GIS Analyses of Walkability in Salem, Oregon

VOLUME 1

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SALEM

GEOG 482/582: GISCIENCE II | COLLEGE OF ARTS AND SCIENCES

UNIVERSITY OF OREGON
CITY OF Salem AT YOUR SERVICE
SCI Sustainable Cities Institute
SCYP Sustainable City Year Program

Acknowledgments

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About SCI

The Sustainable Cities Institute (SCI) is an applied think tank focusing on sustainability and cities through applied research, teaching, and community partnerships. We work across disciplines that match the complexity of cities to address sustainability challenges, from regional planning to building design and from enhancing engagement of diverse communities to understanding the impacts on municipal budgets from disruptive technologies and many issues in between.

SCI focuses on sustainability-based research and teaching opportunities through two primary efforts:

1. Our Sustainable City Year Program (SCYP), a massively scaled university-community partnership program that matches the resources of the University with one Oregon community each year to help advance that community's sustainability goals; and

2. Our Urbanism Next Center, which focuses on how autonomous vehicles, e-commerce, and the sharing economy will impact the form and function of cities.

In all cases, we share our expertise and experiences with scholars, policymakers, community leaders, and project partners. We further extend our impact via an annual Expert-in-Residence Program, SCI China visiting scholars program, study abroad course on redesigning cities for people on bicycle, and through our co-leadership of the Educational Partnerships for Innovation in Communities Network (EPIC-N), which is transferring SCYP to universities and communities across the globe. Our work connects student passion, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.

About SCYP

The Sustainable City Year Program (SCYP) is a yearlong partnership between SCI and a partner in Oregon, in which students and faculty in courses from across the university collaborate with a public entity on sustainability and livability projects. SCYP faculty and students work in collaboration with staff from the partner agency through a variety of studio projects and service- learning courses to provide students with real-world projects to investigate. Students bring energy, enthusiasm, and innovative approaches to difficult, persistent problems. SCYP's primary value derives from collaborations that result in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

About City of Salem

The City of Salem is Oregon's second largest city (179,605; 2022) and the State's capital. A diverse community, Salem has well-established neighborhoods, a family-friendly ambiance, and a small town feel, with easy access to the Willamette riverfront and nearby outdoor recreation, and a variety of cultural opportunities.

The City is known for having one of Oregon's healthiest historic downtowns, hosts an airport with passenger air service, and is centrally located in the heart of the Willamette Valley, 47 miles south of Portland and an hour from the Cascade Mountains to the east and the ocean beaches to the west.

State government is Salem's largest employer, followed by the Salem-Keizer School District and Salem Health. The City also serves as a hub for area farming communities and is a major agricultural food processing center. A plethora of higher education institutions are located in Salem, ranging from public Western Oregon University, private Willamette and Corban universities, and Chemeketa Community College.

Salem is in the midst of sustained, steady growth. As a "full-service" city, it provides residents with services such as police and fire protection, emergency services, sewage collection and treatment, and safe drinking water. Salem also provides planning and permitting to help manage

growth, as well as economic development to support job creation and downtown development. The City also provides 2,338 acres of parks, libraries and educational programs, housing and social services, public spaces, streetscaping, and public art.

Salem's vision is a safe, livable, and sustainable capital city, with a thriving economy and a vibrant community that is welcoming to all. The City's mission is to provide fiscally sustainable and quality services to enrich the lives of present and future residents, protect and enhance the quality of the environment and neighborhoods, and support the vitality of the economy. The City is in the midst of a variety of planning efforts that will shape its future, ranging from climate action planning and implementation, a transportation system plan update, as well as parks master planning.

This SCYP and City of Salem partnership is possible in part due to support from U.S. Senators Ron Wyden and Jeff Merkley, as well as former Congressman Peter DeFazio, who secured federal funding for SCYP through Congressionally Directed Spending. With additional funding from the city, the partnership will allow UO students and faculty to study and make recommendations on city-identified projects and issues.

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Course Description

GEOG 482/582: GISCIENCE II

This course focused on spatial data collection, spatial data models, database design, data editing, geographic information system (GIS) project management, and advanced topics in geographic information science.

Executive Summary

Driven by a shared commitment to improve environmental health, community well-being, and accessibility, students in the Advanced GIS class collaborated with the City of Salem to develop data-driven strategies for urban improvement. Walkability, a concept that refers to the safety and comfort of pedestrian infrastructure, serves as a link between both social considerations and urban design principles. Improvements in walkability can be associated with decreasing traffic congestion and carbon emissions, while improving pedestrians' overall quality of life. In winter 2024, students created recommendations based on spatial patterns gathered from the City of Salem's geodatabase. Using datasets ranging from transportation networks, demographic makeup, and public facilities, students addressed three specific aspects of walkability in Salem:

1. **Public Transportation Core Networks** analyzed datasets with the intent to improve the accessibility and effectiveness of Salem's public transportation.

2. **Equity Focus Areas** analyzed pedestrian infrastructure trends to increase accessibility in a lower-income area of Salem.

3. **Climate-Friendly Areas** created recommendations to improve pedestrian safety within Salem's expanding mixed-use infrastructure downtown.

Student recommendations aimed to elevate Salem's walkability score and foster community livability, sustainability, and social cohesion. By prioritizing public transportation and pedestrian infrastructure, the City of Salem can encourage a reduction in carbon emissions and an increase in walking and cycling. The shift towards sustainable transportation can help tackle urban design challenges such as traffic congestion and design effectiveness. This report highlights some of the key findings and suggestions to improve walkability, contributing to a more vibrant and sustainable urban environment.

