EDIBLE ARCATA: A GIS PERSPECTIVE FOR A LOCAL FOOD-LOVING COMMUNITY IN HUMBOLDT COUNTY, CALIFORNIA

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ABSTRACT

EDIBLE ARCATA: A GIS PERSPECTIVE FOR A LOCAL FOOD-LOVING COMMUNITY IN HUMBOLDT COUNTY, CALIFORNIA

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City and local governments across the United States are beginning to implement urban agriculture and edible landscaping policies and planning procedures to address social and environmental sustainability goals. From the Portland City Hall garden to public orchards in San Francisco, landscaping public space with fruit trees, vegetables, herbs and edible plants has gained popularity as an approach to reduce carbon emissions, improve biodiversity, increase food security and contribute to social activities. In March, 2011, the City of Arcata in Humboldt County, California developed Council Goals for 2012 that include development of edible landscaping around parks and new building projects. Utilizing geographic information systems (GIS), this project models potential edible landscaping sites on City owned property. Suitable sites were mapped based on key-informant interviews and spatial analysis of accessibility, nearness to low income housing and proximity to community gathering places. Literature on GIS food system analysis, urban planning, local native food resources and food foraging was reviewed to contextualize maps and discussion. Recommendations for implementation of the edible landscaping goal are presented along with a list of appropriate plants for the climate. This

undertaking has implications for future research and action including using the findings to influence land use planning for increased diversity within the local food system.

Keywords: urban agriculture, geographic information systems (GIS), edible landscaping, urban food foraging, Humboldt County, Arcata, sustainability, city planning

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INTRODUCTION

Growing food within population centers on small plots of land or in village commons is not a new idea. Human societies have long histories of kitchen vegetable plots, war-time "victory" gardens and community orchards. While growing food within the boundaries of an urban or peri-urban community is not a new phenomenon, large scale industrial agriculture and centralized food processing in the "developed" global North has intensified the divide between non-agricultural areas (cities) and agricultural areas (rural communities). Urban agriculture and edible landscaping counters the land-use dichotomy perpetuated by industrial agriculture practices and encourages local food systems to flourish in spaces between sidewalks, on top of roofs and in parks.

Urban agriculture is a broad term that often includes forms of educational gardens, home gardens, community gardens, small scale farms, Community Supported Agriculture (CSA) models, bee-keeping, animal husbandry and farmer's markets within city limits (Unger and Wooten, 2006). Edible landscaping is the practice of replacing traditionally ornamental landscaping with edible plants such as fruit bearing trees, berries, herbs and other edibles. Edible landscaping is encompassed within urban agriculture but often has less of a retail market focus.

Urban agriculture and edible landscaping are not practices unique to developed countries. Indeed, in many parts of the world, where arable land is scarce or population density is high, growing food in public space, in recycled containers, on doorsteps and

with innovative methods is a necessary norm. The United Nations Development Program recently reported 800 million people worldwide are now engaged in urban agriculture, producing between 15 percent to 20 percent of the global food supply (Zuckerman, 2011). Many of these urban agriculturalists are located in Sub-Saharan Africa, in densely packed cities such as Nairobi, or in South East Asian countries with long histories of edible landscaping. As climates change, urbanization increases and access to arable land is reduced, the resourceful knowledge of how to grow food in population centers will become even more valuable.

In communities across the United States, urban agriculture and edible landscaping practices are increasingly advocated for as a path towards social and environmental sustainability. As the environmental impacts of chemical-industrial agriculture are better understood, local governments from Burlington, Vermont, to Oakland, California, are adopting policies supporting and promoting food production within the boundaries of their cities. Landscaping public space with fruit trees, vegetables, herbs and edible plants has gained popularity as an approach to reduce carbon emissions, improve biodiversity, increase food security and contribute to social activities.

In March, 2011, the City of Arcata in Humboldt County, California, developed Council Goals for 2011-2012 that include development of edible landscaping around parks and new building projects. Utilizing geographic information systems (GIS), this project models potential edible landscaping sites on City owned property. Suitable sites were mapped based on key-informant interviews and spatial analysis of accessibility and

proximity to low income housing and community gathering places. A review of relevant literature and edible landscaping policies in communities around the United States was combined with semi-structured interviews with key-informants involved in city planning and local food advocacy in Arcata to form the foundation of this project. Products of this project include suitable edible landscaping site maps, a list of appropriate plants for the Arcata region and recommendations for implementation of the City Council edible landscaping goal. The geographic extent of this study is the City of Arcata and public lands and parks owned by the City.

While this project advocates creative and sustainable food production on public space through intentional edible landscape design, it should be noted that landscapes are not inherently devoid of food. Native and naturalized plants offer a wide variety of nutrition in the region. An observant walk around town uncovers several types of berries, wild and weedy fennel, abandoned apple trees, gourmet nettles and an abundance of salad greens. The aim of this project is not only to provide resources for urban agriculture development in city planning and policy but also to increase the diversity within the local food system by expanding our understanding of local food.

Study Area

The City of Arcata is located on the central coast of Humboldt County, approximately 280 miles north of San Francisco on US Highway 101(Figure 1). Arcata is situated on a coastal terrace with Fickle Ridge to the south-east, the Mad River to the North and Humboldt Bay to the South (City of Arcata, 2000). Humboldt Bay is the

second largest bay in California and is fed by several perennial creeks that flow through the City of Arcata and surrounding lands. The proximity of the Pacific Ocean causes Arcata's temperatures to remain moderate with little variation between summer and winter months (Humboldt County Division of Environmental Health, 2005). Temperatures rarely exceed 75 degrees and coastal fog and high precipitation maintain high humidity. Annual precipitation varies between 40-60 inches of rain, most of it falling between October and April (Humboldt County Division of Environmental Health, 2005). According to the *Sunset* "New Western Garden Book," Arcata is located within Climate Zone 17, Marine Effects-Northern California. This climate zone is described as dominated by the ocean with fog, wind and incompatibility with heat-loving plants (pg. 24). The vegetation in the area is generally lush and abundant with redwood and conifer forests covering the eastern hills of the City. Despite cool weather, the growing season is long and edible greens, herbs and berries can be found much of the year.

Local food and small scale agriculture is highly visible in the greater Arcata area. Four community supported agriculture (CSA) farms can be found within the City's sphere of influence and much of the surrounding green-belt (that is not redwood forest) is zoned agricultural and is used as pasture. The Arcata plaza is home to the oldest certified farmers market in the State and every year the City declares September local food month (Bramble, 2009).

A liberal university town of 17,231 residents (U.S. Census, 2010), Arcata is known for both progressive politics and innovative environmental programs. The first

city-owned forest in California was acquired by Arcata in 1955. The community forest now includes 2,134 acres of primarily second-growth redwood forest managed for multiple uses (City of Arcata, 2010). The Arcata Community Forest, the Sunny Brae Forest and the Jacoby Creek Forest provide wildlife habitat, recreation, sustainable forestry research and maintain watershed functions. Arcata is also home to the Arcata Marsh, a unique wastewater treatment facility mimicking natural wetland systems. The Arcata Marsh project serves as secondary treatment for the City's wastewater and creates marsh habitat and a highly used recreation area (City of Arcata, 2010).

The community forests and the Arcata marsh are prime examples of City owned land currently utilized by residents for naturally occurring edible plants found along trail systems. During the summer and fall months residents pick blackberries, huckleberries and salal. Arcata is also home to a wild mushroom harvesting community and many residents have coveted spots within city limits (just don't ask them where!).

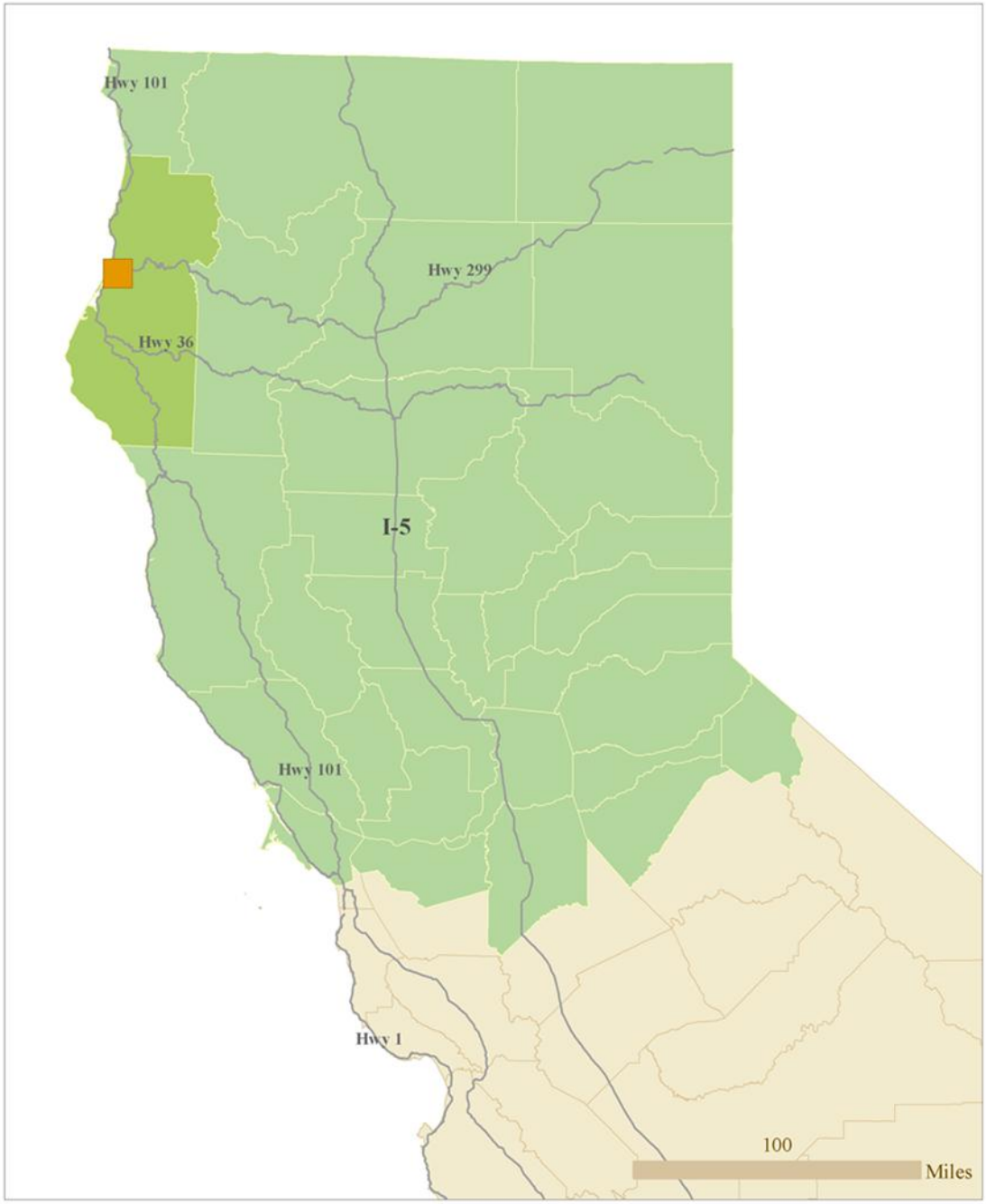

Figure 1: Arcata, Humboldt County, California

LITERATURE REVIEW

This project is grounded in literature sourced from academic research, non-governmental organization (NGO) and local government reports and contemporary publications. I begin the discussion with local food discourse and the popularity of urban foraging then continue with a review on landscape design, permaculture literature and traditional food culture in the Arcata area. I also review the utilization of geographic information systems (GIS) technology in local food system analysis. The last section of the literature review focuses on urban agriculture and edible landscaping as a multi-faceted tool to meet sustainability measures as they are adopted in communities across the United States.

Local Food Movement and Urban Foraging Popularity

Local, seasonal, and slow food enthusiasts have ushered in a new era of food in the United States. Author Michael Pollan, Chef Alice Waters, and NGOs such as Community Alliance with Family Farmers (CAFF) have popularized local food, introducing food system concepts to a wide audience. Local food advocates, along with small-scale farmers and a diverse contingency of social actors, increasingly view local food as a way to reconnect to sense of place, address environmental degradation, create a sustainable society and improve overall human health. Because of these powerful claims, local food systems are increasingly studied to understand how they work and what factors encompass them. The following literature represents a small portion of local food, edible

landscaping and urban agriculture theory and practice reviewed to develop and expand an understanding of local food. With an expanded and nuanced view of local food, edible landscaping in urban planning can be integrated into local food policy discussions. This project aims to create a resource to do just that, and to creatively complicate how local food is perceived to include native, foraged, gleaned and public foodscapes.

Sociologist, Amory Starr, in the article "Local Food: A Social Movement?" analyzes local food's growing influence on society through new social movement theory. Starr views the varied and diverse actors in local food not only as a "set of institutions, policies, or commodities" but instead as a process and a long term dialogue (pg. 486). In Starr's interpretation the local food movement is evolving and should be viewed as multiple, changing and flexible. Conceptualizing local food through the context of dynamic social movements is important to this project because it allows for an expanded understanding of the diverse activities and goals that can be created under the banner of "local food."

While Starr discusses local food as an evolving social movement, there is no one definition of what a local food system is. Because "local" signifies a spatial area, local food is intrinsically a geographic concept (Feagan, 2007). In the paper "The Place of Food: Mapping out the 'Local' in Local Food Systems," Robert Feagan theorizes local food from a cultural geography perspective by examining geographic references in branding and marketing as well as terminology used in local food systems literature. Feagan discusses local food terms as "geographically charged" and central to a "re-

spatialization" of modern food production/consumption systems (2007). Feagan argues that we have a need to better understand how we are re-spatializing alternative food systems by calling them "local." If we better understand the geographic implications we are making with terminology we will have greater clarity and transparency on how local food is delineated (Feagan, 2007).

