

# Vacancy and access to food: Spatially addressing food insecurity in urban Appalachia

Cermetrius L. BOHANNON<sup>1</sup>, Nikolus HENRY<sup>2</sup>

<sup>1</sup> cl@vt.edu • Landscape Architecture Program, Virginia Tech, Blacksburg, Virginia, USA

<sup>2</sup> Niklh94@vt.edu • Landscape Architecture Program, Virginia Tech, Blacksburg, Virginia, USA

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## Abstract

This study examines food deserts in Roanoke, Virginia in the United States and explores ways to address food insecurity by utilizing vacant lots. In the State of Virginia, there are 200 food desert census tracts. Twenty-nine of those tracts have 100% low access to a supermarket; four of those tracts are located in Roanoke (Chittum, 2011). Like many areas in Appalachia, Roanoke has suffered urban decline and has lost population and subsequently lost businesses including grocery stores, thus creating food deserts with a disproportionate impact on low-income communities.

Currently, tract-based food desert data is too coarse to understand the distribution of food deserts in relation to community demographics and other site-scale factors. This study uses census block scale data to specifically map food deserts in more detail at the neighborhood scale. In the case of Roanoke and its thirty unique neighborhoods, addressing vacant lots requires a methodology that considers the unique qualities of each neighborhood in order to understand the impact of vacant lots in each area and how best to address the challenge.

Findings from this study show that this methodology provides community residents and landscape architects a systematic way to analyze, plan, and implement strategies to develop spaces that provide access to fresh food and increase social interaction while reducing the visual impact of vacancy. The authors envision this framework as an early component to a community engaged process that recognizes vacancy patterns and honors community agency and identity in the development of site-specific design strategies.

## Keywords

Food security, Vacancy, GIS, Community food infrastructure, Food resilience.



## 1. Introduction

Food deserts are a major contributor to food [in]security in the United States. Food insecurity in the United States is an epidemic that affects an estimated 48.1 million people, including 15.3 million children who live in food deserts (Feeding America, 2016). The U.S. Department of Agriculture defines a food desert as “an area with limited access to affordable and nutritious food, particularly such an area composed of predominately lower-income neighborhoods and communities” (110th Congress, 2008). Spatially, a food desert is defined as an area where people live more than one mile in an urban area or 10 miles in a rural area from a supermarket or large grocery store. Studies also show there is a strong relationship between health disparities and food insecurity in low-income communities.

Although food deserts and food insecurity are strongly related, they are not the same. Food deserts are a contributor to food insecurity. Food insecure families at the most basic level are unsure where their food will come from. In addition, these families have little to no access to nutritious food. Thus, people who are food insecure often have unbalanced diets and higher health disparities including hypertension, diabetes, and obesity. It is implied that the development of chain supermarkets on the outskirts of inner-cities in affluent areas offer consumers better variety, quality and prices for food options but these markets often fail to serve lower-income citizens. Additionally, these venues tend to have longer business hours that are attractive to consumers in wealthier neighborhoods (Alwitt and Donley, 1997). The increased investment and development of large chain supermarkets have forced neighborhood grocery stores to close, thus creating areas where affordable food is not accessible. (Guy et al., 2004). This development strategy often neglects the utilization of vacant land in low-income communities. In particular the utilization of vacant land as community gardens space for urban agriculture.

This research focuses on census block data to specifically map food

deserts using GIS. This method allows for accurate mapping of food deserts at the neighborhood scale. Roanoke, a city with a population of 97,032, has thirty unique neighborhoods, thus addressing vacant lots requires a systematic strategy to assess the relationship between neighborhood demographics, USDA food desert data, and land use information obtained from the City of Roanoke. As part of this comprehensive approach, it is necessary to employ a methodology that considers the unique qualities of each neighborhood in order to understand the impact of vacant lots in each area and how best to address the challenge.

### 1.1. Food insecurity in Virginia and the city of Roanoke

Food insecurity in Virginia is a growing epidemic in both rural and urban areas of the state. Currently approximately 17.8 percent of the state's population lives in a food desert (USDA, 2013). In fact in 2012, Virginia's capital Richmond was identified as the largest food desert for a city its size in the United States (Community Development Financial Institution Fund 2012). According to the United States Department of Agriculture's food desert locator there are two hundred food deserts in the commonwealth of Virginia. Of the two hundred food deserts in Virginia, twenty-nine census tracts have 100% limited access to a supermarket or grocery store. As reported by Chittum, four of those twenty-nine census tracts (tracts 5, 25, 11, 26) are located in Roanoke, Virginia (2001).

