Evaluating the Feasibility of Urban Agriculture on Oakland's Private Land

Stephanie E. Baker

ABSTRACT

I explored the opportunity to diminish the food desert in the city of Oakland, CA through augmentation of the current inventory of known vacant land parcels for urban agricultural use. Through the creation of a land inventory and subsequent suitability analysis using a Geographic Information System (GIS), I was able to identify the most suitable vacant parcels of land for urban agriculture in Oakland. Overall, I identified 2,961 individual private tax parcels of interest, constituting 1,076 acres of land. Through the weighted evaluation of physical characteristics such as slope, aspect, ground cover type, and access to water, I was able to map the opportunities and constraints to urban agriculture on land in Oakland. In addition, I conducted interviews with leaders from local organizations currently practicing urban agriculture on private land in order to amalgamate the tested methodologies for locating private land for farming. The interviews I conducted illuminated the local networks in which these three urban agriculture organizations operate that assisted them in connecting with landowners in order to gain access to the privately owned land on which they farm. If made available to the public, this information on land suitability and location of vacant privately owned parcels could be useful in aiding those who wish to locate vacant land suitable to urban agriculture in order to grow food.

KEYWORDS

Food desert, community garden, farming, environmental justice, suitability analysis

INTRODUCTION

The city of Oakland, California is often described as a "food desert" (McClintock 2008). For a community to fit the definition of a "food desert", it must be an area with "limited access to affordable and nutritious food" primarily composed of "lower income neighborhoods and communities" (Ver Ploeg 2009). Food deserts have been identified in regions across the United States, including numerous census tracts in Alameda County, and specifically in the city of Oakland (Breneman 2011). Food deserts may arise from the unequal division of capital and "racialized" urban planning (McClintock 2008), and are therefore considered an environmental justice issue. The city of Oakland and various organizations representing both East and West Oakland have conducted numerous studies to address food justice and security issues. Oftentimes in these assessments, urban gardening or urban agriculture is listed as one of the recommendations for solving food security issues (Public Health Law & Policy 2008). For Oakland in particular, the city is a food desert not because there is a lack of food, but rather because of the limited access and affordability of healthy and nutritious food (Unger and Wooten 2008). People who live in inner cities have less access to large chain grocery stores where food prices tend to be lower than do suburban residents (Chung and Myers 1999). Residents in low-income neighborhoods in Oakland cite many reasons why they don't frequently purchase healthy food, and some of the top reasons include prohibitive cost, poor quality of produce and meat, and inconvenience (Unger and Wooten 2008). In one survey, nearly all residents in Oakland surveyed said that they were unsatisfied with some aspect of their food shopping options (Treuhaft 2009). Low-income neighborhoods lack grocery stores that carry healthier foods, and the higher cost of healthier foods that are available have been shown to be a deterrent to purchasing for low-income consumers (Jetter 2006). Because of these barriers to access of healthy foods, low-income and minority communities may struggle with health issues related to a diet lacking in fresh fruits and vegetables such as obesity (Freedman and Bell 2009).

While food insecurity in low-income neighborhoods in Oakland has been studied fairly extensively, not nearly as many studies have taken steps to ameliorate the situation beyond offering suggestions of actions that should be taken to combat them. Although farmers' markets are one part of the solution to decreasing food security issues in certain seasons, they are not always available year-round, and during the off-times low-income residents in some cities have

to travel further to gain access to healthy foods (Widener et al. 2011). Many studies on food insecurity suggest that food deserts can be eliminated through the creation of urban agriculture programs such as community gardens (Public Health & Law Policy 2008). One study identified 1,200 acres of undeveloped public open space in Oakland with the hope that this land could be used for urban agriculture (McClintock et al. 2010). However, no study to date has evaluated the suitability of undeveloped private land in Oakland for urban agricultural pursuits.

METHODS

Data collection

I performed an Internet database search for relevant Geographic Information System (GIS) data. I searched websites including the City of Oakland's GIS database, the USGS seamless server, and data created or provided by UC Berkeley Professor John Radke in his Geography C188 course from the Fall 2011 semester. From the City of Oakland's GIS database, I obtained a CSV file containing Alameda County Tax Assessor parcel data, a shapefile of tax parcels, and a shapefile of EBMUD water meter locations. The USGS seamless server website provided National Agriculture Imagery Program (NAIP) imagery and the National Elevation Dataset (NED) for Alameda County.

I conducted semi-structured interviews with leaders from Bay Area urban agriculture groups that presently use private land for urban agriculture. These groups include Urban Adamah of Berkeley, The Free Farm of San Francisco, and City Slicker Farms of Oakland. Interviews were conducted either over the phone or in person. A list of the seven interview questions can be found in Appendix A.