The idea of understanding the re-spatializing of food systems through local food language is important to this project because edible foodscapes found in the neighborhood, the community forest or on a walk to school are not always understood as "local food". While they may not be "new" or marketed as alternative, free, publically available food within a close proximity to where a person lives is as much "local food" as produce intentionally purchased from a farm stand.

Due to the geographic nature of local food discussions, "food miles" are often associated with local food, although the defining distance varies from region to region. As of 2007, the New Oxford American Dictionary defined "locavore" as a local resident who eats only food produced within a 100-mile radius. Commonly used delineations of local food in Humboldt County tend to focus on food grown or processed within the County but may include foods found within a 250 mile radius (North Coast Co-op, 2011).

Food miles are incorporated into local food discussions because of the energy intensiveness of the modern agricultural model which transports food hundreds to thousands of miles from farm to dinner plate (Horrigan et al., 2002). Many cities throughout the United States are turning to urban agriculture practices to decrease

dependency on oil and carbon dioxide emissions. The City of Portland, Oregon recognizes urban agriculture's potential to buffer impacts of climate change and as important for carbon sequestration within the city (Portland/Multnomah Food Policy Council, 2009).

Another conceptualization of local food is the spatial and social relationships involved in market exchange. The United States Department of Agriculture describes local foods as being directly purchased and minimally transported food grown, processed and sold in a specific region (USDA, 2010). Some descriptions of the local food concept portray it as the shortening of links through the collaboration of social actors such as farmers, experts, retailers, chefs, food writers and consumers (Starr 2010). Links are shortened when consumers are able to purchase local food through restaurants, farmers markets and farm stands. By these interpretations, the local food system can be understood as the geographic nearness of the producer and consumer (USDA, 2010).

But local food is much more than the geographic link between producer and consumer. Local food does not intrinsically fall within a market system as seen with community gardens, edible landscapes, wildcrafting and gleaning practices. Michael Pollan asked us to see beyond local food labels found in high-end grocery stores in the "Omnivores Dilemma". He offers an *alternative* alternative when he forages for chanterelles and hunts wild boar in the oak woodlands of Sonoma County. Home gardening and gleaning within cities, as advocated by Pollan, offers further expansion to

the producer/consumer dichotomous definition of local food by including non-market elements.

In “Of Bodies, Place and Culture: Re-Situating Local Food,” Laura Delind argues that the core values of health, ecology and sustainable economies that are advocated by local food movements are often lost in applications that solely focus on market-based forms of expression (2006). She asserts that non-rational, cultural and tactile, “sensual” experiences are necessary to fully achieve the goals and principles of local food. The arguments forwarded by Delind rest comfortably with the emotional experience of interacting with food growing in public space. Delind also asserts that academic analysis of local food systems create a gap from the on-the-ground activities that make up a holistic food system. By viewing elements of the local food system as outside of the market, Delind’s analysis complicates local food discussions and allows for activities such as gardening, foraging, and landscaping with native edibles to be included in a diverse local food system.

Defining local food as a geographic distance between producer and consumer is a narrow interpretation of the complexity that makes up a local food system. Local food systems need land, climate, and a watershed to anchor them to place. The concept of “Foodshed” was coined in 1929 by Walter Hedden, a researcher with the New York State Agriculture Department who set out to understand food transportation flows into large population centers (Ollar, 2011). A foodshed is a region where food is grown, processed, transported, sold and consumed. A foodshed is described as a “socio-geographic space:

human activity embedded in the natural integument of a particular place (Feagan, 2007)". Foodsheds can be viewed much like a watershed, a distinct spatial basin where, water, or food, interacts and shapes the environment. Foodshed analysis can allow for alternative "flows" into the total system. Within a foodshed, non-commercial food can be considered such as native, foraged foods, food-pantries and community gardens.

As understood through a foodshed analysis, local foods can be foods gleaned from neighborhood trees or pulled from abandoned lots. Surprisingly, the mainstream media has begun to disseminate this idea through a large number of articles about the growing popularity of urban foraging. The New York Times runs a regular column titled the "Urban Forager" in which the columnist Ava Chin describes digging up dandelion roots to replant and sprout in pots at her apartment for healthful spring salads. Several other major papers including the San Francisco Chronicle and the Oakland Tribune have related features and associated urban foraging blogs.

From Euell Gibbon's successful 1962 "Stalking the Wild Asparagus" to current interest in the local food movement, foraging for overlooked edibles has become a legitimate means for non-farmers to actively participate in the energy cycles of regional bounty. Mapping access to berry picking spots, feral fruit trees and other gleaning resources is gaining in popularity within the online local food community. Several organizations have online search engines linked to Google maps where individuals can browse for fruit ready for the picking in their neighborhood. Portland based non-profit,

Urban Edibles, has a public-sourced map with edible plants tagged by location with descriptions to access, property ownership and peak-season picking times.

Portland is not the only community to create a map resource for free, accessible public foods. Maps for foragable foods can be found online for Los Angeles, Berkeley, and Melbourne, Australia, among others. This growing phenomenon demonstrates the public's desire for more accessible food and a hands-on experience with the edible landscape.

Local food can also be constructed as a resistance to the corporate industrial agricultural model. Farmer, writer and activist-scholar Wendell Berry is renowned for his theorizing on the growing movement to resist corporate agriculture and the need to move towards a localized food system. In the essay "The Pleasures of Eating" Berry asserts that "eating is an agricultural act" and that we, as eaters are much more than consumers of products produced on mega-industrialized farms and refined in factories—we are social and ecological actors who can know the land, know our farmers and actively participate in local food (Berry, 1990). Berry asserts seven ways in which we can resist the corporatization of food and become liberated from the role of the unconscious consumer. His non-definitive list towards liberation includes participating in food production to the extent that you can; which can include understanding energy cycles:
"from soil to seed to flower to fruit to food to offal to decay, and around again" (Berry, 1990). Berry's suggestions lend themselves well to the development of edible landscaping and urban agriculture as it encourages stewardship and interaction with food

within the lived community. Berry's work is foundational in this project because it breaks the dichotomous vision that places agriculture only within the country and excludes it from population centers.

While understanding local food as potentially sustainable, ecologically beneficial and participatory is important for this research, it should also be noted that the term local food is a social construction. The language of local food often portrays it as the antithesis to globalized, industrial agriculture (Hinrichs, 2002). In this binary-oppositional description of local food, assumptions and generalizations are made to neatly draw maps and attribute value to food such as good versus bad (Hinrichs, 2002). In positioning local as antithetical to global, nuanced understandings of complex social and environmental relationships are under-represented (Hinrichs, 2002). The term local food allows elements of the food system to be included and excluded; intentionally and unintentionally as they are defined by social actors and attributed to particular places.

Local Native Food Systems

Native edible plants are still foraged, gathered and managed for along the Northern California coast. The native edible landscape is diverse with several types of berries, greens, herbs, nuts, mushrooms and tubers. Humboldt County is home to several Native American tribes with a wealth of local food knowledge that is still actively used, developed and shared.

Viewing your surrounding, lived environment as a potential edible foodscape is by no means a new phenomenon. Traditional native Californian food systems are complex with relationships between seasons, plant and animal ecology, land management practices and spirituality. For many years, the perception of Western historians and anthropologists was that Native Californians lived in hunter/gatherer societies; harvesting the land but not cultivating it (Anderson, 2005). More recent research by tribes, traditional ecological knowledge practitioners and academics has shown this not to be true. Kat Anderson's book, "Tending the Wild: Native American Knowledge and the Management of California's Natural Resources" is the culmination of many years of studying, interacting and learning from California tribal elders about traditional food production and other resource management techniques. "Tending the Wild" describes how Native Californians have plant specific cultivation and management techniques adapted to maximize yield, expand food production and maintain (or enhance) a food resource over an extended period of time—an agricultural system indeed.

California Native food systems do differ from Westernized industrial agriculture systems because traditionally they did not distinguish between agricultural land and non-agricultural land as is often done today (Anderson, 2005). This perspective fits nicely with the concepts of edible landscaping and urban agriculture's attempt to grow food from a more ecological approach and less through intensive landscape manipulation. Edible landscaping and urban agriculture do not fit the mechanized western agriculture model. Similar to processes used by Californian tribes, edible landscaping utilizes native

plants and climate appropriate crops by cultivating them in settings that best fit their ecological niche.

The town of Arcata is located on the ancestral lands of the Wiyot tribe. The Wiyot people have lived in the Humboldt Bay area for thousands of years and actively managed their resources by burning grasslands, cultivating edible bulbs and creating a strict etiquette for fishing and hunting (Kadlecik, 2002). Today, this tradition of managing the land for ecological health and the prosperity of the people continues at the Potawot Health Village. Potawot Health Village is located on Janes Road in Northern Arcata and is run by United Indian Health Services, an inter-tribal non-profit organization providing social, medical, wellness and cultural services to tribal members in Humboldt and Del Norte Counties.

Potawot Health Village has created a modernized traditional native food system that provides hundreds of people fresh produce every year. The Health Village includes Ku'wah-dah-wilth Restoration Area, a twenty acre conservation easement with a large circular vegetable garden, fruit orchards and native edible plant patches. A large portion of the conservation is a restored wetland where many of the plant species have the dual purpose of enabling restoration and producing useful products (Kadlecik, 2002). Native plants create habitat, provide ecological services and are food, medicine and fiber. Examples of traditional use plants at Potawot Health Village include Wormwood (*Artemesia douglasii*), Horsetail (*Equisetum hyemale*), Salmonberry (*Rubus spectabilis*), Cattail (*Typha latifolia*) and Salal (*Gaultheria shallon*) (Kadlecik 2002).

The landscape design at Potawot Health Village incorporates the principle that health is defined by the context of the land, family, community and availability of resources (Kadlecik, 2002). Potawot is an example of successful integration of edible landscaping, biodiversity conservation and urban agriculture in the urban fringe of Arcata. Potawot Health Village is a potential resource for the City of Arcata to collaborate with for implementation of foodscapes on public land.

Permaculture, Agroecology and Landscape Design

Permaculture, or permanent agriculture, is a complete agriculture (energy) system designed to integrate plants, animal and ecological functions to produce a diverse and sustainable yield for humans (Mollison, 1979). Bill Mollison, the founder of permaculture, describes it as a positive feedback system that works with nature rather than against it. A permaculture landscape organizes planting and animal husbandry based on the role played in the ecosystem (i.e., grazing, water filtration, shade, etc.) to maximize their usefulness and minimize impact on the natural environment (Mollison, 1979). A permaculture landscape is diverse with appropriately organized crops, herbs and fiber producing plants with the intent to mimic natural systems. Permaculture will also often incorporate native plants and natural features such as seasonal wetlands and forest canopy.

Permaculture falls under what academic and sustainable agriculture advocate, Miguel Altieri, calls agroecology. Agroecology is an agricultural system that maintains and even increases species richness and ecological services. In agricultural areas,

maintaining biodiversity is important for maintaining important ecological functions including recycling of nutrients, hydrological process regulation, climate control and production of food, fiber and fuel (Altieri, 1999). In areas where biodiversity is simplified, such as industrial farms or paved urban environments, natural services are lost and production and maintenance require significant external inputs often in the form of chemical fertilizers and pesticides (Altieri, 1999).

The disciplines of landscape design and landscape architecture are increasingly adopting permaculture concepts and ecological principles into residential and urban development. As the contemporary human "footprint" expands, and un-disturbed land becomes , re-conceptualizing how residential landscapes are developed is needed. Food, clean-air, water filtration, flood protection and other ecological services provided in the urban and semi-urban built environment have become motivators for landscape managers (Lovell, 2009). The concept of a multifunctional landscape is one that is gaining traction. Multifunctional landscapes buck the idea that human-dominated landscapes are ecologically poor and must rely on high inputs or permanent landscape manipulation (Lovell, 2009). A multifunctional landscape creates a matrix of human developments, natural (or naturalized) spaces and environmental features designed to provide ecosystem services (Lovell, 2009). While a small native plant buffer strip or a non-paved storm drain does not individually contribute greatly to the ecological richness of a developed area, when many of these elements are employed within a city they have a cumulative positive impact on the developed landscape (Lovell, 2009).

Multifunctional landscapes can increase biodiversity and provide habitat for wildlife, recreation space and food for a neighborhood. Edible landscaping is one practical tool to create a multifunctional green space. Fruit trees can provide shade for people and blossoms for pollinators; native berries feed birds and make delicious jam; hardy herb groundcovers reduce erosion and teach children culinary magic.

Philadelphia is one of the many communities across the United States to embrace edible landscaping to improve urban green space. Utilizing a hybrid of urban forestry and urban agriculture practices, 22 orchards have been planted to provide healthy food, clean air and natural beauty (Spencer, 2011). The Philadelphia Orchard Project (POP) utilizes perennial food producing plants to create an edible forest garden. With permaculture techniques and forestry practices, POP designs gardens in layers to mimic natural forest processes and fill ecological niches (Spencer, 2011). Orchard gardens feed the residents of Philadelphia, improve soil, reduce stormwater runoff, provide habitat for migratory birds and improve social conditions (Spencer, 2011).

Green space, a clean water source and a diversity of plants and animals are all ingredients for an attractive landscape. They can also be the ingredients for a multifunctional landscape. An edible landscape is one form of an integrated multifunctional landscape that can improve human quality of life and provide important ecological services. While some local food theorists include non-traditional agricultural practices in the local food system discussion, the idea of eating from multifunction landscapes is not often considered. Municipalities that have incorporated innovative

edible landscaping into planning and development offer a research opportunity. The key question is: can urban and semi-urban multifunctional landscapes feed communities?

