The UCCS Greenhouse and Farm: Reconnecting People, Place, and Food

by

Sara Santa Cruz

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This thesis for the Master of Arts degree by

Sara Santa Cruz

has been approved for the

Department of Geography and Environmental Studies

by

__________________________
David Havlick, Thesis Committee Advisor

__________________________
John Harner, Committee Member

__________________________
Tom Huber, Committee Member

__________________________ Date
Dedication

I dedicate my thesis work to the incredible support group that has stood by my side for years. It has truly been a labor of love to get to this point, and it would not have been possible without the people who surround me. A special acknowledgment of gratitude to my parents, Cameron Santa Cruz and Liz Atamian, for their unwavering love and patience. To my late grandmother, Jeanne Marie Ferrell Johnson, who pursued a life of education (she even taught geography), and instilled in me an enduring love for academics and the ambition to chase my dreams.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

The Global, Industrial Food System

There has never before been a global food system: something as far-reaching and pervasive as what we now experience. Historically, food has been largely localized and place-specific, even with early global trade. What was available depended on seasonality, with local varieties of crops and livestock adapted to specific geographies. People were directly connected to their food and had to labor for it in some way. Additionally, agrobiodiversity and cultural values shaped food choices. Through hunting and gathering or subsistence and small-scale agriculture, people and food grew and developed together, which proves to be a stark contrast from the disconnect we see today.

Throughout the past century, technological advances and races to “feed the world” have led to new developments in the food system—some of which may seem harmless, and even beneficial. This period of development between the 1930s and 1960s is called the Green Revolution. With 7.3 billion people on the planet, scientists have created new “improved varieties” of many food plants, which mature more quickly and provide more calories. Another example of a “success” of the Green Revolution was the tripling of cereal crop production, which resulted in just a 30% increase in land use (Pingali 2012). This is important, as more land becomes urbanized and less available for agricultural production, while the population simultaneously rises. These new, high-
yielding varieties are also more guaranteed to be successful, reducing the overall risk for farmers and making themselves even more enticing (Pingali 2012).

However, there are negative impacts associated with this system of new crops. In this type of food system, both the physical and social landscapes are ignored. Food production has become more of a machine than a living process, and food itself has become a commodity, threatening biodiversity, ecological knowledge, and society’s connection to food. Today’s industrialized food system puts quantity and profit over quality and health. To maximize production, enormous and environmentally degrading commercial farms and concentrated animal feeding operations (CAFOs) have become the face of farming, delocalizing (think large corporate farms vs. small, community- or family-based farms) and creating barriers to healthy systems. Guided by a political economy and desire to profit, agribusinesses produce and import food for year-round consumption, but indirectly export drought, soil degradation, groundwater exploitation and human dislocation (Dev 2011). Modern, industrial agricultural practices are fossil fuel and input intensive, and these inputs replace farmers (Thu 2009), further separating people, food, and place.

If food is a commodity, then agriculture is now more appropriately deemed “agribusiness.” The global, industrial system utilizes pesticides, herbicides, and fertilizers to increase production, without replenishing the nutrients in the land or letting it lay fallow. As Robbins (2012) calls it, this “global chemical commodity chain” (75) has created a political economy all its own. This increase in usage of chemical inputs is both staggering and hazardous. For example, the 1990s saw the use of 3.5-4 times the amount of nitrogenous fertilizer compared to use in 1961 (Yapa 1996), and the EPA has blamed
modern farming practices for 70% of the pollution in the rivers and streams in the U.S. (Horrigan et al. 2002). In addition, nitrogen run-off has been wildly detrimental to environmental health, contributing to phenomena like the Mississippi Dead Zone (Horrigan et al. 2002), an area in the Gulf of Mexico where life cannot exist, since fertilizer and sewage run-off have made the water hypoxic.

In this food system, economics outweighs environmental stewardship, leading to less nutritious food and a suffering landscape. This has created a global crisis regarding natural resources and food sovereignty, which is the right of people to define their own food systems. For example, more calories are produced, but the foods contain less micronutrients (Pingali 2012). In this way, corporations and a political economy can be viewed as the root of the global crisis (Gonzalez 2011). Demand has been created for exotic and out-of-season foods that cannot be produced locally. The global food system has given people the ability to eat fresh fruits and vegetables year round in the temperate and even sub-polar zones because of the increasing lengthy production networks described in our food chain clusters (Hendrickson and Heffernan 2002).

An unusual aspect of our culture today is that the food we eat has a global impact. The garlic used in a favorite pasta dish could be from China, travelling nearly 7,000 miles to flavor a meal. The ways in which food is grown, stored, transported, processed, and then cooked can all influence how it impacts climate change and the environment, according to the Natural Resources Defense Council (“Food Miles…”). For much of agricultural history, food was eaten seasonally and was almost always local—except for spices and rare items acquired through trade. However, the industrial era has created an
industrial culture, putting at risk the ability of our food system to continue to feed billions without massive inputs of nonrenewable resources.

**Purpose of Study**

My research question is: in which ways can the University of Colorado Colorado Springs (UCCS) Greenhouse and Farm be utilized to encourage food literacy on campus? Alternative food systems have the potential to shift food systems away from the industrial model, and begin to restore landscapes and cultures. A study by Terry and Lawyer (1995), revealed that college students perceive the current food supply to be safe (in terms of pathogens), and that it has a positive impact on both the economy and the environment. This highlights students’ cultural disconnect from food and place, as they appear to be unaware of the negative impacts of the global food system, in terms of both environmental and human health. Overall, it revealed a lack of food literacy among people, and an opportunity for food education.

Food literacy includes all forms of food education, such as community and school gardens, cooking classes, and taste education. Growing food, even at the household level, is particularly effective in introducing people to a healthier, holistic approach to food, as it links people to their geographic place and can facilitate cultural and social bonds. Additionally, food literacy includes education on the environment, and how food production and consumption should be environmentally conscious acts that steward people and place.

My research focuses on the UCCS Greenhouse and Farm, and identifies opportunities for it to serve as a campus resource for place-based food literacy. By administering surveys to students, I collected qualitative data that: a) gauges
students’ awareness of the UCCS Greenhouse and Farm, b) gauges students’ awareness of place-based foods and food systems, and c) identifies ways in which the UCCS Greenhouse and Farm can serve as a resource to encourage food literacy.

The UCCS Greenhouse and Farm utilizes traditional agricultural and permaculture methods, but has only been a part of the campus infrastructure since 2012. I sought to assess how many students are unaware of the existence of the UCCS Greenhouse and Farm, and whether or not they have an awareness of place-based foods or alternative food systems. Additionally, I asked if students would like to have input regarding educational opportunities at the UCCS Greenhouse and Farm. The responses from the survey can help determine opportunities for future development at the UCCS Greenhouse and Farm, encourage students to participate in food literacy, and provide justification for in-situ academic programming centered around food.

**Study Area**

The study area for this proposal is the UCCS campus. As a campus-wide food literacy study, it adds to a body of research on food literacy at the level of the campus community. The survey was limited to students, which allowed me to gauge awareness of and experiences at the UCCS Greenhouse and Farm, and whether or not students are aware of place-based foods and food systems. Also, it allowed me to determine what students would like to engage with at the UCCS Greenhouse and Farm to encourage food literacy. The results will hopefully influence further development of programs at the UCCS Greenhouse and Farm, and aid in its development as a campus resource to encourage food literacy, and reconnect people, place, and food.
Significance/Justification

The results of this study will help to determine the effectiveness of the UCCS Greenhouse and Farm in contributing to the food literacy of UCCS students. Place-based learning that incorporates permaculture, traditional agricultural methods, and classes about food and sustainability can all serve as platforms to reconnect people, food, and place. Once it is understood how students interact with the UCCS Greenhouse and Farm and how they would like to use it, further programs can be implemented on campus that continue to foster the social and physical landscapes by educating people about place-based foods and environmental stewardship. In addition, the survey can become an assessment tool that can be re-administered for future uses and studies.

The UCCS Greenhouse and Farm is in the process of changing from a high production model to becoming a model for regenerative and place-based agricultural techniques. By administering surveys to students and interviews to a graduate student, a faculty member, and a staff member, I hope to gauge students’ awareness of the Greenhouse and Farm, their awareness of place-based foods, and ideas on how the Greenhouse and Farm can be incorporated into curriculum. With this information, the UCCS Greenhouse and Farm can continue to develop in ways that can serve to reconnect people, food, and place.

Food is produced thousands of miles from where it actually ends up, undergoing processing, cooling, storage, and shipping—all of which have a negative effect on the planet and its finite resources. The justification for these problems is that we simply need to produce more food, and this is the only way. Unfortunately, the reality is that the consumption of resources is greater than the rate of regeneration (Horrigan et al. 2002).
As participants in the global food system, we have outsourced the growing of food crops in order to grow more food for cattle, racking up food miles. Monocultures have sprung up worldwide, destroying soil and requiring massive amounts of pesticides and herbicides for maintenance, and global pesticide use is estimated at 4.7 billion tons per year (Gopalan 2001). Genetically modified fruits, vegetables, animals, and grains have been engineered for more production, while natural seeds and crops are becoming harder to find. In addition to the effects on the environment, industrial agriculture is harming humans, and studies show that consumption of foods with extensive chemical (including additives, growth hormones, preservatives, and adulterants) inputs interferes with the body’s natural processes (Gopalan 2001), giving due credit to the adage “you are what you eat.”

The environmental impacts of the global industrial food system are numerous. A 2007 Intergovernmental Panel on Climate Change report estimates that agriculture accounts for roughly 10–12% of global greenhouse-gas emissions, with an expected increase of up to half by 2030 (Parry 2007). Additionally, agriculturally induced land use changes, such as deforestation, overgrazing, and conversion of pasture to arable land, accounts for a further 6–17% of global greenhouse-gas emissions (Friel et al. 2009). This compounds the crisis of disconnect propelled by the global food system by promoting unsustainable cultivation practices, creating a positive feedback loop that increasingly worsens the state of the environment. Along with environmental degradation comes social degradation, as people tend to be ignored in today’s global food system, and today, food, bodies, and eating are disengaged from the social contexts in which people live their lives (Delormier, Frohlich, and Potvin 2009). There is hope, however, in restoring
environmental and human health by educating people about place-based agriculture, including biodiversity, food sovereignty, and ecological design.

**Biodiversity**

Throughout history, small-scale agriculture played a historic role in regenerating habitats and allowing for sustainable harvests (Nabhan et al. 2010). By encouraging urban agriculture and local and seasonal foods, biodiversity can again become valued and positively impact local food systems. Historically and globally, people have cultivated and consumed a multitude of plant and animal products, which has been observed to be important for health (Müller 2005), as eating a variety of plant and animal products that are locally produced offers more opportunities for healthy bodies and healthy landscapes. Despite the global food system, diets have become less diverse as processed foods and exotic, imported foods out-compete local varieties.

Biodiversity is a key aspect of sustainable food systems and healthy landscapes. Sustainability, according to the EPA, creates and maintains the conditions under which humans and nature can exist in productive harmony, that allow for fulfillment of the social, economic and other requirements of present and future generations (EPA 2014). With that in mind, sustainable food systems would incorporate numerous wild and cultivated crops, along with sustainably produced animal products. According to Thrupp (2000), practices that conserve, use, and enhance biodiversity are ethically necessary at all levels in farming systems, and are of critical importance for food production, livelihood security, health, and the maintenance of ecosystems.

Unfortunately, biodiversity has dwindled with the growth of the industrial food system. Chemical inputs intended to increase production have decimated the biodiversity
of both plant and animal populations. In the 1962 book *Silent Spring*, Rachel Carson explored the negative effects of chemical fertilizers, herbicides, pesticides, and insecticides that boomed after WWII. The book gained attention and exposed the harsh environmental degradation that is experienced when quantity and economic gain are valued over health. The author states, “Only within the moment of time represented by the present century has one species—man—acquired significant power to alter the nature of his world” (Carson 1962: 5).

With unsustainable farming practices fueling a global food system, a startling amount of biodiversity has been lost. It is estimated that 95% of the world’s food crop diversity was lost in the 20th century, which is likely linked to the observation that only 150 plants are cultivated large-scale, out of a possible 75,000 edible plants (Gonzalez 2011). Loss of biodiversity affects animals, as well, and the Food and Agriculture Organization of the United Nations (FAO) estimates that one breed of livestock becomes extinct somewhere in the world once every week (Thrupp 2000). This loss of edible biodiversity affects the environment, disrupting natural plant and animal relationships, and altering the foods available in the ecosystem.

Over time, plants evolve traits that allow them to thrive in a specific context. It may take wild plants thousands of years to develop complex resistance genes, but modern breeding methods (like genetic modification) are reducing this resource (one resistance gene at a time) faster than nature can replenish it (Myers 1983). Today, these specialized, place-based landraces are in danger. Many types of native crop gene pools have become extinct in their indigenous communities, and a lack of food literacy (i.e. seed-saving, lack of farmers) (Nabhan 1985) has accompanied and contributed to this issue. In Indonesia,
for example, modern rice varieties (planted in monocrops) have largely replaced traditional varieties and diverse regions. This is due to a demand to produce more in less time, and has resulted in the loss of 1,500 local varieties of rice, all in just 15 years (Horrigan et al. 2002).

Groups such as Renewing America’s Food Traditions (RAFT) and Slow Food (Bowen and De master 2011) have undertaken the process of recovering and protecting the heritage and traditions associated with local agricultural products. These organizations view food as physically and socially important, and seek to save foods and their cultural nuances from being lost in a global food system. RAFT—an alliance of environmentally conscious chefs, native food activists, and ecologists—has already identified 267 wild species and subspecies of place-based foods that are at risk of extinction in North America (Nabhan et al. 2010). Their efforts have successfully led to the creation of a catalogue of at-risk foods and crops, but require more public participation.

Similarly, Slow Food is a global organization that links good food to the environment and society. Slow Food strives to defend food traditions, protect communities, and preserve biodiversity (“What We Do” 2015). One of their projects, called The Ark of Taste, seeks to record and catalog place-based foods that are at risk of becoming extinct. Their efforts foster agrobiodiversity, as well as sustainable landscapes and diets. Both RAFT and Slow Food take holistic approaches to the conservation of biodiversity, and consider the ecological system the food is a part of—including people and place.
Some communities have gotten on board, and are trying to prohibit further loss of biodiversity, and have sparked counter-movements dedicated to restoring their food landscapes. Many communities engaging in local food shifts recognize biodiversity as an integral piece of a sustainable future and work toward educating citizens about their foodshed. Biodiversity is a key public good in terms of ecological capital (wildlife habitat, diversity in diet, regeneration, etc.) and economic capital (buffer crops, pest deterrence, etc.), and the public values it can provide need to be demonstrated and captured (Pascual et al. 2011). If people can reestablish relationships with the land and the diverse plants and animals that once made up “food,” then biodiversity can begin to reestablish itself as a cornerstone of a healthy landscape.