Introduction

Walkability is a key factor to enhance the livability and sustainability of cities around the globe. With a walkability score of 42, Salem, Oregon, joins the global effort to promote public transit and active transportation through design and innovative approaches.

WHAT IS WALKABILITY?

The concept of urban 'walkability,' as defined by Dovey and Pafka (2020), combines a series of multidisciplinary fields connecting urban design and planning. As many cities grapple with the challenges of traffic congestion, climate change, and rapid urbanization, walkability gained increasing traction as a measure of urban quality. An area can become more walkable with an expansion of mixed-use areas, adopting pedestrian-forward design, and increasing public spaces to foster a vibrant, flourishing community.

This collaborative effort between the Advanced GIS class and the City of Salem helps highlight many of the urban improvements that could be made by observing walkability patterns. Analyzing an extensive network of sidewalks, crosswalks, population density, and other street data, students uncovered actionable observations. Placed into three focus area groups — public transportation core network, equity focus, and climate-friendly areas — students were tasked with finding inconsistencies and potential improvements in the Salem data to work towards a more walkable future. Once areas with poor connectivity and walkability were detected, students created recommendations and displayed specific areas and points of interests where advancements in pedestrian features could be made.

This report highlights the many recommendations made by the students, putting a spotlight on specific individuals in each topic area. Through detailed analysis, these students identified suggestions to enhance walkability and promote sustainability in Salem.

Methods

To create their analysis and recommendations, GIS students accessed a variety of datasets in Salem's geodatabase.

AVAILABLE DATA

Salem's Geodatabase

- Students extracted over 40 separate vector datasets from Salem's geodatabase. Groups of datasets were established based on the benefit to each topic area and types of data. Variables within these datasets included: public facilities, zoning, bus stops and routes, hazard reports, and numerous other spatial attributes available for analysis.

Visual Guidance Analysis

- In addition to the spatial analysis, students used Google Maps and Google Earth to provide empirical evidence and reinforce recommendations. Many final recommendations included Google Street View images to show how these changes would look at human scale.

ARCGIS PRO TYPES AND TOOLS ANALYSIS:

Network Analysis

- Standardization: Using the reclassification tools, students standardized the data to create comparisons between different variables or datasets. This reclassification allowed students to create categories or groups of similar values, allowing for easier analysis.
- Density Analysis: With a choice between kernel, point, or centroid density, students visualized their analysis for use in further overlay analyses or decision-making processes. This analysis type highlighted the distributions of data, displaying hotspots or spatial trends.
- Network Service Areas: To consider the current transportation network within Salem, students used the University of Oregon network service area to calculate accurate walking and driving times from locations. This tool allowed students to create data layers that factored in travel time, distance, or connectivity to destinations. The assessment of current coverage and effectiveness of transportation networks offered valuable insight into deficiencies.

Overlay and Suitability Modeling:

- Utilizing data formulated from density and network service analysis, students then proceeded to overlay these layers to visualize key areas. This spatial technique allows for the identification of optimal locations for development of walkability considering multifarious data.

Public Transportation Core Network

Students focused on this topic area used data to predict trends in population densities and household income in Salem. By understanding the demographic makeup of different areas of Salem, these students identified areas with a higher demand for public transportation. By assessing areas with a higher demand, this group hopes to aid residents who are more likely to rely on buses to get to and from their destinations.

In addition to household and income data, students analyzed the quality and effectiveness of the existing public transportation network. By evaluating the weaknesses and strengths of Salem's current transportation system, the group identified key components to improve functionality and accessibility.