Urban Agriculture and Sustainability Frameworks

In communities across the United States, urban agriculture and edible landscaping practices are increasingly advocated for as a path towards social and environmental sustainability. Local governments from Burlington, Vermont to Oakland, California are adopting policies supporting and promoting food production within the boundaries of their cities. These local food and urban agricultural policies are approached from a variety of social and environmental sustainability frameworks to serve a range of purposes. The following short summaries of different community approaches to urban agriculture and edible landscaping will highlight these sustainability frameworks.

Burlington, Vermont:

In March, 2011, Burlington City Council passed a resolution creating an Urban Agriculture Task Force. Burlington has an active urban agriculture community including farm to school programs, edible sidewalk gardens, a food systems program at the University of Vermont and several farmers markets. Identified in the Urban Agriculture Task Force resolution was a lack of clear regulation and cohesive policy addressing urban agriculture practices causing confusion and hindering innovation (Burlington, 2011). The resolution called for research and community comments to create recommendations for urban agriculture “best practices” policy and regulations to better promote and govern urban agriculture in Burlington. The City Council recognizes community-based food

policy as benefiting citizens by increasing healthy food access, promoting a local economy and creating environmental benefits (Burlington, 2011).

Oakland, California:

In January, 2006, the Oakland City Council, Life Enrichment Committee unanimously passed a resolution authorizing a food system assessment study conducted by the Department of City and Regional Planning, University of California, Berkeley (Unger and Wooten, 2006). The baseline assessment was initiated to create of a more comprehensive Food Policy Plan for the City and to achieve a goal to produce thirty percent of local food needs. Oakland City Council recognizes local food systems as vital to the overall City Sustainability Plan. The Oakland Food System Assessment identified five urban agriculture sustainability goals (Table 1).

Table 1: Oakland Food System Assessment Goals (Unger and Wooten 2006)

Goal	Description
1: Food Security	Ensure the no Oakland resident experiences hunger. Ensure that access to safe and nutritious food is not limited by economic status, location, or other factors beyond resident's control.
2: Urban Agriculture and Waste Reduction	Maximize Oakland's self-reliance and capacity to grow and provide local food for its citizens through community and rooftop gardens, farmer's markets, community supported agriculture and other urban agricultural activities; and simultaneously promote a "closed-loop" system that makes use of food waste recovery while reducing energy use.
3: Economic Development	Promote and revitalize economic development opportunities in the food sector that create jobs and re-circulate financial capital within the community. Encourage marketing and processing practices that create more direct links between local producers

	and consumers.
4: Agricultural Preservation	Support the preservation of the regions foodshed by encouraging consumption of regionally grown food that uses less chemical and energy-intensive production practices and emphasizes local inputs. Support smart growth policies that direct growth away from prime agriculture land.
5: Public Education/Capacity Building	Increase public "food literacy" and build capacity within communities to make food related choices that positively influence public health and long-term sustainability.

Portland, Oregon:

The City of Portland has several urban agriculture and edible landscaping programs including a City Hall garden planted in 2009. The city council collaborates with the Multnomah County Food Policy Council on many of the programs and has jointly produced several reports influencing policy and procedures in the local government.

In 2007, the Portland/Multhomah Food Policy Council Food Access Committee researched existing City policies regarding fruit and nut tree planting in public right-of-way along with locations of existing fruit and nut trees. The Portland Fruit/Nut Tree Report provided valuable information for policy makers and concluded that the inclusion of fruit and nut trees in City forestry standards and policies supports Portland sustainability goals to improve health and nutrition, reduce carbon emissions, increase food security and address the issue of peak oil (Portland Fruit/Nut Tree Report, 2009). Seven recommendations are made in the report to help achieve sustainability goals including using existing City Urban Forestry program for outreach and education and the expansion of public-private partnerships for the Urban Orchards program. The report also

includes a list of appropriate food bearing trees for the Portland region that has been made public through educational outreach and the City's website.

Another important policy tool utilized by the City of Portland was a land inventory. In 2004, City Council unanimously passed a resolution directing various City departments to conduct an inventory of their managed properties with the goal to determine which lands might be suitable for expanding community gardens or for future agricultural uses. A team comprised of graduate students from Portland State University, Food Policy Council members and City employees completed the report, title the Diggable City. The inventory includes "site snapshots" of suitable locations with acreage, transportation access, zoning, current and historical uses and images. The Diggable City Report is a valuable tool that the City of Portland can refer to for land planning, sustainability and food security decisions.

Sebastopol, California:

The City of Sebastopol is a semi-urban community approximately the size of Arcata. Although Sebastopol is surrounded by agriculture it does not have explicit urban agriculture policies as the other three cities reviewed do. This does not mean that the City of Sebastopol lacks support for the creation of edible landscapes and urban agricultural sites within city boundaries. Sebastopol has innovative, city sponsored edible landscaping programs which address goals for sustainability, clean air, community collaboration and beautification. Although initially it may seem an unlikely pairing, the youth of Sebastopol skateboard in a "skategarden". A traditional urban skatepark is

combined to a community garden with plots available for a $20 annual fee. The "skategarden" is also landscaped with hardy native plants at the edges of half-pipes.

The Public Works Department of Sebastopol also has an Adopt-a-Landscape program. This program allows individuals, businesses or organizations to maintain City green space. This program was developed to address growing maintenance needs, city beautification goals and a shrinking budget. The Adopt-a-Landscape program includes a recommended plant list with several of the City approved plants being native plants, edible herbs and fruits (Table 2).

Table 2: Sebastopol Adopt a Landscape Suggested Edible Plants

Plant Name	**Description**
White Sage (*Saliva apiana*)	Drought tolerant, low maintenance, beneficial insect attractor, medicinal properties.
Rosemary (*Rosemaryinus officinalis*)	Repels garden moths and attracts birds and beneficial insects. Very drought tolerant, good for cooking and is medicinal.
English Lavender (*Lavandula sp*.)	Low maintenance, good for pollinators and is medicinal.
Pineapple Guava *(Feijoa selloana*)	Drought tolerant, beneficial bird and insect attractor, low maintenance. Sweet fruits rich in vitamin C in the middle of winter
Peach Tree (*Prunus persica*)	Highly prized fruits, low maintenance once established.
Gravenstein Apple (*Malus domestica*)	Sebastopol City Tree. Culturally important to the region.

Three of the four cities outlined have adopted urban agriculture and edible landscaping into their sustainability frameworks and passed policy directing

implementation of local food based projects. Burlington, Oakland and Portland's resolutions identify local food production as beneficial to residents and the environment. These resolutions also direct the food system assessments and research and analysis to best implement urban agriculture in their communities. Sebastopol is an example of a City with programs encouraging edible landscaping through beautification and quality of life and sustainability goals.

The policy and programs of the four outlined cities inform this research and the recommendations made in the project. Understanding how other municipal governments are addressing local food production within city limits can inform how Arcata moves forward with innovative sustainability policy and accomplishes current goals.

Geographic Information Systems and GIS in food systems analysis

Geographic Information Systems (GIS) is increasingly utilized as a methodology for food systems research. GIS is both a computer technology and a science. GIS stores, manages, analyzes and displays geographical information to be utilized for research, decision making, and implementing policy. Practically any data that is geographically referenced; any data with a specified location, can be incorporated into a GIS system. GIS is most commonly associated with mapping software such as ESRI's ArcMap and GRASS, an open source software package. Maps are a common GIS product and provide a powerful visual representation of space and time. GIS databases containing information about resources, infrastructure, demographics, hydrology, crime, etc, are often used as decision making tools at all levels of government. (Pequet, 2002).

Although the term GIS may not be widely known by the general public, internet based mapping technology such as Google Earth, Bing Maps, Flicker accounts and other "crowd-sourced" geographic data sharing technologies allow anyone with internet access a taste of the amazing capabilities of geospatial technology.

Humboldt County is no exception to the growing trend of utilizing GIS to understand local food systems. In 2010 the California Center for Rural Policy (CCRP) in conjunction with Humboldt State University conducted the Humboldt County Community Food Assessment. The CCRP assessment identified a number of strengths, needs and recommendations for the county pertaining to local food production, food security, and community health (Stubbelfield et al., 2010). GIS data was gathered for the project through public participatory GIS (PPGIS) mapping sessions. Community stakeholders including farmers, grocers, schools, food pantries, gardeners and others were invited to map food strengths and food needs in the county (Ollar, 2010). The maps produced by the assessment showed gaps in food infrastructure and have since catalyzed food policy work in the region, including the inception of a local food policy council (Ollar, 2010).

Land inventories is another arena in which geospatial technology is facilitating food system analysis, particularly in urban areas where dense populations make green space a valuable resource. Inventorying available land for potential use for urban agriculture is a methodology used by planners and municipal policymakers to begin the process of implementing and encouraging food production (Mendes et al., 2008). Land inventories often use GIS software and theory to catalog parcels, availability of water,

ownership, vegetation type, soil contamination, pollution, transportation, site photographs, etc. to create an overview of what the landscape looks like and what opportunities it reveals.

In 2004, the City of Portland began inventorying city-owned property with the goal to determine suitability for expanding a community gardens program and for the future development of other agricultural uses (Balmer et al., 2005). Titled Portland's Diggable City, the project inventoried vacant or under-utilized parcels such as pump stations. Existing GIS data on property and infrastructure was collected from the Portland City Bureaus of Environmental Services, Parks and Recreation, Transportation and Water (Balmer et al., 2005). A technical advisory committee of City staff, Food Policy Council representatives and community members then "ground-truthed" the parcels, took notes and photographs to further classify the suitability for urban agriculture (Balmer et al., 2005). The end product of the Diggable City inventory was a report with geospatially referenced sites deemed suitable for urban agriculture uses.

In an analysis of the Portland Diggable City case study, researchers from the Centre for Urban Health Initiative at the University of Toronto and the Nohad A. Toulan School of Urban Studies and Planning at Portland State University found the use of a land inventory in Portland both enabled integration of urban agriculture into planning and policymaking and advanced social and ecological sustainability (Mendes et al., 2008).

While GIS has greatly added and improved food system analysis and research, several limitations of the technology merit mention. One of the most commonly lamented limitations is the high cost of the dominant GIS software, ESRI's ArcMap and

the need for high level hardware to go along with it. Another limitation to accessing GIS technology is that it requires specialized knowledge to be able to utilize it. While many GIS users are indeed self-taught, access to the skills needed to utilize complex mapping software can be cost prohibitive for individuals and non-profit organizations.

Despite costs and skills associated with GIS mapping, many municipalities and local food advocacy organizations are conducting land inventories, food system analysis and sustainability reports utilizing geospatial science and technology. This project utilizes GIS to better understand where within the City of Arcata publically owned sites, suitable edible landscaping and urban agriculture can be found. The methodology used for development of the GIS model was influenced by Portland's Diggable City land inventory process and, to a lesser degree, the PPGIS mapping done by CCRP's Humboldt County Community Food Assessment.

METHODS

Overview

This project creates a GIS model for potential edible landscaping sites on public property in the City of Arcata. The project makes recommendations as to how the City can incorporate edible landscaping into planning and land-management based on multiple methods (Figure 2).

Goal 52 of Arcata City Council for 2011-2012 under the Public Works-Parks and Building section reads: "Work with the Parks and Recreation and Open Space and Agriculture Committees to discuss urban landscaping that includes incorporating edible plants."

Starting with City Council Goal 52 and acting as a both a researcher and community member, I made the observation that there are available edible landscaping sites on public land in the City of Arcata. The next step was to begin research to understand and describe suitability of edible landscaping sites through a grounded theory approach. Secondary data including existing geospatial information such as parks, wetlands and socioeconomic variables from the 2000 Census were explored to culminate in new data creation through GIS software analysis tools.

Grounded theory is a research methodology with "systematic, yet flexible guidelines for collecting and analyzing data to construct theories grounded in the data themselves (Charmaz, 2006)." Observations, literature, interviews and GIS data formed

the foundation for exploration and ultimately shaped the constructed concepts, products and recommendations of this project, thus grounding the research in existing knowledge (Charmaz, 2006).

After an investigation of relevant urban agriculture, edible landscaping and city planning literature, key-informants were identified to further inform the project via interviews. The primary research for this project included a total of ten key-informant interviews conducted through semi-structured, open answer sessions. City staff, a native plant expert, permaculture landscape designers, local food advocates and a member of the Arcata Open Space and Agriculture Committee were among the key-informants interviewed to contribute concepts, ideas and data for this project. The key informants were selected based on my prior knowledge and involvement in the community, which ultimately drove my desire to speak with them. The questions created and the manner in which they were presented similarly shapes the outcomes of the project. In the case of this project, co-creation of information does not negatively impact the goal of the research, which is to influence city planning for Arcata as well as provide a resource for City Council Goal 52.

Interview questions for this project were designed to be conversational and open-ended (Appendix B). Questions were focused specifically on edible landscaping in the City of Arcata, locations and appropriate plant choices for the region. Background on the project was presented to the interviewees including the project abstract and a brief verbal discussion of proposed outcomes and goals.

The interview questions were designed to help shape the GIS model and analysis of suitable edible landscaping sites based on a public participatory GIS framework. Parameters, locations, plant types, limits and concerns were taken into consideration to create this project as a useful guide toward the implementation of City Council Goal 52.

These interviews sought to determine three layers of information: first, the locations suitable for edible landscaping sites on City owned property; second, the reasons why the locations were deemed suitable or unsuitable; and third, the types of edible plants recommended for foodscaping. Key-informant interviews were analyzed within the context of relevant literature to illuminate themes and concepts. Themes identified from the interview as well as the knowledge gleaned from literature were integrated into the GIS model created utilizing ESRI ArcMap 10 software.