Data creation and manipulation

Geographic Information System

To create and manipulate my GIS data, I filtered the tax data from the City of Oakland's CSV by "use code". I eliminated all entries that had a use code for publicly owned land, and

then further narrowed down the contents to exclude entries that had use codes that classified them as residential. The remaining use codes and their meanings are listed in Appendix B. I imported the filtered Excel files and the existing tax parcel data layer into ArcMap 10. I created a join between the Excel file and the parcel file using the Assessor Parcel Number (APN). This allowed me to identify exactly where all of the private parcels of interest were located. Then I used the NAIP imagery to first confirm that these parcels were in fact vacant, and subsequently to visually identify the ground cover type of these vacant parcels. I excluded all parcels that consisted mainly of tree cover, but reserved them in the database for their agroforestry potential. I looked to McClintock's (2010) methodology to further classify each parcel by type of ground cover, either hard surface or grass/dirt surface. I used the National Elevation Dataset (NED) to create a raster dataset of slope and aspect of the area of interest.

Interviews

I transcribed the interviews with Urban Adamah and The Free Farm, which were conducted over the phone. I also reviewed notes taken during these interviews and during the in-person interview with City Slicker Farms. Mainly I focused my attention on evaluating the responses to the second question in the interviews, "How did you find out about the vacant land that you are using?"

Data analysis

To analyze my GIS data, I performed a suitability analysis evaluating the ground cover, slope, aspect, and water access of all the land in Oakland. I created an opportunity map of features amenable to urban agriculture, as well as a constraint map of features that would act as obstacles to successful urban agriculture, outlined in Table 1. Next, I summed the weighted totals from the constraint map and opportunity map to show where the land with the most opportunities and the most constraints was located. Finally, I overlaid these suitability maps onto the map of privately owned, undeveloped land to find the parcels that fell on the areas with the highest suitability scores.

Table 1. Criteria for opportunity and constraint maps.

Feature	Opportunities	Constraints
Ground Cover	Grassy/Undeveloped	Hard surface
Slope	<10%	>30%
Aspect	South-facing	North-facing
Water Access	Within 10ft	N/A

RESULTS

GIS analysis

Overall, I identified 2,961 individual private tax parcels of interest, constituting 1,076 acres of land (Figure 1). The breakdown of ground cover type was 55% forested parcels constituting 592 acres, 40% grass/dirt parcels constituting 430 acres, and 5% hard surface/paved parcels constituting 54 acres (Figure 2). The forested area was excluded from the suitability analysis, as it is more suited to agroforestry than to urban agriculture. The slope of the land ranged from 0% to over 30%, with a few parcels reaching up to or near 50% slope. The majority of the gentler slopes reside in the flatlands and most of the steeper slopes are located amongst the Oakland hills (Figure 3). The aspect layer showed which parcels face south, southeast, or southwest (Figure 4). The EBMUD meter map shows a 10ft buffer around all available EBMUD water meters (Figure 5). The opportunity and constraint maps (Figure 6 and Figure 7) show the weighted analysis of the combined features overlaid with the identified private parcels of interest.

Interviews

The interviews I conducted illuminated the ways in which these three urban agriculture organizations obtained the privately owned land on which they farm. A common vein that ran through all of the interviews when interviewees spoke about land procurement was that of connections. All three of these organizations were able to obtain the private land that they currently farm through personal connections that either they or a close friend or acquaintance had

established with a landowner. In two of the three cases, the landowner actively approached the organization or soon-to-be organization without prior solicitation.

Table 2. Connectivity and Land Procurement.

Organization Name	**Degrees of separation from land owner**	**Mode of establishing relationship with land owner**
Urban Adamah	2	Mutual friend put them in contact, acted as character reference, organization owner approached land owner
The Free Farm	1	Met at farm stand, land owner actively approached organization head
City Slicker Farms	Variable	Variable; typically, land owner approaches organization