**Food Sovereignty and Food Justice**

Food sovereignty and food justice imply the ability of people to access healthy food that is both culturally and geographically appropriate. Food sovereignty means that people should be in charge of their food system, while food justice implies equal access to culturally appropriate, healthy food. Loss of biodiversity means a loss of the richness of traditional and geographically appropriate foods, leaving people at the mercy of mass-produced, global food options.

At the same time, increasing global development has led to a decrease in food security. The FAO defines “food security” as all people, at all times, having physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Food and Agriculture Organization of the United Nations 2001). In some regions, loss of biodiversity diminishes opportunities for food sovereignty. This is troubling, as marginalized...
populations already experience limited access to appropriate food and appropriate calories, and often do not have the option to grow food. In developing countries, the negative effects of biodiversity loss are compounded, as economic shocks can mean life or death. Reduced cereal and rice yields are the most troubling in terms of food insecurity in poorer countries (Dixon et al. 2009), especially with a lack of agrobiodiversity that would traditionally provide nutritional variety, as well as a buffer crop for times when food is scarce.

In terms of food sovereignty and food justice, the environment that people live in directly affects food behaviors. These behaviors include all aspects of connecting to food, from the cultivation of home gardens, to purchasing food from a market or convenience store, and even knowledge of preparation techniques. Urban developments have created food access problems, and even in the 1960s, theorists were beginning to link sprawling suburban development to health issues (Lake and Townshend 2006). These health issues include diabetes, overnutrition (too many calories, but not necessarily enough vitamins and nutrients), and a myriad of other food-related problems. Additionally, Lake and Townshend (2006) assert that people interact socially with their environments, which influences health through physical design (i.e. lack of access to fresh food) and socio-cultural rules and norms.

Fast food and processed, packaged foods from supermarkets populate the media and shelves and create demand for unhealthy, cheap options. Due to the nature of the social environment, food, people, and eating have become disembodied and disengaged from the social contexts in which we live our lives (Delormier et al. 2009). Although the disconnection is unhealthy for the environment and society, it is also an opportunity for
citizens to become educated and make shifts toward more environmentally conscious food choices that utilize local foodsheds and urban agriculture.

**Local Foodsheds**

Foodsheds are the regional and place-based spaces where food is produced for a community. What exactly the terms “local” and “regional” mean varies with each individual place, but the idea of cultivating and harvesting food in a sustainable way is the underlying message behind restoring and reconnecting with our foodsheds. According to Metcalf and Widener (2011), whether or not the local “foodshed” is defined by the extent of its bioregion, a fixed radial distance from a center point (e.g., 100 or 200 miles), or a set of counties surrounding a core metropolitan area, the foods provided by a foodshed link people to the place they live in, creating environmental and social connections. In this way, “foodsheds” are socially constructed. To restore foodsheds and make them more viable, cities should be switching the urban focus from planning to “planning for future planting,” starting with a bottom-to-top approach. This way, farmers, ranchers, and other producers are involved in the restoration and restructuring of local food systems (Metcalf and Widener 2011).

Farmers and producers are a key aspect of sustainable food systems, especially for social reasons. Before the current disconnect that people experience with food, people interacted with producers and artisans, mainly at markets or by living closely with them in their communities. Direct contact guaranteed livelihoods for small and medium-scale farmers who rely on relationships to sell their goods. This also allowed people to connect their food to a specific place and person, adding value to the quality of the food. When people have direct contact with other people growing their food, it is mutually beneficial
(Payne 2002), which supports the rising numbers of farmers’ markets seen in the United States. Today, however, there is a global decline in farmers, which parallels the rise of agribusiness (Thu 2009) and positions itself against restoring connections between people, place, and food.

Throughout the United States, communities have banded together against the global food system, and have reintroduced (or added more) farmers’ markets and direct purchasing to their food systems. Especially important for food security and justice, increasing numbers of farmers’ markets are accepting SNAP benefits (formerly known as Food Stamps), according to the USDA (“EBT”). SNAP benefits are a form of government assistance for those who are already food insecure. This is crucial, as people of any socioeconomic status should have access to the fresh foods and social benefits provided by farmers’ markets.

For farmers to fight back with locally produced foods against cheap, processed foods, urban agriculture and farmers’ markets need to be a consistent occurrence in communities, so they can become established and utilized (La Trobe 2001). Unfortunately, people have been removed from the acts of cultivating and purchasing fresh, seasonal, unprocessed foods, so urban agriculture and farmers’ markets and what they offer may seem unfamiliar. There is a need for place-based foods to restore food security (Nabhan et al. 2010), and for education that accompanies these foods, like cultivation and cooking techniques. Research has shown that many people visit farmers’ markets simply out of curiosity (La Trobe 2001), without knowing how much of a resource it can really be to them.
Food Literacy

At this point, it seems that people cannot be expected to redevelop connections to food and place without the educational component: developing food literacy. The global food system has made traditional food knowledge obsolete, erasing cultural and regional associations with food and crops from the memories of people around the world. Food literacy is food education, which means teaching people about their communities and foodsheds, so as to create a value system around local and sustainable food.

Food literacy should start at an early age, so that healthy choices can be made throughout life and prevent a larger loss of food knowledge and values. One study of a California elementary school revealed that the students could not describe different types of farms or purposes for the varieties of these farms, or the cultural implications of conventional farming (Hess and Trexler 2011). If children are not being educated about the cultural, historical, and environmental attributes of their food, then they are not connecting to their food. It appears to follow, then, that adults cannot be expected to have connections to their food and place, either, nor the ability to aid their communities in local food shifts.

Reconnecting

In the United States, the oversaturation of the market with sugary, processed, nutrition-less foods has conditioned taste preferences in our contemporary industrialized society. For many, food is oversimplified and polarized into categories of either good or bad (Stevenson et al. 2007), like pizza versus vegetables. The disconnect with food means that people often do not equate fresh, raw, unprocessed vegetables with “food” or “meals” and the global food system has given these whole foods the reputation of being tasteless
(Stevenson et al. 2007) (i.e. through prioritizing traits such as longevity and size over flavor). To restore foodsheds, people need to be reacquainted with real food, and taste their place.

Food today is not valued or respected as it has been throughout time and place. As a cultural piece, an aspect of health, an expression of a landscape, and the product of strenuous labor, food has shaped society, and vice versa. However, our modern, industrial, and global food system threatens agrobiodiversity and the knowledge of whole and healthy foods. Thousands of species of plants and livestock traditionally used for food have been lost, taking with them the flavors and nuances of their time.

If local food shifts and foodshed restoration are going to happen and re-landscape communities for a healthier future, then all levels of production must be involved—especially education around cultivation. Starting with the growers and producers, people must determine what is culturally and geographically appropriate for their foodshed. To aid in this, implementation of urban agriculture is a key piece, linking people not only to other people, but also to their geographic location. Food literacy and urban agriculture go hand-in-hand, and both must be incorporated to educate people about their foodshed, its significance, and what it means to grow food in ways which steward the planet and the people.

Food literacy involves any and all parts of food education, from cultivation and harvesting to consumption, preservation, and composting. It should be well rounded and interdisciplinary, so as to encompass the environmental and social nuances involved with food. In terms of food literacy, it seems as though a good starting point would be with cultivation techniques. These techniques include traditional agricultural and permaculture
methods. Both of these—when applied properly—culminate in unique, place-based food literacy.

**Traditional Agricultural Techniques**

In today’s global, industrial food system, the average farm uses 3 kcal of fossil fuel energy to produce 1 kcal of food energy (Horrigan et al. 2002). This is due to the added inputs that have replaced traditional ecological knowledge and mindfulness of ecological systems. It has also led to a disconnect between culture and agriculture by distancing people from the source of their sustenance. Throughout agricultural history and up until the recent shift to a global system, the cultivation of food played a pivotal role in society, building community and facilitating the flow of traditional ecological knowledge.

When attempting to encourage food literacy through cultivation, traditional agricultural techniques can serve as a foundation, as they take into consideration elements of both food and place. It is also important to remember that people are the reason agriculture and specific food crops have flourished, and traditional agroecosystems “…represent centuries of accumulated experiences of interaction” (Altieri and Merrick 1987: 88). Traditional methods remind us that "cultural landscapes" should be seen as the tangible meeting point between the mind and nature (Naveh 1998), and provide an example of the intrinsic and binding connections between people, food, and place.

It is important to understand our environment, especially if we are to be good stewards. Traditional ecological knowledge represents the ability of people to utilize local resources with their intimate knowledge of their place (Altieri & Merrick 1987), and educating people about their environment can restore this knowledge. By utilizing this
traditional ecological knowledge—which is embedded in cultural milieu (Agrawal 1995)—people can reconnect not only to food and place, but also to the social and cultural landscapes. Campus gardens and farms can act as living laboratories; places for students to connect to their place, learning about landscape-level processes through direct interaction with the environment.

**Permaculture**

The term “permaculture”— coined by David Holmgren and Bill Mollison in the 1970s— describes an integrated system of (mainly) perennial or self-perpetuating plant and animal species. These species are part of a dynamic system that is encouraged to adapt and change to the landscape (Holmgren 2002). It employs techniques, such as succession and companion planting, which make use of the natural landscape, ideally without any inputs from outside the established system.

Permaculture itself is more of a development strategy (Veteto & Lockyer 2008), meant to guide toward sustainable and regenerative systems. Permaculture principles can be applied to any field, but when applied to agriculture, its elements are grounded in knowledge of local ecology, landscape geography, and political and social systems. When considering food systems, permaculture’s main tenet is to aid in the creation of agricultural systems in accordance with environmental knowledge, emphasizing connections and a holistic approach (Veteto & Lockyer 2008).

**Place-Based Food Literacy**

Both traditional agriculture techniques and permaculture methods focus on context-specific cultivation and connections between the physical and social landscapes. However, actually educating people about these can be difficult, as it requires an
experiential, place-based educational component. Knowledge is situated, and therefore, education to reconnect people to their food and their place should also be situated accordingly. Experiential learning is one example of how to accomplish this.

Experiential learning involves students interacting in activities that are meaningful to them (Parr & Trexler 2011). Focus is placed less on the content, and more on the process of learning. For this to apply to cultivation of food, education should ideally happen at a garden or farm, where students can directly engage with the lesson. In this case, the education also becomes place-based. Lessons can then be designed to educate on the ecological processes involved in food production.

According to Lieblein et al. (2004), place-based learning is socially and culturally constructed. Education at the community level is crucial, as social networks once constituted food sovereignty and knowledge. It seems that food literacy programs should target communities, focusing on land-based social relations (Wittman, Desmarais, & Wiebe 2010). Since food has been stripped of its attachments to people and place (McMichael 2000), it will take community empowerment to effect change that can potentially reestablish those connections.

Learning itself is a social process rooted in cultural norms and values, and food behaviors form in relation to other people and the social context (Delormier et al. 2009). Therefore, engaging a community—even a campus community—can promote successful education. With place-based food literacy, people from different backgrounds have a space to share life histories and connect food to people and place. This creates tight bonds that support the community, the land, and the food.
The Role of Campus Gardens and Farms in Food Literacy

Sustainable food initiatives have expanded rapidly in higher education in North America in recent years, joining green building, energy, water, and waste as foci of campus sustainability efforts (Barlett 2011). Through direct-sourcing of local food, courses on the global food system and its alternatives, and campus gardens and farms, students across the nation have increased opportunities to engage with the food system in some way. Campuses provide the space to offer experiential learning that teaches sustainable, ecological growing practices, but can also be transformative in new careers and orientations to food and place, drawing enthusiastic gardeners from students, faculty, staff, and community members (Barlett 2011). In particular, campus gardens and farms have the potential to educate students on holistic cultivation practices by utilizing place-based techniques and agroecology. By its nature, agroecology is interdisciplinary and facilitates learning through a systems approach, taking into account multiple factors and considering their relationships (Francis et al. 2011) and educating on whole systems.

A wide range of educational programs including apprenticeships, internships, workshops, and beginning farmer-training programs are developed on student farms. Student farms are critical facilities training future producers and educating food-system leaders through diverse learning opportunities in sustainable agriculture production, marketing, research, community engagement, and professional development (Parr and Trexler 2011). Academic engagements with sustainability and food have led the way on some campuses, and community gardens and farmers markets add experiential learning about sustainable food to college and university life. (Barlett 2011)
According to Kloppenburg and Hassanein (2006: 420), academic food programs can add legitimacy, build public awareness, and foster the emergence of “food citizenship,” changing relationships with food and the local bioregion. In a study by Hassanein (2008), students were interviewed about their experience at the University of Montana Missoula PEAS Farm. All of the students interviewed mentioned learning about the food system—including conventional, alternative, and local aspects (Hassanein 2008). In addition, students remarked that talk and discussion around food and sustainability increased, creating social ties and decision-making processes centered around the ecological cultivation of food. Importantly, this collaborative action creates a powerful public space for individuals to develop as food citizens by participating in food systems shifts in a meaningful way, through varying degrees (Hassanein 2008).

Local knowledge and the experience of growing food are key components to food literacy, and penetrate deeper than simply providing food. For example, sites of urban agriculture (like gardens, farms, etc.) can serve as backdrops for cross-cultural understandings and knowledge flow, as well as reproduction of a shared culture (Taylor & Lovell 2014). Furthermore, the success of gardens and farms requires these strong social networks and collective interests (Hale et al. 2011), reinforcing community ties and knowledge flow that is both vertical and horizontal.

Place-based educational programs about farming and food systems can steward the social landscape, educating on aspects of both social and natural science (Sobel 2004). Additionally, place-based learning employs participatory approaches, involving the local community and incorporating local knowledge that is relevant and contextual. This enhances community vitality and environmental quality (Sobel 2004). Through
these means, place-based education can be an effective way to begin to put the “culture” back in agriculture.
In response to nationwide and even world concerns over food, colleges around the country have chosen to take a stand and reform their food options. Some campuses have gardens and farms, others source local food as much as possible, and some combine a mixture of the two. Students at the University of Colorado Colorado Springs (UCCS) have a resource on campus—the UCCS Greenhouse and Farm—that is brimming with ecological design and opportunities to reconnect people, place, and food.

Other schools, such as the University of Montana in Missoula; University of Massachusetts Amherst; and the University of California, Davis; have established campus farms and food literacy programs. Food—due to its political economy, connections, and resonance with family and tradition—can be a strong location for campus sustainability initiatives (Barlett 2011). In this way, campuses can act not only as catalysts for change, but can also serve as models for UCCS as we attempt to create an efficient, consistent, mindful, and sustainable greenhouse and farm.