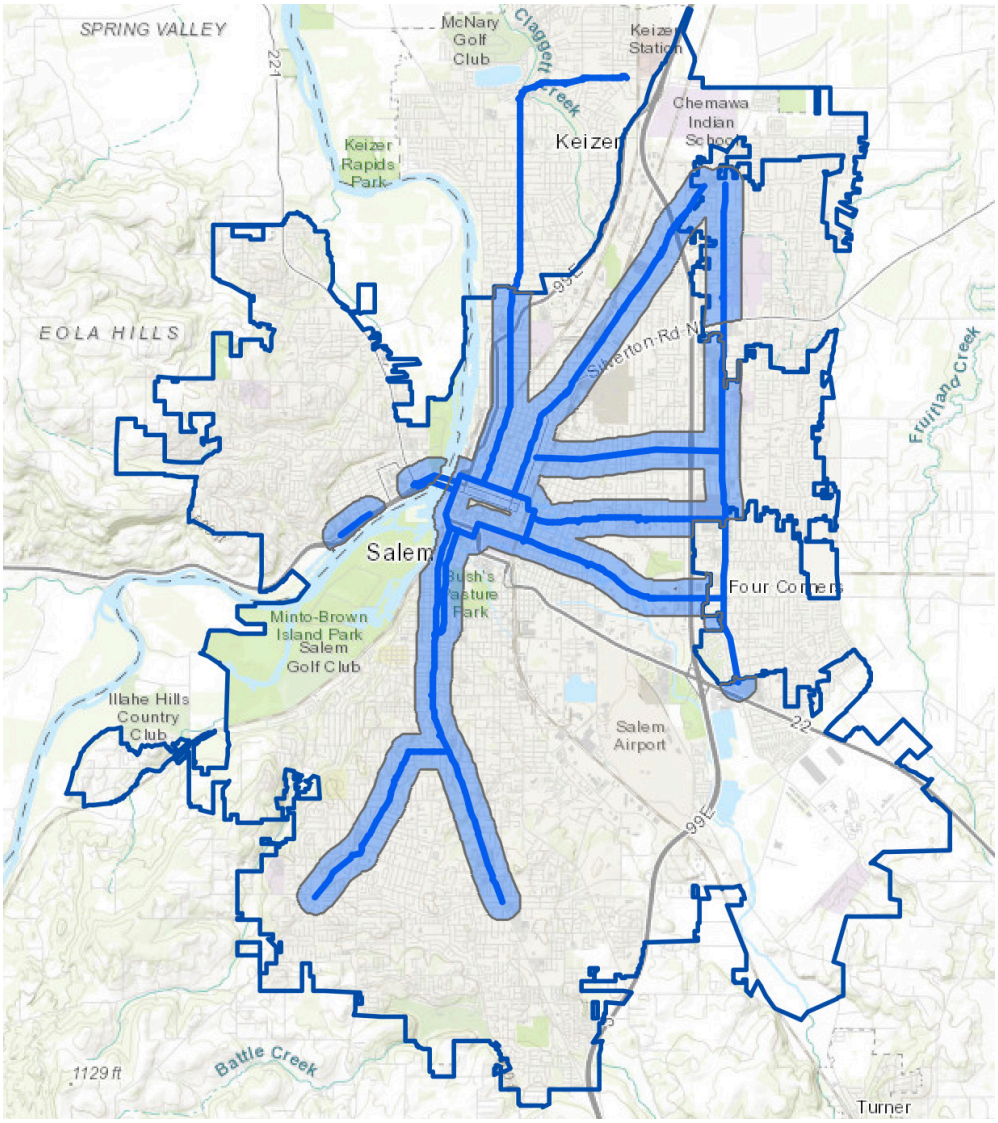

FIG. 1

Public Transportation Core Network topic area focus.

Source: Kohler (2024)

Equity Focus Areas

The equity topic area, defined as a specific focus on lower income areas of Salem, assessed data to gain insight into the transportation needs of pedestrians in these areas. Of particular concern is the equity priority area surrounding I-5, which was flagged due to its high-risk pedestrian infrastructure and lower income students. Students in this group analyzed sidewalks, crosswalks, bus stops, and specific public amenities, such as grocery stores or schools, to ensure residents can safely travel to and from their desired destination. By assessing the quality and accessibility of the pedestrian infrastructure in this area, the group identified inconsistencies and areas for improvement in walkability.

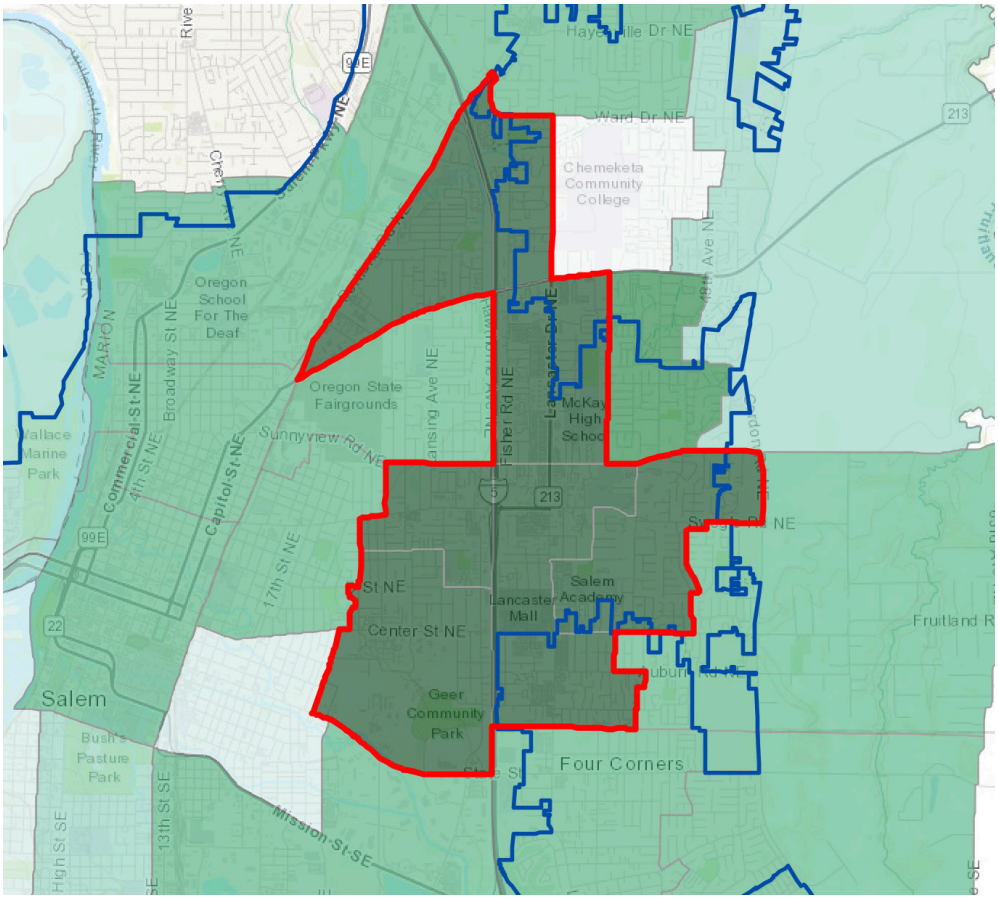

FIG. 2

Equity priority topic area.