The second product created through this research was a list of edible plants suitable to the Arcata climate and appropriate for edible landscaping (Appendix A). This plant list was compiled based on key informant interview questions, and gardening, landscaping and permaculture literature.

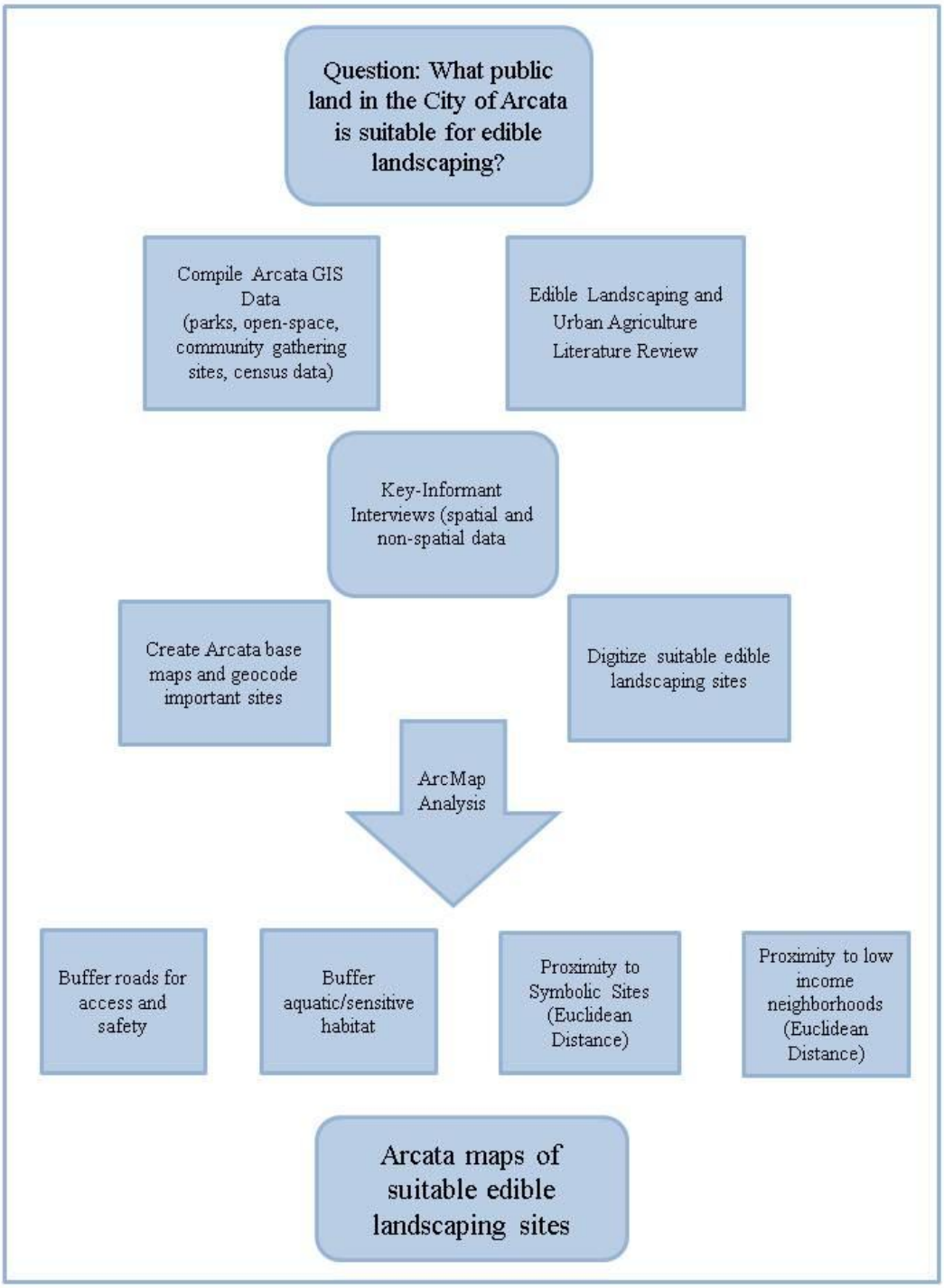

Figure 2: Methodology Flow Chart

GIS and Spatial Data Process

The spatial analysis portion of this project began with gathering base data on the study area and making preliminary field observations of parks and public space in Arcata. Data for the project was stored in a "file geodatabase" created in ArcMap 10. This project utilized existing spatial data, primarily from the City of Arcata, Environmental Services Department, and created new data from interview responses and ArcMap processing analysis (Table 3 and 4 respectively). Data were processed in the projected coordinate system State Plane, Zone 1: California, NAD 83.

Table 3: Geospatial Data Obtained for Analysis

Title	**Source**	**Description**
Arcata City Limits	City of Arcata, Environmental Services	A polygon of the Arcata city limits boundary in area feet.
Arcata City Zoning	City of Arcata, Environmental Services	Vector data of Arcata parcels with area and zoning description. Also has information on Coastal Zone and right-of-ways.
Arcata Open Space	City of Arcata, Environmental Services	Polygon of parks, wildlife sanctuaries, easements and public lands within Arcata's sphere of influence with ownership.
Arcata School Properties	City of Arcata, Environmental Services,	Vector data of schools and education facilities, public and private within the Arcata city limits
California Hydrography: polygon and linear layers	California Forest and Fire Protection Department (FRAP online GIS database)	Polygon and linear layers of in-land hydrologic features (including Humboldt Bay). Created in 1998 from remotely sensed data.
Humboldt County Roads Centerline	Humboldt County Community Development Services	Vector data of road centerlines of public and private roads based on 2005 NAIP air-photos. Updated in 2010.

Geospatial data for this project were created in the GIS database by two primary methods: ArcMap processing of existing data and through digitizing (essentially drawing new data) based on observations and interview results. The methodology was, in part, based on the land inventory process used in Portland's Diggable City Report. The Urban Studies and Planning Department at Portland State University, prepared the Diggable City Report for the City of Portland and the Multnomah County Food Policy Council through a process of interviews, focus groups, literature review, surveys, and existing GIS data collected from City departments. The report inventoried all public space for suitability with urban agriculture practices. The GIS portion of this project utilizes the framework of Portland's land inventory.

Similarly, this project began by retrieving existing city owned green space GIS data from the Environmental Services Department. Starting with all public land within the City limits of Arcata, parameters based on literature and interviews were established to reduce the open green space to usable and suitable edible landscaping sites. Green space was also added to the GIS database based on my observation of suitable open space owned by the City that had not been previously geo-referenced or included in data layers. Examples of green space added to the GIS model include the lawn at Arcata City Hall and medians around the Police Department, Library and Community Center Sports Complex.

The purpose of the map series created is to visually display potential future foodscapes and to inform discussion about local food production within City limits and to move towards achieving City Council Goal 52.

Interview Themes and GIS Analysis

Four themes from the ten interviews were identified and used to develop the GIS analysis and recommendations for the project. Themes were identified when two or more key-informants expressed similar ideas and these ideas were echoed in edible landscaping and urban agriculture literature. Interview results are discussed in greater detail in the following chapter. Parameters established from the themes of the interview process and relevant literature were used to create new geospatial data and ultimately identify suitable edible landscaping sites on Arcata public land (Table 5).

The first theme identified was the management and maintenance of edible landscapes. This theme was established from concerns expressed by several of the interviewees who voiced a need for edible landscaping to be set-back from sidewalks, roadways and parking lots. The management theme was used as a parameter to establish a road buffer using the ArcMap buffer tool for the analysis and maps. Open green space within 17 feet from the centerline of every road was categorized as unsuitable. Maintenance of edible landscaping would also require access to infrastructure. A road buffer of 360 feet from the road centerline was created to represent access. The management parameter excluded roadside green space 17 feet from the road centerline

but included green space only found within 360 feet of a City road from the edible landscape GIS model.

The second theme identified was for education potential of edible landscaping. Several interviewees suggested that proximity to schools as well as other community gathering places such as churches and public centers should be included in the guidelines for GIS analysis due to high foot traffic. Interviewees perceived foodscapes located in proximity to these sites to be educational tools for local food production. Furthermore, edible landscaping would only be beneficial to the general public if it was accessible and located in a prominent place. This theme informed the creation a new data layer titled symbolic sites. Symbolic sites in this GIS model are schools and community centers in Arcata that due to their use and high visibility may act as an educational tool. Geospatial data on schools were provided by Arcata's Environmental Services Department and community centers were geocoded from physical addresses.

Multi-ring buffer and Euclidean distance analysis tools were used to delineate distance of 1/16th to 1 mile to establish the proximity of Arcata open green space to the symbolic sites. Sites which are in in closer proximity to community gathering centers and schools are more suitable than outlying parks (see Figures 4 and 5 for examples).

The third theme identified was food security. Interviewees perceived edible landscaping as a viable system to provide fresh produce to low-income residents and to also increase Arcata's ability for self-sufficiency. This concept was added to the GIS model by including an analysis of low income data from the 2000 United State Census.

U.S. Census data was downloaded from the Humboldt County Summary at the Block Group level for residents at or below the federal poverty level. In 2000, the federal poverty level was a gross annual income of $8,350 for an individual over 16. Block Group data was joined with a 2009 TIGER California Census Block Group shapefile (2009) to bring the socioeconomic data into the analysis. The percent of people living at or below the federal poverty level was then calculated in ArcMap's field calculator. For this project, Block Groups with 25% or more residents living at or below the poverty level are considered low income neighborhoods. Foodscapes are more suitable in public spaces and parks found within these neighborhoods since this designation has the ability to increase food security for residents.

The fourth theme identified was ecological considerations. Native edible landscaping was perceived by several key-informants as beneficial to wildlife, while some expressed concern for non-native edible plants as being able to out-compete native varieties such as Himalayan Blackberry and native brambleberry. Edible landscaping was not perceived as beneficial on all open greens pace as sensitive habitat could become disturbed. The theme of ecological processes was incorporated into the GIS model by excluding sensitive aquatic habitats. Arcata stream and water body date was joined with US Fish and Wildlife wetland data to create a comprehensive aquatic habitat layer. This layer was buffered by the Environmental Protection Agency's (EPA) suggested riparian buffer of 7 feet. The riparian buffer was then erased from the Arcata open green space data layer to exclude sensitive habitat.

Table 4: Geospatial Data Created for Analysis

Title	Reference/credits	Description
Arcata Green Space	Brian Kang, City of Arcata	Compiled city parks, wildlife areas, conservation easements, and digitized green space
Aquatic Features	Brian Kang, City of Arcata and EPA, Mayer et. al 2005	Compiled Arcata streams and water bodies with wetlands data and buffered with standard EPA riparian zone
Symbolic Sites	Interviews	Community gathering centers with opportunity for education identified through interview process
Low Income Neighborhoods	2000 US Census, www.census.gov	Census block groups with 25 percent or more residents living under the poverty level
Road Buffers	Interviews	Set back 17' from road centerline but within 360' of road access
Suitable Edible Landscaping Sites	Multiple sources	Selected sites on public land near symbolic sites and within low income neighborhood. Set back from the road but accessible. Not in sensitive aquatic habitat or riparian zone

In summary, the GIS analysis for this project delineated future sites for orchards, gardens or native foodscapes as suitable, when the City owned green space is located in a low income neighborhood, within close proximity to a symbolic site, set back from the roadway yet is accessible to the general public and does not overlap with sensitive aquatic habitat. When all of these parameters are met, the area is likely to be suitable for edible landscaping and urban agriculture pursuits.

ANALYSIS and RESULTS

The results of this project include maps featuring sites suitable for edible landscaping within the city limits of Arcata, first hand data gleaned from interviews, and a list of recommended edible plants (Appendix A) adapted to the climate of the study area. The results of the interviews produced themes which when analyzed in the context of relevant literature and the maps provide an introductory land survey of public, green space. The recommended plant list provides a snap shot of local knowledge and includes several native plants. The following sections will report key findings as they emerged through interpretation and analysis.

Interviews and Spatial Analysis

Edible Landscaping Management:

The first theme identified was a concern about edible landscaping management. Several interviewees believed fruiting trees could be messy, would require pruning and increased management. Messy, fallen fruit could potentially cause a safety hazard for pedestrians if it fell on sidewalks or roadsides and would attract animals such as rats and raccoons. From a management standpoint, several of the interviewees voiced a need for edible landscaping to be set-back from sidewalks, roadways and parking lots.

Figure 3 represents all suitable land based on interview theme one. The map includes public lands that are accessible by road but set back from the roadways for

safety and maintenance. Figure has a large number of sites with a total of 46 parks, open space areas, community forests, wildlife areas and green space parcels within City limits and incorporated areas.

Key-informants were asked the question "who would manage edible landscaping on public space in Arcata?" Key-informants employed by the City tended to think management should fall on volunteer groups or one dedicated organization. Key-informants involved in urban agriculture and local food advocacy stated that management should be shared between paid city employees and the general public through a volunteer organization. These conflicting perceptions of management strategy could be a potential source of conflict, especially in a time of tight municipal budgets.

The interview responses to the management question are echoed in urban agriculture and green space policy implementation in other cities. For example, the City of Sebastopol, California has an Adopt-a-Landscape program that encourages residents, businesses and organization to maintain City green space. An Adopt-a-Landscape program addresses maintenance needs, fosters community stewardship and helps with dwindling municipal budgets. A similar program could be implemented by the City of Arcata to address installation and maintenance of edible landscaping sites. Allowing for signage that would identify the business or individual could incentivize the program and perhaps mitigate some financial constraints.