The University of Montana in Missoula has a self-operating food service, much like UCCS, and utilizes farm produce in the campus dining hall. Additionally, they have academic programs that are farm-based, which can be accessed through the Environmental Studies major. The Franklin Permaculture Garden at UMass Amherst is an aesthetically-pleasing and functional space that has garnered attention from the
campus community, and even nationally, winning the “Campus Champions of Change Challenge” from the White House. Another example is Student Experimental Farm at UC Davis, which has engaged the community in regenerative growing techniques, and includes spaces for a vineyard, a market garden, and more. As UCCS continues to develop, it can look to these schools for examples on how to engage students and make the most of place-based food literacy.

University of Montana

Dining Garden and PEAS Farm

Located in beautiful Missoula, Montana, the University of Montana has multiple gardens and farms that serve as living laboratories for students. Most notable are the UM Dining Lommasson Garden—used primarily for production and farm-to-college consumption—and the PEAS (Program in Ecological Agriculture and Society) Farm, which is utilized for education and production. These two spaces are meant to educate students about the ecology of food systems, and do so through courses, internships, and overall visibility. By engaging students in interdisciplinary, hands-on learning, the University of Montana turns out graduates that are aware of the complexities and vulnerabilities of food systems.

The UM Dining Lommasson Garden is dedicated entirely to food production for campus eateries. The UM Dining Lommasson Garden is comprised of four main components—multiple raised beds, a kitchen orchard, a large permaculture area of native plants, and a passive solar greenhouse—which are maintained by student employees and volunteers (“UM Dining”). In order to encourage campus involvement, the UM Dining Lommasson Garden is located directly between the dorms and the dining hall. This
location allows for people to see what is happening in the garden, and to connect their food from seed to plate to soil again, demonstrating holistic systems thinking.

The UM Dining Lommasson Garden volunteers work under the guidance of a Farm-to-College Coordinator, a student gardener, and a garden manager. In addition to regular tasks like planting, weeding, and watering, the university engages students in soil classes to analyze and amend soils to create healthier plant communities (“University of Montana Dining Services Garden”), and utilizes botany students to help with seed-saving and plant selection. These educational opportunities allow students to employ sustainable practices and address environmental issues, with the ability to then taste the benefits of their work.

The UM Dining Lommasson Garden not only provides fresh, nutritious food for the Food Zoo (the main campus dining hall)—it is also an interdisciplinary living laboratory. Since permaculture techniques are used, it is a place for people to witness the relationships between plants and animals that have taken thousands of years to develop. The addition of season extenders, like high tunnels and a greenhouse, has helped to start the Wintergreens project, allowing the campus to grow food in colder temperatures through the creation of modified environments and microclimates that are suitable to plant growth, even in the cold and semi-arid climate of Montana (“University of Montana Dining Services Garden”). The campus also operates as a closed-loop system, using the food waste from the dining hall in compost piles, where it will be returned to the soil to nurture other plants as they grow.

In addition to the UM Dining Lommasson Garden—and on a much larger scale—the University of Montana operates a functioning campus farm. Called the PEAS Farm,
this resource is located two miles off-campus, and provides opportunities for place-based farm education. The PEAS Farm is geared toward food literacy and community engagement, and seeks to address the geographic and social distance between producers and consumers (“Environmental Studies Sustainable Food and Farming Emphasis”). The farm hosts internships and courses, which can be applied to undergraduate and graduate degrees. The university does not have an agriculture program (the state university in Bozeman is the state’s land grant institution), but offers undergraduate and graduate degrees in Environmental Studies, and specializations in Sustainable Food and Farming, which turn out students with the ability to cultivate food and community.

Sitting on roughly 10 acres of land, the PEAS Farm provides education about agroecology and community action. Farm-based courses that are offered throughout the year (and which apply to the degree specialization in Sustainable Food and Farming) include: Culture and Agriculture; Food, Culture, and Environment; Assessing the Food System through Action Research; and the Politics of Food. Additional courses that utilize the farm for education include: Basic Human Nutrition, Medicinal Plants, Introductory Soils, Community Forestry, and Agroecology (“Environmental Studies Sustainable Food and Farming Emphasis”). In addition to coursework, students have the opportunity to intern at the farm and engage in experiential learning.

Throughout the spring, summer, and fall sessions, interns produce food for community food banks, as well as a community supported agriculture (CSA) program (see fig. 1 for photograph of harvest). By the end of the internship, students will have been involved in all aspects of the farm, from annual cropping and soil-building to weed
and pest management (“Environmental Studies Sustainable Food and Farming Emphasis”).

Fig. 1. Photograph of PEAS Farm Harvest

Through coursework and place-based experiential learning, the University of Montana has created spaces for food literacy on campus. The Dining Garden and PEAS Farm serve as living laboratories to educate students on all aspects of food production, including physical and social aspects. In addition to stewarding the landscape and the community, the PEAS Farm embraces the sense of place and ecological history of Missoula through coursework, such as Range Livestock Production. This model is well rounded, effective, and inclusive, and can help guide us at UCCS as the Greenhouse and Farm continues to develop.
UMass Amherst

Permaculture Initiative

When considering ecological design as a means to educate students about cultivation techniques, the University of Massachusetts Amherst manages to engage the campus community while stewarding the environment. Originally just a campus green space, the Franklin Dining Commons began to transform in 2009. Set to become a parking lot, students worked with administration to create a more sustainable and usable space on campus. A team of students—along with a single professor—envisioned a permaculture garden that would highlight socially and environmentally conscious cultivation. The group partnered with graduate student and permaculture designer Ryan Harb in 2010 to make their vision a reality, becoming one of the first permaculture gardens at a public university in the United States (“Permaculture Initiative” 2015).

Focusing on community investment, a design charette was held in 2011 to gain interest and support from the campus community and potential stakeholders. This allowed for inclusiveness in the design process, and also encouraged shared ownership of the space (“Franklin Permaculture Garden”). At the end of the charette, more than 40 designs were collected. The designs were analyzed, and a single conceptual design was chosen that best complemented the goals of the garden. The goals include, but are not limited to: education, growing food that students/staff/faculty want to consume, aesthetics, permaculture techniques, and working with site conditions, like water and sun angle (“Franklin Permaculture Garden”).

Working with a quarter-acre plot, Ryan Harb and a team of students set out to implement changes. The chosen design contained roughly 1,500 plants of 150 different
species (“Franklin Permaculture Garden”). From an aerial view, the Franklin Permaculture Garden is leaf-shaped (see fig. 2 and fig. 3), and is divided into five sections. Each is themed, and contains a mixture of annual and perennial plants. The core considerations for the garden design are permaculture-based, and include high visibility forest gardens, ecological design and stewardship, diverse and productive habitats, and storm water management (“UMass Permaculture”). With student involvement throughout the years, the garden has continued to evolve to meet these considerations.

In its first year, the Franklin Permaculture Garden produced 1,000 pounds of food, and by 2014, the total production surpassed 4,500 pounds (“Franklin Permaculture Garden”). The food is utilized by the Dining Commons, adjacent to the garden. The location is ideal in terms of educational opportunities, since students can observe the garden, participate in growing food, and enjoy the yield—all within a few hundred feet. The location of the garden itself—through central placement—encourages students to participate. The success of the garden is attributed to student involvement, and has led to the development of a 3-credit class, in which students work at the garden for a full semester. By growing food in a manner that cares for both the physical landscape and the social landscape, the Franklin Permaculture Garden has served as an example for the UCCS Greenhouse and Farm.
Fig. 2. Diagram of Franklin Permaculture Garden Design

Fig. 3. Photograph of Franklin Permaculture Garden

University of California Davis

Student Experimental Farm

One of the most impressive student farms in the country can be found at the University of California, Davis. Developed in the mid-1970s through partnerships with
faculty, students organized a new course called Seminar on Alternatives in Agriculture under the Alternatives in Agricultural Development Program (AADP), which sought to utilize a twenty-acre plot of land to learn more about alternative agricultural methods. The land was donated by the College of Agricultural and Environmental Sciences, and became the Student Experimental Farm (SEF), which has been in full operation ever since.

The SEF has become the university’s space for experiential learning and interdisciplinary interaction, focusing on alternative food systems and sustainable cultivation. In the 1980s, the first intensive summer courses began at the SEF, followed by the addition of courses throughout the regular academic year. The “agricultural systems and environment” major was created in the 1990s, followed by an increase in course offerings and student-driven farm-based projects in the 2000s (Parr & Van Horn 2006). Since then, the UC Davis has implemented multiple programs and academic majors that highlight themes of agriculture, the environment, and sustainability, and the success of the SEF as an educational tool can be linked to the involvement of students in all aspects of its creation, expansion, and development of academic components.

Academic programs were developed in concert with the Sustainable Curriculum Workgroup (SCW), comprised of faculty and staff. The goal of the SCW was to propose core values for the academic programs, which could then be applied and carried out through curriculum design. Out of this workgroup came the seven guiding principles of the sustainable agriculture curriculum which require that the education be adaptive, interdisciplinary, experiential, encourage systems thinking, facilitate skill development, build community, and link the real world to the classroom (Parr & Van Horn 2006).
Through hands-on, place-based education, students gain practical experience in areas related to organic farming, ecological horticulture, and environmental education.

According to Parr and Van Horn (2006: 431), experiential learning “necessitates building upon students’ sense of purpose, current conceptions, and cycles of reflective observation, abstract conceptualization, and experimentation in real-world social contexts.” Some examples of student-driven projects that took place during the initial years of the SEF can be seen below (table 1).

Table 1

List of SEF-Sponsored University Courses, Community Projects and Events, and Student-Initiated Projects between 1977 and 1979

<table>
<thead>
<tr>
<th>University Courses</th>
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<tbody>
<tr>
<td>Alternatives in agriculture seminar</td>
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<tr>
<td>Corn development</td>
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<tr>
<td>Ethical questions and planning criteria in projects</td>
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<td>Organic agriculture</td>
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<tr>
<th>Community Action Projects and Events</th>
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<tbody>
<tr>
<td>Farm worker cooperative resource coordination project</td>
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<tr>
<td>California rural apprenticeship program</td>
</tr>
<tr>
<td>Local farmer outreach survey</td>
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<tr>
<td>Draft horse workshop</td>
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<tr>
<td>Market garden field day/workshop</td>
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<tr>
<th>Student-Initiated Projects</th>
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<tr>
<td>Mulching with clear tarps for yellow nutsedge control</td>
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<tr>
<td>Planned hedgerows for pest management</td>
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<tr>
<td>Honey bee hive demonstration</td>
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<tr>
<td>Corn improvement techniques for small farmers in developing countries</td>
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<tr>
<td>Simplified method for farmer produced seedless watermelon seed</td>
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<tr>
<td>Blue corn/amaranth study</td>
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<tr>
<td>Wheat/legume intercropping trials</td>
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<tr>
<td>Leguminous cover crop study</td>
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<tr>
<td>Rapeseed cover crop study</td>
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<tr>
<td>Mosquito fern applications in rice production</td>
</tr>
<tr>
<td>Small pond mixed species aquaculture</td>
</tr>
<tr>
<td>Overwintering of western mosquito fish in greenhouse aquaculture ponds</td>
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<tr>
<td>Solar straw bale greenhouse</td>
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</table>
Permanent beds for vegetable crops
Lamb rearing project
Multipurpose windbreak demonstration
Windmill project
Compost production and evaluation projects

Source: Parr, Damian M., and Mark Van Horn.

"Development of organic and sustainable agricultural education at the
University of California, Davis: A closer look at practice and theory."


In addition to serving the social and academic aspects of agriculture, the SEF incorporates ecological design with an Ecological Garden. Occupying ½ acre of land, the Ecological Garden at the SEF is a living laboratory of agroecological processes, following patterns found in nature. The Ecological Garden integrates flowers, herbs, vegetables, bees, fruit trees, vines, and composting techniques, and also provides education about seed-saving and mushroom cultivation ("Ecological Garden"). Additionally, the Ecological Garden serves the community as a central site for school field trips and gardening lessons.

Another component of the SEF is the Market Garden. Started in the 1980s as a space for students to learn about organic vegetable production and marketing, the Market Garden is now a robust seven acres. Students are the leaders in all aspects of production, which include greenhouse crop production, irrigation, harvesting, marketing, pest management, and field management. The produce is harvested by students, as well, and is sold through a student-run CSA and to multiple dining outlets on campus ("Market Garden"). Though much larger than the UCCS Greenhouse and Farm, the SEF at UC
Davis has similar intentions and operational procedures. Additionally, the SEF can serve as a model for UCCS in terms of future academic programming including majors, minors, and internships.
CHAPTER 3

UCCS GREENHOUSE AND FARM

In 2012, UCCS moved forward with the purchase of a greenhouse, intending to use it for campus food production. The campus administration placed the greenhouse on a bluff in the historic Cragmor Village, at the east end of a frontage road and a 10-minute walk east of main campus. Sitting on a ¾ acre lot of what is called the Farm House—with direct sun exposure and predominantly sandy soil (the bluffs are ancient sand dunes)—the prospect of a successful greenhouse and potential garden seemed a bit ambitious. With the hiring of its first Farm Manager (Kelley Jennings) and a student assistant in 2012, the greenhouse and plot of land began its transformation from a neglected landscape to campus resource that reflects environmental and social responsibility.

The early days of what is now the UCCS Greenhouse and Farm focused on infrastructure and production. With the 3,000-square-foot greenhouse as a blank slate, the farm crew started with the construction of twenty raised beds. The climate in Colorado Springs and the model of greenhouse created a need for heating and cooling. To accommodate this in an environmentally conscious way, a climate battery was installed in each bed. The climate battery helps regulate the extreme temperature fluctuations by pushing air through pipes laid in each individual raised bed. To create this effect, the beds are constructed out of two layers of stacked concrete block (CMU), and a perforated pipe manifold is placed on top of sheet insulation and then encased in gravel. Next, a
third layer of CMU is placed around the bed, and the bed is filled with soil. At each wall-end of the 12’ x 4’ beds, the inside manifold comes out, joining together the two beds and allowing them to share a fan. On a winter day, solar heating of the greenhouse rises upward to the peak of the structure, and is driven into the climate battery. At night, this collected heat radiates into the soil, keeping the plants warm and utilizing heat energy that would otherwise be lost (“Specialty Beds Tutorials”).

Fig. 4 and Fig. 5. Photograph of Climate Battery Installation

Aside from the greenhouse, the farm crew developed outdoor gardens. The area closest to the Farm House is known as the Upper Garden, and the area surrounding the greenhouse is known as the Lower Garden (see fig. 6). After building CMU raised beds in the greenhouse, the farm crew began to develop and cultivate the Upper Garden, constructing another series of CMU raised beds. The CMU beds lend themselves to heat retention, and also to increased growing space, as the holes of the CMU blocks can also be cultivated. With the greenhouse beds and Upper Garden beds filled with organic soil, the first crops were seeded and harvested in 2013.
As time passed, more student assistants (including myself) were added to the farm crew. This allowed for the construction of more beds, the implementation of a compost system, development of the Lower Garden, and a harvest system. In 2014, the UCCS campus ended its contract with Sodexo, and sought to create a self-operating food service. This created a new, urgent pressure to produce as much food as possible, while still attempting to create the proper infrastructure. The pressure to produce left less time for ecological planning and design, and less time to harness educational opportunities, such as hosting volunteers and holding workdays. Due to this need for production, the Greenhouse and Farm was disconnected from people and place, as incremental and intentional connections could not be put in place. My research sought to discover ways in
which the Greenhouse and Farm could connect with the campus community, and engage students in learning about their food and place.