Roanoke, Virginia is the largest city in Southwestern Virginia and is located in the Blue Ridge Mountains in the middle of the Roanoke Valley, a uniquely situated place where the mountains meet the city. Known as ‘The Star City,’ the convergence of urban life and rural mountain landscape that make Roanoke different from other cities of its size in the State of Virginia. The Star City is located in the heart of the Appalachian mountain range, a 205,000-square-mile region that spans from southern New York to northern Mississippi. Much like the cities Cincinnati, Chattanooga, and Knoxville, Roanoke is classified, as an urban Ap-

palachian city. This distinction is different from Appalachia's rural past, but illustrates the growing number of Appalachians who live an urban lifestyle.

The demographic make up of Roanoke as reported in the Community Health Needs Assessment (CHNA) by Carilion indicates 66 percent as Caucasian, 28 percent as African-American and just under 5 percent Hispanic (2012).

The report also states that roughly 20 percent of Roanoke's population lives below the federal poverty line based on household income data. The unemployment rate in the city at the time of the study was around 8.2 percent, slightly higher than the rest of the state at 6.2 percent (CHNA, 2012). The number of residents that receive Supplemental Nutritional Assistance Program (SNAP) benefits in Roanoke is approximately 32,000. These few demographics illustrate the severe state of food access in the city of Roanoke and highlights the disparities faced by residents with one third receiving federal food assistance and one-fifth living be-

low the poverty line. Populations that are food insecure, not only face food access issues, but are often considered low income and lack sufficient transportation and therefore are limited in their ability to travel to grocery stores, without using public transportation. Limited access to healthy food options also contributes to health disparities for residents that live in food deserts.

## 1.2. Vacant land

Cities across the country, regardless of size, have dealt with urban shifts including de-industrialization, population decline, and decentralization. These urban processes often leave areas of vacant land. Vacant land in urban areas is often viewed as a problem often associated with crime, abandonment, depressed real estate values and social failure. (Accordinio & Jonshon, 2000; Bowman & Pagan, 2004). In Appalachia in particular vacancy can be traced to disinvestment, weak economic cycles, and the downfall of industries based on coal and rail. In the literature there is no one single recognized definition of vacant land, but many of the definitions included characteristics such as unutilized, underutilized, derelict land, brownfields, greenfields, and land with abandoned buildings and structures (Kremer et. al, 2013; Bowman & Pagano, 2004; Pagano & Bowman, 2000). In his work Northman developed a typology of vacant land that included five categories; (1) remnant parcels; (2) land that is difficult to build on; (3) land owned by utility companies to be used for future expansion, (4) land held for speculation and (5) land in institutional reserve (1971). Regardless of definition vacant land often comes with negative perceptions. One such perception is loss of economic revenue from the land due to its unoccupied state. Another is the negative perception that vacant land can have on how people view a community in terms of safety and community vitality. In some cities there is an on going debate on how to address the issue of vacancy. Some municipalities view redevelopment strategies that would increase the economic productivity of vacant land to raise tax revenue. These strategies include commercial, resi-

**Table 1.** Vacant land typology.

Vacant Lot Type	Characteristic	Potential Future Usage
Missing Tooth	Lot or adjacent lots with a block that creates gaps between houses. Size and shape of these lots depend on the type of block in which they are located.	<ul style="list-style-type: none"> <li>- New building</li> <li>- Community/private garden</li> <li>- Outdoor market</li> <li>- Woodland</li> </ul>
Corner Lot	One or more adjacent lots at the corner of a block. These lots are highly visible because of their location.	<ul style="list-style-type: none"> <li>- Gateway to community</li> <li>- Meeting place</li> <li>- Play space</li> <li>- Community garden</li> </ul>
Connector	A vacant lot or several lots that make a new connection between streets or blocks.	<ul style="list-style-type: none"> <li>- New building</li> <li>- Community garden</li> <li>- Path</li> <li>- Community meeting place</li> </ul>
Vacant Block	Vacant land made up of an entire city block of an acre or more. This lot type is highly visible and susceptible to dumping.	<ul style="list-style-type: none"> <li>- New building</li> <li>- Playfield</li> <li>- Community garden</li> <li>- Flood control</li> </ul>
Swiss Cheese	Vacant land when there is an equal number or more vacant lots on a block than buildings. Can be made up of missing teeth, corner, and connector lots.	<ul style="list-style-type: none"> <li>- New buildings</li> <li>- Community garden</li> <li>- Community meeting place</li> <li>- Orchard</li> </ul>
Multiple Contiguous Blocks	Vacant land/blocks of an acre or more. These blocks are highly visible.	<ul style="list-style-type: none"> <li>- New buildings</li> <li>- Community gardens</li> <li>- Flood control</li> </ul>