Prominent and Accessible Edible Landscaping:

The second theme identified in the interview process was the need for edible landscaping to be accessible and located in a prominent place where people would see it and utilize it. This theme was identified from the responses to the question "Where are ideal sites for edible landscaping?" One interviewee stated that parks with higher use or on main roads would be a good location. Several interviewees suggested that proximity to schools should be a guideline in establishing edible landscapes as well as other community gathering centers such as churches and public centers because of the high foot traffic.

Figures 4 and 5 represent an analysis of community gathering places and proximity to symbolic sites appropriate for demonstration gardens and local food education. Figure 4 displays the D Street Community Center, City Hall and the Community Center Complex along with five schools. Figure 5 displays Arcata Elementary School, Arcata High School and Humboldt State University. The overall analysis of the geodatabase reveals several parks including the Plaza, Redwood Park, Shay Park, The D Street Green corridor, Valley West Park and Pacific Union Park within 1/4 mile of selected symbolic sites.

Accessibility to fresh produce is an often discussed topic in local food system analysis. Food accessibility is based on several variables including distance to travel by foot, public transportation or personal vehicle, relative cost and availability of healthy foods (Ollar, 2010). Because the goal of this project is to provide recommendations for suitable edible landscaping sites and to add to the sustainability of the local community,

accessible locations near schools and community centers were prioritized in the GIS analysis.

Theme two also includes an element of education based on proximity to prominent symbolic sites. Several of the interviewees perceived edible landscaping and urban agriculture as an educational tool if located in close proximity to schools or other community gathering locations. Sites around community centers and schools provide access and serve as locations for instructional. Research on the use of gardens in education programs for school-aged children has been found to increase students' consumption of fruits and vegetables as well as their understanding of nutrition (Graham et al. 2005).

The siting of a foodscape near or on a school does not guarantee that it will act as an educational tool. Curriculum would need to developed, classroom time would need to be allocated and teacher participation and appropriate training would need to be incorporated into a successful program. The Humboldt Chapter of Community Alliance with Family Farmers (CAFF) runs a Farm to School Program developing hands on local food system curriculum connecting children to the agricultural process and healthy foods. CAFF's curriculum and strategies could be used for the development of education and outreach for future edible landscaping sites in Arcata.

The concept of siting edible landscapes in prominent public space for education and demonstration is a concept that is reflected in other communities as well as literature on urban agriculture and community gardening. Prominent sites around the City center

were deemed “symbolic and educational sites” by one key-informant because of their ability to demonstrate local food production possibilities and inspire home gardeners to grow more edibles. The concept of a demonstration garden was voiced by four interviewees.

Portland is an example of one of the many Cities that has planted a City Hall food garden. The southeast portion of City Hall grounds is landscaped with an esthetically pleasing vegetable garden promoting local food and spreading awareness about food insecurity in the region. Signage at the City Hall garden educates visitors and passersby about participating in the “Plant a Row for the Hungry” and donating to the Oregon Food Bank (Redden 2009). Portland Mayor Sam Adams stated at the inauguration of the food garden “the purpose of this garden is to show that in Portland you can grow food in relatively small spaces”.

Food Security:

The third theme identified from the interviews was food security. Interviewees perceived edible landscaping as a way to provide fresh produce to low-income residents and increase Arcata’s ability to be self-sufficient. Publically available, free food created by edible landscaping was seen as potentially having both a positive and negative impact on the Arcata community. A potential negative impact was that making fresh produce available to everyone could potentially encourage transient and homeless people to congregate in Arcata.

Edible landscaping and urban agriculture contribute greatly to food security in many parts of the world. As noted previously, 800 million people worldwide are engaged in urban agriculture practices and are producing between 15 percent to 20 percent of the global food supply (Zuckerman 2011). Kampala, Uganda, is an example of a high population city which feeds large numbers of people through community gardens and urban agriculture. Not only do they grow fruits and vegetables, but over 70% of poultry products consumed by residents were raised within the City (McCuaig 2006). While edible landscaping in Arcata might not provide an enormous quantity of food, adding another piece to the local food system will only make the overall community more sustainable and resilient.

Figures 6 and 7 map low income neighborhoods in Arcata based on 2000 Census data on populations at or below the poverty level. Figure 6 is a map of Block Groups based on percent of residents living at or below the federal poverty limit. According to the 2000 Census there were 5,757 residents living at or below the poverty limit representing 25 percent of the total population. Figure 7 displays the analysis of suitable edible landscaping sites that fall within neighborhoods with a poverty rate of 25 percent or more. Thirty potential foodscaping sites fall within the low income analysis. Prominent examples include the Arcata Marsh, the D Street Linear Park, the Arcata Skateboard Park, the Community Center Sports Complex and Valley West Park.

Ecological Considerations:

The fourth theme identified through the interview process was ecological considerations. Interviewees discussed concepts such as native plant habitat and wildlife interaction in the urban fringe environment. Native edible landscaping was perceived by several people as beneficial to wildlife. One interviewee, a native plant expert, stated that flowering edible plants such as huckleberries and blueberries are an important food source for pollinators such as butterflies and bees. Some expressed concern for non-native edible plants as being able to out-compete native varieties (example Himalayan black berries and native brambleberry) and recommended that edible plants with potential to become invasive be planted only in contained spaces or not at all. All maps created in the project map series include an accommodation for ecological considerations by excluding sensitive aquatic and wetland habitats from potential suitable sites.

Theme four is also reflected in the literature reviewed. Increasingly, urban and peri-urban agriculture is being researched for its potential role in biodiversity conservation. Urban agriculture and small gardens provide ecosystem services through increased pollination, improved air quality and storm water infiltration (Havaligi 2011). Philadelphia is an example of a city that has embraced edible landscaping to improve urban green space. Utilizing a hybrid of urban forestry and urban agriculture practices, orchards have been planted to provide healthy food, ecosystem services and natural beauty (Spencer, 2011). Utilizing permaculture and sustainable agricultural practices in combination with native landscaping design could continue Arcata's commitment to ecologically sustainable development.

Another result of the interview process was a list of edible landscaping plants suggested by the key-informants (Table 5). The question "What types of plants are appropriate for edible landscaping in Arcata?" was posed to the interviewees. All interviewees believed that perennial, fruit bearing plants were appropriate for edible landscaping. Many native berries were suggested because they are relatively easy to grow, are low maintenance and provide habitat and food for native fauna.

Table 5. Interview Results- Suggested Edible Landscaping Plants

Common Name	**Notes**
Apple	Dwarf or semi-dwarf more suitable for landscaping. Can be trellised.
Aronia berry	High vitamin C content. A superfood.
Artichoke	
Blackberry, native	Himalayan blackberry is invasive and can out-compete the local variety. Thorny plants can pose management concerns.
Blueberry	Northern varieties grow well here. Flowers attract bees.
Chilean guava	Fruit looks more like a blueberry than a guava.
Cranberry	A good groundcover.
Flowering dogwood	
Gooseberry	
Hops	A pretty, climbing vine.
Huckleberry	Slow growing native plant that attracts bees.
Kiwi	
Lemon	Only the Improved Meyer will produce fruit that ripen in Arcata.
Lingonberry	A good groundcover
Mulberry	Very common on the East coast. Can be messy
Peach	Frost variety will produce in Arcata
Pear	Under-utilized in the Arcata climate. Can tolerate wet soil.
Plum	European varieties. Asian varieties bloom too early for the North Coast climate.
Salal	
Salmonberry	Native berry, but not a very good producer.
Serviceberry	
Thimbleberry	Native berry, difficult to harvest and very perishable.