Source: Kohler (2024)

Climate-Friendly Areas

These students focused on enhancing the developing mixed-use areas in the urban downtown area of Salem. Mixed-use areas, characterized by a blend of commercial, residential, and recreational spaces, present a dynamic and sustainable future for urban infrastructure. The creation of mixed-use areas can yield a variety of benefits for Salem's urban community, ranging from alleviating traffic congestion and stimulating economic growth to fostering social connectivity and reducing carbon emissions. Students in this group identified issues with public transportation and pedestrian infrastructure, while also targeting areas to increase greenspaces and leverage the diverse mix of amenities found within downtown Salem.

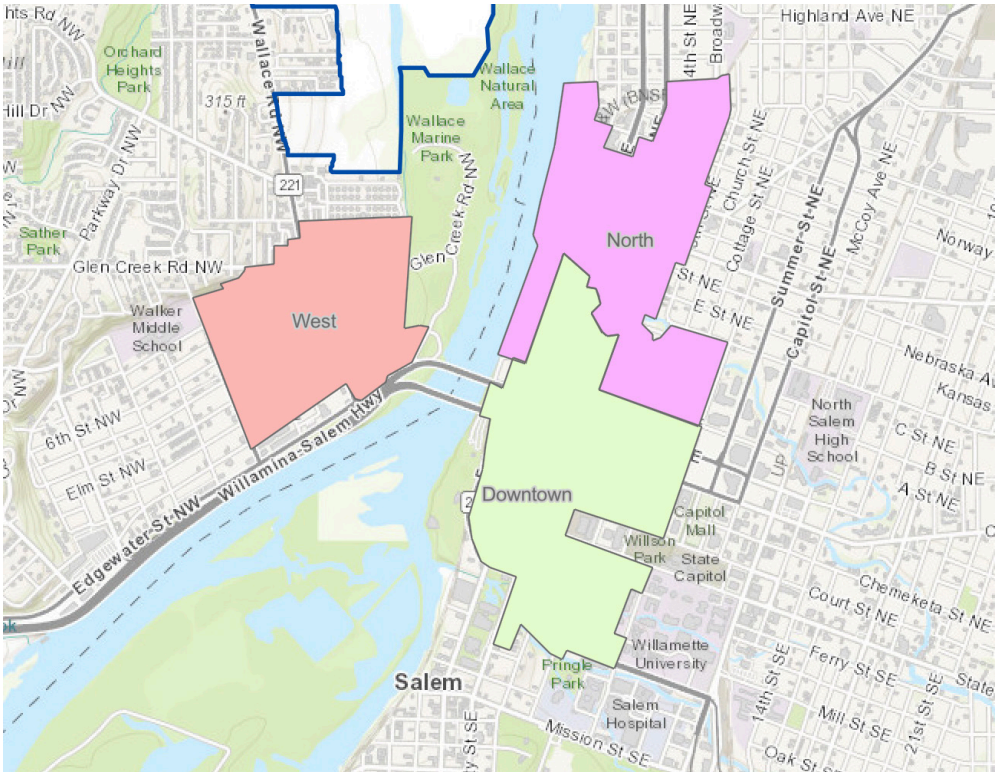

FIG. 3

Climate-Friendly Areas topic area.

Source: Kohler (2024)

Results

The results of this collaborative effort yielded valuable insight, offering a collection of unique perspectives on how to address walkability and transportation challenges within the City of Salem. This section highlights individual recommendations for each topic area: Public Transportation Core Networks, Equity Focus Area, and Climate-Friendly Areas. Each recommendation emphasized overall walkability as well as on specific concerns found in each area.

Recommendations

PUBLIC TRANSPORTATION CORE NETWORK

Figure 4 demonstrates a walkability analysis model grounded on central goals of this group. Following an overlay analysis route, this student highlighted areas with an elevated need for pedestrian infrastructure by Census block. Using population by block data for both working and residential areas and bus stop data, this student uncovered the following trends: The red and orange surface areas depict blocks that are in higher need of bus stops based on where there might be increased pedestrian traffic, considering both locations to housing and workplace. Investments into these areas could help increase use of public transportation due to increased accessibility.

