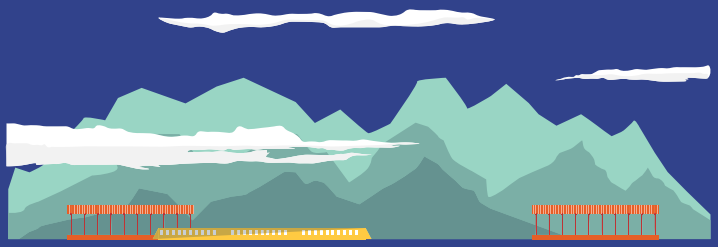
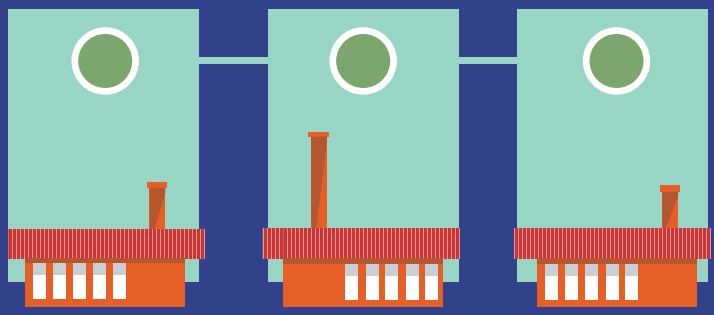
Geospatial Analysis Project Portfolio

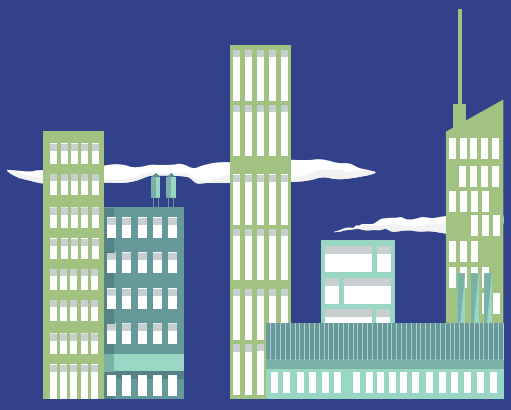
Geospatial assessments and recommendations have helped cities target improvements and distribute funding.

GIS/Geospatial coursework in the Geography Department (GI Science) and School of Planning, Public Policy and Management (Advanced GIS) have responded to the diverse needs of the Sustainable City Year Program's partners, from identifying pedestrian and transit network gaps, improving downtown viability and wayfinding, to assessing how cities can become more equitable with spatially determined infrastructure improvements. A selected project portfolio follows.





What is the Sustainable City Year Program?



The Sustainable City Year Program is an innovative university-community partnership program founded by the Sustainable Cities Institute at the University of Oregon in 2009-10. In this unique model, existing courses, faculty, and students from across campus are purposefully directed toward a single Oregon community over an academic year to address vexing issues identified by the partner. SCYP and the students, faculty, and communities it engages with are an example of Oregon innovation, leadership, and how leveraging resources can contribute to meaningful, additional, and society-wide value. SCYP creates a conduit for translating knowledge into practice, and provides significant workforce development opportunities for students, adding 'hard' and 'soft' skills and hands-on experience to all levels of students' education.

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WINTER 2024

GIS Analysis of Walkability in Salem, Oregon

Partner: City of Salem
Instructor: Nick Kohler

Project Description: Students collaborated with the City of Salem, focusing on evaluating and improving the City's pedestrian infrastructure. Using Geographic Information System (GIS) tools, the project analyzed Salem's transportation networks, demographics, and public amenities to assess walkability—a key measure of urban livability and sustainability. The study targeted three key areas: public transportation networks, equity focus areas (specifically in lower-income neighborhoods), and climate-friendly mixed-use zones in the downtown area. Through spatial data analysis, students provided recommendations aimed at enhancing pedestrian safety, accessibility, and comfort, while promoting sustainable urban growth and reducing carbon emissions. The findings and proposals offered insights to help Salem advance its urban planning goals and foster a more walkable, sustainable city.

Recommendations: Student recommendations addressed three specific aspects of walkability:

Public Transportation Core Networks:

- Improve bus stop accessibility, especially in areas with high pedestrian traffic.
- Increase street lighting near bus stops to enhance safety.
- Prioritize areas with higher demand for public transportation based on population and income data.

Equity Focus Areas:

- Address sidewalk hazards and non-signalized crosswalks around public schools.
- Improve pedestrian infrastructure in lower-income areas, focusing on safety and accessibility.
- Introduce sidewalk buffers and greenspaces to enhance comfort and safety.

Climate-Friendly Areas:

- Develop pedestrian infrastructure in mixed-use areas to support a sustainable urban environment.
- Focus on increasing greenspaces and improving pedestrian connectivity in downtown areas.
- Encourage the integration of public amenities to foster social connectivity and reduce carbon emissions.