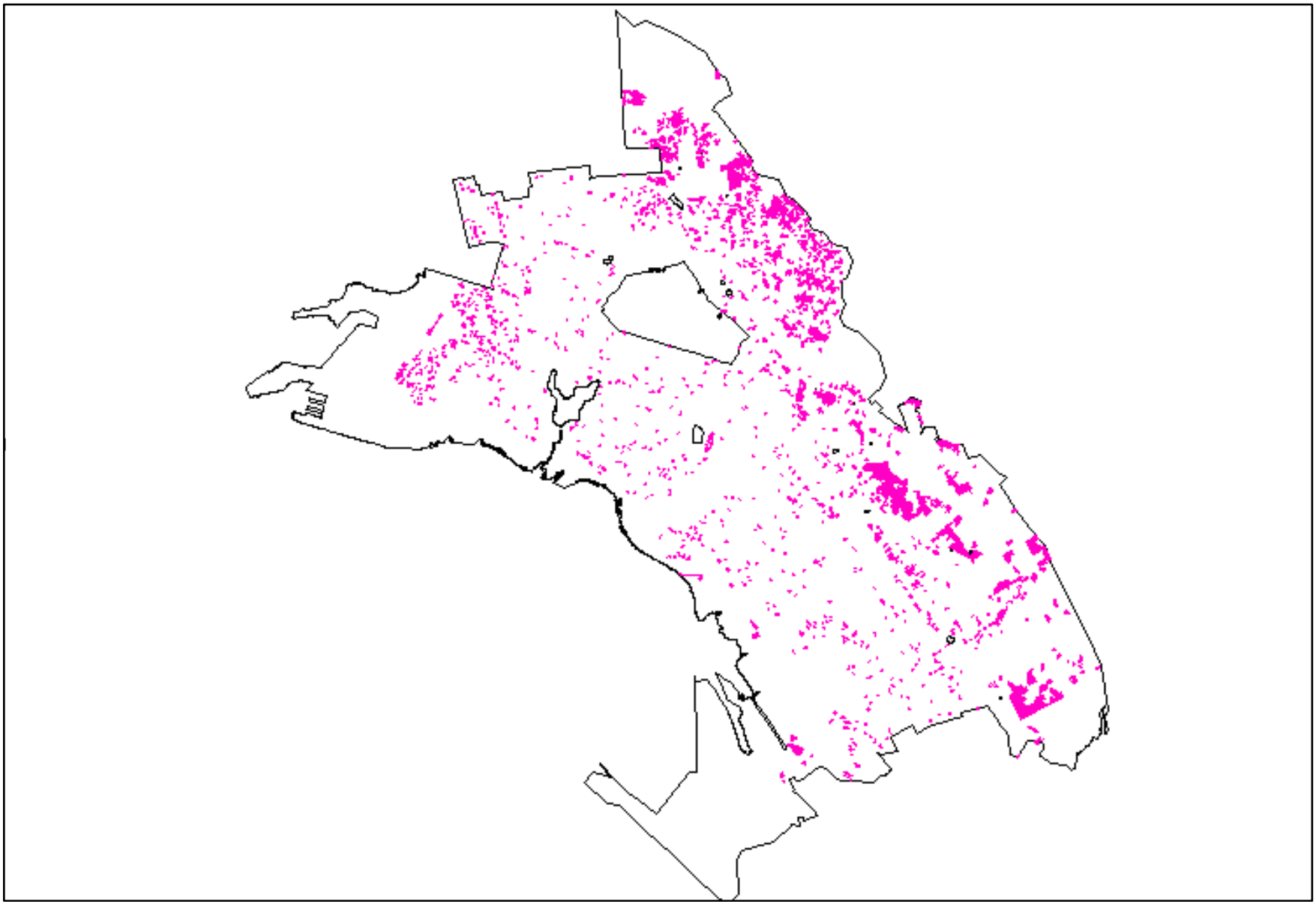

Figure 1. Vacant Parcels. The pink outlines represent private parcels visually confirmed as vacant using NAIP imagery.