**Ecological Design**

After attending the UMass Amherst Revisioning Sustainability Conference in 2014, Farm Manager Kelley Jennings, another graduate student, and I returned to the UCCS Greenhouse and Farm with a plan. Having been exposed to permaculture and place-based learning initiatives at the conference, the farm crew identified opportunities to add to the focus of the Greenhouse and Farm from production alone to include education. The Greenhouse and Farm seeks to steward the physical and social landscapes, through a farm design that is based in ecology. In this way, it incorporates aspects of place, regeneration, and sustainability in a setting that can be used as a living laboratory. Utilizing ecological design, the Greenhouse and Farm is moving toward becoming a place for interdisciplinary and community perspectives to merge, creating an intellectual space to reconnect people, place, and food.

Ecological design incorporates traditional ecological knowledge and permaculture techniques—both of which are regenerative and tend to reflect holistic stewardship of the physical and social landscapes. The Greenhouse and Farm employs traditional agricultural techniques (specifically of the Hopi, Zuni, and Hidatsa), and through these methods, the Greenhouse and Farm continues to develop in ways that are efficient and mindful of resources.

**Traditional Agricultural Techniques**

Colorado Springs is located along the Front Range of the Rocky Mountains, and therefore is unique in that its landscape has characteristics of mountains, deserts, and
plains. To encourage place-based cultivation and restore connections to food and place, the Greenhouse and Farm employs techniques of the Hopi and Zuni of the semi-arid Southwest, and the Hidatsa of the Plains. Traditional agroecosystems represent centuries of accumulated experience of interaction between farmers and the environment (Altieri & Merrick 1987), and is loaded with complex agroecological knowledge of how to grow food. Agroecology can be defined as the ecology of food systems (Francis et al. 2003), and since ecology is place-specific, so are food systems. By creating features at the Greenhouse and Farm that model techniques of the indigenous people, the component of place-based food literacy is combined with ecological stewardship of the landscape.

Both ancestral and modern Hopi and Zuni peoples live at elevations ranging between 6,000 and 8,000 feet. This elevation, along with their geographic location throughout the arid southwest, makes them susceptible to hot, dry summers and inconsistent rainfall (Stewart 1940), much like the climate experienced in Colorado Springs. In terms of soil and water management, the Greenhouse and Farm has adopted multiple techniques of these people. For example, the Hopi never adopted plowing, largely due to the risk of soil erosion and loss from high winds (Stewart 1940). Situated on a bluff at over 6,000 feet, the Greenhouse and Farm experiences high gusts. Due to this, the Greenhouse and Farm uses cover crops to protect bare soil and fix nutrients, and does not plow. Instead, soil is lightly turned over for planting, and is amended with rich, organic compost. The Hopi and Zuni also used plants for windbreaks and fences made of shrubs (Stewart 1940), in order to counteract some of the gusts; the farm crew has begun to trellis honeysuckle, clematis, and trumpet vine on the chain-link fence that surrounds the property.
In terms of water efficiency, the Hopi and Zuni provide examples for conserving the little precipitation that Colorado Springs receives. Using trenches for water management, along with earth checks—which are like earthen dams—to deflect and spread water (Stewart 1940), the Hopi and Zuni can manipulate the water so it most benefits the crops. The Greenhouse and Farm has created multiple berms and swales based on these methods, which direct water to where it needs to go on the farm.

Another technique that the Greenhouse and Farm applies is known as “raised field agriculture.” Raised field agriculture is more labor intensive, but provides a large yield and is often utilized in regions that are marginal for agriculture (Doolittle 1992). At the UCCS Greenhouse and Farm, workers mound up soil with other biomass to create soil with a high water-retention capacity and more nutrients from amendments, like compost. The Hopi and Zuni may have amended their raised fields, as well, in a process similar to...
sheet composting. The Zuni grow their corn in raised fields (Stewart 1940), and 2015 marked the first year that the UCCS farm crew grew and harvested corn from a raised field bed.

Other techniques in use at the Greenhouse and Farm include keyhole beds (which are similar to Zuni waffle gardens), terraces, and Three Sisters agriculture. The Zuni waffle garden is a water-conservation technique, which consists of square grids with berms in between. Squares are generally 1-2 feet wide, and are recessed to catch water and hold it close to the roots of the plants. The Greenhouse and Farm has adopted this technique on the north side of the greenhouse, under the guise of the more modern name of “keyhole beds” (to be described in the next section). Terraces are also used extensively on the farm, as they are primarily used to create level planting surfaces, in addition to having deep soils with a high capacity for water retention (Doolittle 1992).

The Greenhouse and Farm has gleaned knowledge of the Three Sisters guild from Native American tribes, especially the Hidatsa people. The Hidatsa people have
historically occupied parts of Montana, North Dakota, and Wyoming. The climate in these regions is also semi-arid, and the Hidatsa conserve water by mounding the soil, much like the Hopi. For crops, the Hidatsa mainly grew corn, beans, and squash, the “three sisters” crops (Wilson 1917). The Hidatsa planted their corn on a hill or mound in May, and, utilizing their traditional ecological knowledge, the women would look to the gooseberry bush for further instruction. When the gooseberry bush was almost in full-leaf, they knew it was time to plant their corn (Wilson 1917). To cultivate squash, seeds were sprouted to ensure success before being planted in pairs near the corn in late May or early June. Bean planting followed the squash planting, and the beans were also planted in mounds, about two inches deep and three seeds at a time (Wilson 1917). In 2015, the Greenhouse and Farm created their first Three Sisters garden, mimicking the timeframe and methods of the Hidatsa people with much success.

Local populations possess highly detailed and complex information about agriculture (Agrawal 1995). Utilizing techniques of the Hopi, Zuni, and Hidatsa, the Greenhouse and Farm can participate in in-situ preservation of both the physical and social landscapes and encourage people to reconnect to food and place. Throughout time and space, growing food has always been more of a “group effort.” For the Zuni, Hopi, and Hidatsa, labor and entertainment were simply part of the harvest (Stewart, 1940). People gathered around food, and thanked the land for providing nourishment. Harnessing traditional ecological knowledge that is dynamic and adaptable (Agrawal 1995), this led to food systems that focused on the holistic and integrated nature of what it means to cultivate.
Permaculture

In 2014, incorporation of permaculture techniques began to change the landscape of the Greenhouse and Farm. Since then, agrobiodiversity, soil management, and water efficient designs have found their place, increasing the educational opportunities and reducing the environmental impact of the operation. This is achieved through integration of the twelve principles of permaculture, as described in the book *Gaia’s Garden* (2009) by Toby Hemenway. The principles 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

The integration of these principles into the design of the Greenhouse and Farm has led to increased biodiversity, a greater yield, and an increase in educational opportunities.
Cultivating Agrobiodiversity

When considering what a healthy cultivated system should look like, it is important to mimic natural systems—the key word being “systems.” Permaculture highlights integrated systems and processes that support one another, and for this to happen, diversity is crucial. Agrobiodiversity is a necessary component to environmental stewardship and food literacy, and should be valued as a key public good. Through mindful design and incorporation of agrobiodiversity, it is possible to create cultivated ecological systems that allow for the continued dynamic adaptation of plants to their specific environment (Altieri & Merrick 1987).

One of the greatest threats to biodiversity is the loss of seed sovereignty. The global food system has targeted agriculture, resulting in a monopoly of so-called “gene giants” who genetically modify seeds (Wittman, Desmarais, & Wiebe 2010). Unfortunately, the modifications are more for profit than food sovereignty or food security, and result in higher replacement costs and the need for chemical inputs. It is important to add that most genetically modified seeds also contain a terminator gene, which renders them unviable after a single planting. This is the effect of a “life science industry”—decreased food sovereignty.

La Vía Campesina, an international peasant movement for food sovereignty, considers seeds to be a fourth resource, after land, water, and air (Wittman, Desmarais, & Wiebe 2010), which more accurately reflects the true value of food, and not as a commodity or input. Agrobiodiversity can also facilitate seed sovereignty through the cultivation of a variety of both food and non-food annual and perennial plants. The Greenhouse and Farm stewards seeds and agrobiodiversity by doing this very thing, and
by saving its seeds. Each season, as new plants are seeded, the plants that are phasing out are observed for beneficial traits, like overall production and drought-resistance. The farm crew then gets to work on saving seeds from desired plants, creating a pool of resources that is place-based and eliminating the cost of having to purchase seed the following season.

Agrobiodiversity includes many types of resources, including genetic resources, edible plants and crops, livestock, soil organisms, wild resources, scales and methods of growing food, and ecological pest control (Thrupp 2000). The use of folk-varieties (also known as heirloom varieties or landraces) helps to incorporate place-based crops and techniques. For example, the Greenhouse and Farm has gotten many of its seeds from Hobbs Family Farm, located about 63 miles southeast of campus. These seeds are well adapted to the Colorado Springs climate, persevering through conditions in which other seeds may not survive or produce a decent yield. Additionally, this facilitates the horizontal flow of cultivation literacy that is place-specific, and also supports a local, organic family farm. This year, the farm crew cultivated concho corn, purple dragon carrots, and garlic from Hobbs Family Farm, utilizing the successful genes from these landraces to connect the food directly to the land, encouraging the flow of nutrients at the same time.

The Greenhouse and Farm produces food for campus consumption, and cultivates more than 120 food crops. Each cultivated area is home to multiple plants, ensuring a landscape that is polycultured (cultivated with a variety of crops), as opposed to the monocultures that make up industrial farm landscapes. The planting design is based off of a combination of perennial and annual plants, and acknowledges companion planting, or
specific crop associations. When utilizing companion plants, the idea is that some plants grow extremely well with others and encourage nutrient cycling, such as tomatoes, basil, and peppers, or—as discussed in the previous section on traditional agricultural methods—corn, beans, and squash. Through these crop associations of regionally adapted patterns, the functions of nutrient cycling, natural pest control, and soil conservation can be optimized (Altieri & Merrick 1987).

![Fig. 9. Photograph of UCCS Greenhouse and Farm Polycultures](image)

Some food crops grown in polycultures this year at the Greenhouse and Farm include: zucchini, yellow crookneck squash, patty pan squash, fava beans, Kentucky wonder beans, contender beans, more than 30 varieties of heirloom tomatoes, bunching onions, leeks, radishes, hardneck and softneck garlic, chard, mustard greens, a variety of lettuces, 5 varieties of carrots, kale, Japanese white eggplant, potatoes, a variety of
cucumbers, more than 7 varieties of hot and sweet peppers, sage, thyme, chives, oregano, rosemary, mint, marjoram, Thai and Italian basil, and sorrel. Other plants cultivated on the farm include lupine, which reduces the need for fertilizer by fixing nitrogen (Altieri & Merrick 1987), and bee balm to attract pollinators. Bees and other pollinators play an important role in agroecological systems, so the Greenhouse and Farm has planted pollinator-attracting plants throughout the farm, like zinnias, borage, and bee balm, in addition to a wildflower patch that booms with pollinator life in the spring and summer.

**Soil and Water**

In addition to food crops, many plants at the Greenhouse and Farm are cultivated to conserve and efficiently utilize resources, including water and nitrogen (Nabhan 1985). Agriculture accounts for 2/3 of all water use worldwide (Horrigan et al. 2002), and in the Colorado River Basin specifically, agriculture accounts for up to 80% of water use (Lee & Plant 2013). This is shocking when considering the drought that much of the western United States is experiencing in present times. In desert environments, nitrogen deficiency can limit agriculture just as much as water availability (Homburg et al. 2005), so it is important to return nitrogen to the soil, while also being mindful of precipitation and water use.

One way that the Greenhouse and Farm incorporates soil and water management into its design is through the use of berms and swales. This technique is reminiscent of both traditional agriculture and permaculture techniques. A berm is a mound of earth, and a swale is the depression on the inside of the mound. This allows for water to be slowed and redirected through hydrostatic manipulation, conserving it and sending it directly to
the plants (Nabhan 1979). This technique is used all over the farm, allowing for the plants to receive the maximum benefit from minimal precipitation, and requiring less irrigation. This technique, along with cover crops and zero-tillage, reduces the risk for desertification that is so prevalent in semi-arid climates, and is all part of ecological design (Tittonell et al. 2012). Additionally, clover, which is used as a nitrogen-fixer and evergreen ground cover (Robbins 2012), is grown throughout the berms and swales, returning nutrients to the soil, holding in moisture, and protecting the soil from wind erosion.

Soil itself is one of the most misunderstood components of life as we know it. It is much more than weathered rocks, and no less than its own universe on the microscopic level. Soil develops on a geologic time scale, requiring up to 1,000 years for one inch of development (Pimentel et al. 1995). The Colorado Master Gardener program trains prospective specialized gardeners in soil management and care, honing in on soil as a dynamic substance that is alive, and in which complex chemical and biological reactions are constantly occurring (Whiting, O’Meara, & Wilson 2013). Ideally, soil is composed of mineral matter, air, and water, with organic matter making up less than 5% of the soil. There are five factors that affect soil development: climate, topography, time, organisms, and parent material. These factors allow for drastically different soils to develop in close geographic proximity, and allow for the biodiversity of our natural world.

Another aspect of soil management is the production of good, rich soil on site. One way this is achieved is through sheet mulching, which utilizes intercropping and native species or perennials as biomass, which add nutrients to the soil and serves as in-situ composting. Another way this is achieved is through the creation and maintenance of
compost piles. For as long as agriculture has been around, compost has played a significant role in nature’s cycle. Soil receives many benefits from composting, including improvements in soil tilth, added nutrients, and higher, healthier yields.

According to Judith Rice-Jones, a Colorado Master Gardener, the key components to a healthy compost pile are: air, moisture, particle size, a carbon to nitrogen ratio of 30:1, and routine turning and mixing. If the process is well managed, the end result of composting is a rich, dark substance known as “humus.” This organic matter is incredibly valuable to gardeners and farmers. After decomposition occurs in the compost pile, a mixture of stable and complex organic compounds remains, decomposing slowly over time (Whiting, O’Meara, & Wilson 2013) and providing lasting nutrients to plants, as well as a habitat for soil organisms.

Compost has innumerable benefits for soil and plants. Humus improves the physical and chemical attributes of soil by amending it and balancing the chemical components within the soil (Whiting, O’Meara, and Wilson 2013). Soil in Colorado is often alkaline, but compost can help to alter the acid levels. Compost allows natural processes to restore equilibrium in the soil, and humus buffers the soil pH, keeping it stable for plant roots (Whiting, O’Meara, & Wilson 2013).