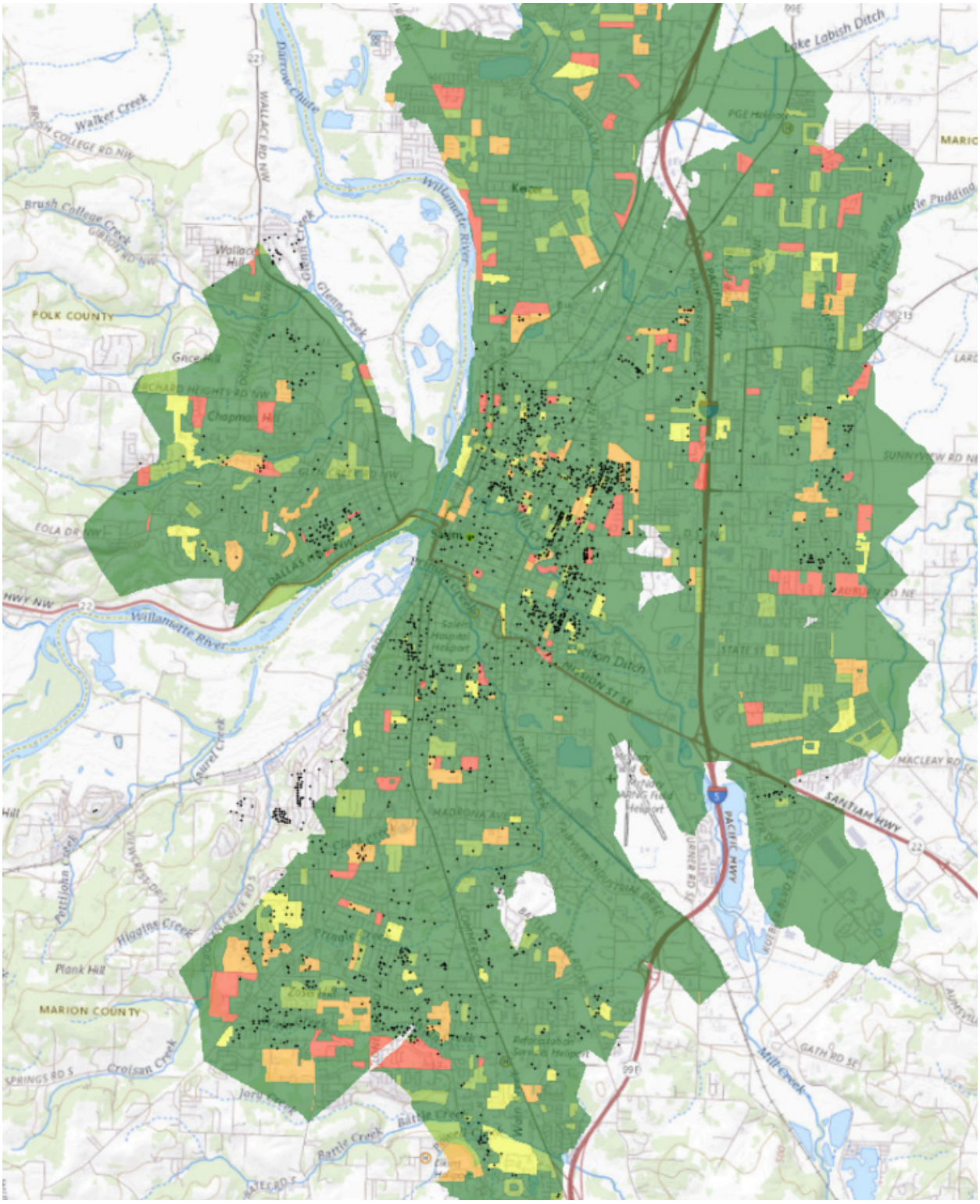

FIG. 4

Walkability to public transit by block.

Source: Naomi Gates

Addressing a more specific need, Figure 5, offers a specific recommendation targeting the design of bus stops throughout the core transportation network. With a goal of increasing safety for public transportation users, this student recommended areas that need to expand street lighting near bus stops. The first map (Figure 5 – A) shows the current location of bus stops and crosswalks with no lighting. The second map (Figure 5 – B) highlights surface areas with orange and red, identifying regions with more need for streetlamps. An expanded view of these priority areas reveals specific zones where investments could help boost urban safety, reduce crime rates, and improve residents' quality of life.

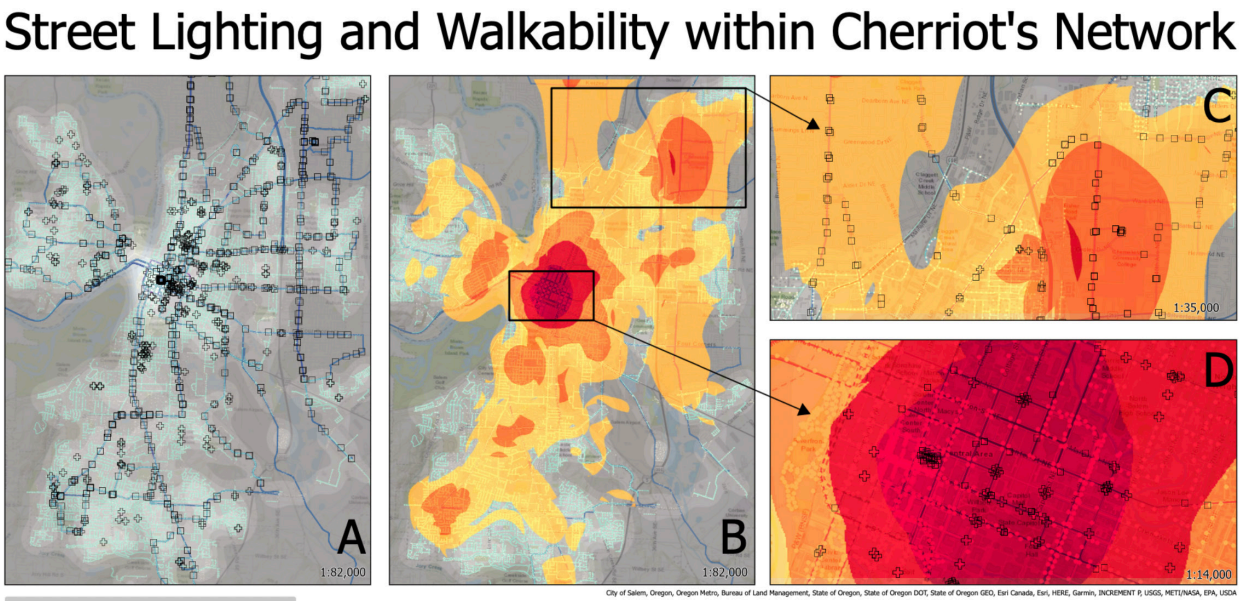

FIG. 5

Current Street lighting near bus stops; B) Areas with decreased walkability due to lack of adequate street lighting near bus stops.