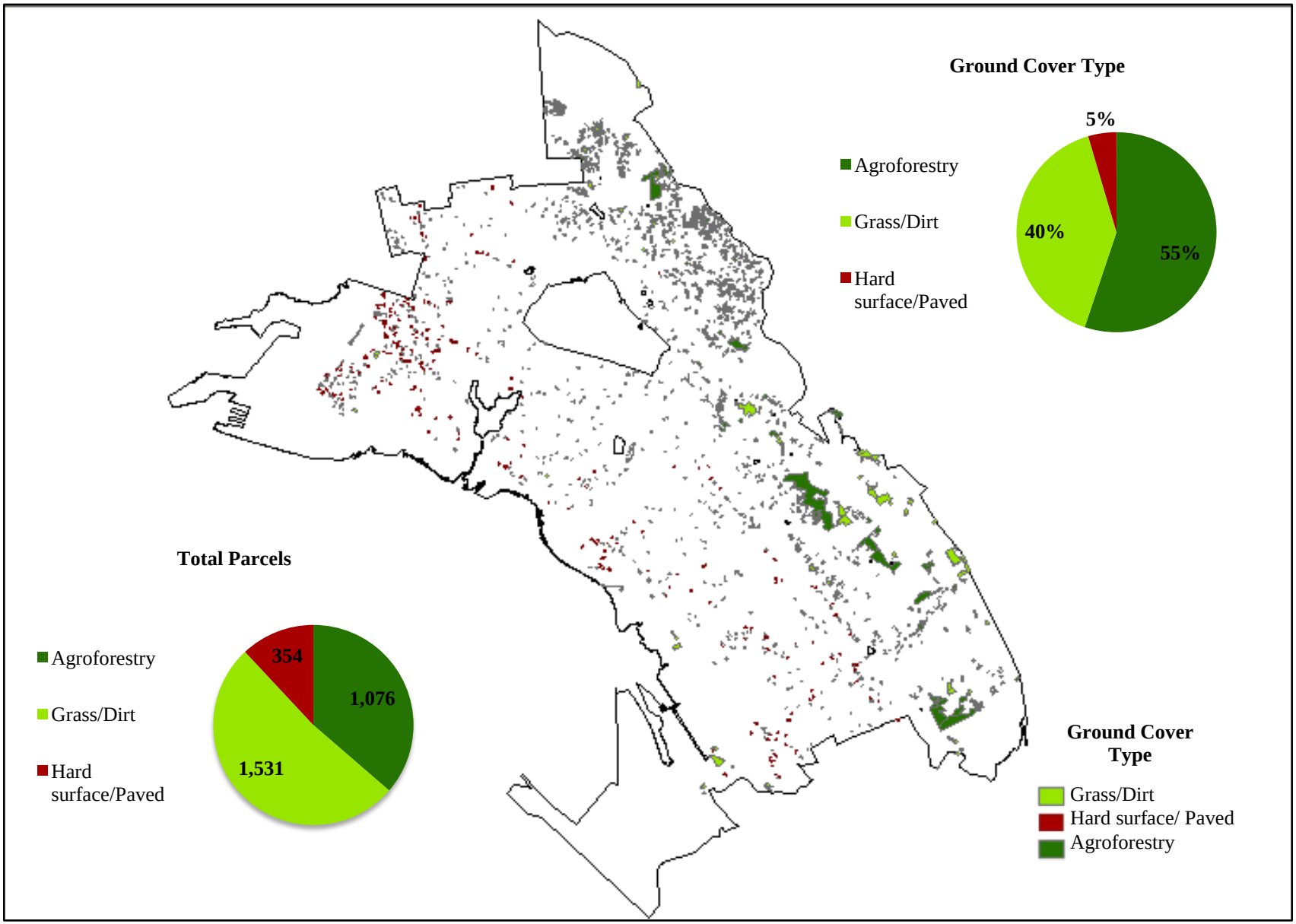

Figure 2. Ground Cover.

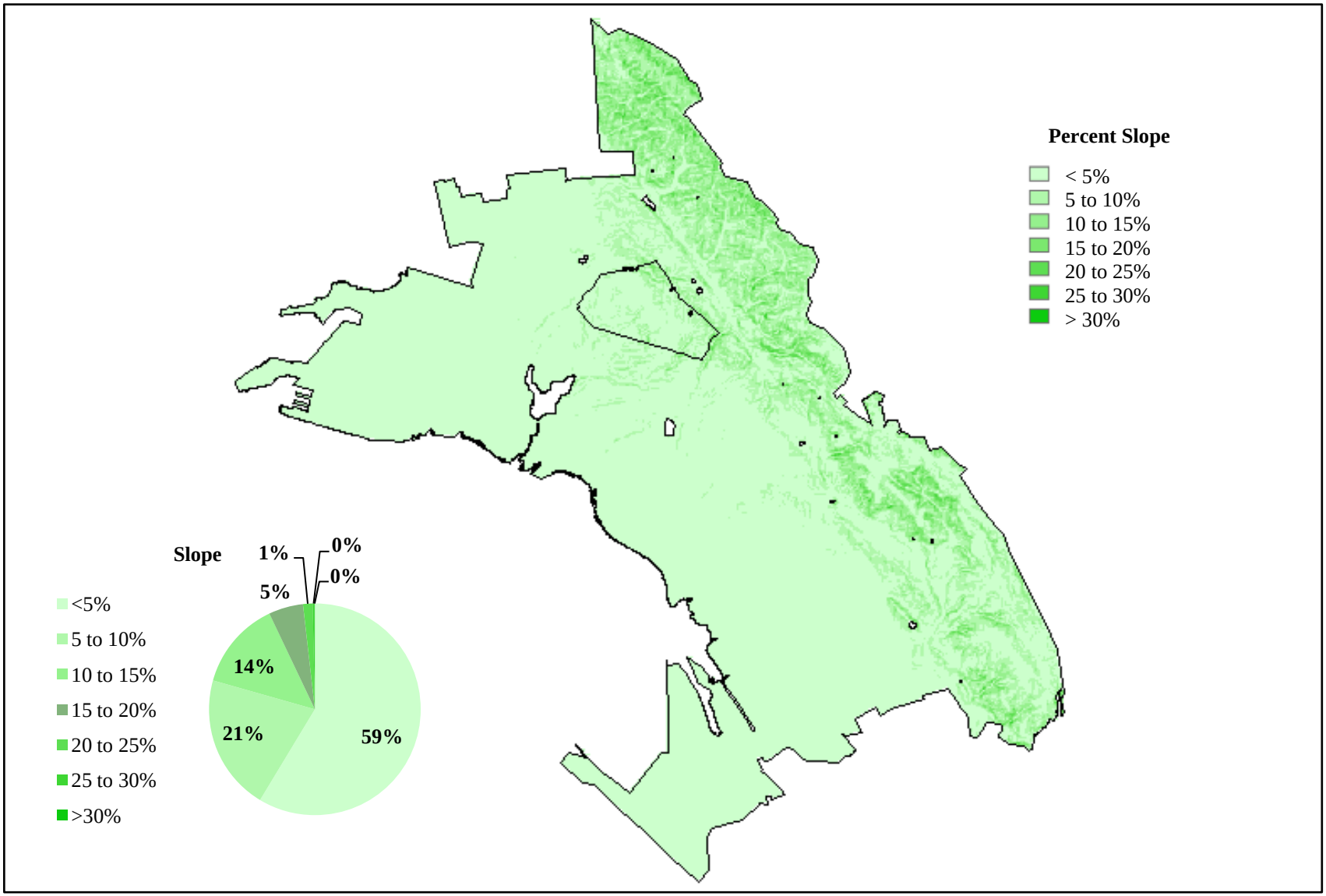

Figure 3. Slope. The darker colors represent steeper slopes, and the lighter colors gentler slopes.