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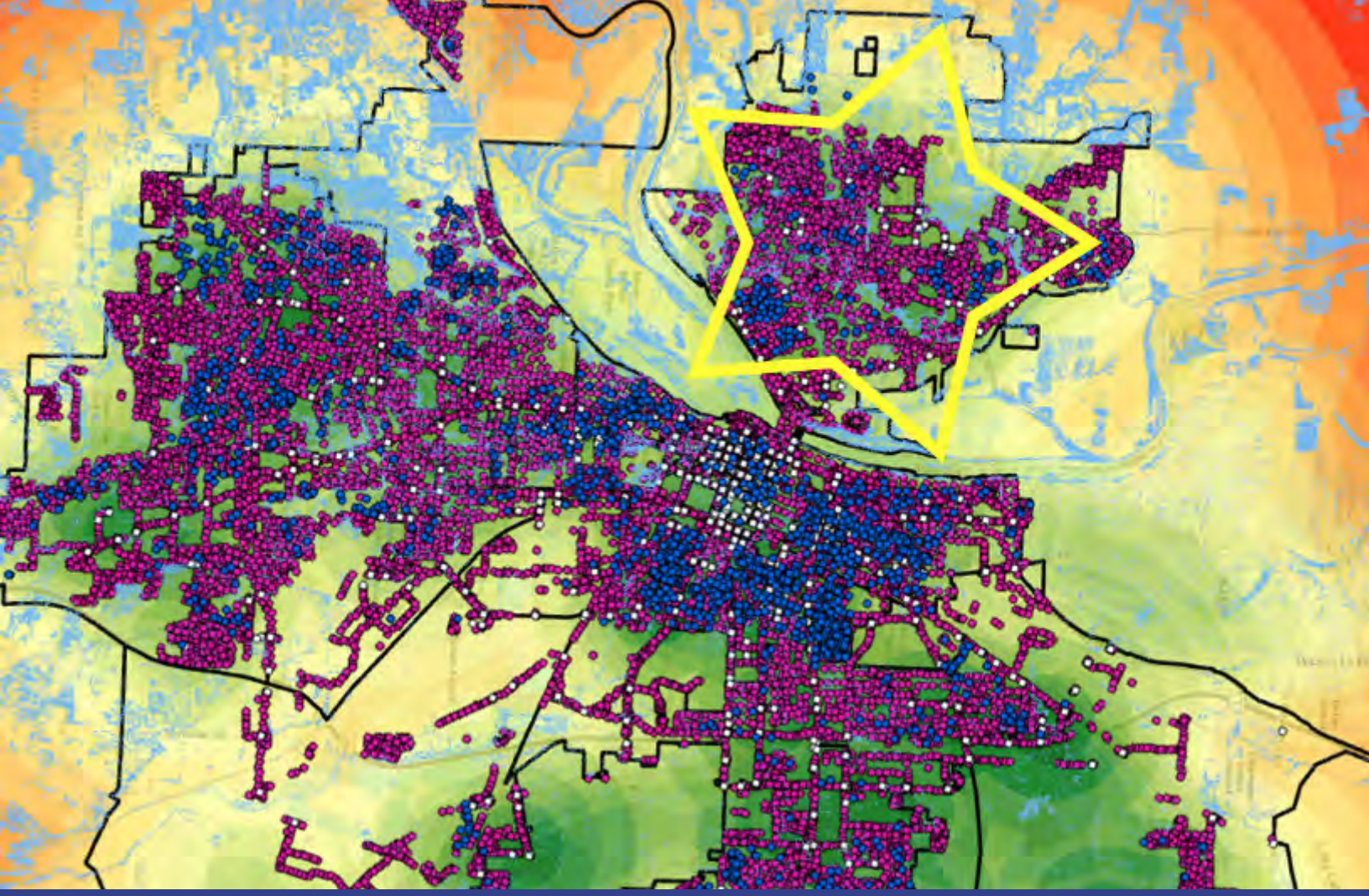

FALL 2023

Map Credit: Vivi Hurley

Navigating Urban Networks: A GIS Exploration of Walkability in Salem, Oregon

Partner: City of Salem
Instructor: Nick Kohler

Project Description: This project explores the benefits of improved walkability and how it aligns with the city's broader sustainability objectives. Students assessed Salem's infrastructure and identified deficiencies such as a lack of sidewalks, crosswalks, or discontinuities in the sidewalk network. Using ArcGIS technology and city data, students analyzed demographic distribution, amenities, zoning, and commuting behaviors to assess pedestrian navigation feasibility. Students identified specific areas where walking could be a viable transportation mode, focusing on diversity, equity, inclusion, safety, and accessibility.

Recommendations: The resulting spatial recommendations aim to enhance Salem's walkability, fostering a sustainable, community-focused urban environment that encourages walking and cycling, reduces emissions, and eases congestion. Recommendations include:

- Implement continuous sidewalks and secure pedestrian crossings along the northeast corridor, particularly Silverton Road NE, to bridge existing gaps and improve safety, especially for school children.
- Implement raised crosswalks and traffic calming measures such as road diets and median islands on west Salem's Wallace Road NW to create a safer walking environment.
- Enhance infrastructure around the Peter Courtney Minto-Brown Island Bridge, including raised park pathways, to improve connectivity between Minto-Brown Island Park and downtown to encourage walking and recreation.
- Promote mixed-use developments to bring amenities within walking distance and reduce reliance on vehicles. Advocate for a review of traffic regulations to prioritize pedestrian safety.

