers in order define site boundaries, perform a land capability analysis, identify keypoints and keylines, and design placement of homes, streets, trails, and irrigation routes.

3. The design process indicates a hierarchy of importance, progressing in this order: keypoints, keylines, homes, shared green spaces, trail system, and lastly streets and shared parking.

4. While following this design process five community goals were devised. The first goal was to design for diversity. Designing diverse lot sizes, house sizes, and housing types promotes diverse ages, ethnicity and income ranges in the community. Second, to design for increased density. Designing smaller lots, shared greens and shared parking promotes walkability within the community. Third, to design for decreased auto dependency. Designing shared parking areas and a connective network of pedestrian trails promotes car sharing and alternative methods of transportation. Fourth, to design for increased neighbor relations. Designing shared green spaces, shared parking, and a labor structure promotes social interaction within the community. Fifth, to promote the keylines’ importance. Designing every home with direct access to a keyline, and designing residents’ daily routes to require utilization of the keylines increases their value.

This thesis project is a journey of explorations. While varied in form and outcome, these explorations are united by their aim to create a place which supports and exemplifies humanity's integration with ecological and agricultural systems.

Keywords: Guild, Keyline, Keypoint, Permaculture, Community, Agriculture, Ecology, Society
These images, taken in Calera, Alabama during research visits, show rapid residential growth that has occurred in the town. They attempt to capture the environmental impacts of typical methods of subdivision development.

Opposite page from top left:

Figure 1: Erosion of poured concrete, gravel and clay in Waterstone subdivision.
Figure 2: Construction vehicle tire prints.
Figure 3: Waterstone Community, end of sidewalk.

Current page from top left:

Figure 4: New home advertisements on roadside.
Figure 5: Island left from fill dirt excavation.
Figure 6: Infrastructure in place for future expansion at Waterford subdivision.
I. Research
Calera is a small town in Alabama, located near the exact geographical center of the state. It is a town which is defined by limestone mining, railroad convergence and agricultural production. Calera is Alabama’s fastest growing city (measured by percent) according to current US census data. In 2000, Calera’s population was 3,168, and by 2010 it had exploded to 11,620. In ten years the town had grown four times it’s previous size. This rapid growth has led to increased developmental pressures in Calera; residential construction has reached historical highs (Calera, AL - Official Website). Due to the increasing residential growth and development, Calera is chosen as the site for this thesis exploration.
Growth Patterns in Jefferson and Shelby Counties
2000-2010

- Sustained Growth
- Decreased Growth
- Undeveloped Area
- New Growth

Location of Calera

Rail
Interstate
Major City
CONTRIBUTORS TO CALERA’S GROWTH THROUGH HISTORY

Although the area we now refer to as Calera was first inhabited by Native Americans, the first recorded European settler was John R. Gamble who purchased 100 acres of land in 1821. Only a few, less than ten recorded, families settled in Calera before 1850. The small settlement was called Buxahatchie at this point, also a Native American name for a stream southeast of the settlement.

The advancement of the railroad brought a significant amount of settlers into Calera. The tracks for the South and North railroad line, and the Richmond and Danville railroad were crossed between 1854 and 1855 in Calera. The town’s name was changed to Limeville, after the large amounts of lime deposits in the soil. Many of the settlers that came to Calera by rail were limestone miners.

While the lime industry gave the town its name and played a dominant role in Calera’s history, it was not until after the Civil War that lime became an important commodity and contributed to the rapid growth of the town. The growth of Calera can be seen through an article in the local newspaper, the Shelby Guide in 1871; "The citizens desire a first class drug store, one first class dry goods store, one first class family grocery, hardware and crockery, a baker, a watch maker, a blacksmith, a wagon maker, a tinsmith, a shoe maker, and a barber." The town’s name was officially changed to Calera in 1869, and the City of Calera was incorporated in 1887. Calera is the Spanish translation for limestone mine.

In 1896, the University of Montevallo was formed seven miles away from Calera. Today, many university employees live in Calera and work at the University. Educational services rank as the largest single category of workforce employment in Calera. This town-gown relationship is an important factor when considering Calera’s demographics and economics.

One of the first sections of Interstate 65 opened in Alabama between Clanton and Calera in November of 1960. The interstate connected Calera to other southeastern cities such as Birmingham and Montgomery, and brought increased automobile usage and personalized travel opportunities.

Shelby County Airport was yet another step of growth for Calera. While the airport was founded in 1965 with one runway, it now utilizes two. It is home to over 100 personal aircraft, including single, multi, jet-engine planes. Having the county airport in Calera demonstrates the increased opportunity for economic development in the city (Kaetz 2011) (Roberts).

These milestones are a small representation of Calera’s growth over time, however they aid in an understanding of background and context for the thesis site.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957</td>
<td>Calera Library</td>
</tr>
<tr>
<td>1960</td>
<td>Section of I-65 open</td>
</tr>
<tr>
<td>1963</td>
<td>Shelby County Airport</td>
</tr>
<tr>
<td>1965</td>
<td>Heart of Dixie Railroad Museum</td>
</tr>
<tr>
<td>1993</td>
<td>Akridge Arboretum</td>
</tr>
<tr>
<td>1999</td>
<td>SYSCO opens</td>
</tr>
<tr>
<td>2000</td>
<td>Boom begins (population 3,160)</td>
</tr>
<tr>
<td>2001</td>
<td>Walmart</td>
</tr>
<tr>
<td>2002</td>
<td>Ozan Winery</td>
</tr>
<tr>
<td>2004</td>
<td>Timberline Golf Course</td>
</tr>
<tr>
<td>2005</td>
<td>George Roy Park</td>
</tr>
<tr>
<td>2009</td>
<td>Vizzni Farms Winery</td>
</tr>
<tr>
<td>2010</td>
<td>Calera Farmers Market opens (pop. 11,620)</td>
</tr>
<tr>
<td>2011</td>
<td>1st Annual Strawberry Festival</td>
</tr>
</tbody>
</table>
Permaculture

“Permaculture is a design system for creating sustainable human environments. The word itself is a contraction not only of permanent agriculture but also of permanent culture, as cultures cannot survive long without a sustainable agricultural base and land use ethic.”—Bill Mollison

Permaculture design is a holistic approach which strives to integrate society, ecology, geography, agriculture, architecture, and community building. It empowers people to connect to the ecosystem in which they live. It works toward the integration of landscape and people by engaging with the environment to provide food, shelter, energy and other needs in a sustainable way (Telford).
In order for one to understand Permaculture, it helps to see other methods of design for comparison and contrast. Below are eleven methods of designing which have varying degrees of environmental focus.