dential, and industrial uses (Bowman & Pagano, 2004). On the other hand community and neighborhood organizations may prefer to redevelop vacant land into green spaces including parks, community gardens, or other spaces that can be used to increase social capital.

Ann Spirn's "Vacant Land a Resource for Reshaping Urban Neighborhoods" illustrates five vacant lot types, as seen in Table 1. Her work shows how diverse vacant lands can be in both context and characteristics.

Some vacant lots were once the site of buildings, now demolished, while others were never built upon. These lots often occur as small isolated "missing tooth" (Figure 1) lots, and as large tracts under single or multiple tenure (Figure 2). The physical and social character of neighborhoods in which vacant lots occur varies significantly. Vacant lots can be viewed as part of the urban fabric that can hold transformation opportunities to meet community needs and provide places for urban agriculture and community gathering via community gateways and meeting places.

We are interested in vacant lots for two main reasons. First, vacant land can be used to develop permanent and temporary community gardens to enhance local food environments thus increasing access to fresh and healthy food for community residents.

Second, vacant land has the potential to provide opportunities for transformative community spaces that can help address the disproportionate social and environmental pressures many urban communities face. Third, developing vacant land can provide community engagement opportunities that can bring together landscape architects and designers, community residents, and others with shared interests to address community needs.

### 1.3. Community gardens and food access

Community gardens have emerged in cities and towns across American as a way for citizens to address issues of low access to healthy food. Gardens take many forms and varying operating patterns; from informal guerilla



**Figure 1.** Vacant lot in the Hurt Park neighborhood in Roanoke, Virginia.



**Figure 2.** Multiple tenure vacant lot in the Hurt Park neighborhood.

plots to more structured gardens that are supported by local community garden associations and other non-profit organizations. Some gardens are used to supplement families' diets, others are used to grow food for food pantries. In addition, many schools are now incorporating community gardens as active outdoor learning laboratories to teach students about nature and nutrition. These spaces also play a key role in building social capital by reclaiming community space and providing opportunities for residents to collaborate to address mutual needs. Community gardens have been popular in areas, primarily in communities of color, where the inequitable distribution of green space is the result of urban renewal, redlining and disinvestment.

In terms of addressing food insecurity in urban populations in particular, community gardens currently play a large role in establishing a network of productive green spaces that provide healthier food options than those that

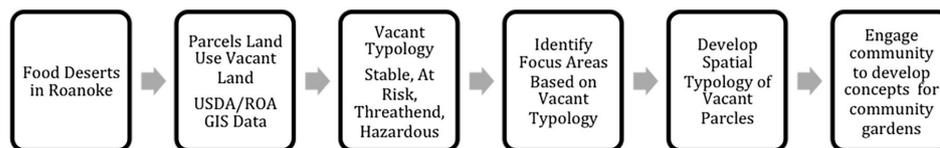


Figure 3. Diagram showing methodological process.

can be found at fast food restaurants. Similarly community gardens are useful in closing the grocery gap that many urban communities face due to substandard or event non-existent grocery stores. By giving the opportunity for community members to grow their own food, this reduces the dependence on stores with poor quality produce, such as convenience stores or corner stores.

## 2. Methods

This study uses GIS data to investigate the distribution of food desserts and vacant land at the block scale (Figure 3). The methodology used in this study was adopted from a project titled Vacant Lots Occupied completed by Keep Cincinnati Beautiful (KCB) in 2013. The primary method used in this study combined USDA map layers with land use and demographic layers to show the relationship between vacancy and food insecurity. By using this methodology the authors were able to provide a visual representation that can be used to analyze the geographical relationship between the concepts low access to food and high land vacancy in an urban area, particularly at the

neighborhood scale.