Source: Nicole Cleland

EQUITY FOCUS AREAS

To improve the quality of pedestrian and public transportation infrastructure, the following maps targeted necessary improvements needed within the equity topic area. Figure 6 assesses walkability based on public school accessibility. Considering population density, sidewalk hazards, and non-signalized crosswalks, this student showcased areas around schools that could benefit from attention. Areas with high concern are noted in a red and orange color while areas of lesser concern are green. Also noted on the map are the locations of each non-signalized crosswalk and sidewalk hazards. Increasing accessibility around schools can promote a safer community, encouragement of physical activity, and enhance educational opportunities.

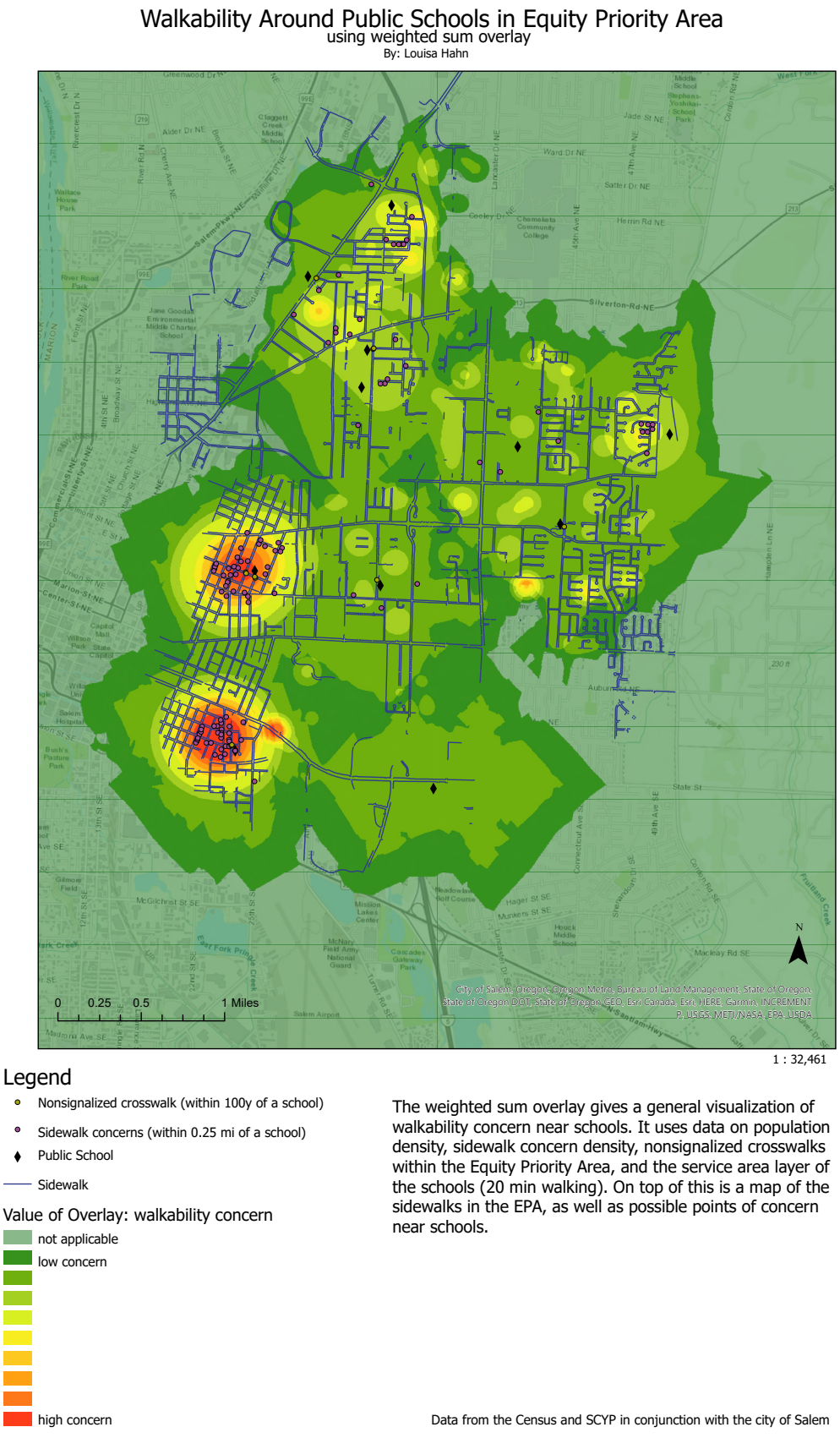

FIG. 6

Walkability safety around public schools in Equity Topic Area

Source: Lousia Hahn

Figure 7 offers a comprehensive walkability analysis factoring in all crosswalks, public amenities, and retail zones. Surface areas depicted in red represent a higher walkability while yellow represent much lower walkability. As part of the assessment, this student noted that despite certain areas having a much higher walk score, after visual assessment on Google Street View, there remains room for improvement. Specifically, the addition of sidewalk buffers could enhance pedestrian safety and comfort while also creating urban greenspaces.