a. **Ecological Design** is any form of design that minimizes environmentally destructive impacts (Van der Ryn. 1996).

b. **New Urbanism** is the revival of place-making, and a re-ordering of the built environment into the form of complete cities, towns, villages, and neighborhoods around the world. New Urbanism involves fixing and infilling cities, as well as the creation of compact new towns and villages (NewUrbanism.org).

c. **Conservation Subdivisions** preserve open space and natural areas by clustering development. This protects environmentally sensitive areas from encroachment (Arendt 1996).

d. **LID** is a stormwater management approach of managing rainfall at its source using distributed decentralized micro-scale controls. LID’s goal is to mimic a site’s predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff. The LID approach can be applied to new development, urban retrofits, and redevelopment / revitalization projects (LID-stormwater.net).

e. **LEED ND** is a system for rating and certifying green neighborhoods. LEED-ND builds on USGBC’s Leadership in Energy and Environmental Design (LEED) systems. LEED-ND integrates new urbanism, green building, and smart growth into a national standard for neighborhood design (cnu.org).
f. Ecovillages are human-scale full-featured settlements in which human activities are integrated into the natural world in a way that is supportive of healthy human development, and can be successfully continued into the indefinite future (Gilman, 1991).

g. Intentional communities are comprised of people living and working cooperatively to create a lifestyle that reflects their shared core values. The people may live together on a large piece of rural land, in a suburban neighborhood, or in an urban high rise. They may share residences or live in individual dwellings. The common purpose of the intentional community varies from religious beliefs, sexual preferences, to any common passion (ic.org).

h. Urban agriculture refers to cultivation within existing cities and suburbs. It is usually a secondary activity which takes place in community gardens, private yards, or rooftops by people who are concerned primarily with other economic pursuits (Duany 2011).

i. Agricultural urbanism refers to communities equipped with a working farm which is economically associated with the residences and businesses, but it is not physically or socially integrated. Anyone may visit, volunteer, and learn from the farm, but few of the residents participate in the productive activities (Duany 2011).

j. Agrarian urbanism refers to settlements where the society involved with agriculture in all its aspects: organizing, growing, processing, distributing, cooking and eating it. A distinction of agricultural urbanism is that the physical pattern of the settlement supports the workings of an intentional agrarian society (Duany 2011).

k. Permaculture is selected as a framework because of its holistic nature and focus on integration of people, agriculture and ecology.
Permaculture has twelve guiding principles. “Each principle can be thought of as a door that opens into whole systems thinking, providing a different perspective that can be understood at varying levels of depth and application” (Mollison 1995). They are as follows:

1. Observe and interact
2. Catch and store energy
3. Obtain a yield
4. Apply self-regulation and accept feedback
5. Use and value renewable resources and services
6. Produce no waste
7. Design from patterns to details
8. Integrate rather than segregate
9. Use small and slow solutions
10. Use and value diversity
11. Use edges and value the marginal
12. Creatively use and respond to change (Telford).
1. Observe and Interact
Design should not be generated in isolation, but created from the site.

2. Catch and Store Energy
Harness and store energy from the land through keyline irrigation and keypoint water storage.

3. Obtain a Yield
Design for maximum functionality through guilds to produce peak yields.

4. Apply Self Regulation and Accept Feedback
Community governing structure (committees and boards) will be cross-regulating.

5. Use and Value Renewable Resources
Use renewable material sources and community services that are long lived.

6. Produce no Waste
View waste as a resource and opportunity where the outputs of one systems are the inputs of another.

7. Design from Patterns to Details
Use keyline patterns to structure design of agriculture, irrigation, residences, shared spaces, trails, streets and parking.

8. Integrate rather than Segregate
Integrate existing systems of ecologies, agriculture, and society through design.

9. Use Small and Slow Solutions
Design for performance over time through incremental stages of development.

10. Use and Value Diversity
Vary house lot sizes, types and prices to accommodate diverse income ranges, ethnicities and age groups.

11. Use Edges and Value the Marginal
Protect habitat edges by maintaining buffers throughout development and over time.

12. Creatively Use and Respond to Change
Community partnership with a Landscape Architect and other specialists will provide adaptive resilience to change.
Permaculture utilizes the concept of living guilds, which views plants and animals not for their singular use, but in terms of their relationships to context and surroundings. It layers and stacks functions through mutualistic and symbiotic relationships; therefore, gaining maximal yields with minimal inputs.

Possible interactions of plants and/or animals in a guild:
1. Trellis or support
2. Screen and shade
3. Provide nutrients
4. Cross fertilize
5. Live in obligate relationships
6. Host to beneficial insects
7. Provide parts for plants such as grafts
8. Organic matter production
9. Decoy for harmful insects
10. Disease resistance
11. Toxicity creation such as phenols

The “Three Sisters” is a classic example of a guild used by Native Americans. Corn provides the structure for bean vines to climb. Beans fix nitrogen on their roots, improving soil fertility by making nutrients available to nitrogen hungry corn. Bean vines also help stabilize shallow rooted corn plants, making the tall stalks less vulnerable to blowing over in the wind. Squash vines become a living mulch, shading emerging weeds and preventing soil moisture from evaporating, thereby increasing drought resistance. Due to their spines, squash plants also help discourage predators from approaching the corn and beans (Mollison 1979).
“On one level, permaculture deals with plants, animals, buildings, and infrastructures (water, energy, communications). However, permaculture is not about these elements themselves, but rather about the relationships we can create between them by the way we place them in the landscape.” —Bill Mollison
Permaculture introduces the concepts of keypoints and keylines, which act as the armature of this design. Keylines and keypoints are a way to harness the existing natural energy within the land. They use the natural topography of the land to maximize water use, increase productivity, and provide climatic variations. Keypoints are the natural places where water accumulates on a slope and provides a higher elevation water storage point. In plan view, keypoints can be found by identifying where two contours distance themselves on a slope. Or thought of in section view, where the slope turns from concave to convex. Keylines extend parallel from the keypoints and offer the lowest energy path for water transport. Keylines increase the underlying soil’s hydration, which raises the water table. Keyline design combines soil building and water harvesting, resulting in the soil becoming the largest reservoir of water in the landscape (Yeomans 1954). These diagrams help explain how keylines and keypoints are used for highest benefit in the community design.
Climatic Interaction:

- Cold Air
- Warm Downdraft
- Thermal Belt

Hydrological Interaction:

- Keypoint
- High Storage
- Frost
- Water Movement

A. High Plateau: Catchment
B. Upper Slopes: Runoff
C. Lower Slopes: Absorption
D. Plains: Distribution
Case Studies

“The natural world is the larger sacred community to which we belong. To be alienated from this community is to become destitute in all that makes us human.”—Thomas Berry