The first phase of this research identified neighborhoods in the City of Roanoke that have the highest level of low access to food and lowest income (Figure 4). By using the USDA's Food Access Research Atlas and neighborhood association data provided by the City of Roanoke, ten food insecure neighborhoods met the criteria low income and low access. These neighborhoods became the target areas for this research (a total of 2077 acres). To insure low access to grocery stores, areas were evaluated at  $\frac{1}{2}$  mile and 1-mile distances. In addition, Supplemental Nutrition Assistance Program (SNAP) locations were mapped to analyze store distribution in the target area (Figure 5).

### 2.1. Neighborhood vacancy

The second stage of this research mapped vacancy in the City of Roanoke. To accomplish this, the authors used two sources of information: vacant land use and vacant buildings. Neighborhood vacancy was mapped by calculated the percentage of vacant parcels in each target neighborhood. For this study vacancy typologies adapted from the 'Vacant Lots: Occupied' were used: stable, at risk, threatened, and hazardous. The first category 'stable', includes neighborhoods that have less than 10 percent of their parcels listed as vacant. The fabric in these neighborhoods is intact and is not faced with vacancy pressures. Neighborhoods that fall into the 'at risk' category have between 10 and 20 percent vacancy. These neighborhoods are in danger of facing serious vacancy issues. Neighborhoods that have between 20 and 35 percent of its parcels listed as vacant is considered 'threatened'. This type of neighborhood has a higher potential for vacancy to have a negative effect on the area both

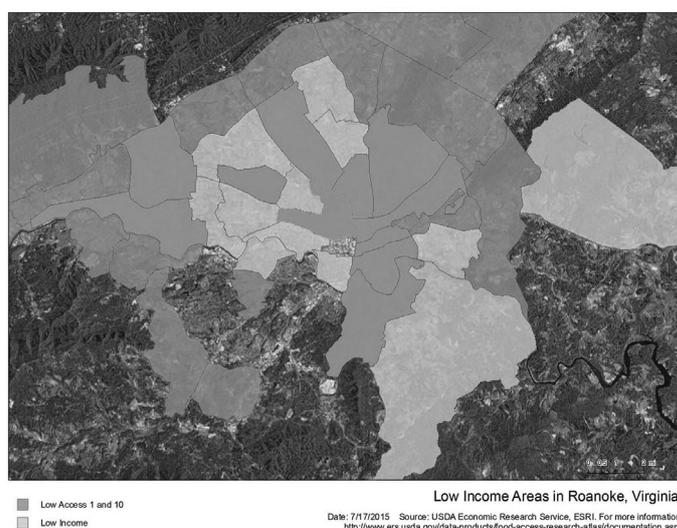


Figure 4. Low access between 1 and 10 miles and low income areas in Roanoke.

physically and socially. Areas in the city that have greater than 35 percent vacant parcels is considered 'hazardous'. These areas tend to be in serious decline with extreme pressures on the residential fabric of the neighborhood.