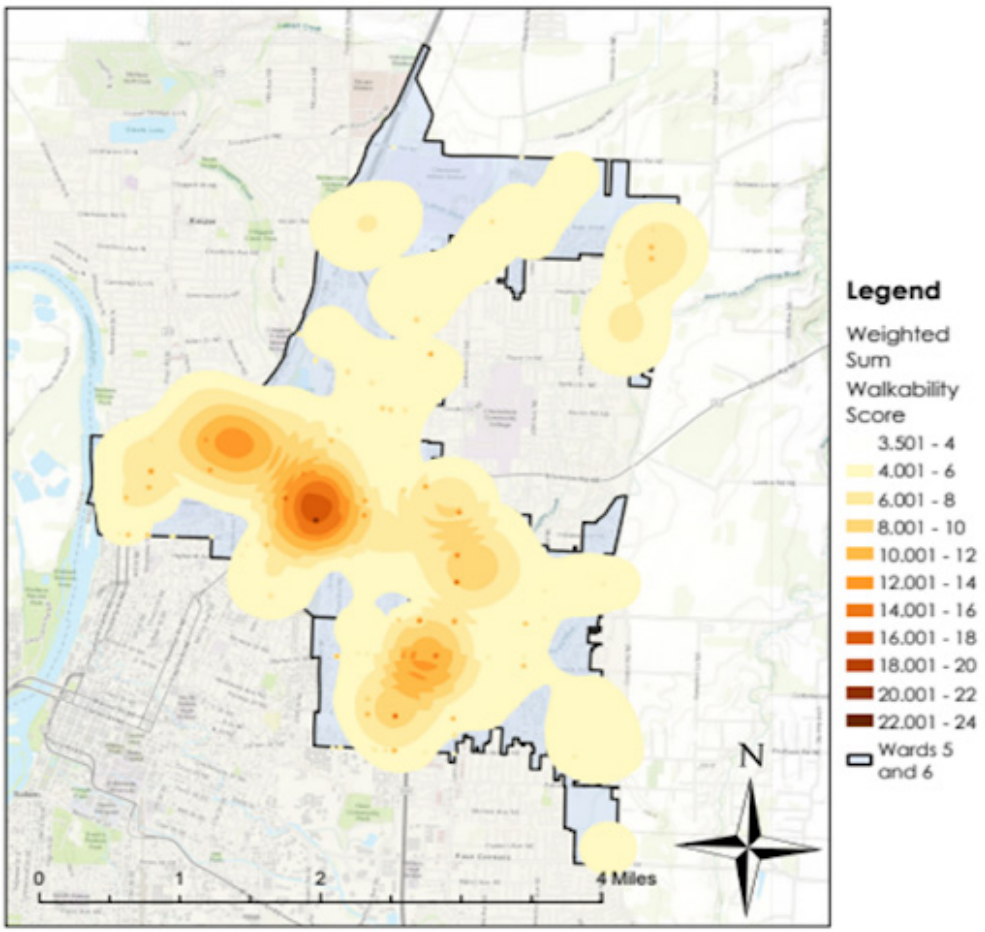

FIG. 7

Overall walkability analysis of Equity Priority Area.

Source: Ben Adams

CLIMATE-FRIENDLY AREAS

With a focus on the current infrastructure found within the mixed-use area, the map (Figure 9) overlays population density data, amenity density, and sidewalk concern density shown in Figure 8. Areas with a higher amount of walkability are determined by a lesser value of sidewalk concerns and a higher density of amenities and residents. The overlay demonstrates that the area between the north and downtown mixed-use areas are of most concern. With the diverse mix of amenities and services that these areas offer, creating pedestrian infrastructure near concentrated neighborhoods will enhance the overall quality of life for these residents.