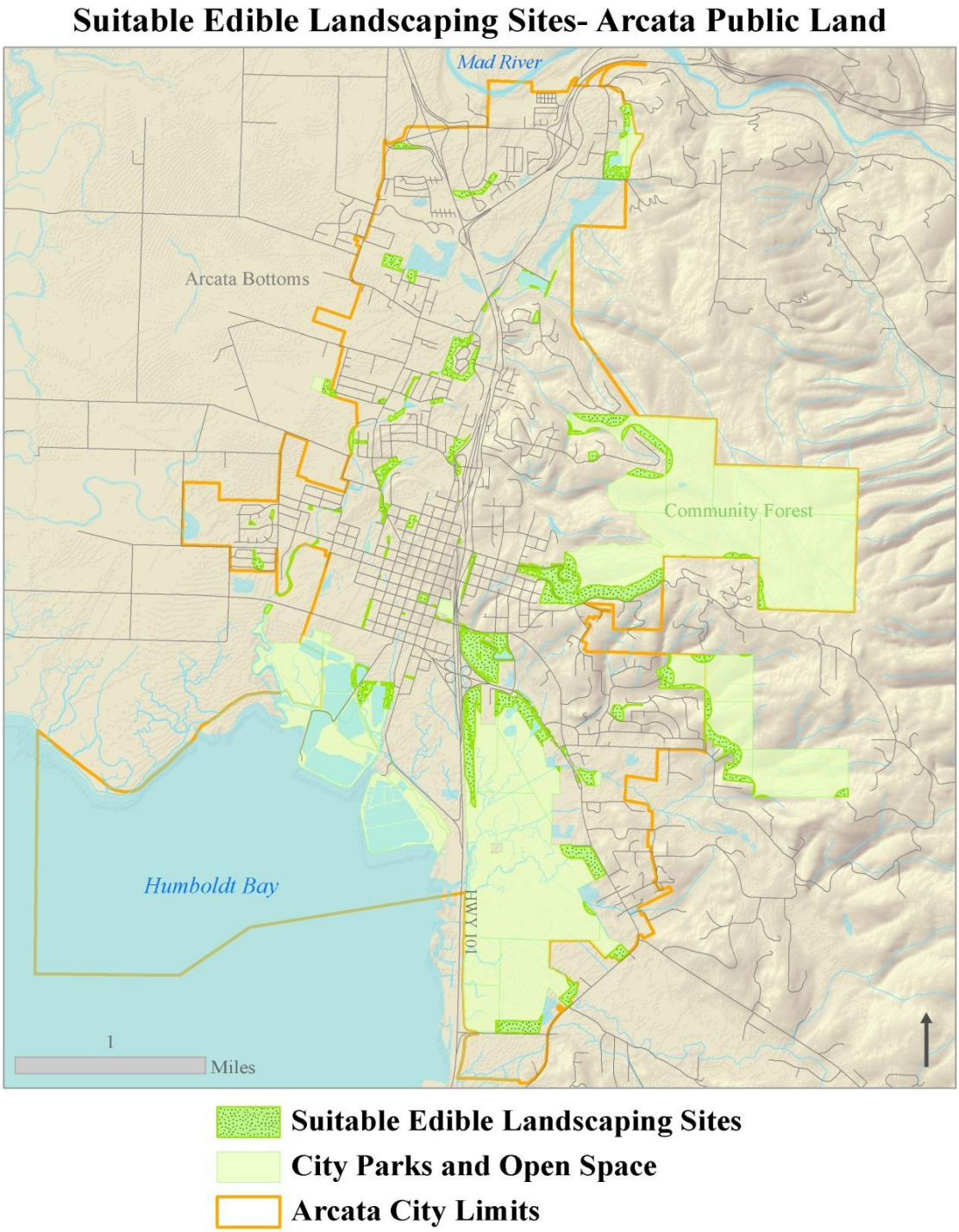

Figure 3: Suitable Edible Landscaping Sites-Arcata

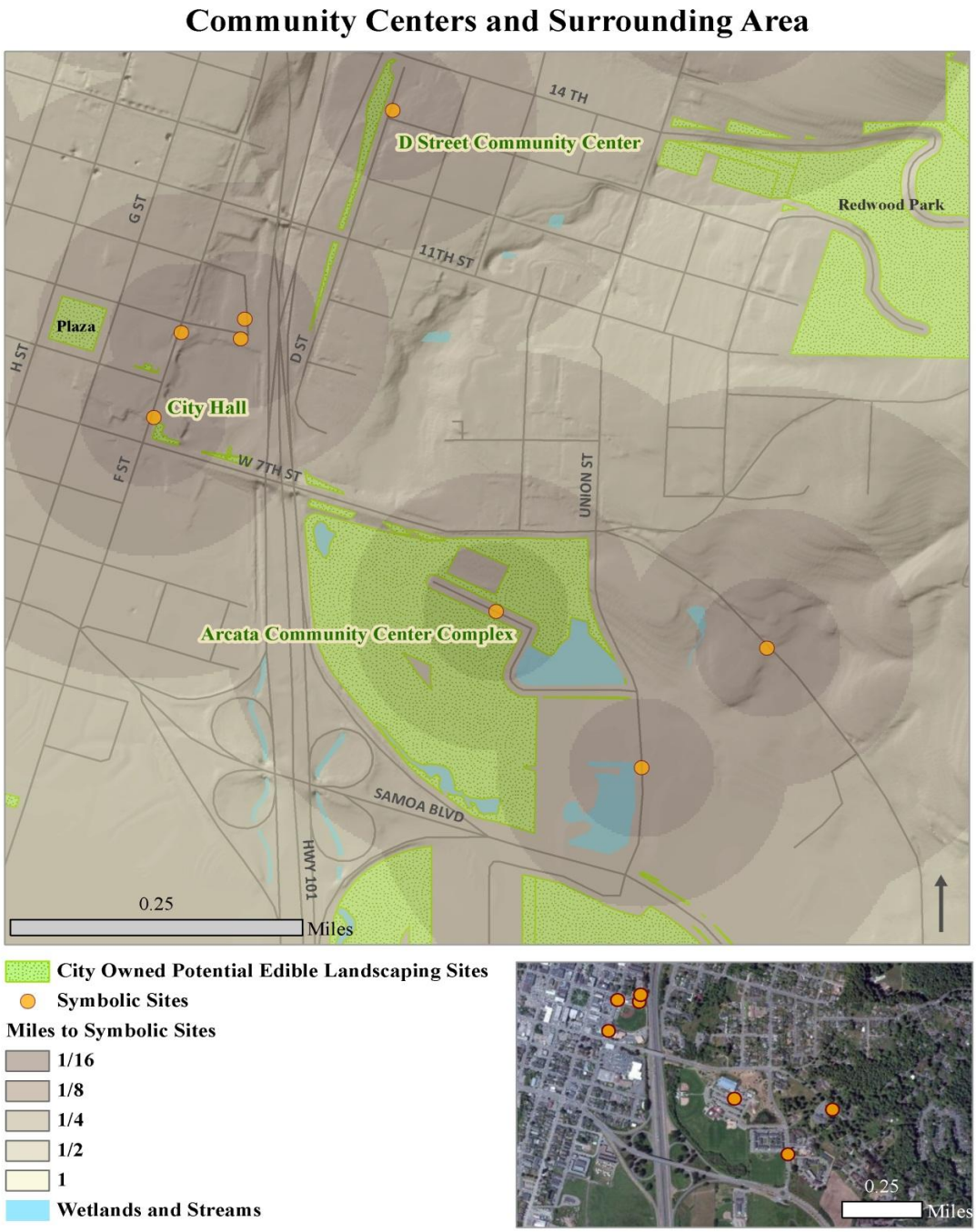

Figure 4: Suitable Edible Landscaping Sites-Community Centers and Symbolic Sites

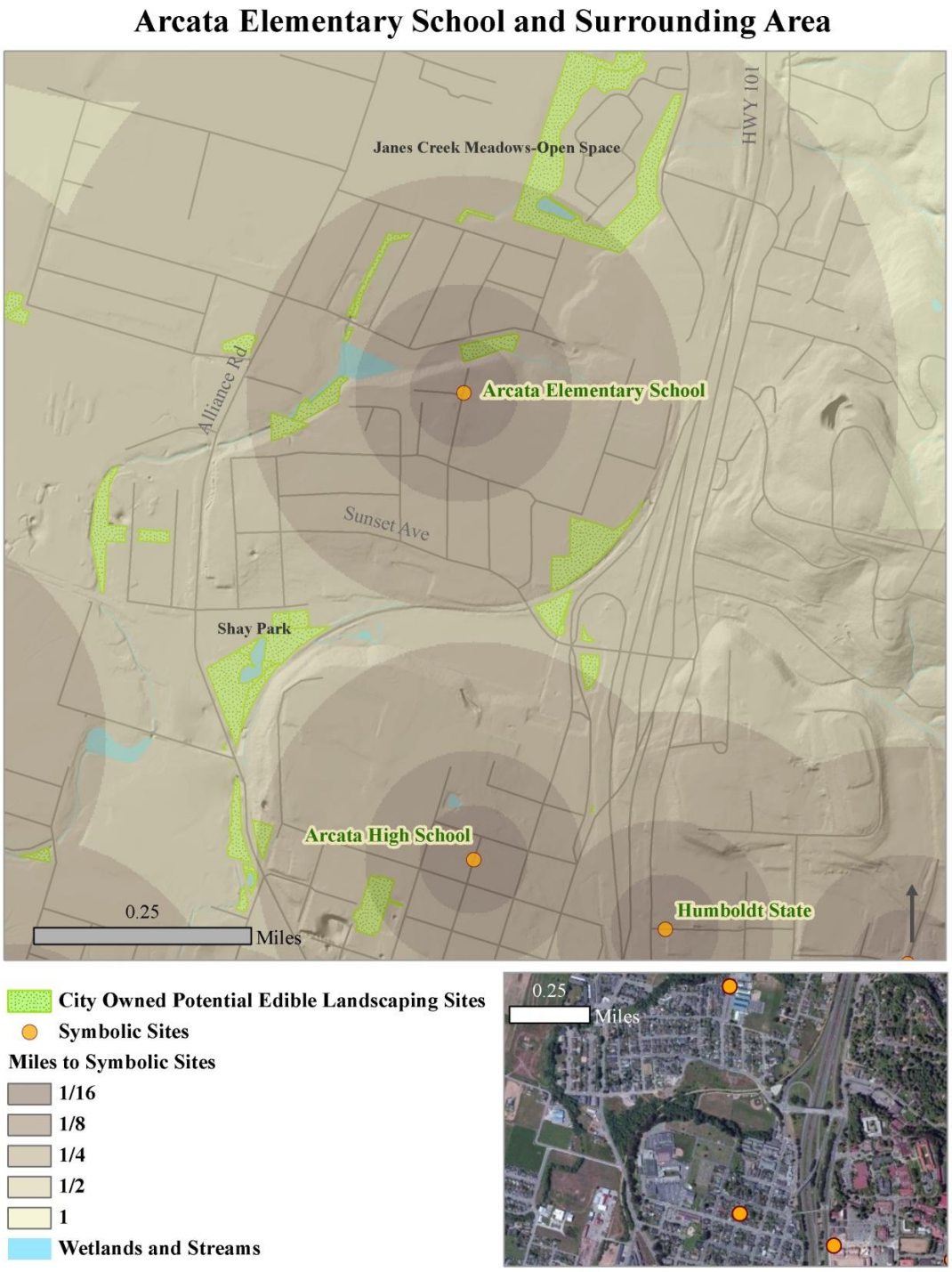

Figure 5: Edible Landscaping Sites-Arcata Elementary and Surrounding Area

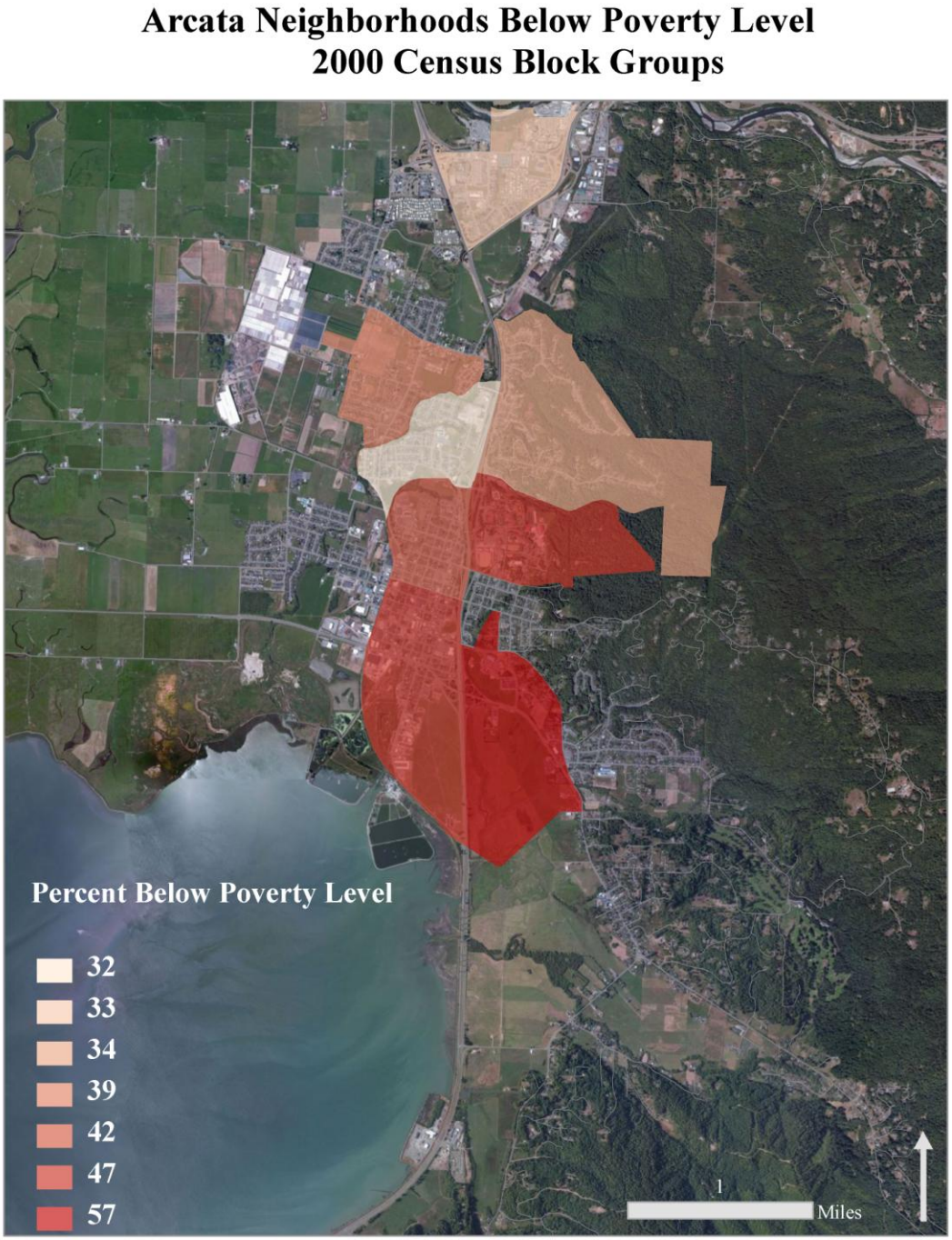

Figure 6: Arcata Neighborhoods Below Poverty Level, 2000 Census Block Groups

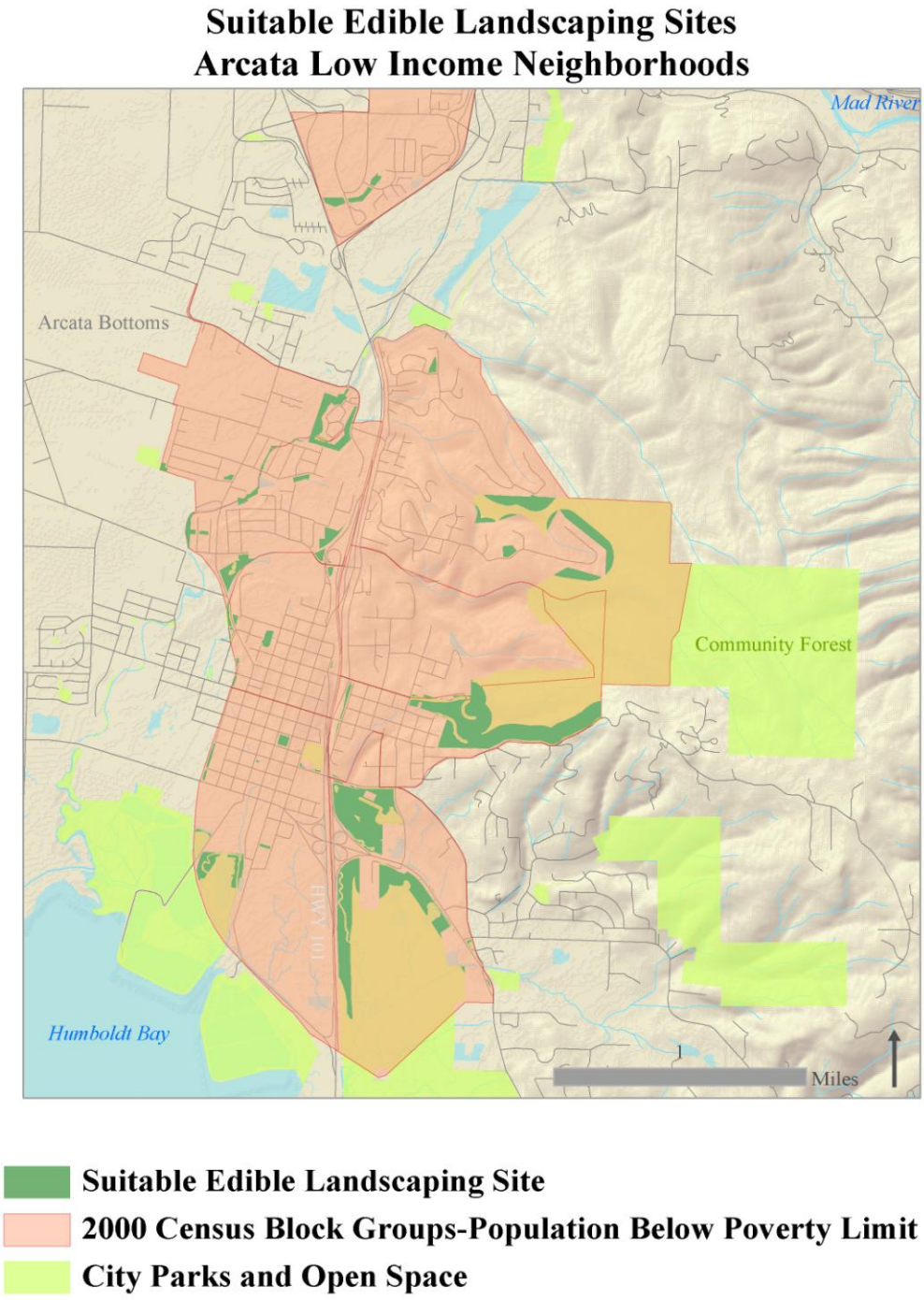

Figure 7: Suitable Edible Landscape Sites-Arcata Low Income Neighborhoods

Recommended Edible Plant List

A recommended edible plant list is another product created by primary and secondary data analysis in this project (Appendix A). The intent of the list is to provide a resource for the City of Arcata to utilize when implementing future edible landscaping. Data collected in the interview process (Table 6), ideas from Rosalind Creasy's "The Complete book of Edible Landscaping" and a short list of recommended fruit tree varietals from the City of Arcata's Open Space and Agriculture Committee were compiled. The list includes thirty seven different edible plants with common names of the specific varieties best for the region, scientific names and a brief description. The plants are hardy, low maintenance and either perennial or biennial. The list is organized into six color coded categories. The categories are shrubs, groundcovers, culinary herbs, fruit trees, climbing vines and vegetables. Twenty two of the thirty seven plants in Appendix A are plants identified through interviews. Native edible plants were also prioritized with eight different, locally occurring, berry producing plants on the list.