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SPRING 2023

Let's Start Counting! A Methodology to Count On-Street Parking Spaces in Oregon Cities

Partner: Oregon Department of Land Conservation and Development
Instructor: Yizhao Yang

Project Description: Oregon's Department of Land Conservation and Development introduced parking reforms to alleviate financial and environmental pressures associated with parking mandates. Among the requirements, cities with populations over 100,000 are given the option to eliminate parking mandates or implement pricing for a portion of on-street parking spaces. However, accurate data on on-street parking is lacking in many cities. Using the City of Eugene as a case study, this project devises a methodology for inventorying on-street parking using GIS data and collection tools, with the aim of creating a consistent method for identifying and estimating the quantity of on-street parking spaces.

Recommendations: Recommendations facilitate the implementation of the methodology for estimating parking inventory in cities, including:

- Utilize the simplest available data set to ensure consistency across cities, especially considering the variability and incompleteness of GIS data.
- Prioritize real-world surveying of streets over extensive GIS geoprocessing, as it is more accessible and feasible for cities with varying staff sizes and administrative capacities.
- Acknowledge the possibility of alternative methods based solely on GIS data, especially if a city possesses comprehensive data on street elements influencing on-street parking.
- Creating preset worksheet/Excel templates with all necessary fields and expressions filled out to streamline backend calculations, as well as configuring Field Map App with required fields to save time.

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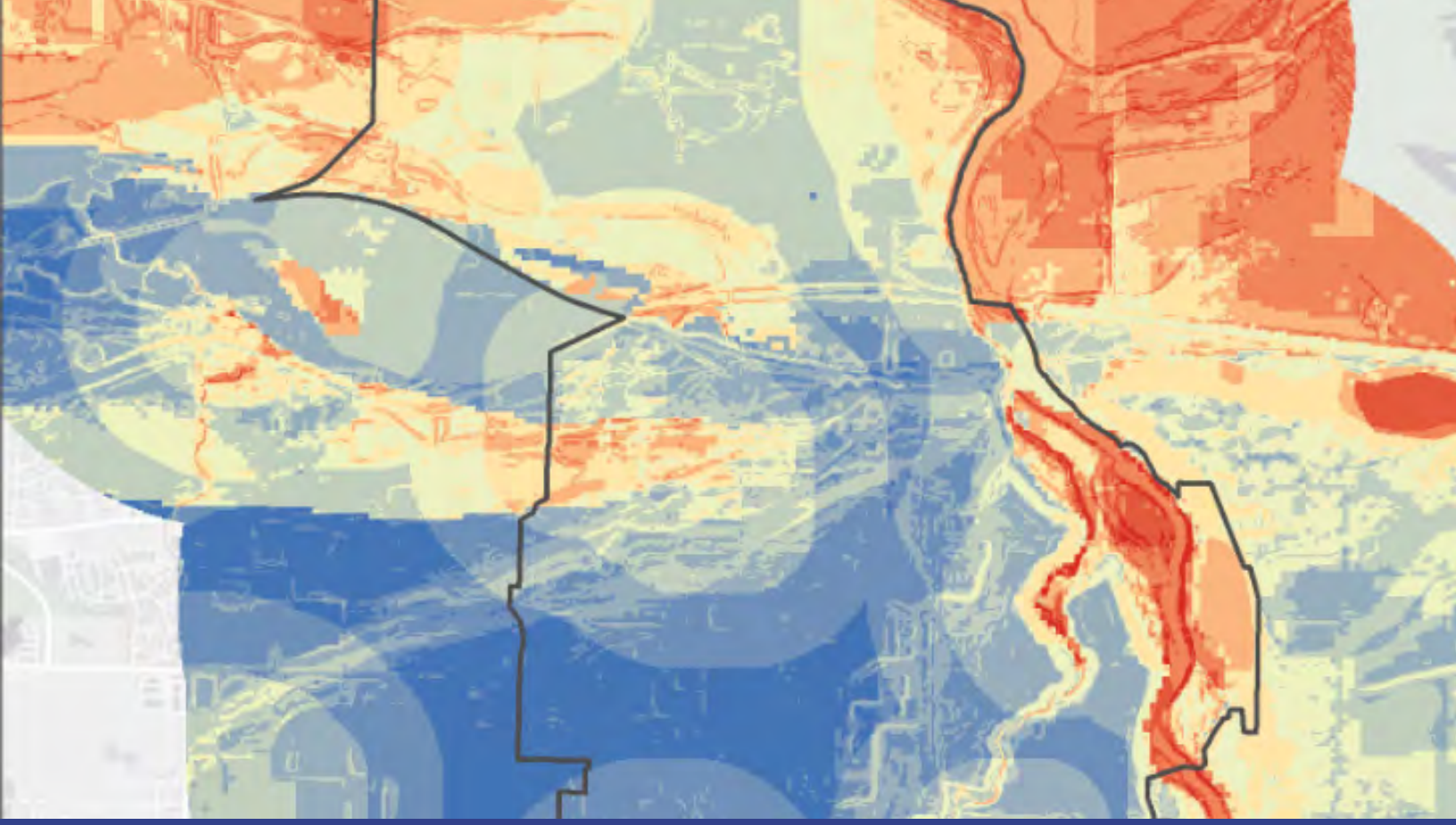