Compost can be created from pre-consumer waste, post-consumer waste, animal and human manure, yard trimmings, and most other organic materials. For our purposes at the Greenhouse and Farm, however, health guidelines must be followed. Pre-consumer waste from Dining and Food Service is utilized for compost materials. The two main components of compost are the “green” (nitrogen) and the “brown” (carbon). In a healthy
compost pile, the nitrogen and carbon components are layered, allowing for proper heating and decomposition.

There are three compost systems at the Greenhouse and Farm, spread out across the property and used in a rotation. Food waste, plant matter, hay, and leaves are added to the piles, watered in, and mixed. As decomposition begins, the piles start to look less like food waste and hay, and more like soil. When the organic matter has fully decomposed, the end result is rich, dark humus that is then added to soil throughout the property where cultivation is planned. This is an example of what permaculturists call a “closed-loop system,” since the food grown at the Greenhouse and Farm is returned by means of food waste, and the compost created from this waste becomes part of the soil that sprouts new seedlings. This lends itself to the creation of a regenerative system, composed of cyclic flows of energy, water, and nutrients (Naveh 1998).

Fig. 10. Photograph of UCCS Greenhouse and Farm Compost
The UCCS Greenhouse and Farm seeks to steward its place by fostering agrobiodiversity and managing its water and soil resources. As a form of ecological urban agriculture—which can potentially address the interrelated crises of climate, food, and agrobiodiversity (Gonzalez 2011)—the Greenhouse and Farm can educate people about natural cycles and our dependency on the land. For healthy and regenerative systems, biodiversity must be implemented with agricultural systems. This integration can have numerous benefits, environmentally and socio-ecologically (Thrupp 2000). By its nature, agroecology is interdisciplinary and facilitates learning through a systems approach, taking into account multiple factors and considering their relationships (Francis et al. 2011). Through its design and location, the UCCS Greenhouse and Farm has the potential to become a campus resource for place-based food literacy education.

**Cultivating a Sense of Place**

As an effect of the global, industrial food system, people are disconnected from the sources of their sustenance. This includes the land, the producers, the taste, and the quality of food (Feenstra 2002). As a form of small-scale sustainable agriculture, which can potentially address the interrelated crises of climate, food, and agrobiodiversity (Gonzalez 2011), urban agriculture (like the UCCS Greenhouse and Farm, community gardens, etc.) can be utilized as spaces to educate people about natural cycles and our dependency on the land, in addition to creating a strong sense of place.

Cresswell (2012) asserts that life is made meaningful through human activity that is both intentional and purposeful. With shared work at a farm, individual routines coalesce into something larger than themselves, which produces a sense of place that is enduring and can help students feel invested in their campus community. Additionally,
gardens and farms educate participants about seasonality and local ecosystems (Barlett 2011). Through experiential learning on a farm or in a garden, students are given the tools to become problem-solvers (Lieblein et al. 2004), and are invested in the ecologically-sound production of food. Through this investment and connection to place, campus food projects can create a common language and build capacity for political activism (Barlett 2011) to create place-based, agroecological food systems that complement the landscape, rather than degrade it.

Through shared responsibilities and interests, urban agriculture provides opportunities to bring cultivation back into the daily lives of people, lending itself to the process of community-building. The UCCS Greenhouse and Farm represents purpose, coherence, and social inclusion, while providing an arena to foster local knowledge (Hale et al. 2011). It is a place where the campus community can come together to talk, problem-solve, question, argue and come to agreement, compromise, share, and learn to know and trust one another in the context of a common purpose or vision (Feenstra 2002). Spaces like this allow people to reestablish connections to the land and each other, and connect communities to the environment. At the same time, they serve as reminders that people should act as caretakers of the land, not owners (Kuhnlein 1996), and foster a sense of place which can perpetuate education, along with environmental and social stewardship.

As people come together to produce food, agrarian citizenship enacts horizontal relationships within and between communities (Wittman, Desmarais, & Wiebe 2010). Shared interests for desired outcomes in the garden or farm can generate stronger social ties, and engage people in outdoor activities. People have a natural yearning to be close to
nature (Hale et al. 2011), and gardens and farms can help to meet social and environmental needs while producing food. As people come together to work for their food, they form relationships that foster personal, interpersonal, and environmental needs that can become powerful catalysts of change.
CHAPTER 4

METHODS AND RESULTS

Research Design

My research question seeks to determine ways in which the UCCS Greenhouse and Farm can encourage food literacy on campus by gauging students’ awareness of the Greenhouse and Farm, their awareness of place-based foods, and ways in which they see the Greenhouse and Farm fitting into curriculum. The primary methods for collecting data include surveys and case studies (Chapter 3). In total, I received 84 survey responses (from UCCS students only). The 12-question surveys resulted in data that I have analyzed and turned into graphs and charts. Surveys and questionnaires are often used in research when trying to glean information about people, behavior, experiences, attitudes, opinions, and awareness of different topics (Hay 2000), and therefore provided an appropriate method to respond to my research question.

With the survey, I asked students about their awareness of the UCCS Greenhouse and Farm, their awareness of place-based foods, and ways in which the UCCS Greenhouse and Farm could better serve as a resource for food literacy. The survey included open-ended questions (listing), close-ended questions, and opportunities for participants to circle multiple answers. I analyzed survey responses using descriptive statistics in order to generalize information about the population (in this case, UCCS
students). From this data, I converted frequencies into graphs and charts, allowing for a visual aid in determining students’ awareness of place-based foods.

**Procedures**

For the survey, all results were completely anonymous and random. Surveys were administered in person three times throughout one week in October 2015. During this time, I administered surveys in different locations, switching between the UCCS University Center and Columbine Hall, and morning and afternoon. In addition, I visited a World Regional Geography Course, a Freshman Seminar class, and a Physical Geology class, and interested students were given the opportunity to complete the survey. Overall, I collected 84 surveys (n=84). For multiple choice answers, any possible answer not circled received a “0”, and answers marked received a “1.” I then coded the results from the open-ended questions by counting and organizing the responses. In order to distill the responses down to key themes, I utilized content analysis to identify common terms, and analytic codes in order to group responses with a common theme (Hay 2000). Table 13, for example, contains the category “water” under which responses like “water,” “lack of rain,” and “aridity” have been grouped. This creates simpler data analysis when looking for trends.

**Survey Results**

Question 1 (see fig. 11) from the survey sought to gauge students’ awareness of or experience at the UCCS Greenhouse and Farm. “Aware” means the respondent is aware of the existence of the Greenhouse and Farm, but has never visited the facility, while PT and FT mean part-time and full-time, respectively. The results show that most respondents (roughly 41%) are unaware of the UCCS Greenhouse and Farm, while 27%
are aware, but have no experience with it. Interestingly, 24% of the respondents have 1 hour or less of experience at the Greenhouse and Farm, which could possibly be contributed to tours. It can be inferred from the results that more publicity and educational opportunities are necessary in order to make students aware of the Greenhouse and Farm, so that it can play a larger role in food literacy. Ideally, every student would be aware of the UCCS Greenhouse and Farm, but that will require time, increased publicity, and more scheduled tours of the facility.

![Experience with UCCS Greenhouse and Farm](image)

**Fig. 11. Results from Survey Question 1**

Question 2 (see fig. 12) asked whether or not the respondents have learned something by gardening, farming, or visiting a farm or garden. Of 84 respondents, 48% said that they have learned something at a farm or garden. I counted the responses, and selected key words for frequency. Then, I grouped the results by similar associations, like “growing” and “how to grow food,” and “changing seasons” and “seasonality.” Overall, the responses imply that many respondents learned about growing food, the importance of having fertile soil, and how to plant crops by engaging directly with some version of
growing food. The results suggest that cultivation is an experience that people remember. Additionally, the experience creates agroecological linkages around the processes and components of cultivation, as reflected by the frequencies of “grow/growing” and “soil”.

**Have You Ever Learned Something by Gardening, Farming, or Visiting a Farm or Garden?**

<table>
<thead>
<tr>
<th>Word Frequency</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>grow/growing</td>
</tr>
<tr>
<td>7</td>
<td>soil</td>
</tr>
<tr>
<td>4</td>
<td>seasons/seasonality</td>
</tr>
<tr>
<td>4</td>
<td>crop rotation</td>
</tr>
<tr>
<td>3</td>
<td>planting</td>
</tr>
<tr>
<td>3</td>
<td>pollination</td>
</tr>
<tr>
<td>2</td>
<td>sun</td>
</tr>
<tr>
<td>2</td>
<td>hard work</td>
</tr>
<tr>
<td>3</td>
<td>respect</td>
</tr>
<tr>
<td>4</td>
<td>weed/weeding</td>
</tr>
</tbody>
</table>

**Common Words Used to Describe the Learning Experience**

Fig. 12. Results from Survey Question 2

Question 3 (see fig. 13) asked respondents about their experience growing food, based on 5 possible multiple choice selections, ranging from “I have never gardened or farmed” to the subject considering themselves a gardener or farmer. In this case, n=84 generated 87 responses, as some respondents selected multiple answers, adding that they have “friends or relatives who garden or farm.” The most respondents answered that they have friends or relatives who garden or farm, so it is not completely removed from their lives. Twenty-eight percent of respondents garden or farm occasionally, but 15% have absolutely no experience growing food. Right behind in numbers at 14% are the
respondents who consider themselves gardeners or farmers. This leaves a large gap in the middle, between having no experience growing food and doing it frequently. The results suggest that there is a need to educate people about the benefits and importance of growing food so that it becomes more commonplace in the lives of students, so that the number of respondents who call themselves gardeners or farmers increases, along with those who garden or farm occasionally.

**Fig. 13. Results from Survey Question 3**

In Question 4 (see fig. 14), I asked respondents what experience they have had growing food in Colorado. In this case, n=84 generated 88 responses, as some respondents selected multiple answers. The results reveal that 52% of respondents have no experience growing food in Colorado, while 40% have experience growing food at a home garden, community garden, or farm. Of all of the responses, only 1 subject was revealed as an employee of a garden or farm. With such a high number of respondents having no experience growing food, the results imply that education about the cultivation of crops is necessary, as the act of personally growing food seems to be removed from the lives of students. However, the results from Question 3 in figure 13 show that only
15% of respondents have no experience growing food at all, and Question 4’s results show that 52% have no experience growing food specifically in Colorado. This means that respondents have grown food elsewhere, but have not connected to food and place through cultivation in Colorado.

![Experience Growing Food in Colorado](image)

Fig. 14. Results from Survey Question 4

Question 5 (see fig. 15) asked which food crops students have experience growing in Colorado, which could be answered by listing. Out of the responses, the most frequently mentioned were sorted by frequency into 21 categories, including “no experience.” Overall, 46 respondents answered that they have experience growing food in Colorado with 160 responses. The results show that most respondents have experience growing tomatoes (31 respondents out of 46 who have experience growing food in Colorado have grown tomatoes), squash (pumpkins and zucchini were lumped into this category), herbs, carrots, beans, and corn. This is reassuring, as these foods are place-based and grow well in Colorado with proper management (including water, season extension in cold weather, and microclimates). However, chilies and melons also grow
well in Colorado and throughout much of the Southwest (and have been utilized as staple crops to Native Americans in this region for thousands of years), and this suggests an opportunity to educate about place-based food and ecological gardening, whether or not the respondents have experience growing food at all.

![Bar chart showing food crops students have experience growing in CO](image)

**Food Crops Students Have Experience Growing in CO**

- No experience: 38
- Tomatoes: 31
- Squash: 26
- Carrots: 16
- Peppers: 13
- Beans: 12
- Corn: 11
- Strawberries: 9
- Potatoes: 8
- Spinach: 7
- Apples: 5
- Beets: 5
- Watermelon: 3
- Raspberries: 3
- Kale: 3
- Sunflowers: 2
- Chilies: 1
- Cantaloupe: 1

Fig. 15. Results from Survey Question 5

Question 6 (see fig. 16) asked for respondents to recall food plants that evoke a “sense of Colorado.” Twenty-six respondents (25%) did not respond or answered “none.” 58 respondents responded positively, and out of their results, 106 were categorized into the above groups based on frequency. Corn scored the highest, with roughly 20% of positive-responses linking it to Colorado. This is followed by squash, peaches, tomatoes, and peppers, in descending order. The positive results and foods mentioned do reflect place-based food knowledge, as these crops grow well in Colorado (with proper care, of course), and can be found in abundance at farmers markets in the right season. Still, roughly ¼ of the respondents did not answer the question, suggesting an opportunity to educate about place-based foods.
Question 7 (see fig. 17) sought to determine if students understand challenges to growing food in Colorado. Eighty-three respondents responded to this question, generating 161 answers. The word frequency was calculated manually, and results were then grouped into categories. For example, “soil quality” and “soil” were simply categorized as “soil,” and “drought” and “arid” were categorized under “water.” “Weather” had the highest frequency of mentions, culminating in 42% of the results, and was followed by soil and water. These results show that the respondents are aware of general challenges that farmers face in Colorado, more specifically the extreme weather fluctuations, soil quality, and lack of precipitation. Having farmed at UCCS for 2 years, I know the challenges of farming in our specific environment, and weather, soil, and water do present the greatest challenges when growing food.
Question 8 (see fig. 18) sought to identify what farming and gardening methods students would like to know more about. All 84 respondents responded, generating 302 results. 55 respondents are interested in learning about water efficiency, and 50 are interested in learning about native plants. Pollinators/bees received 39 responses, and composting received 37 responses. One subject specifically mentioned “permaculture and forest gardening,” and another single subject suggested they would really be interested in any of the options. This can help guide future development of curriculum and workshops at the Greenhouse and Farm, and also justify more publicity, as water efficiency methods, native plants, and pollinator gardens are already established, just unknown to the general campus.
Question 9 (see fig. 19) generated 218 responses from a sample of 84 respondents regarding what they would like to see at the Greenhouse and Farm. The respondents could choose from a variety of answers, or write their own. Sixty-one percent of respondents responded that they would like workshops and classes, and 48% would like to see bees/beekeeping at the Greenhouse and Farm. Few respondents (less than 23%) would like to see aquaponics, which is useful for future development, as the Greenhouse and Farm has been considering a small-scale aquaponic system (the low
response rate for “aquaponics” may be due to a lack of knowledge regarding the term). This can potentially redirect our development, encouraging more workshops, as well as beekeeping, in order to meet the interests of students.