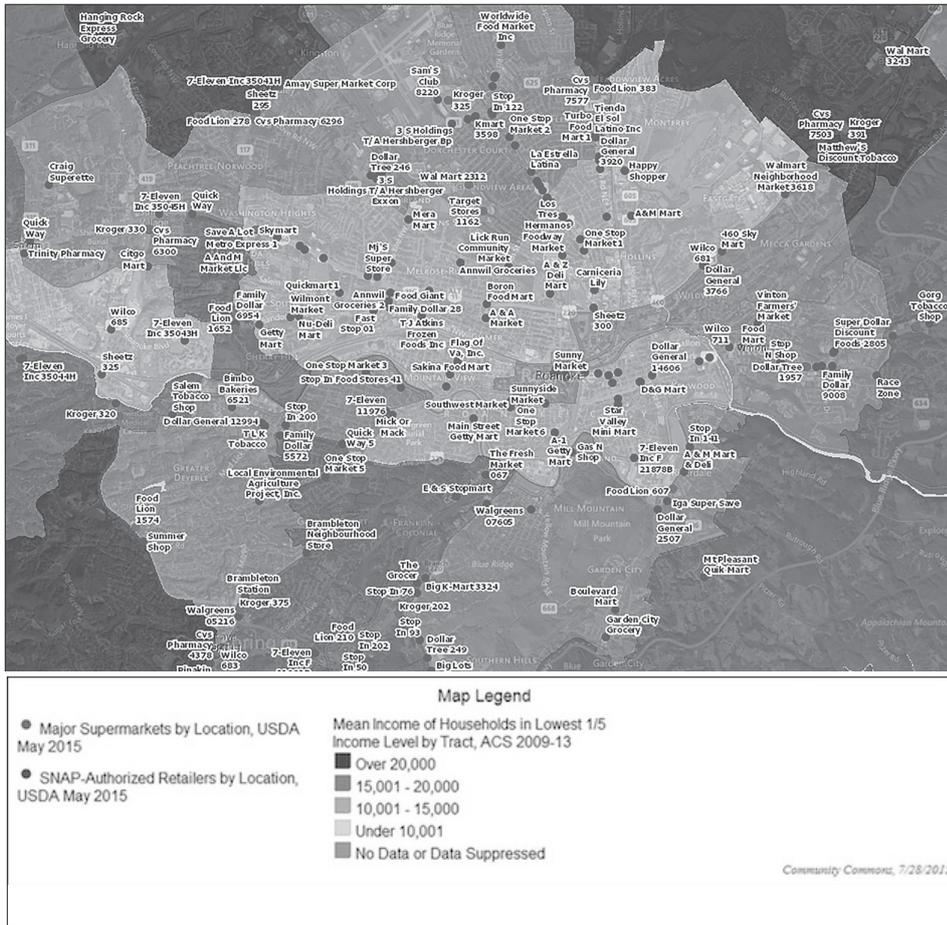


Figure 5. Map showing supermarket and SNAP locations and income by tract.

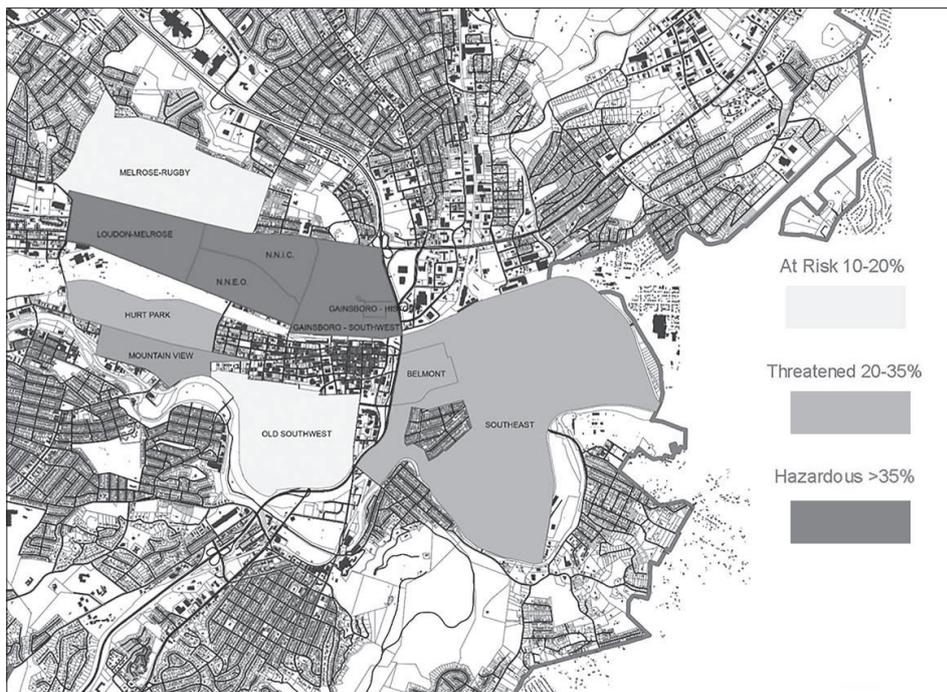


Figure 6. Map showing Vacant Lot Percentages.