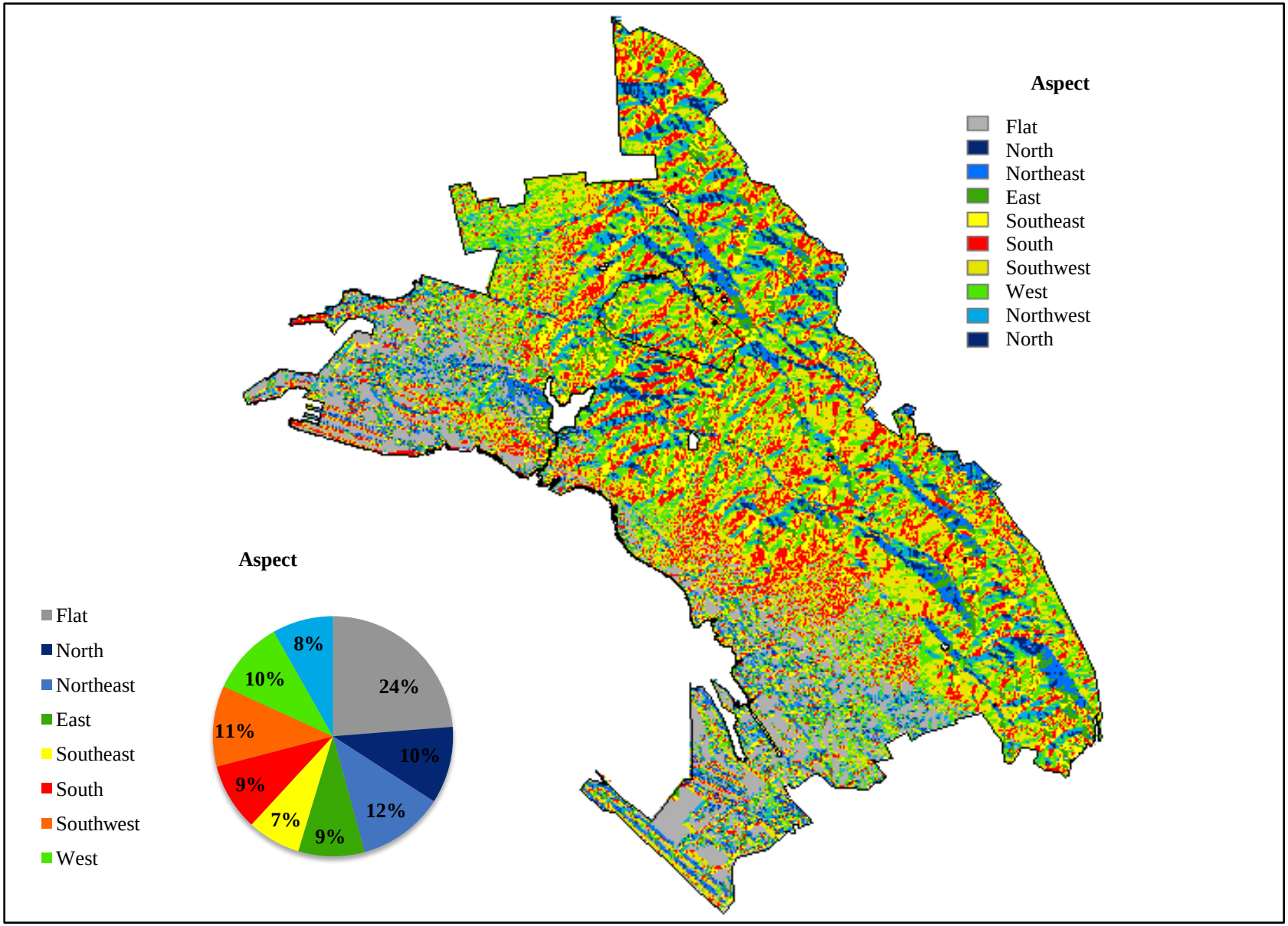

Figure 4. Aspect. South-facing slopes are represented by warm colors, while north-facing slopes are represented by cool colors.