Case studies influential to this project include, but are not limited to: Beacon Food Forest located in Seattle, WA; Crystal Waters Eco Village located near Queensland, Australia; Earthaven Ecovillage located near Asheville, NC; Hampstead located in Montgomery, Al; Village Homes located in Davis, CA; Levittown located near Farmingdale, NY; Serenbe located in Chattahoochee Hills, GA; The Farm Ecovillage located in Summertown, TN; The Sage Projects located in Atlanta, GA; The Waters located in Pike Road, AL; The Villages at Crest Mountain located in Asheville, NC; and Wild Sage Cohousing located in Denver, CO. The most germane case studies, however, are Earthaven, The Villages, and Crystal Waters. Each case study is described here by the same criteria to make their comparison logical. The information for each case study is broken down into four categories. The “Basic Info” section lists: Founding date, Location, Number of members, Site description. The “Environmental” section lists: Land use, Physical Infrastructure, Agriculture, Buildings/Energy Use, Materials, Certifications/ Awards. The “Economic” section lists: Property ownership, Dues and fees, Personal Income. The “Social” section lists: Membership structure, Community Events, Schools, Spirituality, Community service, Community Goals.
Basic info:
Founding date: 1995
Location: Black Mountain, North Carolina, 30 Mi. from Asheville
Number of members: 54 Adults, 10 Children in 2012
Site description: The 329 acre site is a part of three converging valleys. It is comprised mainly of forested mountain land with streams, springs, flood plains, bottom land, and steeper ridge slopes. The land lies between 2000’ and 2,600’ in elevation.

Environmental:
Land use: Earthaven's permaculture site plan includes fourteen residential neighborhoods, compact business sites, orchards, market gardens, and wetlands. The plan considers both ecological issues and potential income sources for members. Potential income streams taken into account by the plan are: forest harvesting, lumber production, home construction, specialty agriculture, horticulture, and food production.
Physical infrastructure: Roads, footpaths, bridges, campgrounds, ponds, constructed wetlands, off-grid power systems, gardens, council hall, shared kitchen-dining room, and approximately thirty-five buildings.
Agriculture: The agricultural systems in place consist of developed fields, orchards, terraced garden areas. Within this, there are areas devoted to fishing, plant propagation, livestock rearing, vegetable and fruit production, medicinal and herb cultivation, bio-fuel production, CSA operation and honey bee apiary.
Buildings/Energy Use: Before new construction one year’s worth of site analysis is conducted in order for the resulting building to be created in tune with its...
ecological context. Because of this, Earthaven is able to be 100 percent off the grid by harnessing renewable energy sources such as hydro-electric/micro-hydro, passive & active solar, and energy conservation.

Materials: Earthaven utilizes materials such as adobe, straw bales, and recycled pallets. The yearlong extensive site analysis also provides time to utilize on site resources for building materials. All of the existing materials cleared during construction are used in the new building or elsewhere in the community.

Certifications/Awards: One Earthship building.
Economic:
Property ownership: Earthaven paid off their land loan in 2005 ($580,000). All members share ownership of the property and its assets equally through a homeowners association. Therefore, individual members have a site lease but not the deed and title to a home site. Residential site leases can range from $10,500 – $21,000 depending on size of the lot. If a member leaves, the profit from their lease is split evenly between remaining members.
Dues and fees: One-time joining fee, around $4,200, for new members. The amount of both the joining fee and lease is in accordance to a member’s annual income.
Personal income: Income independent

Social:
Membership structure: The membership levels are broken down into: 1- Supporting member (financial contribution, camping), 2- Exploring member (lives on site months to a year, non-member fees, community service), 3- Provisional member (six months to one year, community members assess better), 4- Full member (live in community, build home, granted full decision-making rights).

Events: Movie showings, musical gatherings, potlucks, dancing, games, holidays, and yoga classes.
Schools: Children grow up together and are homeschooled in the Forest Children Collective.
Spirituality: Earthaven does not promote a single religious practice, although there is a general awareness of spirituality brought through a relationship with the Earth.
Community Service: Community service requirement is expected by Full and Provisional Members. Full Members donate 1,500 hours over 10 years (3 hours/week), and Provisional Members donate 48 hours per season.
Community Goals: Consensus decisions, made by a committee. The committee holds twelve community goals which state the common beliefs and purpose of the community (Alexander 2010) (Dani 2011) (Earthaven Ecovillage).
Overview Evaluation of Earthaven Ecovillage

- Number of Residents
- Land Use
- Agriculture
- Buildings/Materials
- Energy
- Certifications/Awards
- Property Ownership
- Dues/Fees
- Membership Structure
- Community Events
- Schools
- Spirituality
- Community Service
- Community Goals

Measurement of Intensity:
Less
More
**Basic info:**

Founding date: 2009  
Location: Four and a half miles from the heart of downtown Asheville, North Carolina  
Number of members: 28  
Site description: Part of the larger development, Crest Mountain, which is a 165 acre mountain development including banquet facilities, vacation rentals, office studios, a gated residential community, luxury condominiums, The Villages, and the Hanger Hall School for Girls.

**Environmental:**  
Land use: The first phase of The Villages is located on twelve combined acres of former baseball and soccer fields. This land provides fifty-nine lots in phase one, positioned around the perimeter of the fields, and leaves two acres in the center for common space. The common space includes gardens, walking trails, open areas, and future community structures. The lot sizes in phase one are small by design, emphasizing the shared common space instead of individual home sites. The second phase is The Orchards and adds twenty-two acres and forty lots of ridgeline property with views, sitting higher in elevation than the first phase. This phase provides bigger lot sizes, averaging around one-third of an acre and ranging up to one-acre parcels, and larger homes with increased privacy.  
Physical infrastructure: There is over a quarter mile of pervious garden trails through The Villages that lead to the Community Center, Greenhouse, Orchards and Vineyards, and Orchard Home sites. These trails connect to over two miles of Crest Mountain’s hiking trails. Future plans include trail connections to the Woodfin Riverfront Municipal Trail System, which would give residents bicycle access to the French Broad River, Beaver Lake, downtown Asheville and downtown Woodfin. The Villages is a LEED Neighborhood Development registered project.  
Agriculture: Shared gardens and personal gardens  
Materials: None specified.  
Buildings/Energy use/ Certifications:  
At The Villages, all building are certified NC Healthy Built and Energy Star. The Villages incorporates green technologies including solar panels and rainwater harvesting on a site-wide scale. The solar panels
located on the common buildings offset electricity used and also sell power back to the grid. Most residential lots are south facing in order to maximize solar panel energy harvesting as well.