## 2.2. Vacant lot typologies

After analyzing food deserts and neighborhood vacancy in Roanoke, the researchers used vacant lot data to develop a set of vacant lot typologies that could be used to understand the vacant fabric in the targeted neighborhoods. As a point of reference the researchers reviewed Ann Spirn's typology of vacant land. This vacant lot typology aided the researchers in identifying a total of 2,923 vacant lots equaling 430 acres in the food insecure neighborhoods. In order to achieve accuracy in the data, researchers verified vacant lots via aerial photography and field observations. The process of field verification

allowed the researchers to gain a better understanding of the spatial impact of vacancy on each neighborhood.

## 3. Results

Results indicate there are no 'stable' neighborhoods in terms of vacancy in the target area. As shown in Table 1, Melrose-Rugby and Old Southwest neighborhood fell under the 'at risk' category. There were four neighborhoods categorized as 'threatened': Belmont, Hurt Park, Mountain View, and Southeast. Three neighborhoods were categorized as 'hazardous': Loudon-Melrose, Gainsboro, and Northwest. Results also indicate there is a spatial disparity in the distribution of grocery stores in the targeted neighborhoods. Most of the grocery stores are located on the edges of the target area. On the other hand, there is an abundance of SNAP locations, normally convenience stores, in these areas.

Another finding from this research is the typology of vacant lots in the target neighborhoods. The researchers were able to develop a typology of vacant lots, from the GIS data and field verification that can be used to develop areas for urban agriculture, including community gardens and urban orchards. The types of lots include missing tooth, corner, connector, swiss cheese, and vacant blocks, which were consistent with findings from Ann Spirn's work. A "missing tooth" is a vacant lot or a group of adjacent lots within a block that creates a gap between structures (Figure 7). These types of vacant lots are particularly noticeable in blocks of row houses and among rows of commercial buildings. Corner lots consist of one or more adjacent vacant properties at the corner of a block. Corner lots are usually bounded between two buildings and streets and sidewalks. This type of lot is often exposed to traffic and is more likely to experience dumping and vandalism. Connector lots are lots that span through a block. Swiss cheese lots occur when there are as many vacant lots on a block than buildings. Vacant block lots occurs when an entire city block or an area of acre or more is vacant. Vacant blocks may consist of single property or many, adjacent properties.

**Table 2.** Vacant lot statistics in Roanoke's food deserts.

Neighborhood Organization Name	Total Lots	Total Lot Acreage	Number of Vacant Lots	Total Vacant Acreage
Belmont Neighborhood	345	52.67	124	13.38
Gainsboro Southwest Community	635	160.82	312	42.18
Hurt Park Neighborhood	599	116.16	186	29.97
Loudon-Melrose Neighborhood	727	148.23	264	40.97
Melrose-Rugby Neighborhood	1,533	325.91	228	50.60
Mountain View Neighborhood	399	75.86	111	19.39
Northwest Neighborhood Environmental Organization	591	87.66	287	34.59
Northwest Neighborhood Improvement Council	682	89.94	254	27.71
Old Southwest, Inc.	1,315	261.95	250	38.53
Southeast Action Forum, Inc.	3,355	757.96	907	133.18
<b>Totals</b>	<b>10,181</b>	<b>2077.18 Ac.</b>	<b>2,923</b>	<b>430.55 Ac.</b>

**Table 3.** Food insecure neighborhood and vacancy typology.

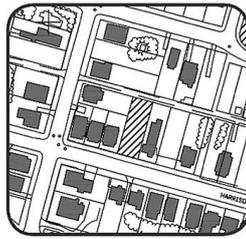
Neighborhood Organization Name	Total Lots	Number of Vacant Lots	Percent Vacant	Neighborhood Vacancy Typology
Belmont Neighborhood	345	124	35.0%	Threatened
Gainsboro Southwest Community	635	312	49.0%	Hazardous
Hurt Park Neighborhood	599	186	31.0%	Threatened
Loudon-Melrose Neighborhood	727	264	36.0%	Hazardous
Melrose-Rugby Neighborhood	1533	228	14.8%	At Risk
Mountain View Neighborhood	399	111	27.8%	Threatened
Northwest Neighborhood Environmental Organization	591	287	48.5%	Hazardous
Northwest Neighborhood Improvement Council	682	254	37.2%	Hazardous
Old Southwest, Inc.	1315	250	19.0%	At Risk
Southeast Action Forum, Inc.	3355	907	27.0%	Threatened

As a result of our findings the researchers were able to identify a collection of vacant parcels in the Melrose Rugby community, a community that currently does not have a community garden. The researchers developed a conceptual master plan that converted five parcels into a community garden space, as seen in Figure 10. The conceptual design included raised beds, urban orchard, and community pavilion, as seen in Figure 11. Included in the plan was a play area for kids and seating area for adults, which would provide opportunities for interaction of various age groups. To maximize food access benefits of the proposed community garden and to establish a community food infrastructure, a food market and pavilion was proposed across from the garden for residents and visitors to purchase vegetables and other local goods.