Fig. 19. Results from Survey Question 9

Question 10 (see fig. 20) generated 221 results from 84 respondents regarding workshops and clinics that they would be most interested in attending. More than half of the respondents (57%) are interested in attending workshops about medicinal herbs, and farm-to-table (55%) workshops. This could include planting, maintaining, harvesting, and processing of crops. The “other” category revealed that respondents would also be interested in “plant studies” (no further explanation was included), as well as nutritional courses. Forty-five percent of respondents are interested in attending workshops or clinics to learn more about bees and beekeeping, which reflects responses to Questions 8 and 9, where wanting to learn more about bees and seeing bees and beekeeping at the farm
generated results with high frequencies. These responses could serve as support to get beehives at the farm so that workshops and clinics can be created based on student feedback. Curiously, “permaculture” received the lowest response rate, selected by less than 10% of respondents. This is a concern, as designing the Greenhouse and Farm in accordance with permaculture principles has been the main focus of planning and development for both Kelley Jennings (Farm Manager) and myself. This response rate could also indicate that students are unaware of the term and its meaning, and therefore did not select it due to unfamiliarity.

**Fig. 20. Results from Survey Question 10**

**Workshops/Clinics Students Would Be Interested in Attending**

<table>
<thead>
<tr>
<th>Workshops/Clinics</th>
<th># of Responses, n=84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed-saving</td>
<td>19</td>
</tr>
<tr>
<td>Farm-to-Table</td>
<td>46</td>
</tr>
<tr>
<td>Compost/Worms</td>
<td>26</td>
</tr>
<tr>
<td>Permaculture</td>
<td>8</td>
</tr>
<tr>
<td>Medicinal Herbs</td>
<td>48</td>
</tr>
<tr>
<td>Bees</td>
<td>38</td>
</tr>
<tr>
<td>Canning/Preserving</td>
<td>34</td>
</tr>
<tr>
<td>Other:</td>
<td>2</td>
</tr>
</tbody>
</table>

Question 11 (see fig. 21) asked about other topics that students would like to know more about. In this case, n=84 generated 315 responses. More than half of the respondents (54%) said they would like to know more about local food, followed closely by seasonality (48%), then climate and organic farming (both at 42%), and water (41%).
These results suggest opportunities for effective place-based cultivation education, since the topics students are most interested in can be learned by experience. Additionally, topics such as local food, seasonality, climate, organic farming, and water efficiency can foster connections between people, place, and food, helping students to develop a stronger sense of place.

The responses with the lowest frequencies include permaculture, regenerative agriculture methods, place based food, seed-saving, and ecological design. It may be that students are unfamiliar with these terms and methods, and therefore did not select them as frequently. This suggests an opportunity to educate on these methods, as they encompass aspects of other high-frequency responses, such as organic farming, water, and climate.

Fig. 21. Results from Survey Question 11

In Question 11 (see fig. 22), respondents were asked how they see the Greenhouse and Farm fitting into curriculum. The respondents generated 123 responses, which were
grouped and categorized based on affiliation. For example, the response “soils” was grouped under “GES” (Geography and Environmental Studies), since that is the department that offers a course on soils, while “nutrition” and “health” were grouped under “HSCI” (Health Science). Of 123 responses when n=84, 38% had no response to the question. However, GES scored highest at 27%, with HSCI a close second at 26%, and Biology came in third with 23%. This can aid the campus in developing curriculum for the Greenhouse and Farm, providing insight as to where it could fit in based on students’ perspectives. It is important to note that in the sampling process, two GES courses were utilized, so the high frequency of “GES” as a response could reflect inherent bias.

![Bar Chart]

Fig. 22. Results from Survey Question 12
CHAPTER 5

DISCUSSION, CONCLUSIONS, AND FUTURE DIRECTIONS

Campuses across the country have developed programs and courses around farms and gardens, which have impacted the curriculum of their schools and engaged students in place-based education. Survey results from this study suggest that students are interested in learning about cultivation techniques, but nearly half of the respondents who took the survey did not even know that the UCCS Greenhouse and Farm exists. Through publicity, increased tours, and development of curriculum around topics that pique students’ interests, the UCCS Greenhouse and Farm has the potential to become a campus resource for food literacy, utilizing place-based experiential education to reconnect people, place, and food.

Overall, the study suggests that education is needed to show the connections between the biological and social aspects of food, between production and consumption, and between research and application (Feenstra 2002). The Greenhouse and Farm can serve as a living laboratory, educating people on farming methods, ecology and the environment, nutrition, and much more. In addition, it is a place where agroecology can be taught as both theory and possibility (Lieblein et al. 2004), displaying the positive effects of holistic systems management in terms of food production.

Future directions for the UCCS Greenhouse and Farm include not only curriculum development and incorporation (such as agriculture classes, workshops, and clinics), but also education regarding the social landscape. Agroecology, traditional
agricultural methods, and permaculture all have a social aspect to them, but this is often overshadowed by the physical components of growing food (as revealed in survey results in which students indicated water and soil as challenges to growing food, in addition to wanting to learn more about water efficiency and seasonality). The global, industrial food system is full of social inequities, and those, too, are often overlooked, as people tend to focus on physical effects, like drought and loss of biodiversity. As additional support for food literacy, it is important to understand that the physical environment is shaped by the social environment. In order to have a food system that is participatory, decentralized, and inclusive (Allen 2010), social justice needs to be taught so that students can feel empowered.

For example, community gardens and campus farms support the broader need for social inclusion in alternative food systems and food literacy (Macias 2008). If people are educated by one another in their communities with knowledge that is relevant to them, then increased literacy can lead to empowerment. This empowerment can impact food policy, food systems, and potentially benefit entire communities. Essentially, this community empowerment can facilitate better access to fresh food and other educational opportunities, paving the way toward a more just food system.

People should have a voice in their food production and distribution. However, society must step back from the economic and power models in effect to benefit from alternative food systems. For community empowerment to happen and for these benefits to be experienced, a reform of policy is needed to acquire a level of food literacy that enables communities to engage in gardens, cooking classes, and taste education. These forms of education foster environmental and social elements of food that have been lost
in a global race for power and profit. Food literacy reestablishes connections between society and food, encouraging food sovereignty through improved environmental and human health.

There is a direct correlation between environmental and social justice, and community food production can help people to become unified over socioecological issues. Community-based food production impacts food equity, social integration, and natural human capital (Macias, 2008). In terms of socioecological connections, Blaikie and Brookfield (1987) have called land degradation both a cause and result of social marginalization. This follows Thu (2009), who asserts that social and economic equity go along with environmental equity. This implies that the Greenhouse and Farm can be used to educate people on sustainability’s “triple bottom line,” which includes social, environmental, and economic equity. People have been disconnected from their food and the environment, so a landscape that reflects a connection to food and the environment is needed to restore that innate link.

Based on the results from my survey, campus food literacy is lacking. Overall, students are unfamiliar with the Greenhouse and Farm, place-based foods, and cultivation techniques. The global, industrial food system has largely removed people from methods of food production, so that students are unaware of where their food comes from, and all of the external costs associated with industrial growing, transport, storage, and sales. Of the 84 students surveyed, 52% of respondents have no experience growing food in Colorado, revealing opportunities for students to connect to their place and food through experiential learning.
However, the UCCS Greenhouse and Farm can play a role in facilitating connections between people, food, and place. Switching from a model of high-production to regenerative, place-based techniques, the social and physical landscapes at the Greenhouse and Farm are changing to become more inclusive and holistic. By providing examples of how to cultivate food in a semi-arid environment and bringing students, staff, and faculty together in the process, there is potential for this space to become a campus resource for food literacy.

My survey asked students what they would like to see and how they would like to participate at the Greenhouse and Farm. Responses included water efficiency techniques, bee-keeping, crop rotation, medicinal herb clinics, farm-to-table cooking, and traditional farming methods. Aside from medicinal herb clinics and bee-keeping, all of the other responses are already in place in some way. For example, for water efficiency, we have created berms and swales to help direct the flow of water across the landscape, and crop rotation is used all over the farm. Farm-to-table cooking workshops have been initiated by SWELL (Sustainability, Wellness, and Learning) with “Farmhouse Fridays,” a program in which the campus community is invited to help process and preserve the food produced at the farm. This reveals that students are unaware of these educational opportunities to get involved with cultivation, harvesting, and processing, and suggests an urgent need for more publicity around the Greenhouse and Farm and its mission.

When considering the case studies (chapter 2) and their successes, publicity and curriculum development will be key in developing the UCCS Greenhouse and Farm as a campus resource. The University of Montana in Missoula and its PEAS Farm offers farm-based courses for credit through their Environmental Studies program, which helps
to facilitate student involvement since credits are awarded, and not just strictly volunteer-based, like the UCCS Greenhouse and Farm. Additionally, the PEAS Farm produces enough food to provide for a CSA (community-supported agriculture) program, furthering the outreach of the PEAS Farm into the broader Missoula community.

The Franklin Permaculture Garden at UMass Amherst has hosted more than 1,000 volunteers (“Franklin Permaculture Garden”) and has received national recognition as a recipient of the White House’s “Campus Champions of Change Challenge” for their ecological design. The high numbers of students involved can be attributed to publicity, the central, visible location of the Franklin Permaculture Garden, and a 3-credit course developed around permaculture and cultivation.

Though much larger and well-established than the UCCS Greenhouse and Farm, the University of California Davis Student Experimental Farm (SEF) also provides an excellent example of student involvement. The SEF includes a market garden, an experimental garden, a farm shop, and a vineyard. Students are also encouraged to use the various spaces for projects and research, providing an educational landscape that can be uniquely tailored to individual interests. UC Davis has also developed academic majors in Agricultural and Environmental Education and Viticulture and Enology. The SEF also provides outreach to the greater Davis community by hosting field trips and tours.

These case studies provide examples of student involvement and academic opportunities that are currently lacking at the UCCS Greenhouse and Farm. For the Greenhouse and Farm to become more of a campus resource to impact food literacy and to engage students in place-based learning, a curriculum must be developed around the
facility. The Greenhouse and Farm offers volunteer opportunities, but there needs to be more of an incentive to get students involved. Time is valuable, and many students (especially at our largely commuter-based campus) do not have extra time to devote to volunteer hours. However, offering credits and classes that lend themselves to a degree could engage more students in learning at the Greenhouse and Farm. Other future development could include expanding the area of the Greenhouse and Farm, offering more space to cultivate food and the potential to create a UCCS CSA program, or a campus market where students can purchase food grown on campus.

Additional suggestions to increase awareness of the Greenhouse and Farm and to get the campus community engaged include: farm dinners (departmental and by invitation), a partnership with Visual and Performing Arts (VAPA) to bring art and sustainable construction to the site (like cob building), and cultivating a small garden in a highly visible spot on campus with signage the links it to the Greenhouse and Farm.

Currently, the Greenhouse and Farm is making conscious efforts to steward the physical and social landscapes through ecological cultivation. As the space continues to develop, I hope to see curriculum development and marketing around the systems in place. The foundation has been laid for ecological design and education around alternative food movements, and with more student involvement, the UCCS Greenhouse and Farm can become a campus and community resource, cultivating food, growers, and community to reconnect to our place.
References


[http://sites.duke.edu/farm/](http://sites.duke.edu/farm/).


APPENDICES

APPENDIX A

Survey and Consent Form for Respondents in the Research Study

UCCS Greenhouse and Farm Survey

1. What has been your experience with the UCCS Farm?
   a. One hour or less
   b. Part-time volunteer (up to 15 hours total)
   c. Full-time volunteer or employee (more than 15 hours total)
   d. Passerby or aware of its existence (have not had a tour, but know the Farm is there)
   e. None- I am not aware that UCCS has a farm

2. Have you ever learned something by gardening, farming, or visiting a farm or garden?
   a. Yes (if yes, please list up to 3 things below that you learned/considered educational)
      i. 
      ii. 
      iii. 
   b. No

3. What experience have you had with growing food?
   a. I have never gardened or farmed
   b. I have friends or relatives who garden or farm
   c. I do not have a garden or farm, but help others grow food
   d. I have gardened/farmed occasionally, but do not have a garden or farm
   e. I currently have a garden/community garden space/farm (you would consider yourself a gardener or farmer)

4. What experience have you had with growing food in Colorado?
   a. Home garden, community garden, or farm
   b. Volunteer/intern in a garden or farm
   c. Employee on a garden or farm
   d. None

5. What food plants do you have experience growing in Colorado? (Please list as many as you can in the space provided)

6. What food plants evoke a “sense of Colorado” when you think of them? (List as many as you would like)
7. When you think of growing food in Colorado, what are the top 3 challenges that come to mind?

8. What gardening/farming methods would you like to know more about? (circle all that apply)
   a. Companion planting
   b. Polycultures
   c. Water efficiency
   d. Season Extension
   e. Native plants
   f. Composting
   g. Sheet mulching
   h. Crop rotation
   i. Pollinators/bee-keeping
   j. Other:

9. Which of the following would you like to see at the farm? (circle all that apply)
   a. Workshops and classes
   b. Harvest festival
   c. Bees
   d. Livestock (chickens, goats, pigs)
   e. Aquaponics
   f. Native American/traditional farming methods
   g. Other:

10. Which of the following workshops/clinics would you be most interested in attending? (circle all that apply)
    a. Seed-saving
    b. Farm-to-table cooking
    c. Compost/vermiculture
    d. Permaculture
    e. Medicinal herbs
    f. Bee-keeping
    g. Canning/preserving
    h. Other:

11. What are you most interested in learning more about? (circle all that apply)
    a. Place-based food
    b. Ecological design
    c. Local food
    d. Seasonality
    e. Regenerative agriculture methods
    f. Native American/traditional farming methods
    g. Permaculture
    h. Water
    i. Climate
j. Seed-saving
k. Organic farming
l. Other:

12. How do you see the farm fitting into campus curriculum?

a. What courses, specifically?
Title: UCCS Greenhouse and Farm Survey

Principal Investigator: Sara Santa Cruz

Funding Source: N/A

Introduction
You are being asked to be in a research study. This form is designed to tell you everything you need to think about before you decide to consent (agree) to be in the study or not to be in the study. A member of the research team will describe this study to you and answer any questions. It is entirely your choice. If you decide to take part, you can change your mind later on and withdraw from the research study. You can skip any questions that you do not wish to answer.

Before making your decision:
- Please carefully read this form or have it read to you.
- Please ask questions about anything that is not clear.

Feel free to take your time thinking about whether you would like to participate. By signing this form you will not give up any legal rights. If you are completing this consent form online, you may want to print a copy of the consent form for your records.

Study Overview. This study intends to learn more about students’ connection to food and place, and ways in which the UCCS Greenhouse and Farm can better serve as an educational space to encourage food literacy.

Procedures You are being asked to be in this research study because you are a current enrolled student at UCCS.

Other people in this study: Up to 100 people will participate in this study.

Risks and Discomforts: A possible risk includes annoyance/frustration at completing the questionnaire. The risk will be minimized by keeping the questionnaire brief.

Benefits: This study is designed for the researcher to learn more about students’ food literacy and connection to food and place. It will assess ways in which the UCCS Greenhouse and Farm can better be utilized to foster an environment of food literacy, leading to knowledge development and possible development of UCCS Greenhouse and Farm- based curriculum. In addition, this research will help me complete my master’s thesis.

Compensation N/A

Confidentiality
No identifying data will be collected. Additionally, data obtained will be stored a flash drive that will be kept in a locked location that is only accessible by the PI.