SPRING 2021

Map Credit: Sian Meng

Assessing Hazard Vulnerability in Troutdale

Partner: City of Troutdale
Instructor: Yizhao Yang

Project Description: Students sought to understand and address potential natural hazards and their social implications in Troutdale. The project involved four research groups, each focusing on one of four hazards: wildfire, flooding, landslide, and earthquake/ liquefaction. The students employed various research methods, including a hazard plan literature review, analyzing U.S. Census and GIS data, and conversations with city staff and professionals in related fields.

Recommendations: Recommendations focus on preparation, mitigation, and prevention strategies to enhance Troutdale's resilience to natural hazards:

Preparation Strategies:

- Increase awareness among high-threat/high-vulnerability residents and encourage them to develop response plans.
- Organize public awareness workshops to disseminate information about hazards and evacuation procedures.
- Install signage at tourist destinations to alert visitors about hazards and evacuation routes.
- Identify and coordinate with city-level emergency response partners, including non-traditional partners like economic development practitioners and community organizations.
- Identify alternative evacuation routes in case major transportation routes are impacted by hazards.

Mitigation/Prevention Strategies:

- Use land use codes to restrict future development in high-threat areas, particularly for high vulnerability populations.
- Collaborate with city or county-level organizations to provide housing options or shelter away from high-risk hazard areas.
- Secure funding for retrofitting transportation, utility, and emergency infrastructure.
- Support agricultural property owners and natural resource managers in creating defensible spaces to reduce fire risks.

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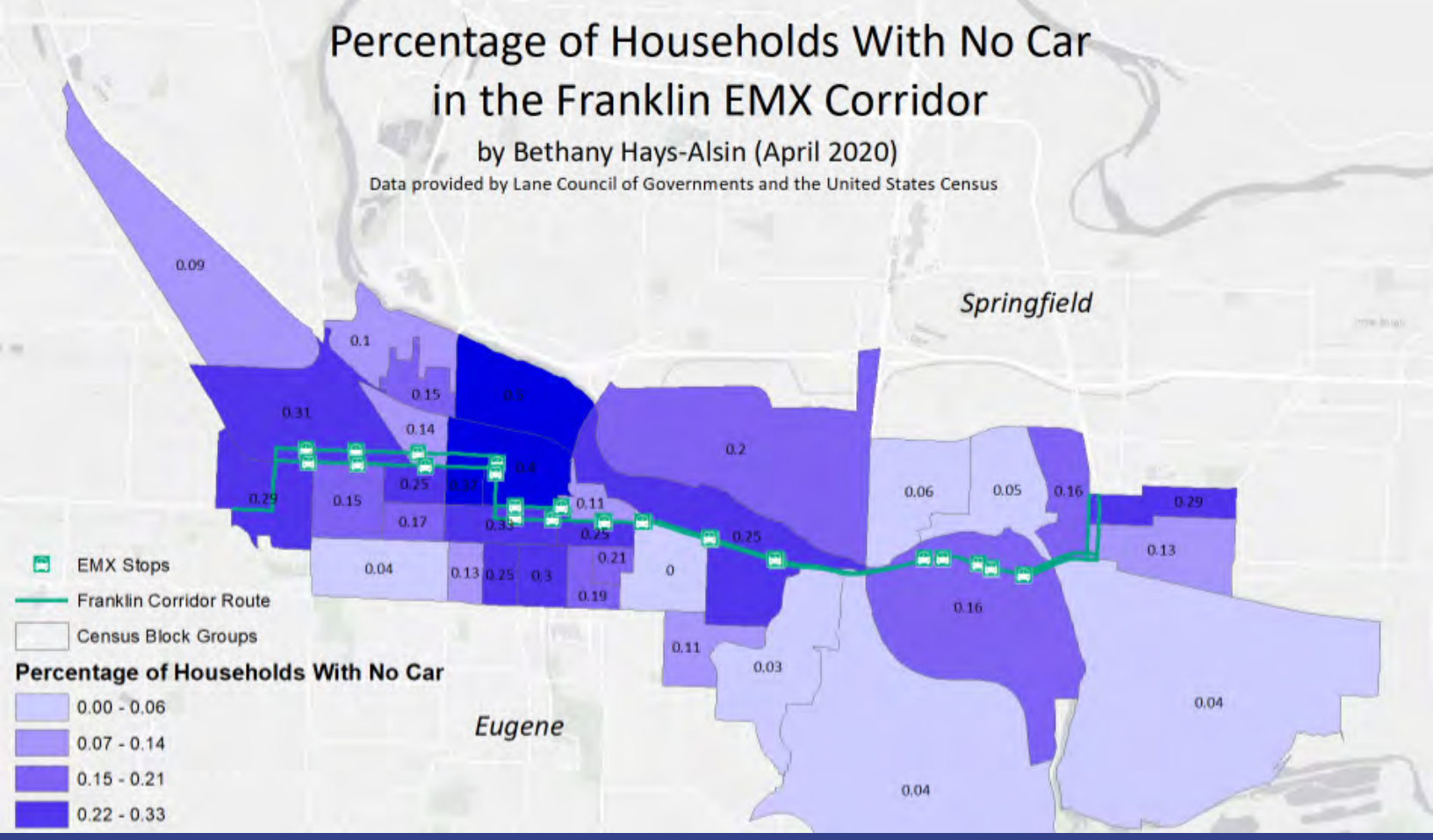