Economic:
Property ownership: Home and lot sizes start from $175,000 but are applicable for substantial tax credits. Residents can rent homes; however, only long term leases over three months in length are allowed.
Dues and fees: There is a one-time fee of $1,250 administered by the Home Owners Association which covers maintenance and care of the common areas.
Personal income: Non shared, Income independent.

Social:
Membership structure: None.
Events: Book club, Holiday parties.
Schools: Hanger Hall Middle School for girls, integration with local Asheville school system.
Spirituality: None Specified.
Community service: None required
Community goals: The Villages lists five Social Development Goals on its website (VCM).

Figure top:
Organic grapes grown in the common garden.

Figure bottom:
Common garden area with Zinnia flowers in foreground.
Figure left:
House and personal garden in background with wildflowers in foreground.

Figure below:
Cherry trees in bloom in front of the Common House.
OVERVIEW EVALUATION OF THE VILLAGES AT CRESTMOUNTAIN

Number of Residents
Land Use
Agriculture
Buildings/Materials
Energy
Certifications/Awards
Property Ownership

Dues/Fees
Membership Structure
Community Events
Schools
Spirituality
Community Service
Community Goals

Measurement of Intensity:
CASE STUDY THREE: CRYSTAL WATERS

Basic info:
Founding date: 1985 world’s first permaculture ecovillage
Location: Rural part of Southeast Queensland, Australia; Eighteen miles away from town of Maleny.
Number of members: Over 230 residents
Site description: Subtropical climate consisting of a warm humid summer from December to February amidst a mild and dry autumn, winter and spring.

Environmental:
Land use/Physical infrastructure/Agriculture: 83 individual lots on 640 acres of land. Fourteen percent of the land is allocated for individual residential lots, six percent is shared spaces, and eighty percent is common land. As part of the fourteen percent individual land, residential lots are one acre each and arranged together in a number of small clusters. The six percent shared land holds the Crystal Waters Community Co-operative which provides facilities and services for the social and economic aspirations of the community. The common land (eighty percent of the total acreage) is the best land on site and is used for farming, recreation, animal grazing, forestry, wildlife habitat, dams and water bodies. Some of the common land which provides important habitat is set aside for preservation.
Buildings/Materials: Timber from a community saw mill makes up part of the community buildings. Homes are made from a variety of materials including brick, timber, pole frames, mud, straw and rammed earth. Wet and dry composting toilets are often installed in homes.
Energy use: Most dwellings are not connected to the grid for energy needs, primarily relying on passive solar design along with active solar energy for a hot water heating system. Other dwellings use a mix of stand alone power systems plus back up connection to the grid. A lot of residents feed power back into the grid through excess harvested solar energy and also draw from the grid as needed.
Certifications: Awarded the UN World Habitat Award

Economic:
Property ownership: Private lots. Lots listed currently with homes average around $200,000.
Dues and fees: Council rates are a yearly charge of $700 Australian Dollars, which is roughly equivalent to $700 US Dollars. Body Corporate rates are an additional fee of $700 per year.
Personal income: Income Independent

Social:
Membership structure: None specified
Events: Privately organized clubs, community meals, meditation groups, women’s groups, children’s play groups, Saturday market, volleyball, table tennis, film nights, and special occasion parties. The Village Green is the social hub of the community, with open space for people to meet, talk and play together. Surrounding the Village Green are The Kitchen and The Deck, which are used regularly for markets and concerts and a variety of privately owned businesses. Residents and visitors alike regularly rent parts of these areas to hold events. Volleyball games between

Figures left and right:
Comparison between the neighborhood layout (left) and contour lines (right).

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Crystal Waters and the neighboring town are held in the Village Centre.

Schools: Integrated with local school system.

Spirituality: There is no common community religious beliefs, although many residents find spirituality through their connection with the Earth.

Community service: Crystal Waters does not require mandatory community service, but work on shared trails and buildings are popular activities among residents.

Community goals: Crystal Waters has six basic community objectives (Lindegger 2003) (Crystal Waters).

Figure below:
Residents write their own community goals.

Figure top right:
Two children enjoy market produce.

Figure bottom right:
A weekend market located within the community and open to public.
OVERVIEW EVALUATION OF CRYSTAL WATERS

Measurement of Intensity:

Less

More

Number of Residents
Land Use
Agriculture
Buildings/Materials
Energy
Certifications/Awards
Property Ownership

Dues/Fees
Membership Structure
Community Events
Schools
Spirituality
Community Service
Community Goals
Comparison of All Three Case Studies

Earthaven
Crest Mountain
Crystal Waters
II. Analysis
Site

“There is not a “fragment” in all nature, for every relative fragment of one thing is a full harmonious unit in itself.”

—John Muir

A designer must realize that he or she is not bringing life to the site; but that life and all its processes are already existing and occurring. Analysis of existing ecological systems and conditions aids in all design decisions within this project. The land provides answers in order to define site boundaries, perform a land capability analysis, identify keypoints and keylines, and produce designs. Identifying and mapping systems on regional and site scales contributes to an understanding of these systems and a holistic design approach used to formulate designs.
The intent of the community is to recognize integration with existing systems and a connection to the land; therefore, the first design decision must stay true to this intent. Quite frequently, site boundaries are formulated by simply drawing an arbitrary shape on a map. Delineating site boundaries in this way is segregating an already existing network of systems. It is suggesting that everything within that box is important, and everything outside is not. In reality, that shape is connected to the area outside; in reality, there is no shape at all. But in order for design to occur, a manageable area must be discerned. Floodplains, adjoining properties, roads, hydrology, parcels, ecotopes, contours, and zoning are layered to delineate the most appropriate boundaries. The resulting site boundaries show that the southern edge follows Watson Creek. The east edge follows the crest of a topographical ridge. The northern edge cuts along existing roads and property lines. And the west edge borders the adjacent Timberline Golf Course Community. This method is a rejection of the arbitrary shape, instead, it is an attempt to define a site boundary which correlates to its context and is truly drawn from the site.
SITE BOUNDARIES DETERMINED

Timberline Golf Course

Watson Creek

Road

Ridgeline

Parcels
Average Last Frost:
- March 15
- March 20
- March 25
- March 30
- April 5

Average First Frost:
- Oct. 5
- Oct. 10
- Oct. 15
- Oct. 30
- Nov. 10

Average July Temperature:
- 80
- 81
- 82

Average January Temperature:
- 44
- 46
- 48
- 50

Regional Mapping
Shelby County and Calera

Data provided by the University Of Alabama.
Site located within its Watershed context: Watson Creek, Buxahatchee Creek, Waxahatchee Creek, and the Coosa River/Lay Lake basin.