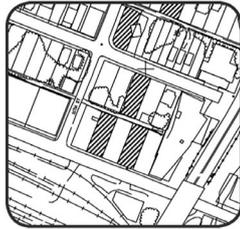
#### 4. Discussion and conclusion

As discussed in this paper over 48 million Americans are affected by food insecurity. The number of food insecure Virginians is also high with Roanoke having a disproportionate number of its citizens relying on government assistance and living in communities that are known as food deserts. This paper proposes a GIS-based process that investigates the distribution of food deserts and vacant land at the block and neighborhood scale. Our paper aimed to demonstrate the potential of this place based approach to spatially examine the relation of vacancy and food insecurity and to demonstrate how vacant land can be considered from an asset based view to be re-conceptualized physically, socially, and environmentally to provide access to healthier food options for community residents.

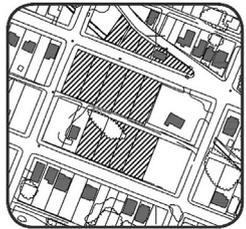
Through the use of GIS and a systematic analysis process landscape architects and community designers can develop a better understanding of vacancy patterns, land use typologies, neighborhood characteristics, and the relationship between income and food access. With this approach designers can begin to address food insecurity and vacancy spatially. We see this approach as the starting point of a



**Figure 7.** Missing tooth lot in food insecure neighborhood in Roanoke.



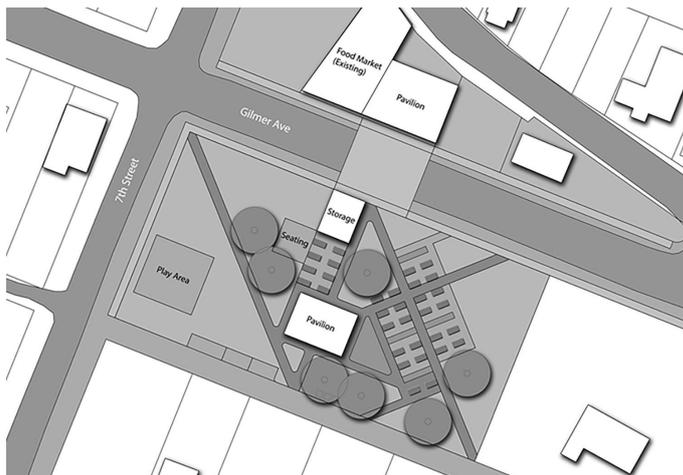
**Figure 8.** Swiss cheese vacancy pattern in food insecure neighborhood in Roanoke.



**Figure 9.** Vacant block pattern in food insecure neighborhood in Roanoke.

community engaged based design and planning approach. The results of this work provided us with information that was used to work with community members to conceptualize a new community garden space. Through this project the researchers have tried to demonstrate the importance of considering vulnerable populations when addressing problems that affect their lives. This study has also demonstrated that there is a strong relationship between high vacancy rates and low access to food. Armed with this understanding, designers can now approach the issues of food insecurity and other access bases disparities in urban areas in a way to better meet the needs of citizens.

Future research should examine the implementation of this GIS based method of investigating and identifying vacant parcels located in food deserts into food security based design and planning processes. Furthermore more research needs to be conducted to evaluate stakeholder feedback of this process of identifying community vacant



**Figure 10.** Conceptual community garden design proposal for vacant block.



**Figure 11.** 3-D rendering of community garden design proposal.

land assets. Although this study was conducted in Roanoke, this research can be replicated in many smaller cities in towns throughout Appalachia that are facing issues of food insecurity. Additionally, future studies could actively engage community members and existing neighborhood associations in the input and field verification of vacant land that could be used to develop a place-based framework for a resilient food system.

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