Certain offices and people other than the researchers may have access to study records. Government agencies and UCCS employees overseeing proper study conduct may look at your study records. These offices include the UCCS Institutional
Review Board, and the UCCS Office of Sponsored Programs and Research Integrity. UCCS will keep any research records confidential to the extent allowed by law. A study number rather than your name will be used on study records wherever possible. Study records may be subject to disclosure pursuant to a court order, subpoena, law or regulation.

**Voluntary Participation and Withdrawal from the Study**
Taking part in this study is voluntary. You have the right to leave a study at any time without penalty. You may refuse to do any procedures you do not feel comfortable with, or answer any questions that you do not wish to answer. If you withdraw from the study, you may request that your research information not be used by contacting the Principal Investigator listed above and below.

**Contact Information**
Contact Sara Santa Cruz (ssantacr@uccs.edu):
- if you have any questions about this study or your part in it,
- if you have questions, concerns or complaints about the research, or
- if you would like information about the survey results when they are prepared.

Contact the Research Integrity Specialist at 719-255-3903 or via email at irb@uccs.edu:
- if you have questions about your rights as a research participant, or
- if you have questions, concerns or complaints about the research.

**Consent**
A copy of this consent form will be provided to you.

I understand the above information and voluntarily consent to participate in the research. By signing this consent, I am confirming that I am 18 years of age or older.

Signature of Participant ________________________________ Date ____________
## Principal Investigator Submission Checklist

This checklist is designed to ensure all basic requirements have been included as part of your IRB submission. Applications/Protocols without the following will be returned without review. Reminder: As studies vary greatly in topics and methodologies, the IRB reserves the right to request additional information or clarifications as required.

---

**Reminder:** Faculty Advisors must review and confirm the application is complete before submitting the application to the IRB for review.

| ☐ Yes | ☒ No | Does the research involve interaction with a vulnerable population i.e. Children, Prisoners, Pregnant Women? If yes, complete the applicable addendum to the application available at [IRB website](#). |
| ☒ Yes | ☐ No | I have read and understand the [IRB Researcher Manual](#) for IRB Submission. |
| ☐ Yes | ☒ No | Will any of the researchers be non-UCCS personnel? If Yes, please contact the IRB (irb@uccs.edu) to discuss the role of the non-UCCS researcher. |
| ☒ Yes | ☐ No | Does the research involve employees of the PI or Co-PI as research participants; or is the PI or Co-PI recruiting students of classes they currently teach as research participants? |
| ☒ Yes | ☐ No | The correct and most up-to-date application and templates from the [IRB website](#) have been used. |
| ☒ Yes | ☐ No | Did you attach the Consent/Assent Forms using the IRB template? |
| ☒ Yes | ☐ No | All study-specific supporting documents are included with the application. Examples may include (but not limited to) final copies of surveys, questionnaires, interview questions, recruitment scripts, flyers, letters of access, etc.) |
| ☐ Yes | ☒ No | Does the study involve a local school district? If yes, please [click here](#) for a list of school district contacts to ensure all district requirements are met prior to initiating your research study. |
| ☒ Yes | ☐ No | Does the study involve international research? If yes, review the international research SOP and complete the applicable addendum to the application available at [IRB website](#). |

**Reminder**

All students must route applications to their Faculty Advisor for Approval and submission. Applications that contain typos and/or grammatical errors that make the application difficult to review may be returned without review.

---

*Version: 8/11/2015*
UNIVERSITY OF COLORADO COLORADO SPRINGS
INSTITUTIONAL REVIEW BOARD (IRB) for Human Subjects

REQUEST FOR IRB REVIEW

Review application deadlines and meeting dates, listed at the beginning of each semester on the IRB meeting, which is available here.

PLEASE NOTE: IRB CITI Training is required for all personnel, including PIs and Co-PIs involved in human subjects research. Faculty Advisors must complete the training before submitting a protocol for review. All student requests for review must be submitted by a Faculty Advisor; via email and IRB CITI training must be complete prior to IRB review. If you do not provide the Completion Report Number (located at the top of the Completion Report) and the date of your most recent training, YOUR APPLICATION MAY BE RETURNED TO YOU WITHOUT IRB REVIEW.

Follow the instructions to complete the required IRB training.

The level of review is determined by the IRB.

Inclusion of Application Addendums:

Check ALL pertinent application addendums that are attached:

☐ Research Involving Children
☐ Research Involving International Research
☐ Research Involving Pregnant Women, Human Fetuses, and Neonates
☐ Research Involving Prisoners

Pre-Approvals:

Will you collect or work with human blood, body fluids or tissues? (IBC approval must be obtained before the IRB review.) Information about the IBC can be found here.

Yes ☐ (If Yes, submit a copy of the IBC approval with your application) No ☑
A. STUDY TITLE: **UCCS Greenhouse and Farm Survey**

B. PROPOSED DATE: From **9/14/15-10/12/15**
   Note- Research may not start until the IRB has provided a letter of approval.

C. PRINCIPAL INVESTIGATOR:
   
   Name: **Sara Santa Cruz**
   
   IRB Training Completion Number: **16385724** Most recent IRB Training Date: **07/06/15**
   
   Check one: □ UCCS Faculty/Staff   □ Current UCCS Student*
   
   Department, Center, or Institute: **Geography and Environmental Studies**
   
   Mailing Address: **119 E. Van Buren Street, Colorado Springs, CO 80907**
   
   Phone: **909-224-7487**   UCCS email address: **ssantacr@uccs.edu**

D. CO-PRINCIPAL INVESTIGATOR:
   (Submit additional sheets if necessary) If additional sheets are included, check the box □
   
   Name: ______
   
   IRB Training Completion Number: ______ Most recent IRB Training Date: ______
   
   Check one: □ UCCS Faculty/Staff   □ Current UCCS Student*
   
   □ Non-UCCS Personnel (Note: Non-UCCS personnel must be approved by the IRB). If checked, explain role of Non-UCCS personnel: ______
   
   Department, Center, or Institute: ______
   
   Mailing Address: ______
   
   Phone: _____   UCCS email address: _____

E. ADDITIONAL PERSONNEL INVOLVED WITH HUMAN SUBJECTS:
   (Submit additional sheets if necessary) If additional sheets are included, check the box □
   
   CITI training is required for all personnel involved in the research.
   
   1. Name: ______
   
   IRB Training Completion Number: ______ Most recent IRB Training Date: ______
   
   Check one: □ UCCS Faculty/Staff   □ Current UCCS Student*
   
   □ Non-UCCS Personnel (Note: Non-UCCS personnel must be approved by the IRB). If checked, explain role of Non-UCCS personnel: ______
   
   2. Name: ______
IRB Training Completion Number: _____ Most recent IRB Training Date: ____

Check one: ☐ UCCS Faculty/Staff ☐ Current UCCS Student* ☐ Non-UCCS Personnel (Note: Non-UCCS personnel must be approved by the IRB). If checked, explain role of Non-UCCS personnel: _____

F. * FACULTY ADVISOR (REQUIRED FOR ALL STUDENTS):

Name: David Havlick

IRB Training Completion Number: 1095117 Most recent IRB Training Date: 8/28/2015

Department, Center, or Institute: GES

Phone: 255-4926 UCCS email address: dhaylick@uccs.edu

G. HAVE YOU APPLIED FOR/OR RECEIVED EXTERNAL (outside of UCCS) FUNDING FOR THIS STUDY?

☐ Yes ☐ No If yes, answer 1 below:

1. STATUS OF EXTERNAL FUNDING FOR THIS STUDY:

☐ Pending/Under Review ☐ Received** ☐ Not Awarded

Is the proposal for funding attached? ☐ Yes ☐ No (Note: If the proposal for funding is not provided, the protocol may be returned as not reviewed.)

Name of Sponsor _____ and Proposal Title _____

**If received, provide the following information:

Speed type _____ or OSP Proposal Number _____

(For assistance, contact the Office of Sponsored Programs at X3321 or email osp@uccs.edu)

H. PLEASE ANSWER THE FOLLOWING RESEARCH SUMMARY QUESTIONS BELOW (Additional information and instructions regarding the Research Summary may be found here.)

1. Purpose/Significance:

Provide a brief background and describe the major research question/s of the proposed study in language that can be understood by an individual outside your discipline: This study is intended to gauge students' awareness of the UCCS Greenhouse and Farm, their connection to place-based foods and agricultural methods, and to provide information as to how the Greenhouse and Farm can serve as a campus resource to reconnect people, place, and food through food literacy. The major research question is: in what ways can the UCCS Greenhouse and Farm serve as a campus resource to encourage food literacy?
2. **Methodology (Answer all questions):**

   a. **Describe, in narrative format, the research design and list procedures to be used:** For this research, data will be collected via survey and interview. The survey is structured to gauge students' awareness of the UCCS Greenhouse and Farm, their overall connection to place-based foods and agricultural methods, and to determine from that information possible opportunities for the UCCS Greenhouse and Farm to further contribute to food literacy.

   b. The survey is composed of 12 questions, with 1 follow-up question after question 12. The questions are designed to gauge students' awareness of the UCCS Greenhouse and Farm, their connection to place-based foods, and to identify opportunities for the UCCS Greenhouse and Farm to encourage food literacy on campus. The survey will take approximately 7-10 minutes to complete, and will be a combination of fill-in-the-blank, open-, and close-ended questions. Some questions will allow for the participant to circle as many answers that apply.

   c. The interview portion will be administered to 3-5 participants (graduate students, faculty, and staff), who will be selected based on their role with food literacy or sustainability on campus.

   d. For the survey, participants will be selected randomly as they pass by a table. After consent is given, the survey will be administered. Tabling will occur at least 3-5 times in the University Center to ensure a mixed sample.

   e. Data will be coded, transferred to a spreadsheet, and analyzed using SPSS. Descriptive statistical methods like frequency and ordering will allow for a generalization of the results, providing valuable data about the baseline of students' food literacy regarding place-based foods and connections to food, and information for future growth of the UCCS Greenhouse and Farm as an educational resource.

   i. **Check ALL of the different procedures planned for this study:**

      | Records review | Audiocaping / videotaping |
      | Questionnaires / surveys | Social or behavioral intervention |
      | Interviews | Behavioral observation |
      | | Other: ____ |

   b. **Participant Recruitment:**

      i. **Describe from where the participant population will be drawn; include when, where, and how potential participants will be recruited:** For the survey, only students will be asked to participate. I will hold tabling sessions at the University Center and/or west side of the library and/or Columbine Hall foyer three to five times until a sufficient number of surveys have been completed (at least 100). For the interview, graduate students, faculty, and staff will be asked to participate, based on their affiliation with food literacy on campus.

      ii. **Estimated number of participants to be enrolled:** At least 100 for the survey, and 3-5 for the interview portion.

      iii. **Describe how participants will be selected and rationale for the selection criteria:** Survey- In person: I will have a table set up in the University Center (or alternate locations listed above), and ask students to participate as they pass by. This location and method should allow for a random sample of ages, majors, and interests. Interview- graduate students, faculty, and staff will be asked (in person) if they would like to participate. The rationale for interviewee selection will be based on current affiliation with food literacy on campus, and mostly used to determine future directions for the UCCS Greenhouse and Farm to be utilized to encourage food literacy.
iv. Will participants be placed into groups? □ Yes ☒ No if “Yes”, please describe: 

v. Does your research involve any of the following populations? Address all that apply:

<table>
<thead>
<tr>
<th>Indicate the age of the participants you plan to use</th>
<th>Total Number of Participants</th>
<th>Number of Expected Male Participants (if applicable)</th>
<th>Number of Expected Female Participants (if applicable)</th>
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<tbody>
<tr>
<td>☐ Neonates 30 days or less</td>
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<td>☐ Children 31 days - 18</td>
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<tr>
<td>☒ Adults 18-65</td>
<td>&gt;100</td>
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<td>☐ Adults over 65</td>
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vi. Does the research involve any of the following populations? Check all that apply:

☐ Cognitively impaired  
☐ Educationally disadvantaged individuals  
☐ Economically disadvantaged individuals  
☐ Subjects who are supervised by or are students of the investigator  
☐ Non-English speaking individuals  
☐ Active duty military/Veterans  
☐ Prisoners*  
☐ Placental/fetus tissue  
☐ Pregnant Women/fetuses*  
☐ Neonates (non-viable/uncertain viability)*  
☐ Children under the age of 18*  
☐ People living outside the United States  
☐ People living in Native Peoples Tribal Communities**  
☐ Research involves NONE of the populations listed

* If your research involves neonates, placental/fetal tissue, pregnant women/fetuses, or neonates (non-viable/uncertain viability), addendum is required. Addendum is available on the IRB website.

** If your research involves Native Peoples Tribal Communities, approval from the Tribal Chief will be required.

vii. Will the following items be used to identify and/or recruit potential participants?

- Paper files (e.g., school or medical records) □ Yes ☒ No
- Electronic files (e.g., school or medical records) □ Yes ☒ No
- Other records □ Yes ☒ No
  - If “Yes”, describe: ______
- Flyers/brochures □ Yes ☒ No
- Web postings □ Yes ☒ No

Version: 8/11/2015
If “Yes”, what companies:  
- Advertising company  
  - If “Yes”, what companies:  
- Letters/Emails/Tweets  
- Recruit students in your current courses  
- Recruit employees supervised  
- Other  
  - If “Yes”, describe: Convenience sampling of students passing by a table set up in a public area on campus.

vii. List all recruitment materials used in this study. Recruitment materials must be submitted as attachments and approved by the IRB in their final form, including graphical elements, before the study can be implemented.

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Description</th>
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<tbody>
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<td>1:</td>
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<td>5:</td>
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(Submit additional sheets, if necessary) If additional sheets are included, check the box ☐

ix. Describe how coercion or perceived coercion of research participants will be avoided for all research populations (i.e. provide detail regarding subjects who are students of or supervised by the investigator): Participants will be assured that the survey or interview is optional and anonymous, and that there is no penalty for not completing the survey or interview.

Coercion – When an overt or implicit threat of harm is intentionally presented by one person to another in order to obtain compliance. For example, if an investigator tells a student that non-participation in their study could affect their grade.

*Please note, if your research involves a vulnerable population (prisoners, children under 18, or pregnant women, your protocol may need to be reviewed at a full board meeting. Please click here for IRB meeting dates and protocol submission deadlines.

x. How will participants be involved? Include information for each procedure that will be used: N/A

d. List ALL materials used in the research that will be shared with research participants (Marketing material is addressed question 5 in section H. Items must be submitted as attachments and approved by the IRB in their final form. (e.g. surveys, questionnaires, images, instructions, debriefing, etc.)

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. UCCS Greenhouse and Farm Survey</td>
<td>A survey/questionnaire designed to gauge students' level of food literacy, connection to place-based food, and opportunities for the UCCS Greenhouse and Farm to encourage food literacy.</td>
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(Submit additional sheets, if necessary) If additional sheets are included, check the box ☐
e. Does this protocol involve the use of medical equipment (i.e. X-rays, PET Scans, MRI, etc.)?