GIS data provided by the City of Calera.
Infrastructure within the Waxahatchee Creek Watershed: Rails, Roads, Structures and Hydrology shown.

GIS data provided by the City of Calera.
Subwatershed boundaries delineated.
SOCially AND ENVIRONMENTALLY IMPORTANT AREAS
Topography is "the lay of the land" — the physical surface of the Earth. In order to maximize its potentials through design, one must understand that topographical decisions can go beyond the standard ‘steep slope rule’: conserving where slopes are greater than 15%. Topography in part determines wind, moisture, temperature, soil, habitat, wildlife, and vegetation of the land. Wind and moisture are largely influenced by orientation of slope. The slopes facing the direction of prevailing winds, windward slopes, are more moist than the opposite slope, the leeward side. Temperature is significantly influenced by elevation and orientation of slope. The higher the elevation of a slope, the cooler the temperature. For every 1000’ in elevation there is a 3.3°F change; less than 1°F can determine the vitality of an agricultural crop. Southern orientation of a slope, in the northern hemisphere, provides warmer temperatures and increased daylight hours. Habitat, wildlife, and vegetation are influenced by many factors which, accordingly, are dependent on topography: temperature, elevation, wind, moisture and soil (Yeomans 1954). These systems are highly connected and their implications and influences cannot be delineated from one another. It is not a singular ‘cause equals effect’ relationship.

Because topography is so influential, it plays a major role throughout analysis of the site and design process. The images below are taken from built 3D digital relief models which serve as a method to visualize topographical implications.
In order to develop appropriate land use, a land capability analysis is performed. This method derives answers from the inherent qualities and characteristics of the land on site and eliminates conflicts between design projections and site capabilities. A land capability analysis could examine innumerable characteristics, but for this site and project eight are examined. Slope percentage, waterbodies, watershed buffers, and floodplains are four of the eight characteristics and are considered the most critical. The other four germane characteristics examined are: solar aspect, soil pH, soil texture, and woodland ecologies. The process of analysis for each critical characteristic includes first gathering data and maps, and then analyzing these based off known requirements for agricultural and residential development. The maps of critical characteristics (slope percentage, waterbodies, watershed buffers, and floodplains) are overlain and the areas which do not overlap are subtracted to show the best land suited for development. The other germane characteristics (solar aspect, soil pH, soil texture, and woodland ecologies) go through the same analysis process and are combined with the results of the previous analysis to provide more comprehensive results.
Soil Texture:

Woodland Ecologies:

Subtraction of Clays and Sands:

Subtraction of Higher pH:

Subtraction of wooded Forest:

Land best suited for Development:
III. Design
Eating is an Agricultural act. It is also an ecological act and a political act. To eat with a fuller conscious of all that’s at stake might sound like a burden, but in practice few things in life can afford quite as much satisfaction.”

—Michael Pollan

Food is a primal part of our being, and yet we have become far removed from our food sources. Most of us do not know from where our food actually comes, how it was raised, or how it came to our plate. This community merges the separation between the residents and their food, by cultivation of agricultural crops and livestock. Residents engage with their food sources every day, passively and actively.
Keypoints and keylines are identified by building a geographical model. Being able to haptically experience the topography aids in an understanding beyond what 3-D digital modeling can achieve. The process of physically building the model and interpretatively searching for keypoints provides benefit in itself, and culminates in accurately locating keypoints and keylines. The contour interval of the model is ten foot at 1"=1/24" scale. Photographs of the process are below and finished site model photographs are shown on opposite page.
The initial model is useful in that it shows the keypoints and keylines within a contextual view of the entire site. However, a 1"=1/24" scale and ten foot contour interval are not appropriate to work in accordance with the land capability analysis performed. The scale is too large to determine the keypoints and keylines located within the area best suited for development, as determined by the land capability analysis.

A second exercise is performed in order to find the keypoints and keylines within the area best suited for development. Maps showing one foot contours on the site, and the area best suited for development are overlaid. Due to previous experience from the model exercise, keypoints and keylines are more easily distinguished, even from an aerial contour map.
Keyline Agricultural Crops

Keyline agricultural design yields higher crop production more efficiently than conventional agriculture. It does not reduce the water or fertilizer needs of crops, but instead, provides the crops with their needs by harnessing the natural energy of the land. Keylines provide irrigation and nutrients to crops by using natural topography (Yeomans). Crop selection for the keylines is procured from these criteria:

1. Main crop needs little attention after establishment
2. Easy to harvest, store and use
3. High economic value
4. Somewhat rare and in demand
5. Particularly suited to site

Over time, the community will experiment with several crop species guilds which fit these criteria. Using such criteria to select crops provides a sustainable production model, and a sturdy supply into the market. The first requirement, “Main crop needs little attention after establishment,” leads to a decision that all species in the crop guilds are perennial. Perennials species provide many advantages such as:

- Dependable habitat for wildlife
- Dependable food source for wildlife
- Increased soil health
- Increased accumulation of biomass
- Less time devoted to planting, soil preparation
- Less water and nutrients required
- Less vegetative growth needed
- Less stress on plant
- Decreased weeds (Holmgren 2010).
Blueberry Appropriation

Southern Aspect:

Loam Soil Texture:

11/5 First Frost Date:

3/30 Last Frost Date:

Slopes 4/15%:

pH Under 5.5:
Blueberries are the first perennial species selected in the guild. Rabbiteye Blueberry, *Vaccinium ashei*, ‘Tift Blue’ ‘Brightwell’ Climax’ and ‘Premier’ are varieties chosen due to their suitability to many site factors:

**Site Condition:**
- Blueberries:
  - Soil pH: Acidic soils under 5.5 pH.
  - Soil texture: Sandy loam to loams
  - Southern facing slopes: Increases light hours
  - 4-15% Slope: Prevents pathogens
  - USDA Zone 8a: Zones 7-10
  - Frost dates 11/5-3/30: Minimal bloom interruption

The other species selected for the first keyline guild are: Wild Arugula (*Diplotaxis tenuifolia* and *D. muralis*), and ‘7 Year’ Lima Beans (*Phaseolus lunatus*). Both species are perennials and are chosen based off their relationship to each other and to the site conditions (Bohnert 2008) (Carroll 2012) (Dozier 2002). This is explained in further detail on the following pages.
Agricultural Guild One

The blooming time, fruiting time, the water needs, sun requirements, soil preferences, root zone depths, insect attractants, disease and fungi susceptibility, growth rate, harvesting time, and maintenance requirements of each plant selected needs to work in rhythm with the others. The relationships between Blueberries, Lima Beans and Arugula is dependent upon these factors. To explain how this crop guild functions, the following diagram shows the unique symbiotic and mutualistic relationships between the three species:

Perennial Lima Bean
*Phaseolus lunatus*

- **Plant type:** All perennials
- **Temperature requirements:** Frost and heat tolerances
- **Mycorrhizal fungi:** BB= do not have root hairs so dependent upon Mycorrhiza. Beans= Mycorrhiza hosts.
- **Virus and bacterial susceptibility:** Minimal overlap
- **Bloom time:** Sequential, BB= Jan-April, Beans= June-July, Arugula= Sept-Oct.
- **Soil Texture:** Well drained, sandy loam with organic matter topsoil
- **Water week needs:** 3x/
- **Sun requirements:** BB= 6+ hrs, Beans= 4-5 hrs (height of BB and sun angle provides this), Arugula= full or partial sun
- **Harvesting time:** BB= May-June, Beans= July-Aug, Arugula= Dec-April

Blueberry Bush
*Vaccinium ashei spp.*

- **Temperature requirements:** Frost and heat tolerances
- **Fruit yield:** Light shade
- **Soil pH:** 5.5-6.5

The blooming time, fruiting time, the water needs, sun requirements, soil preferences, root zone depths, insect attractants, disease and fungi susceptibility, growth rate, harvesting time, and maintenance requirements of each plant selected needs to work in rhythm with the others. The relationships between Blueberries, Lima Beans and Arugula is dependent upon these factors. To explain how this crop guild functions, the following diagram shows the unique symbiotic and mutualistic relationships between the three species:
Perennial Arugula
*Diplotaxis tenuifolia*

**Soil Temp:** Arugula acts as ground cover and keeps soil temp low for best mycorrhizal health.

**Growth rate:** Arugula=fast, Beans=medium, BB=slow

**Nitrogen Needs:** BB and Argula= low, Bean's N fixation is adequate to exclude fertilizing with N

**Insects:** Arugula's biofumigant properties repel insects from BB

**Coinciding pollination:** different species, same bloom time

**Root zones:** BB deepest, Beans slightly shallower, Arugula shallowest

**pH preferences:** < 5.5

**Perennial Arugula**
Labor Structure

A labor structure is formed based off the concept of guilds. In the same way that plants and animals are viewed for their relationships and not as singular objects, humans can be too. Three committees are formed to organize and make feasible the agricultural production: Produce, Process, and Sell. Committee members are able to move fluidly between committees, so information is easily shared and change and adjustments can easily and rapidly occur. Residents are required to serve on one committee, and form their own personal schedule of rotation between committees, specializing or diversifying as they choose. The three committees take into account the entire life cycle of food. The production committee is in charge of planting, cultivating, and harvesting the crops. The processing committee is in charge of cleaning and packaging the produce. And the selling committee is in charge of distributing and selling to markets.
These charts show a projected labor required for each month. It is broken up by committee: Producer, Processor, and Seller.
Agricultural Guild Two

- Clover (Trifolium spp.)
- Jerusalem Artichoke (Helianthus tuberosus)
- Daffodil (Narcissus spp.)
- Comfrey (Symphytum officinale)
- Apple (Malus spp.)
- Centaury (Saponaria officinalis)
Agricultural Guild Three

- Horseradish: Armoracia rusticana
- Crimson Thyme: Thymus serpyllum
- Cosmos: Cosmos bipinnatus
- Peach: Prunus spp.
- Clover: Trifolium spp.
- Jerusalem Artichoke: Helianthus tuberosus
Food forests are not ‘natural’, but are designed and managed ecosystems that are very rich in biodiversity and productivity. A food forest mimics the physical structure of a wild forest, but is designed to capitalize on beneficial relationships. Three food forest guilds have been designed for this site, and as with the keyline guilds, the community will experiment with creating more food forest guilds over time. Food forest guilds are intermixed with the existing forest emanating from the residential forest edge (Holmgren 2010).

**Food Forest Guild One**

- Loblolly Pine
- Pinus Taeda
- Seaside Sassafras
- Sassafras albidum
- Red-osier Dogwood
- Cornus sericea
- Bayberry
- Myrica cerifera
- Coneflower
- Echinacea purpurea
- Huckleberry
- Gaylussacia nana

Food forests are designed to meet these goals:
- To produce food, beverages, or materials for humans
- To produce forage for wildlife, particularly beneficial insects, pollinators, and song birds
- To create wildlife habitat
- To sustain themselves in native forest ecosystems
Food Forest Guild Two

- Black Locust
  - *Robinia pseudoacacia*

- Mulberry
  - *Morus rubra*

- Wild Sunflower
  - *Helianthus maximiliani*

- Elderberry
  - *Sambucus canadensis*

- Red-oiser Dogwood
  - *Cornus sericea*
Food Forest Guild Three

Persimmon
Diospyros virginiana

Serviceberry
Amelanchier arborea

Spicebush
Lindera benzoin

Fall Aster
Symphyotrichum ericoides
Fitting Into the Agricultural Market

The agricultural keylines will yield more produce than the residents will need for personal consumption. The excess produce will be sold to Birmingham’s Pepper Place Farmers Market, The Calera Farmers Market and to local grocery stores. The Calera Farmers Market is held June through August on Tuesday afternoons. In April 2011, Calera held its first annual Strawberry Festival as an outreach of the farmers market. The festival attracted some 35 vendors and between 1,500-2,000 visitors (Calera Farmers Market). This is an example of the town’s growing interest in connecting to seasonal agricultural harvests. Over time, the community has the option of diversifying their customer bank to include individuals (through a Community Supported Agriculture, CSA, operation), and institutional (local schools and colleges) buyers. A farm to school program will be developed where the school buys produce from the community and includes it in the school lunches. Selling produce at farmers markets, to stores, individuals and institutions will provide a valuable link between this community and the larger town of Calera. It is important that this community not be seen as a separate entity from Calera, but rather a contributing part of it.

Figure top right: The Calera Farmers Market started in 2012 and runs every Tuesday.

Figure bottom right: Participants compete in a watermelon seed spitting contest at the Calera Farmers Market.

Opposite page: The Calera Strawberry Festival started in 2011 and is an annual community event.
Seasonal Farmers Markets

Pepper Place Market
Where: Dr Pepper, 28th Street and Second Avenue S
When: Saturdays, 7 a.m. to noon, through Oct. 10

Fresh Market on the Green
Where: Renaissance Welcome Center, 2101 Grand Ave., Hoover
When: First and third Saturdays, 8 a.m.-noon, beginning June 6

Valleydale Farmers Market
Where: Faith Presbyterian Church, 4601 Valleydale Road
When: Saturdays through Sept. 26, 7 a.m.-noon.