Limitations of the Analysis

There are several limitations to this research and analysis process. While the methodology does loosely follow the framework of a GIS land survey for potential urban agriculture sites, there are key elements that if included, would have greatly increased the effectiveness and usability of the model. A more in-depth analysis of suitable sites would include parameters such as access to water for irrigation, soil types, sun exposure and photo documentation. Another area of weakness is the inclusion of all City-owned open

space parcels. Several of the parcels are designated as wildlife sanctuaries and nature preserves. In hind-sight, I would have only included these areas as potential sites for native foodscapes, or excluded them due to sensitive habitat.

Perhaps the greatest limitation to this research is the socioeconomic data used to establish an analysis of low-income neighborhoods within Arcata. The 2000 U.S. Census is the most current, spatially referenced and federally recognized poverty data readily available to the general public. Residents at or below the poverty level are geo-referenced by Block Groups—a spatial delineation created by the Census Bureau. Block Group data is relatively coarse and likely lumps neighborhoods of different socio-economic levels into one group, thus overestimating the diffusion of poverty. Generalization is problematic because it reduces the effectiveness of the GIS analysis. The data is also twelve years old and it is possible that poverty rates have changed within the study area.

Another important limitation of this data is the designation of residents at or below the federal poverty level. Government poverty measures are contradictorily critiqued as either vastly underestimating or grossly overestimating the number of people experiencing poverty (Miller 1996). Federal poverty line methodology was established in 1964 based on commodity food expenditures for a family of four and then multiplied by three (Miller 1996). The annual food budget for a family was multiplied by three because it was estimated that most families spent 1/3 of their income on food. Critical poverty and race theory critiques this method as outdated, ineffective and flawed. Current

sociological research shows families spend approximately 1/6 of their income on food but that housing and transportation costs have disproportionately risen (Miller 1996). The federal poverty level for one individual in the year 2000 was $8,350. Locally, this does not factor in regional housing prices, food, transportation or the unique economic conditions of Humboldt County. It is likely that the U.S. Census underestimates the number of individual living at or below the poverty level and simultaneously does not capture data on many individuals who do not report their earnings.

Despite limitations to the GIS analysis based on environmental parameters and over-generalized Census data, the results of this project offer a preliminary land survey of publicly owned, suitable edible landscaping sites, insights on key-informant perceptions of edible landscaping in the area and a recommended edible plant list. How these results can be integrated into the food-centric community of Arcata will be discussed in the following chapter.

DISCUSSION

City Council's goal to incorporate edible plants in landscaping is just one small step towards increasing urban agriculture and encouraging edible landscaping within city limits. Currently, the Arcata City government and the community at large have policies, resources and supporting infrastructure that could be utilized and improved upon to achieve City Council Goal 52. One such supporting policy is Ordinance 1300, which effectively banned pesticide use on parks, fields and right-of-ways. Another supporting resource is the wealth of park land, including the Bayside Park and Arcata Educational Farm—a center for permaculture learning. The Ed Farm, as it is locally referred to, is currently growing food just a little over a mile from City Hall. Many supporting resources can be found within the Humboldt Bay Area including several organized and regularly meeting groups who advocate for food justice, urban agriculture, permaculture and edible plants. These groups are potential partners who could provide volunteers to implement edible landscaping on selected sites in Arcata.

Arcata's supporting policy- no pesticide ordinance

Arcata currently has policy that is complementary to edible landscaping and supports safe and organic agriculture. In February of 2000, the City of Arcata passed Ordinance No. 1300, banning the use of pesticides on City property and directing the creation of an integrated pesticide management (IPM) plan. Ordinance No. 1300 cited scientific research that finds no pesticides to be completely safe to human health or the

environment as one of the reasons for adoption. The City of Arcata had effectively stopped the use of chemical pesticides in May of 1986 due to mounting complaints about City employees spraying parks and city streets (CATs 2000). Community members and local environmental justice organization, Californians for Alternatives to Toxics, formed a citizen task force to work with the City to research and implement the best non-toxic pest control methods. Arcata effectively became the first city in the United States to manage a semi-professional baseball field, the Crabs Stadium, without the use of chemical pesticides. The non-toxic vegetation management techniques utilized by the Parks and Recreation department show adaptability and present a possibility for other innovative practices such as edible landscaping.

This important ordinance was the first of its kind and several other cities such as Sebastopol have since followed Arcata's example. A no-spray ordinance is important for the adoption of edible landscaping and urban agriculture because it allows foragers and harvesters to pick freely without worrying about pesticide residue. In many cities and counties, herbicides and chemical fertilizers are routinely applied to walk-ways, roadsides and parks. When these chemicals are not dyed or warning signs are not posted, harvesters have no way of knowing if what they pick is safe to eat. Because of this, many people are discouraged from gathering food in public space.

Arcata Educational Farm-Bayside Park

The City of Arcata already has one public park dedicated to semi-urban agriculture and feeding the local community. In 1993, Arcata's first CSA was formed in

Sunny Brae through a partnership with Humboldt State University faculty, students and the City. Arcata Educational Farm was developed as a "permaculture park" where the community and aspiring farmers could learn coastal farming skills, how to raise livestock, appropriate technology and the operations of community supported agriculture (City of Arcata website). In 2010, the Arcata Educational Farm, officially became a City program through the Department of Parks and Recreation. Now titled the Bayside Park Farm and Community Garden, educational farmers are directly employed through the City (City of Arcata website). The Bayside Park also features community garden plots where residents can rent 4x25' plots for $75.00 per year. The community garden portion of the park is still in the development phase with only 24 of the planned 58 plots built. The Arcata Educational Farm at Bayside Park is an important community center for the residents of the Humboldt Bay Area. School groups visit the farm, several gardening workshops are held on the grounds every year and Local Food Month events were held there for the first time in September of 2011.

Potential Partners

There are several well established organizations within the Humboldt Bay Area that advocate for food justice, local food production, native plants and ecological landscaping practices. These groups could potentially act as allies for the City of Arcata to move forward with sustainability measures surrounding urban agriculture and edible landscaping. The four communities discussed in the Urban Agriculture and Suitability Frameworks section of the Literature Review in this project all have active volunteer and

non-governmental group components that contribute to edible landscaping practices. Utilizing these existing models locally, NGOs could provide valuable resource collaboration through knowledge, expertise and volunteer-power. Below are brief descriptions of some potential partners for City Council Goal # 52.

Food for People:

Food for People, based in Eureka, is Humboldt County's designated food bank. Established in 1979, the non-profit has several programs addressing food insecurity in the region and distributes food to communities all over the county. Food for People's Gleaning Program and Plant a Row for the Hungry are two programs with potential for collaboration with City sponsored urban agriculture. Through these programs, Food for People staff and volunteers collect fresh produce from local gardens, farms and orchards. The City of Arcata could plant edible landscaping for the enjoyment of residents and have some of it harvested by Food for People to feed Humboldt County residents experiencing hunger.

North Coast Resource Center:

Located on 9th Street in Arcata, the North Coast Resource Center (NCRC) is a social service providing non-profit. Services at NCRC have included an on-site food pantry, hot meals, transportation assistance, shelter referral and a job training program. Currently the NCRC is closed due to a lack of funding. Despite this temporary closure, this long standing organization has great potential for partnership with the City of Arcata

to increase edible landscaping in parks. Their Life Skills and Employment-Readiness programs provide low or no-income local peoples the opportunity at a fresh start through trainings, volunteer jobs at the Center and eventually paying jobs contracted through NCRC such as festival garbage and recycling duties. The City of Arcata could utilize their volunteer and low cost crews to plant and do maintenance of edible landscaping areas.

Humboldt Food Policy Council:

The Humboldt Food Policy Council is a network of food system stakeholders with the goal to build a robust and equitable food system through policy work. The Council includes grocers, farmers, public health agencies, planners, elected officials and consumers. The Food Policy Council is included as a potential partner because it could collaborate with the City of Arcata to draft future policy and land-use planning for urban agriculture and food security within city limits. Food Policy Councils have also played an integral role in local food system development in other communities such as Portland and Burlington.

California Native Plant Society- Humboldt Chapter:

The California Native Plant Society (CNPS) is a non-profit organization dedicated to the preservation of Native flora and their habitats. The Humboldt Chapter of CNPS meets once a month in Arcata and offers a variety of nature hikes, lectures and gardening workshops. CNPS Humboldt Chapter is a potential edible landscaping partner because of

the wealth of knowledge its members have on local native plants and gardening. CNPS members may have interest in volunteering to install and maintain edible natives on City lands.

Humboldt Permaculture Guild:

The Humboldt Permaculture Guild (HPG) is a regularly meeting group that organizes the popular, annual Plant and Seed Exchange. HPG members organize and lead workshops on permaculture skills, orchestrate local foods pot-lucks and produce exchanges and participate in other local events. The permaculture knowledge and skills within this collective group of people would make for great collaboration with the City of Arcata. HPG could potentially provide edible landscaping designs based on ecologic principles to the City of Arcata and help with garden installation.

North Coast Community Garden Collaborative:

Started in spring of 2009, the North Coast Community Garden Collaborative is a network of people and community garden groups who share resources, tools, people power and ideas to support local residents growing food in an autonomous, non-commercial, community-based agriculture model. The Garden Collaborative is a volunteer based organization that offers services including; organizing workdays, recruiting volunteers, a tool share program and networking with other community garden/local food groups. The Garden Collaborative is in-part, fiscally sponsored through the Redwood Community Action Agency and is primarily based out of Eureka.

The services provided by the Garden Collaborative could be utilized by the City of Arcata for implementing new communal gardening sites.

The list of organizations and descriptions of potential avenues for collaboration is by no means exhaustive. Humboldt County and the Arcata area are truly rich in local food-centric groups and individuals. By partnering with existing local food-centric groups and organizations, and utilizing the results and recommendations of this project, the City of Arcata could tap into a wealth of established expertise, networks and energy. Charitable organizations and foundations also look favorably at community collaboration. The City of Arcata could potentially increase their ability to access funding for urban agriculture projects by working with these NGO groups. As demonstrated in other municipalities, volunteers and community group support is important for the development of publically operated foodscapes.

CONCLUSION

This project utilized local food literature, urban agriculture policy, a GIS land survey analysis and data from interviews to inform practical steps forward for food production within the city limits of Arcata. The aim of this project was to assist in the completion of City Council Goal 52. The GIS analysis established a database of suitable edible landscaping sites and a map series visually representing results. Parameters for GIS analysis were based on key-informant interviews with participants active in local food advocacy or City governance and management. The GIS analysis methodology was also grounded in a land survey framework utilized by the City of Portland, an environmentally innovative community.

The second product of this project is a recommended edible plant list (Appendix A). The recommended plant list was developed from interviews, permaculture concepts and edible landscaping resources. The recommended edible plants are hardy, mostly perennial, low maintenance and suited for the Arcata climate. The intent of this list is to provide a resource for the City of Arcata to utilize when implementing future edible landscaping.

Similarly to the four cities outlined in the Urban Agriculture and Sustainability Frameworks section of this project, the City of Arcata has supporting policy for edible landscaping including City Council Goal 52, an Open Space and Agriculture Committee and Ordinance 1300 which banned pesticides use on public lands. The City of Arcata

also has the Arcata Ed Farm, a park dedicated to local food production. There are several NGOs and regularly meeting groups who advocate for local food production and sustainability. In many ways, Arcata is a local food-loving community. Four community supported agriculture (CSA) farms can be found within the City's sphere of influence, supported by a relatively small population of 17,231 (U.S. Census 2010). The green-belt surrounding much of the City is zoned agricultural and is used as pasture land. The Arcata plaza is home to the oldest certified farmers market in the State and September is Local Food Month.

Despite the presence of local food and a community that celebrates it, the public lands within City limits are lacking in fruit trees, culinary herbs and intentionally managed berry patches. Below is a set of recommendations that I have developed to promote moving forward with foodscaping and urban agriculture. These recommendations reflect the results of this research as well as literature and real world examples.

Recommendations

Recommendation 1:

To begin implementation of City Council Goal 52, the City should endorse an edible landscaping plant list. This list would inform future beautification projects, park design, maintenance and urban development projects. Currently the Open Space and Agriculture Committee have a document titled "Integrating Gardens and Edible

Landscapes-Guidelines for Residential and Commercial Development Projects" (Appendix C). This document includes a short list of recommended fruit trees and assists developers in complying with the Arcata 2020 General Plan, particularly protection of agricultural soils. Endorsing a more comprehensive list, such as the one found in Appendix A, would allow city employees, private developers and residents a resource to be utilized when making landscaping decisions. Recommended plant lists are fairly common in City management. Both Sebastopol and Portland have recommended plants lists that include edibles.

Recommendation 2:

Key-informant interviews and explorations of urban agriculture literature revealed the potential educational value of edible landscaping in prominent locations. The second recommendation is for the creation of a demonstration foodscape at City Hall. Located at a symbolic site, an edible landscape could solidify the importance of local food production for the Arcata community. Converting the lawn into a garden with local native plants, low maintenance edibles and herbs would demonstrate to residents what plants work well in the region and how to grow food sustainably on a small piece of land. Food grown at City Hall could be donated to Food for People's gleaning program or signage at the garden could encourage residents to utilize produce. Workshops and fieldtrips could use the space making it an educational resource for the community.