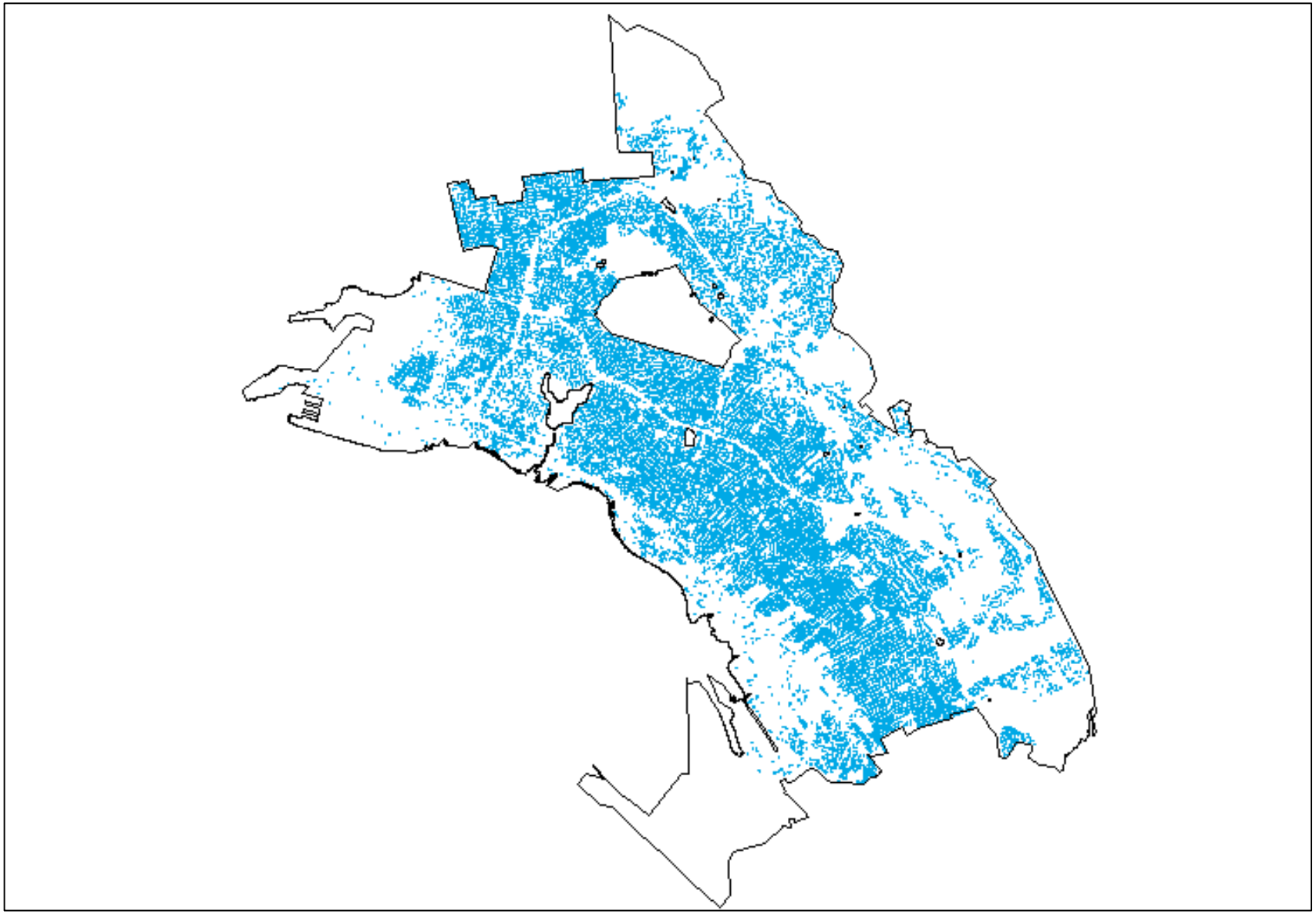

Figure 5. EBMUD Meters. The blue area represents a 10-foot buffer around all EBMUD water meters.