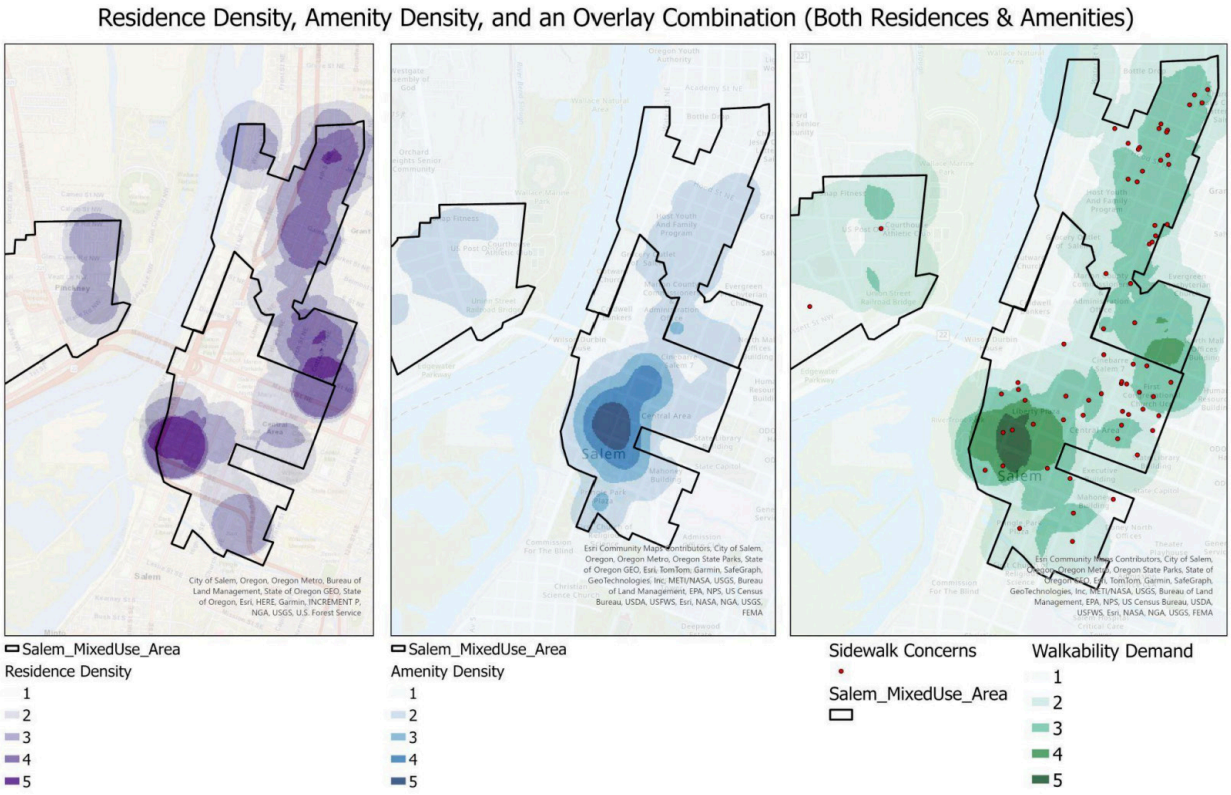

FIG. 8

Population Density, Amenity Density, and Sidewalk Concerns of Climate-Friendly Areas

Source: Hannah Siegel

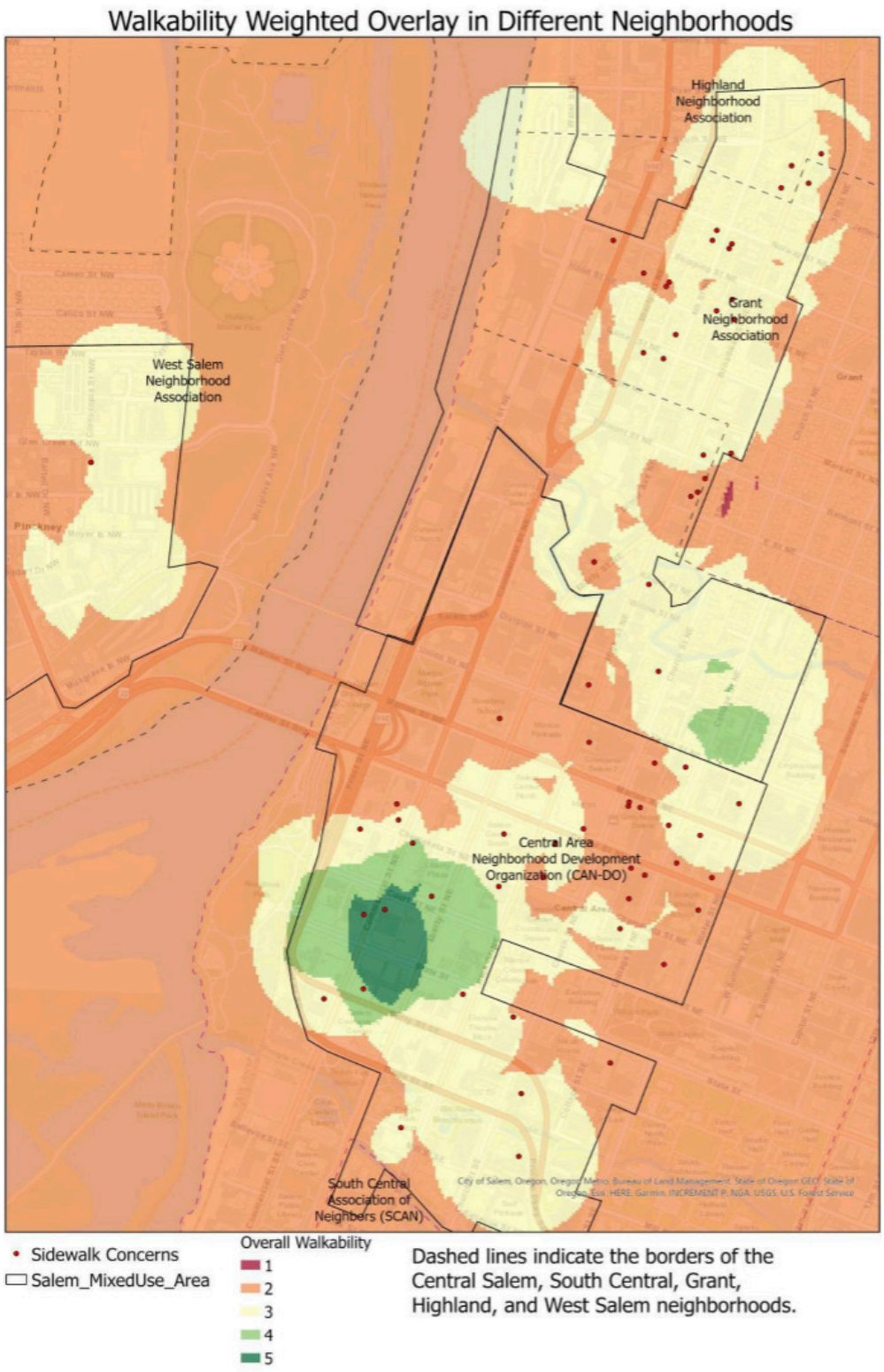

FIG. 9

Overall Walkability analysis of Climate-Friendly Areas using data from Figure 8

Source: Hannah Siegel

Conclusion

The City of Salem is dedicated to revitalizing its community through improvements in pedestrian infrastructure and public transit options. With goals of enhancing Salem's urban environment, and fostering a more sustainable and walkable space, the recommendations created by the students support these sustainability initiatives. With suggestions informed by datasets such as sidewalk quality, population density, and various other factors, Salem can use these assessments to help guide its urban development initiatives.

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