Recommendation 3:

The third recommendation for the Arcata is to manage suitable sites in City owned forests as native food forests. Food forests are gaining in popularity as an urban and peri-urban landscape technique for their recreational, environmental and nutritional value. The local tribes and gardeners from the Potawot Health Village could be consulted for traditional ecological knowledge and management practices for huckleberries, salal and other food and medicine plants already growing in the Community Forest. A community outreach and education campaign, along with workshops and signage could encourage residents to participate in the development and maintenance of a food forest.

Recommendation 4:

The last recommendation is the creation of specific edible landscaping and urban agriculture policy within City government. City Council Goal 52 is a small step towards a vibrant, more sustainable and self-sufficient food system within the city limits of Arcata. While it is unlikely that Arcata would ever produce 100 percent of the food consumed by residents, nor is this project advocating for such a strict of a definition of local food, diversifying the regional food system to include urban edible landscapes and native food forests would benefit the community. Creating specific policy on park use and development that includes clauses for edible landscapes or other urban agriculture activities would increase access to fresh foods and perhaps benefit the environment by creating ecosystem services such as pollination, erosion control and carbon dioxide sequestration.

This project has implications for future research and action. Building on this GIS model, a more complete land survey including existing edible plants, soil types and irrigation access could be undertaken. Included in a more complete land survey, public participatory mapping sessions, surveys and outreach events could be performed to access current sociological information. Including this type of primary and specific sociological information would most likely create a more realistic snap-shot of suitable edible landscaping sites. Public Participatory mapping sessions and surveys could also contribute to the recommended plant list and inform the City about public perception of communal food resources.

In conclusion, this project is a starting point for including urban foodscapes into the city planning and development of Arcata. Utilizing the recommendations in this project offers an opportunity for a municipality to further embrace and enhance the diversity found within the local food system and support non-market expressions of local food. . Edible landscaping as imagined by this project is participatory and fosters an understanding of ecological cycles and a connection to the land. Peak oil, climate change, economic destabilization and scarcity of arable land and water have lead communities around the world to adopt (or reintroduce) urban agricultural practices as a means for increased resiliency. While Arcata and Humboldt County may have a growing local food system, cultivating living, edible public spaces and encouraging residents to do the same will only strengthen the community and contribute to long-term sustainability in the region.

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APPENDIX

Appendix A: Recommended Edible Plant List

Common Names	**Scientific Name**	**Description**
Aronia berry, red and black	*Aronia arbutfolia, Aronia melanocarpa*	Shrub, red, purple or black berries. Very astringent when raw, should be processed or cooked.
Blueberry, northern varieties	*Vaccinium L.*	Shrub, dark blue, sweet and slightly tart berries.
California blackberry	*Rubus ursinus*	Native, climbing, evergreen shrub. Shiny black fruit when ripe. Dense thorns.
Chilean guava	*Ugni molinae*	Shrub with dark red-purple berries similar in shape and size to blueberries. Makes an excellent, hardy hedge.
Elderberry	*Sambucus racemosa*	Large native shrub with small, bright red berries. Berries should be processed or cooked before ingested.
Flowering quince	*Chaenomeles speciosa*	Shrub often planted as an ornamental hedge. Beautiful dark pink flowers. Produces a hard, astringent, yellow fruit suitable for preserves.
Hillside Gooseberry, California Gooseberry	*Ribes californicum*	Tall, native shrub well loved by birds and pollinators. Dark purplish-black berries when ripe.
Huckleberry, evergreen huckleberry, California huckleberry	*Vaccinium ovatum*	Native, perennial shrub with small black-purple berries prized by people and wildlife. Makes an excellent hedge.
Raspberry	*Rubus idaeus*	Shrub with biennial, vertical canes. Delicious red berries.
Rugosa Rose, Saltspray rose	*Rosa rugosa*	Shrub that can form dense thickets. Produces a large, sweet rosehip that has several

		uses.
Salal	*Gaultheria shallon*	Native perennial shrub with lovely foliage often used for floral arrangements. Dark purple, somewhat bland fruit.
Salmonberry	*Rubus spectabilis*	Native shrub with red or yellow berries resembling raspberries. Needle like thorns on stalks.
Serviceberry	*Amelanchier alnifolia, Amenlanchier pallida*	Native shrub with white flowers and reddish-purple fruits resembling blueberries.
Thimbleberry	*Rubus parviflorus*	Native shrub without thorns. Produces a tart red fruit that makes good jam.
Cranberry	*Vaccinium macrocarpon*	Groundcover, low lying shrub with white berries that turn red when ripe. Acidic, tart taste, many prefer cooked.
Lingonberry	*Vaccinium vitis-idaea*	Groundcover, tart red berries.
Strawberry	*Fragaria vesca californica*	Native, fast spreading groundcover with small, sweet red berries.
Wintergreen, creeping wintergreen, Eastern Teaberry	*Gaultheria procumbens*	Groundcover, perennial that can tolerate full shade. Slow growing. Bright red berries with white centers. Leaves and berries often used for tea.
Chives	*Allium schoenoprasum*	Culinary herb. Bulb forming perennial plant with narrow, hollow scapes. Grows in clusters. Lovely star shaped purple flowers.
Mint	*Mentha sachalinensis*	Culinary herb. Wide-spreading and can become invasive if not contained. Best grown in containers. Great for tea.
Parsley	*Petroselinum crispum*	Culinary herb. Bright to dark green, attractive leafy biennial. Once established it will self-seed.

Rosemary	*Rosmarinus officinalis*	Culinary herb. Woody perennial shrub. Makes a good hedge.
Thyme	*Thymus vulgaris*	Culinary herb. There are many varieties. Makes a great groundcover.
Apple, var. Gravenstein, Liberty, Ida Red, Mutsu, Winesap, Braeburn, Waltana	*Malus domestica*	Fruit tree. Deciduous. Semi-dwarf varieties are 12-18ft tall. Establish trees do not need watering.
Flowering dogwood, Kousa dogwood	*Cornus florida, Cornus kousa*	Fruit tree often used as an ornamental. Red fruits are creamy, white on the inside and have a sweet delicate flavor.
Peach, var. Frost	*Prunus persica, var. Frost*	Fruit tree, semi-dwarf and self-fertile. Can produce in the Pacific northwest. Needs pruning and well-drained soil.
Pear, var. Bartlett, Bosc, Comice, D'Anjou	*Pyrus L.*	Fruit tree. Tolerant of wet soil conditions. Require cross-pollination.
Plum, var. Beauty, Improved French Prune, Santa Rosa	*Prunus domestica.*	Fruit tree with freestone fruits.
Mulberry	*Morus rubra*	Fruit tree native to the North East. Berries are red ripening to dark purple. Popular for pies and jam.
Lemon, var. Improved Meyer	*Citrus x meyeri*	Fruit tree that is thought to be a cross between a true lemon and a mandarin orange. Grows well against a south facing wall with lots of sun.
Grape, cold hardy varieties	*Vitis L.*	Climbing vine with clusters of edible fruits. Good for trellising.
Hops	*Humulus lupulus*	Climbing perennial vine. Produces light green flower cones (hops) that are used in beer making.
Kiwi	*Actinidia deliciosa*	Climbing, woody vine.

		Oblong brown, hairy fruits. Can be picked when firm and ripened in a paper bag. Large, deep green leaves.
Artichoke	*Cynara cardunculus*	Cultivated perennial thistle. Immature flower head is eaten as a vegetable. Attractive silvery-green large plant.
Chinese mustard greens	*Brassica juncea*	Cultivated vegetable green. Leaves, flowers and seeds edible. Mustards can become invasive. Plant in contained spaces.
Kale, many varieties	*Brassica oleracea* (*Acephala* group)	Cultivated biennial vegetable that can be grown nearly year-round. Both nutritious and decorative.
Jerusalem artichoke, sunchoke	*Helianthus tuberosus*	Cultivated perennial root vegetable. Species of sunflower with delicious, edible tubers. Can become a hardy weed. Best planted in contained spaces.

The recommended plant list includes plants suitable for edible landscaping for the Arcata climate. Weather variation affects productivity and health of plants in a given season or year. For the first time since 1990, the USDA has updated its "Plant Hardiness Zone Map" due in part by warming temperatures in the US (Charles 2012). This has potential future implications for the recommended edible plants, particularly the non-natives, as climate change may impact which plants do well and produce food within the study area.

The recommended plant list is not comprehensive; there are many plants that may be suited for edible landscaping within the city limits of Arcata. There may also be plants on the list that prove difficult to manage or are low yielding (ease of maintenance was considered). This list is a resource and a starting point for City managers and residents who wish to include food producing plants into their green spaces. For a more comprehensive guide to edible landscaping plants with detailed descriptions, maintenance and care, Rosalind Creasy's The Complete Book of Edible Landscaping,1982 is an excellent resource.

Appendix B: Key-informant Interview Questions

1. How do you describe edible landscaping?

2. What types of plants come to mind? What plants are suitable for Arcata?

3. Who would manage edible landscaping in the City of Arcata?

4. Who would benefit from edible landscaping? Who wouldn't benefit?

5. What are ideal sites for edible landscaping? Specific locations in Arcata?

6. What sites are unsuitable for edible landscaping? Why are they unsuitable?

7. What concerns/issues do you have about edible landscaping?

8. Do you have specific ideas for implementing edible landscaping?

9. Do you think edible landscaping fits into local food discussions? How?

10. Is there a demand for edible landscapes in a semi-urban, agricultural community like Arcata?

Appendix C: Integrating Gardens and Edible Landscapes: City of Arcata

Fall 2006

OPEN SPACE AND AGRICULTURE COMMITTEE
OF THE CITY OF ARCATA

GUIDELINES FOR RESIDENTIAL
AND COMMERCIAL DEVELOPMENT PROJECTS

INTEGRATING GARDENS AND EDIBLE LANDSCAPES

Prime Agricultural Soils are an irreplaceable and valuable resource for current and future generations as recognized by the City of Arcata, and they exist in areas that are zoned for non-agricultural use. In order to ensure continued protection of this resource and to assist in compliance with the City's General Plan (GP2020), the Open Space Committee has developed the following guidelines.

The City of Arcata is committed to protecting our agricultural soils and providing places for residents to share and increase their horticultural skills and knowledge. Access to land for gardening and food production contributes to our cultural wealth and serves a practical need for personal food production. The opportunity to experience growing food within communities will help provide continuity to the ever-important human art of gardening. Application of these guidelines offers opportunities for self-sufficiency and access to healthy food, especially for people living in apartments, condominiums and affordable housing.

We recommend that prior to the approval of a project, the Open Space and Agriculture Committee review development applicant's land use components with a focus on provisions for food production opportunities through garden space and plantings.

We propose that when these conditions are accepted, they be brought into the fold of a landscape bond to insure completion and implementation for a period of 3 years.

Guidelines are as follows:

1. Incorporate Edible landscaping throughout the development with a suggested 20% of the open space of the site to be planted with edibles depending upon the specific site conditions.
    a. We recommend careful choice of varieties that do well in the region. [Please find our list of recommended varieties following our guidelines.]

2. Provide Community Garden space at a minimum 50 sq. feet per unit, not including the edible landscaped common areas. These areas can be provided adjacent to homes, or as a combined garden area.
    a. Garden sites are to be identified with appropriate signage indicating availability for present and future use by residents.
    b. Garden sites can be planted with ryegrass and clover when not in use as a garden, so they can be mowed for maintenance, if necessary.
    c. Identification and availability of these sites for gardening be made known to residents through lease agreements or sale disclosures.

3. That a community garden/edible landscape Condition of Approval be utilized to insure implementation and include the following:
   a. Signage placed at the garden plots identifying the availability of these areas for gardening;
   b. Ensure placement of gardens in areas with optimal solar access;
   c. If topsoil is removed, it should remain separate from sub-soils and should be reused on site, and specifically returned to garden areas;
   d. Restrict use of pesticides and herbicides to those approved by the City of Arcata's Pesticide Reduction Plan;
   e. Provide adequate irrigation with available faucets for all garden and edible landscaped areas;
   f. Provide for on-going Humboldt State University's Campus Center for Appropriate Technology (CCAT) involvement or on-site gardener to conduct gardening workshops for residents;
   g. Restrict the location of garden sites to outside a 25-50-foot setback from the top of bank of any protected watercourse, depending upon site conditions.

EDIBLE LANDSCAPE PLANTS FOR COASTAL HUMBOLDT COUNTY

A short list of recommended varieties that perform well in coastal conditions

Apples
- Liberty
- Hudsen's Golden Gem
- William's Pride
- Gravenstien
- Ida Red
- Ashmead's Kernal
- Johnafree
- Waltana

Lemon
- Meyer's Improved

Plums
- Beauty
- Santa Rosa
- French Improved Prune

Asian Pears
- Shinseiki

Peaches
- Frost

Figs
- Desert King
- Genoa

Other Berries
- Gooseberries
- Raspberries
- Tayberries

Blueberries
- All northern varieties

Where to find more information:

LOCAL RESOURCES:
City of Arcata – Community Development Department
comdev@arcatacityhall.org (707) 822-5955
UC Cooperative Extension: Deborah Giraud
Specialty: Plant sciences, fruit trees, vegetables, community development, ornamentals
ddgiraud@ucdavis.edu (707) 445-7351
Humboldt State University – Campus Center for Appropriate Technology (CCAT)
ccat@humboldt.edu (707) 826-3551
Arcata Educational Farm
farm@humboldt.edu (707) 825-1777

REFERENCE BOOKS:
Creasy, Rosalind. The Complete Book of Edible Landscaping. San Francisco: Sierra Club Books, 1982.
Kourik, Robert. Designing and Maintaining Your Edible Landscape Naturally. Santa Rosa: Metamorphic Press, 1986.