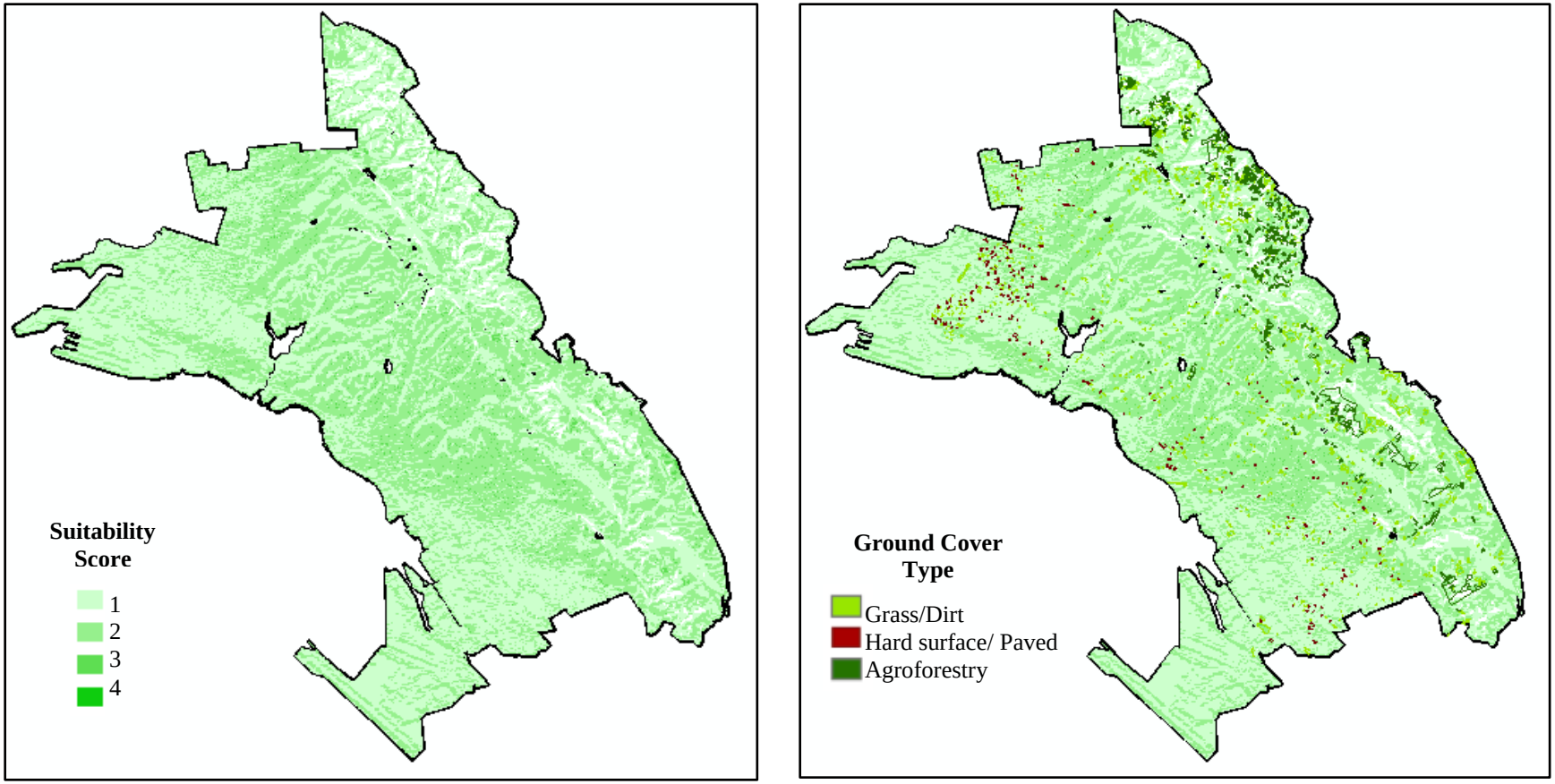

Figure 6. Opportunity Map. The dark green areas indicate the most suitable areas to farm with a weighted suitability score of 4. The map on the right shows the parcels of interest by different ground cover types overlaid on the opportunity map.

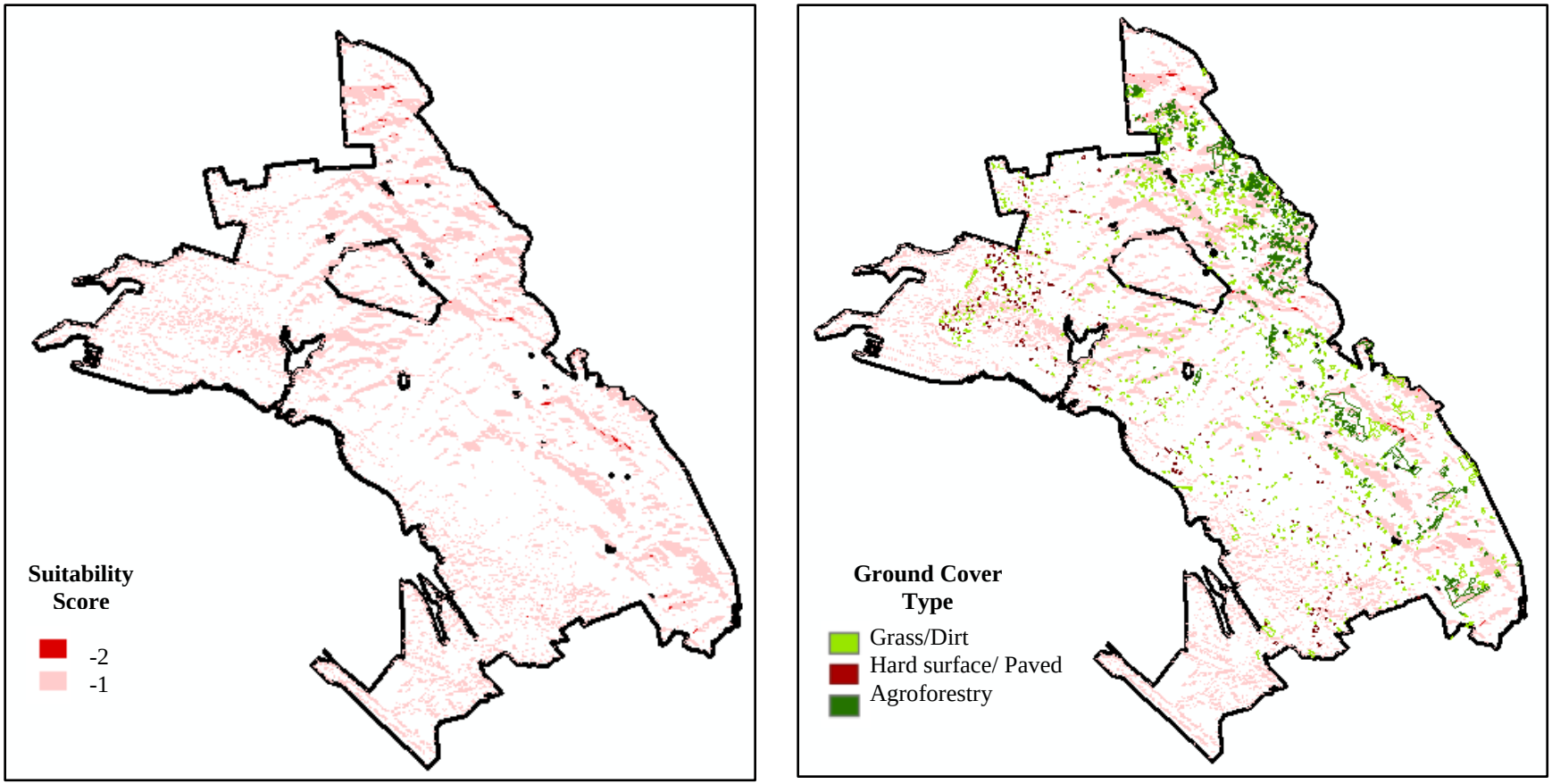

Figure 7. Constraint Map. The dark red areas indicate the least suitable areas to farm with a weighted suitability score of -2. The map on the right shows the parcels of interest by different ground cover types overlaid on the constraint map.