SPRING 2020

Map Credit: Bethany Hays-Alsin

Environmental Assessment of the Emerald Express Franklin Boulevard Corridor

Partner: Lane Transit District
Instructor: Yizhao Yang

Project Description: In collaboration with Lane Transit District (LTD), students conducted a comprehensive analysis of the Emerald Express (EmX) in the Franklin Boulevard corridor. The study concentrates on stops with the highest daily average ridership along the EmX line, aiming to identify factors contributing to success and suggesting ways to enhance ridership, accessibility, and safety along the corridor. Key components of the study include an equity and demographic analysis, network connectivity analysis, and land use analysis. Factors affecting ridership, such as population density, proximity to facilities, concentration of commercial parcels, and bike share stations, are examined. The report includes findings from surveys conducted at 13 outbound stations within the study area, presenting station highlights and recommendations for improving facilities and safety.

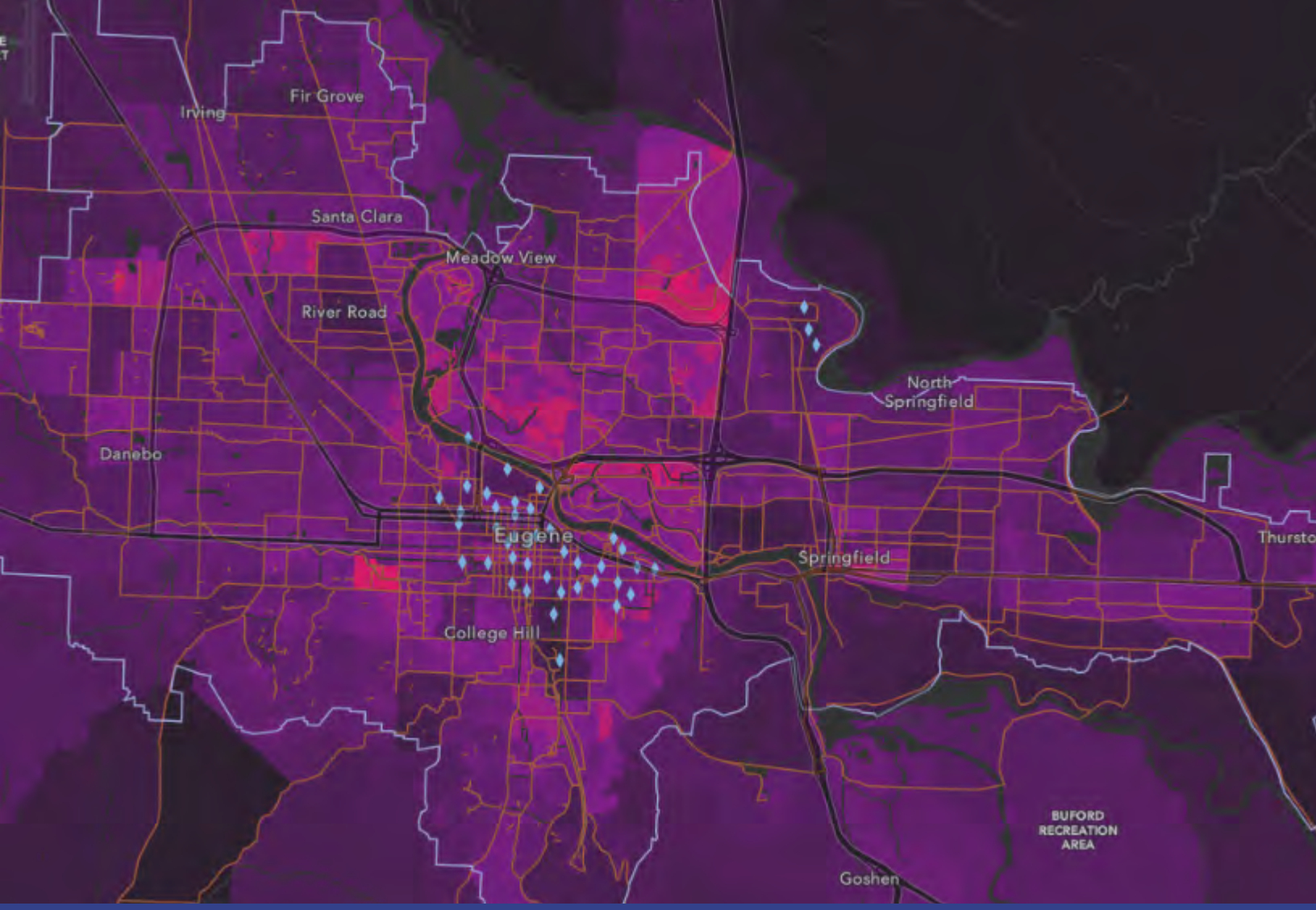
Recommendations: The recommendations are organized into two categories:

Safety Improvements:

- Invest in audio, communication, light, and advanced sensor technologies at stations.
- Develop additional lighting infrastructure to increase visibility, especially in areas with larger female populations.
- Coordinate with local authorities to improve sidewalk connectivity, marking, and signage.

Facilities Improvements:

- Develop additional bicycle facilities, such as storage and bike share hubs, at selected stations.
- Re-evaluate underperforming stations located near automobile-centric infrastructure.
- Advocate for mixed land use in Springfield to enhance ridership.
- Improve station art to resonate with residents of Eugene and Springfield.



SPRING 2020

Map Credit: Noah Tigner

Expanding the PeaceHealth Rides Bikeshare Network

Partner: Lane Transit District
Instructor: Nick Kohler

Project Description: Students collaborated with Lane Transit District (LTD) to explore expanding bike-share coverage to enhance multimodal transit stops, especially in underserved areas. They utilized spatial datasets to analyze demand for bike-share expansion, considering factors such as residential and business density. The analysis incorporated current LTD bus routes to integrate bike-share systems with existing transit infrastructure. Historical bike-share usage data also informed placement decisions. Each project generated suitability maps that highlight demand for bike-share stations within and outside of the current operating zone.

Recommendations:

- Prioritize areas within the current operating zone such as 14th Avenue/Kincaid Street, 13th Avenue/Agate Street, and the margins of the UO campus "super-block."
- Consider expansion to underserved populations and potential high-demand areas, particularly focusing on the downtown side of the Defazio/Ferry Street Bridge and the area immediately south of the current operating zone.
- Explore opportunities for expansion in the Kinsrow area and adjacent student housing.
- Expand services southward to address significant demand.
- Implement additional measures, such as incentives or education, to realize potential need for expansion to the north of the current operating zone.

SPRING 2019

Environmental Assessment of the Emerald Express Gateway Corridor

Partner: Lane Transit District
Instructor: Yizhao Yang

Project Description: Students collaborated with Lane Transit District (LTD) to understand why the EmX Gateway corridor has lower ridership compared to other lines. Students collected data on neighborhood characteristics, accessibility, connectivity, and land uses along the corridor and then spatially analyzed and mapped the datause.

Recommendations: The report outlines findings and actionable recommendations, organized by neighborhood, accessibility, connectivity, and land use mix, with specific suggestions provided for each station along the corridor.

Neigborhood Characteristics:

- Coordinate with the City of Springfield to encourage infill development in the EmX Gateway neighborhood to increase population and housing densities, supporting ridership.
- Consider reducing financial barriers for households below the poverty line to promote ridership and reduce transportation costs.
- Evaluate bus stops in areas with high female populations to ensure adequate amenities for female ridership.
- Ensure housing in the corridor meets the needs of people aged 25 to 54 to match the capacity for likely riders.

Accessibility & Connectivity:

- Prioritize bicycle facilities around EmX Gateway corridor stations to improve accessibility and street connectivity.
- Re-evaluate poorly connected and accessible stations to determine their viability and potential improvements.
- Identify frequented destinations to prioritize station and service area improvements.
- Enhance the pedestrian experience and accessibility around Springfield Station Bay B to increase ridership.

Land Use Mix:

- Work with the City of Springfield to intensify and diversify land uses in station service areas.
- Focus on up-zoning areas with potential for ridership based on existing land use mix, accessibility, and connectivity.