Helena Market Days
Where: Helena Amphitheater, 4151 Helena Road
When: Saturdays through Sept. 5, 8 a.m.-noon.

East Lake Farmers Market
Where: East Lake United Methodist, 7753 First Ave. S
When: Saturdays through Oct. 17, 8 a.m.-noon.

Leeds Farmers Market
Where: 7901 Parkway Drive
When: Fridays, 3-6 p.m., beginning June 12.

Riverchase United Methodist Church Market
Where: 1953 Old Montgomery Highway
When: Thursdays, 1-5 p.m., through Aug. 27

Trussville Farmers Market
Where: 147 North Chalkville Road
When: Tuesdays, 2-5:30 p.m., June 2- mid-Sept.

Columbiana Farmers Market
Where: West College Street, Columbiana
When: Weekdays, noon until; Saturdays, 7-noon.

Mt Laurel Farmers Market & Craft Fair
Where: Manning Place, Town of Mt Laurel
When: Saturdays, 8 a.m.-noon, June through October.
(Calera Farmers Market).
“Wilderness is the raw material out of which man has hammered the artifact called civilization. The rich diversity of the world’s cultures reflects a corresponding diversity on the wilds that gave them birth.” — Aldo Leopold

The community is designed to be integrated with agricultural and ecological systems, allowing society to be a part of its larger context. Design was derived from first from site analysis, then keypoint identification and keyline design, and lastly community objectives. The process of design for the master plan was indicative of an order of importance: agriculture, dwellings, shared green spaces, pedestrian trails, and lastly streets and shared parking.
The keylines define the spine of the design proposal. The first step shows the keypoints and keylines within the best developable land, based off the land capability analysis. Three areas of interest are then identified based off the frequency and intensity of keypoints and keylines. Specific keypoints were chosen from these areas of intensity to use for setting up the design framework. The keypoints and keylines are used for agriculture and irrigation, pedestrian connectivity, and housing placement. Agricultural crop guilds will be planted within, pedestrian biking and walking trails will flow along, and dwellings will be N/S oriented facing the keylines. By using the keylines as a frame for the community’s designed layout, agriculture and ecology are integrated with residencies.
In addition to keypoint frequency and intensity, the location is also advantageous because:
- land is already cleared
- rich soil from past livestock inhabitation
- gentle 4-15 degrees slopes
- southern orientation
- loam soil texture
- acidic soil pH.
FIVE OBJECTIVES FOR THIS COMMUNITY

1. Promote Diversity
   - Diverse lot sizes, house sizes, and housing types promote diverse ages, ethnicity, and income ranges in the community.

2. Increase Density
   - Designing smaller lots, shared greens and shared parking promotes walkability within the community.

3. Decrease auto dependency
   - Designing shared parking areas and a connective network of pedestrian trails promotes car sharing and alternative methods of transportation.

4. Increase neighbor relations.
   - Designing shared green spaces, shared parking, and a labor structure promotes social interaction within the community.

5. Promote the keylines’ importance.
   - Designing every home with direct access to a keyline, and designing residents’ daily routes to require utilization of the keylines increases their value.

HOUSING TYPE VARIATION

Lot sizes are derived from high density urban neighborhood recommendations; however, the areas that were devoted to lawn and parking are subtracted since both parking and green space will be shared. Cutting out these two areas further densifies; and therefore, increases walkability.

- Row Homes: 25’ x 50’
- Mansion Apartments: 50’ x 50’
- Neighborhood Homes: 50’ x 50’
- Cottage Homes: 35’ x 50’
These sketches show layout configurations of homes, streets, parking and open space adjacent to the agricultural keyline. Each configuration keeps the shared open space with the keyline as a constant. Each configuration is tested by applying it to a simple neighborhood layout, shown in the appendix. After reviewing each layout, its benefits and drawbacks, the option shown in figure 5 is selected for which to move forward.

The rationality behind this decision is based off these points:
1. Homes are directly adjacent to agriculture and green space.
2. Least land use.
3. Dense, more walkable.
4. Potential to decrease auto dependence.
5. Increase neighbor relations through interaction.
6. Promotes car sharing.
7. Least infrastructure and materials required.

A note on shared green spaces:
Creating shared green spaces is an integral part of meeting the design objectives. Shared green spaces increases density and walkability of a neighborhood and creates a space for interaction between neighbors. The amount of inputs for shared green spaces is less than what it is for individual lawns: less fertilizer, pesticides, mowing, labor, and land overall.
**Design Progression**

The design is built upon the realizations from the layout configuration and multi unit relationship investigations. These realizations include incorporating diverse housing types, shared green spaces, and shared parking. The process of design for the master plan is indicative of a hierarchy of importance designed in this order: agriculture, dwellings, shared green spaces, pedestrian trails, and lastly streets and shared parking. Multiple iterations of each step are performed; however, only the last iteration is shown for each. The community addresses the stated five objectives through this design process as well.
4. Irrigation Flows

5. Keylines and Water Storage Points

6. Dwellings and Buildings

7. Greens and Pastures
KEY:
- Keyline
- Food Forest
- Green space
- Pond
- Cistern
- Agricultural Guild 1
- Agricultural Guild 2
- Lamp post
- Walkways to Homes
- Pedestrian Trails
- Street
- Personal Garden
- Personal Orchard
- Patio or deck
These perspectives show snapshots of what life is like within this community.
Reflections

“Of one thing we can be sure: our own future is inseparable from the larger community that brought us into being and which sustains us in every expression of our human quality of life, in our aesthetic and emotional sensitivities, our intellectual perceptions, our sense of the divine, as well as in our physical nourishment and bodily healing.”

— Thomas Berry

In order to be strong designer one must be able to step back, view, and critique one’s own work. This self-reflection will most likely cause a multitude of questions and objections to arise, but it is only through this process that the design will be able to progress.
The questions below have been brought about by my own self reflection and spurred by comments from reviewers. Some have been addressed more thoroughly than others, but they all contribute to a bettering discourse of this design.

1. Would this community be marketable?

This question is one I struggled with throughout the design process. I came to a decision that I would limit the influence that marketability has. If I let marketability guide this design I would no doubt have a very different design output. My project addresses its main goal foremost: to combine agricultural, ecological and social systems and to do so in a way which is true to its intent. Marketability is placed behind this objective; however, it is not ignored. Market analysis was performed, shown in the appendix. While this market analysis did shape the design output, if this model and process of community design was used for actual development, it would be more marketable in a different region of the country where cultural norms would be more promotive.