DISCUSSION

The purpose of this study was to determine the suitability of Oakland's private land to urban agriculture. Through the creation of a land inventory and subsequent suitability analysis, I was able to identify the most and least suitable vacant parcels of land for farming in Oakland. In addition, I conducted interviews that uncovered the role that social connections play in establishing alliances between urban agriculturalists and landowners. Further discussion of the GIS and interview findings will illuminate the significance of these findings for urban agricultural organizations and the communities that they serve.

GIS and interview analysis

The creation of a land inventory of available private land parcels and their basic physical attributes is an important contribution to the pool of location-based information that is available to urban agriculturalists. This land inventory could be of great use to an urban farming organization or individual with urban farming aspirations to locate a potential site on which to start a farm. It is a tool that disseminates knowledge on a parcel of land's physical suitability to urban agriculture and therefore eliminates the need for an urban agriculturalist to undertake that research individually. The private land that I identified contributes to the stock of vacant public land already identified and thereby increases the amount of known suitable land available for urban agriculture.

Through conducting interviews with leaders of organizations that practice urban agriculture on privately owned land, I learned that it was not as difficult as I anticipated it would be for interested parties to connect with one another to form an urban agricultural alliance. Oftentimes land access can act as a barrier to urban agriculture (Hagey 2012), but in these cases, whether the direction of the search was from landowner to urban agriculturalist or vice versa, the interested parties were able to connect with one another because of pre-established relationships with a mutual acquaintance or another organization. The fostering and maintenance of these types of connections and networks is very important for the proliferation of urban agriculture on private land because it is not as regimented or institutionalized as many urban agricultural pursuits on public land. The city of Oakland has been involved in granting organizations such as

City Slicker Farms permission to farm on publicly owned land, but there is no one institution that grants permissions for farming on privately owned land. Recently, the San Francisco Planning and Urban Research Association, or SPUR, has taken an interest in simplifying the process of obtaining land for urban agriculture (Lee 2012), but until that occurs in San Francisco and throughout the Bay Area, these informal networks and connections will prove to be vital for the urban agriculture movement's spread and growth not only on private land, but everywhere.

Limitations

The scope of my study was site specific, which limits how much I can infer from my data. Additionally, the data I gathered does not include a complete picture of what social factors should be considered in selecting a site for urban agricultural pursuits. But as long as the necessary data is accessible and properly formatted for use in a GIS, the type of results that I produced for Oakland could be found for any other city or region with similar food access issues.

The number of urban agriculture representatives I was able to interview limited the scope of the findings. In the first place there appear to be far fewer urban agriculture groups that farm on private land than public land, and subsequently not all of these organizations were responsive to my request for an interview. So, the subset of organizations that did grant me an interview may have been representative of the Bay Area, but may not have been wholly representative of urban agriculture on private land in Oakland specifically. Additionally, in most interviews I was only able to speak with one or two representatives from each organization. The results of my interviews were therefore biased to the experiences and opinions of a small contingent, and not the organization or the urban agriculture movement as a whole.

Future directions

Future researchers may wish to add to this study by analyzing other physical and social factors that contribute to the agricultural suitability of private land parcels. Other factors that would be of value to consider in future analyses include the historical land uses on each site, the presence of toxics in the soils such as lead, and community access indices. While I identified many potential sites for agricultural development, further research could examine potential

interest in developing the identified sites. This might be accomplished through conducting a community-wide survey of existing urban agriculture organizations and their affiliates in the community. One endeavor that I would consider very worthwhile to groups farming on private land would be figuring out a way to disseminate the results of my land inventory to the community.

Broader implications

These findings have broader implications for the future of urban agriculture and access to healthy food for residents of Oakland. I have expanded the known inventory of suitable land for urban agriculture in Oakland to include private land in addition to the public land holdings found by McClintock (2010). Including private land in this inventory presents more opportunities for urban agriculture in areas that may have been previously unknown to individuals or groups looking for a suitable farm site. The results from the interviews highlighted the importance of informal networks in connecting prospective urban agriculturalists with private landowners. All urban farms have their own unique obstacles to surmount, but perhaps these can be overcome by examining how other similar groups have achieved success regarding their own issues. This study presents data that will be a resource for urban agricultural groups and contributes to the success of these groups in increasing food access and security for residents of Oakland. It is becoming ever more evident that underserved communities will rely on working outside of the current food system through other means such as community-supported agriculture and other local phenomena (Buttel 1999). The development of local food systems gives people the ability to rethink the food system and increase social justice (Allen 2010), and this study represents one small but meaningful step in that direction.

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