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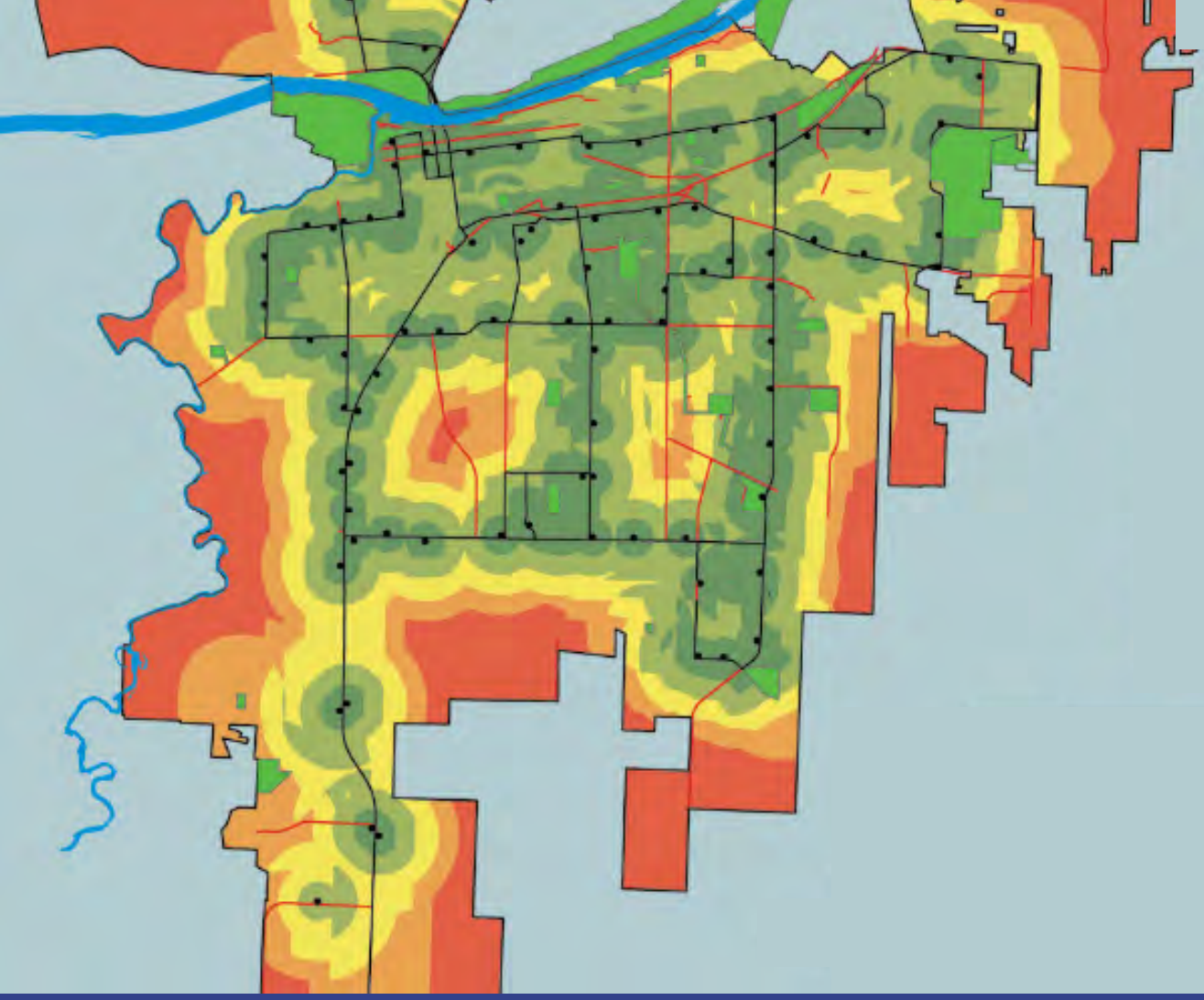

WINTER 2017

Map Credit: Orion Jaramillo

Geographic Information Systems Housing Analysis in Albany, Oregon

Partner: City of Albany
Instructor: Nick Kohler

Project Description: Students partnered with the City of Albany to collect, organize, and map geospatial data related to segregation patterns among underrepresented demographic groups such as racial/ethnic minorities, low-income individuals, people with disabilities, and seniors. The students focused on factors such as housing, access to amenities, and public services and analyzed housing patterns, access to opportunities, segregation of minority groups, publicly supported housing, and disability access.

Recommendations: Project outcomes visualize segregation patterns, identify areas with concentrated populations, and promote future integration efforts. Recommendations also consider HUD's fair housing standards. Key findings and recommendations include:

- Address the prevalence of housing cost burden among Albany households, particularly those with families.
- Address the lack of grocery stores in south Albany, where a higher percentage of racial/ethnic minority populations reside.
- Recognize the correlation between areas with higher toxin emissions and a higher concentration of racial/ethnic minority populations, particularly in three block groups near downtown Albany.
- Acknowledge the full occupancy of public housing and its proximity to commercial or industrial zones, compared to other housing options.
- Recognize the growing population of disabled residents living below the poverty line, particularly in areas further from disability services.

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WINTER 2017

Geographic Information Systems Housing Analysis in Albany, Oregon

Partner: City of Albany
Instructor: Nick Kohler

Project Description: Students collaborated with the City of Albany to gather, organize, synthesize, and map geospatial information. Albany is interested in better understanding the segregation patterns of underrepresented demographic populations like racial/ethnic minority groups, low-income individuals or families, people with disabilities, and seniors. GIS students used these potential segregation factors and compared them to access or availability of amenities and services. The students were divided into five groups to cover a greater variance of findings: Housing Patterns and Needs, Access to Opportunity, Segregation/Integration of Racial/Ethnic Minority Groups, Publicly Supported Housing Analysis, and Disability and Access Analysis.