2. How are the agricultural labor needs met?

The residents are expected to perform the majority of the labor needed to support the agricultural keylines. A formation of three committees, based off the concept of guilds, organizes and structures the labor requirements. Labor needs were divided by category: production, processing and selling. Research was conducted in order to find vital information for each crop species such as: the number of plants possible, amount of produce provided, seasonal maintenance requirements, seasonal harvesting requirements, and estimated number of workers. On average, residents would devote a few hours a week, varying seasonally, in the committee of their choice. The proceeds from sales would firstly be used for inputs, potential labor and overall maintenance of the keylines. Additional monetary gains would be reinvested for other community bettering projects.
3. What if the agricultural guilds within the keylines fail?

This is a question that is somewhat external to the designer’s control; however, several design moves have been formulated to increase the sustainability of the keylines. First, much research has been done in order to design the first proposed guilds as successfully as possible. Second, it is proposed that the community work very closely with local farmers, Horticulturists, Pathologists, Entomologists, and Soil scientists in order to be trained in correct agricultural practices. Third, the success of the keylines is not designed to be solely reliant on agricultural guilds. The keylines support many other facets of the community such as biking and walking trails, lighting, and the route between one’s car and home. This extends residents’ interest in the keyline’s continuation and success beyond agriculture.

4. What makes this different from other communities which are integrated with agriculture and ecology?

Using the framework of Permaculture gave the project a starting base, but then allowed it to take its own path. Choosing this framework was beneficial to the project because of its openness for interpretation and its adaptability. There are four defining ideas which separate this project from other Permaculture communities, and other ecological and agricultural communities: guilded keylines, derived decisions, designed hierarchy, and community goals. Each of these are discussed in depth in the abstract.

5. How appropriate was the community’s location?

The town of Calera was chosen because of its rapid growth rate and the increased residential development associated with that. In addition, the site is located beside an expanding golf course community and is up for sale. These two locational pressures gave the project a driving force. However, the proposed location is a “greenfield site” (developing previously undeveloped land), and located within the suburban zone of urbanity. Although a greenfield site, it is assumed the adjacent golf course community will purchase and develop the land soon. Because of its suburban zone of urbanity, it is admitted that residents would be prone to commuting to Birmingham for work, although it would be preferred for residents to work in Calera or Montevallo. However, if a more urban location was chosen, a completely different proposal would have arisen.
Many works which contributed to this thesis work have not been included in this document for coherency’s sake. Research by design lends to a design path that diverts, skirts, backs up, and somehow makes its way forward eventually. In order for the design process to be articulated in the linear fashion of a book, many works must be eliminated. The following pages show a sampling of these works.
**LAND USE CONFIGURATIONS:**

These land use configurations experimented with the placement of agriculture, commercial and residential land uses. If started from the beginning and followed to the last test, there is a progression from a more traditional land use appropriation to a more site specific, ecologically driven, socially productive and economically viable land use design. The first few configurations showed a separation of land uses, whereas, the last shows a mix and combination of uses throughout the site. After selecting a land use configuration diagram, broad scale design investigations could move forth.
This design investigation provides for dense multi and single family homes and apartments surrounded first by shared agricultural orchards and then open green space.

Contrast from other investigations:
- Places orchards at the keypoint
- Homes at higher elevations
- Open spaces on flat land
DESIGN INVESTIGATION 2:

This design test circles multi and single family homes and apartments around orchards on the exterior and interior of shared greenspaces.

Contrast from other investigations:
- Places homes at the keypoint
- Agriculture at both higher and lower elevations
- Open spaces on highest land.
Design Investigation 3:

Design 3: This design test mixes multi and single family homes and apartments with orchards and shared greenspaces to create a dense community fabric.

Comparison from other investigations:
- Streets designed last
- Narrow streets ~25’
- Multi-use trails
- Two stages
- Shared green space and orchards
- Mixed use commercial and residential
- Stormwater filtration
- Oriented N/S for solar and E/W for winds
- Ag for economical benefit

Contrast from other investigations:
- Places homes and Ag at different keypoints
- Agriculture is more dispersed
- Open spaces are smaller but more frequent
Layout Configurations Tested

Each configuration was applied to a simple neighborhood layout design in order to evaluate it. For example, layout configuration number one (previous page) corresponds to test layout number one (this page). Lay out configuration five was used to design the shared parking spaces for the master plan.

Multi Unit Relationships
In order to attract customers, one must first know the market. It is important to realize that market demographics change, they are not static. However, the current market in Calera has a median household income of $53,000 and owns a home whose median cost is $140,000. The racial demographics show that 70% of residents are Caucasian, 22% African American, and 5% Hispanic. The average household size is 2.5 people and the median age is 31 years old (Kaetz 2011).

In order for people to live in this type of community, the lifestyle choices must be attractive to the customer. People who are interested in food sources, agriculture, environmentalism, ecology, wildlife, neighbor relationships and community bonds are the customers of this community. Among these potential customers, there are three types:

1. The ethicists: Are interested in these topics because it’s the right thing to do.
2. The trendsetters: Will make choices which support these ideals, but not if it involves sacrifice.
3. The opportunists: Focused on the economics of these subjects.

In order to “sell” the community, it will need to respond to the market demographics and also appeal to each of these types of customers (Duany 2011).
In order to help us understand Small Town, USA situated amongst its context, we can use something called the Urban to Rural Transect. The Urban to Rural Transect has evolved over time, from the nineteenth century to the present. It started with its roots in ecology, describing sequential ecotones and edges. Patrick Geddes, a Scottish biologist and urban planner took this ecological transect a step further, and related different ecological zones to societal use. For example, a section would be labeled both “Coastal Ecotone” and “Fishermen”. Duany Plater-Zyberk has recently updated the Urban to Rural Transect to include form. The zones in his transect are as follows: Natural, Rural, Sub urban, General Urban, Urban Center, and Urban Core (Duany 2011).

The sub urban sector of the transect represents the location of most American small towns. A small town was chosen as the project’s location, because over the next few decades, most people are going to find themselves living in this already well established environment. Most ordinary people will continue to live in small towns instead of large cities for justifiable reasons: better school systems, more space, larger house and lot sizes, less taxes, closer to family, etc. However, because of the negative environmental and social effects from this small town development, it is an urgent task to figure out how to re-configure our existing forms of design in these areas. Some of the advantages that small towns offer for creating an agricultural community are: development happens at a slower pace, consensus is easier to gain, land is less expensive, and developing new codes and regulations can be easier in small towns, Because development can act as an economic generator, there is mutual benefit to the small town as well (Walters 2010).
EXISTING CONTOURS AND ROADS
References


“Realize the universe is a communion of subjects, not a collection of objects.”—Thomas Berry