☐ Yes (If Yes, provide information in the box below.) ☒ No (If No, proceed to 2f)

<table>
<thead>
<tr>
<th>Name of medical equipment used</th>
<th>Describe how the will be used</th>
<th>Describe any known risks/safety concerns (if unknown mark as N/A)</th>
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</table>

(Submit additional sheets, if necessary) If additional sheets are included, check the box ☐

f. Will existing or archived data, documents, records, or biological specimens be used?

Existing - Data, which have been collected for purposes other than the proposed research and are on the shelf at the time of this application:

☐ Yes (If Yes, answer i. and ii.) ☒ No (If No, proceed to 2g)

i. Is the source publicly available? ☐ Yes ☒ No (If Yes, describe the source: _____)

ii. Is the information recorded in such a manner that subjects can be identified, directly or through identifying links? ☐ Yes ☒ No

g. Will observations of public behavior, interviews, tests, and/or surveys be used?

Public Behavior - Behavior generally open to view by any member of a community and/or which would not involve any special permission to observe (i.e., no reasonable expectation of privacy by those being observed), such as, at a park, in a mall, at a movie theater, etc. What occurs in a classroom would not generally be considered observation of public behavior.

☒ Yes (If Yes, answer i., ii., iii., and iv.) ☒ No (If No, proceed to the next section)

i. Is the information recorded in such a manner that subjects can be identified, directly or indirectly through identifiers linked to the subject? ☐ Yes ☒ No

ii. Would the disclosure of subjects’ responses outside the research place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, insurability, or reputation? ☐ Yes ☒ No (If yes, describe: _____)

iii. Is the research an observation of public behavior? ☐ Yes ☒ No

(If yes, describe the setting: _____)

iv. Will you or any researcher participate in the activities being observed? ☐ Yes ☒ No (If yes, describe how you will participate: _____)

3. Research Setting: Provide information about each research site (including sites/people/organizations providing existing data) that will be included in this research study. You may be required to obtain a letter of access/permission to access the site before IRB review may be complete. Recruiting on campus typically will not require a letter of access, but you may need to get campus approval for using campus space for research activities.

Note: If data collection will be performed through an online website (e.g., survey monkey), please include the website as the research site, and rather than permission, indicate that the terms of service of the website allow research to be performed.
### Site #1 (If applicable)

<table>
<thead>
<tr>
<th>Site/Organization Name</th>
<th>UCCS Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>University of Colorado Colorado Springs</td>
</tr>
<tr>
<td>Location (*) (If international or on Tribal Land additional approvals may be required)</td>
<td></td>
</tr>
<tr>
<td>Contact Person</td>
<td>Sara Santa Cruz</td>
</tr>
<tr>
<td>Contact Person Email/Phone #</td>
<td><a href="mailto:ssantacr@uccs.edu">ssantacr@uccs.edu</a> 909-224-7487</td>
</tr>
<tr>
<td>Site will be used for (select all that apply):</td>
<td></td>
</tr>
<tr>
<td>Recruitment</td>
<td>x</td>
</tr>
<tr>
<td>Data collection</td>
<td>x</td>
</tr>
<tr>
<td>Consenting participants</td>
<td>x</td>
</tr>
<tr>
<td>Existing Data</td>
<td></td>
</tr>
<tr>
<td>Other (describe)</td>
<td></td>
</tr>
</tbody>
</table>

**If a site other than UCCS, have you received permission from this site for this research study? (If “Yes”, attach a letter of access stating what access is being provided for to you to conduct the research as stated in your protocol. The letter should also list any restrictions (e.g., time frame, types of classes, etc.).)**

- Yes
- No (describe status)

### Site #2 (If applicable)

<table>
<thead>
<tr>
<th>Site/Organization Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>Location (*) (If international or on Tribal Land additional approvals may be required)</td>
<td></td>
</tr>
<tr>
<td>Contact Person</td>
<td></td>
</tr>
<tr>
<td>Contact Person Email/Phone #</td>
<td></td>
</tr>
<tr>
<td>Site will be used for (select all that apply):</td>
<td></td>
</tr>
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</table>

**If a site other than UCCS, have you received permission from this site for this research study? (If “Yes”, attach a letter of access stating what access is being provided for to you to conduct the research as stated in your protocol. The letter should also list any restrictions (e.g., time frame, types of classes, etc.).)**

- Yes
- No (describe status)
4. Risks/Benefits:
   a. Describe all benefits of the research (benefits to individual participants, society, and/or science). If none, state in the space provided and in the consent form: Individual participants may be inspired to assess/think about their connection to food and place. Society and science can benefit from the analyzed data, which will provide information about the ways in which the UCCS Greenhouse and Farm can further be utilized to encourage food literacy, especially through curriculum and other educational programs.
   b. Describe all risks (e.g., physical, mental, emotional, and/or legal) to the participants. The risks must be disclosed in the consent form. Include in the response all potential risks. All studies entail at least some risk (e.g., annoyance, frustration): Annoyance at questionnaire or interview length/time to complete being unfamiliar with terms.
   c. Describe how the risks are reasonable in relation to anticipated benefits: The risk of annoyance is minimal if a proposed benefit is to be more aware of the UCCS Greenhouse and Farm and assess one’s connection to food and place and existing food literacy. Respondents may also opt out of the questionnaire or interview and discontinue taking it at any time.
   d. Describe safeguards (e.g., medical consultation, counseling, etc.) that will be taken to protect participants’ rights, welfare, and reduce risks: The questionnaire and interview are completely optional, and do not need to be completed if the participant feels like stopping at any time.

5. Informed Consent: Use the consent template located on the OSPRI webpage, and send your consent form as a Word document along with your IRB application.
   a. Are you requesting a waiver of written documentation of informed consent? ☐ Yes ☐ No
      (i.e., a signature)
      If “Yes”, complete the following two questions if you are requesting a waiver of documentation of informed consent:
      1. Describe how the waiver of written documentation will not adversely affect the rights and welfare of the research participants: The informed consent will be used for the interview portion only. If an interviewee wishes for me to quote them directly and include their affiliation with food literacy on campus, it will remain optional. Otherwise, data collected will remain anonymous.
      2. Describe why the research could not be carried out without the waiver: It can be carried out without the waiver, unless the interviewee wishes to be quoted (including name and/or position on campus), in which case consent will need to be obtained.

Note: (45 CFR 46.117 (c) (1 or 2) An IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either:

(1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject’s wishes will govern; or

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(2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

In cases in which the documentation requirement is waived, the IRB may require the investigator to provide subjects with a written statement regarding the research.

b. Are you requesting an alteration of informed consent? ☐ Yes ☐ No
   (i.e., no consent, consent is altered to omit certain required elements)

If "Yes", complete the following two questions if you are requesting an alteration or waiver of informed consent:

1. Describe how the alteration of informed consent will not adversely affect the rights and welfare of the research participants:_____

2. Describe why the research could not be carried out without the waiver:_____

Note: With sufficient justification, the IRB may approve a consent process that does not include or alters some or all of the elements of informed consent, provided that it finds and documents specific requirements. If requesting an alteration of consent, justify such in accordance with the criteria established under 45 CFR 46.116(d)(1-4) [waiver of consent] or 45 CFR 46.117(c)(1 or 2) [waiver signature]

c. Describe the consent process, including who will be obtaining consent? I, Sara Santa Cruz, will be obtaining consent for the interview portion. The consent form will be administered and explained prior to the interview being administered.

d. Describe the time commitment to participate: 7-10 minutes

e. Will research participants be offered compensation for participating in the research?
   ☐ Yes ☐ No

If "Yes", describe the nature of the compensation. Provide dollar value and schedule of payment
(include compensation amount in the informed consent form):_____

f. For research involving minors, describe how assent will be obtained, whether parental permission will be obtained, whether permission will be obtained from one or both parents (if not both parents describe why, i.e. deceased, unknown, etc.):_____

g. Describe any plans to share results of the research with participants: N/A

6. Data Monitoring:

a. Describe where the data will be stored, who will have access to the data, and measures taken to secure the data. Include procedures for maintaining participant confidentiality (for any hardcopy data, CD, tapes, specimens, etc., describe any physical safeguards that will be in place; for example, locked cabinet/office, data de-identified, encryption, approved cloud storage [Dropbox not allowed], etc.): No identifying data will be collected with the survey. For the interview, participants will be given an ID number (if the interviewee chooses to include their name and/or position) to protect their identities. Data will be stored on a flash drive that will be kept in a locked location.

Note: Data may be required to be protected using encryption.

b. Describe how the privacy of the participants and the confidentiality of the data will be maintained (i.e. Participants will be assigned an ID number to protect identity): Survey participants will not
be asked to include any personally identifying information. Interview participants will be assigned an ID number if they choose to include identifying information.

c. Describe the plans for the final disposition or de-identification of data that are identifiable in any way (directly or indirectly via codes) once the study has ended. If the data will be kept indefinitely describe the format of the data and purpose of retention. If data will be destroyed, describe the timeline and method. The data will be stored on a flash drive which will be stored in a locked location. There will be no identifying information collected with the survey. Interviewees will be assigned an ID number, which can be further coded at the end of the study.

Note: Records should be kept for 3 years after the completion of the research or after the funding has ended depending on which is longer.

d. Name those who will identify, document, and report adverse or unanticipated events: Sara Santa Cruz

Note: Adverse events must be reported to the IRB within 5 days of occurrence using the Unanticipated Event Form.

I. HAVE YOU SUBMITTED THIS STUDY TO ANY OTHER IRB? □ Yes □ No

If “Yes”, describe the IRB (name and location) and action taken: _____

Submit a copy of the other IRB approval.

J. WILL YOU BE COLLECTING OR SHARING PROTECTED HEALTH INFORMATION (PHI)?

Specify if the study involves Protected Health Information (PHI).

PHI is involved if any of the following are involved:

- Accessing or collecting information from a medical record
- Adding information to the hospital or clinical record
- Creating or collecting information as part of health care
- Using information collected from the study to make health care decisions

1. □ Yes, PHI is involved. Note: All UCCS personnel must use the UCCS HIPAA Authorization form when obtaining informed consent for research that involves PHI from UCCS HIPAA covered entities which may be any work performed at/with the Lane Center clinics. Other institutions may require use of their version of the HIPAA authorization form to access their medical records. The authorization form originates from the covered entity that owns the PHI.

   a. Are you requesting a waiver of HIPAA Authorization? □ Yes □ No
      If “Yes”, please attach a waiver of HIPAA Authorization. Attach HIPAA authorization if appropriate.

2. □ No, PHI is not involved.

K. WILL THIS STUDY INVOLVE FOOD, DRUGS, OR DEVICES?

1. Does the study collect safety and or efficacy data about a device (i.e., contraption, contrivance, lab test, in vitro reagent, mechanical test, computer software, or computer algorithm)?
☐ Yes  ☒ No

a. If yes, will data from the study be submitted to FDA?  ☐ Yes  ☒ No

2. Are subjects given any drug or over-the-counter medication, food, dietary supplement, or biologic agent as part of the study?  ☐ Yes  ☒ No

   a. If yes, are subjects given a food or dietary supplement?  ☐ Yes  ☒ No

   b. If yes, is the purpose of the study to examine the impact of the food or dietary supplement on a disease or condition?  ☐ Yes  ☒ No

L. CERTIFICATIONS/ASSURANCES:

   1. CONFLICTS OF INTEREST SHALL BE CONSIDERED TO INCLUDE:
      • Stock (holdings or options) in a sponsoring organization
      • Director, advisor, or consultant to the sponsoring organization
      • Other vested interests such as the inventor and/or patent holder of the drug, procedure, technique, device, or software being tested

   Does the PI, Co-PI or Faculty Advisor have an actual, potential or perceived conflict of interest as included above and/or defined in the University of Colorado Conflict of Interest Policies?

   ☐ Yes  ☒ No

   If “Yes”, please describe the conflict and how you will manage the conflict: ______

   2. INVESTIGATOR’S CONTINUING RESPONSIBILITY TO IRB:
      Once the study has been approved, it is the Principal Investigator’s (PI) responsibility to:
      • Ensure additional personnel take the CITI training and understand their responsibility when working with human participants.
      • Report all changes in research activity related to the study by submitting a Report of Change to the IRB.
      • Provide the IRB all study and consent form amendments and revisions. IRB must approve these changes prior to their implementation. All changes to advertisements recruiting study participants must also receive prior approval by the IRB.
      • Promptly report any injury, adverse event, or detrimental incident experienced by a research participant that is or may be related to the research procedures.
      • Renew study with the IRB prior to expiration. All studies must have a continuing review at least annually. Some studies will have the continuing review more frequently as determined in the initial review and approval. Retro-active approval for lapsed studies is not allowed. If the study approval lapses, you may be required to destroy any data collected or work completed during the lapsed time period.
      • Notify the IRB (irb@uccs.edu) when the study is complete.

      Failure to comply with these federally mandated responsibilities may result in suspension or termination of the study.

INVESTIGATOR ACKNOWLEDGMENT:

• I have listed all potential Conflicts of Interest.
• I have read the definitions of Misconduct in Research.
• I have read the Training requirements for IRB review.
• I have read the Investigator’s Continuing Responsibilities to the IRB.
• I understand the definitions of Scientific Misconduct and Conflicts of Interest and my continuing responsibilities to the IRB.
• I understand submitting this application to the IRB does not constitute IRB approval, and that I will not proceed with my research until I receive an approval letter from the IRB.
• By submitting this Request for Review to irb@uccs.edu I attest to my agreement to conduct this research study in such a manner that acts of misconduct in research and conflicts of interest will not be committed and I will comply with the continuing responsibilities to the UCCS IRB.
• I will conduct my study in compliance with the UCCS IRB Standard Operation Procedures.

*FACULTY ADVISOR ACKNOWLEDGMENT:

By submitting this Request for Review to irb@uccs.edu, I acknowledge that the information contained in the study is accurate to the best of my knowledge. I verify that I am the faculty advisor for the Principal Investigator for this study and that I shall be responsible for the oversight of the conduct of the research and adherence to all applicable University policies and procedures.

*SUBMISSION PROCEDURES:

• UCCS Graduate and Undergraduate students must have their faculty advisor submit the application via the faculty advisors email address.

By submitting this form, As Principal Investigator, I hereby certify that to the best of my knowledge, the information furnished above is true and complete, and that I have read and understand the Investigator Acknowledgement section. I understand that if found to be otherwise, it is sufficient cause for refusal or dismissal. I authorize representatives of the University of Colorado Colorado Springs to make any and all appropriate inquiries regarding the information listed in this supplement. I hereby release you or others from any liability or damage that may result from furnishing the information requested.

Submit Requests for Review as a PDF to irb@uccs.edu. Please submit other documents when possible as Word documents.