Recommendations:

- Consider focusing on increasing homeownership opportunities for racial/ethnic minority groups, especially Hispanics, who are concentrated in areas with lower rental costs but also lower access to ownership.
- Explore initiatives to improve access to grocery stores and other essential services in underserved areas, particularly in south Albany.
- Address environmental injustices in minority-dense areas, such as exposure to pollution and limited access to parks in areas with lower air quality.
- Expand public housing availability in more diverse neighborhoods, as there is a need for more publicly supported housing, especially in areas with higher poverty levels but lower median house values.
- Enhance access to disability services, particularly in areas where disabled populations are growing and further from existing services.

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WINTER 2017

Cartographic Visualization of Parks, Trails, and Recreation Centers in Albany, Oregon

Partner: City of Albany
Instructor: Emily Miley

Project Description: Albany Parks and Recreation sought to expand funding to areas that may serve greater areas of the population. In addition, the City of Albany wanted to connect riverfront parks and amenities with other areas of the City by means of trails and bike networks. The City then planned to utilize the results produced by students to analyze areas for increased funding to promote usage by the public. To help visualize accessibility, cost, and location variables, the City of Albany collaborated with students to find ways to seamlessly present large amounts of information in one layout. By utilizing basic design principles, the students worked with ArcMap and Adobe Illustrator to effectively portray existing and proposed trails, park locations, maintenance costs, accessibility, and recreation center access.

Recommendations:

- Expand Trail Networks: Continue building trails to connect riverfront parks with residential areas and downtown. Proposed additions include the Corvallis Connector Trail and Oak Creek Greenway Trail.
- Targeted Funding: Allocate funding to parks that serve larger population areas, especially those connecting through trails.
- Use Visual Tools: Leverage cartographic tools to map park locations, accessibility, and maintenance costs, guiding efficient funding decisions.
- Enhance Accessibility: Focus on ensuring recreation centers and parks are easily accessible to nearby neighborhoods, prioritizing areas within a three-minute drive of key facilities.

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WINTER 2017

Remote Sensing Technologies and Techniques for Parks and Historic Asset Management in Albany, Oregon

Partner: City of Albany
Instructor: Nick Kohler

Project Description: The City of Albany set three primary goals to enhance the management, analysis, and visualization of historic aerial images for parks and recreation and historic asset management.

1. Create a geospatial database of images and maps
2. Provide analysis and visualizations for park and asset management
3. Explore future applications of remote sensing technologies for these purposes

To support these objectives, students developed frameworks and proof-of-concept projects. These included using technologies like LIDAR for change detection and analysis, creating databases and websites for data storage, and manipulating historic imagery with modern tools like Structure from Motion to produce digital orthophotos and 3D models of Albany from eighty years ago. The class's projects aimed to help Albany in managing its park and historic assets and to outline future possibilities for remote sensing technologies.

Recommendations:

- Geospatial Databases: Create a database of geospatially registered images and maps to help analyze and visualize historical and current data, using technologies like LIDAR and photogrammetry.
- Vegetation Management: Utilize remote sensing technologies (e.g., NDVI, LIDAR) to monitor and manage park vegetation, ensuring healthy and sustainable urban green spaces.
- Path Planning: Use aerial photography and LIDAR data to manage and plan park pathways, focusing on informal trails (desire paths) as a basis for new formal routes.
- Riparian Monitoring: Apply LIDAR and GIS tools to monitor vegetation and structural changes in riparian zones, vital for maintaining healthy river systems.
- Historical Imagery: Use software like Agisoft PhotoScan (Metashape) to digitize and analyze historical aerial photos, creating orthophotos and 3D models for preservation and planning.
- Data Management: Establish a well-organized system for storing and accessing remote sensing data, enabling better decision-making for park and asset management.

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SPRING 2016

GIS Analysis of Redmond's Great Neighborhood Principles

Partner: City of Redmond
Instructor: Yizhao Yang

Project Description: The City of Redmond has seen significant population growth over the past decade, prompting the development of the Great Neighborhood Principles to guide future development. The city worked with students to assess how well existing neighborhoods align with these principles. Students conducted an in-depth analysis of three neighborhoods, using GIS analysis and on-site assessments to evaluate walkability, urban design, and other indicators.

Recommendations: Students identified areas for improvement and proposed policy recommendations to ensure future development adheres to the Great Neighborhood Principles, including:

- Use the methodology outlined in the report for comprehensive neighborhood evaluations citywide to ensure alignment with the Great Neighborhood Principles.
- Advocate for the establishment of a connected, gridded street network with shorter block lengths to enhance walkability and accessibility.
- Consider Study Area 3 as a reference point for effectively implementing strategies to create walkable and accessible neighborhoods.
- Encourage higher densities and a diverse mix of land uses in existing neighborhoods through proactive zoning and development code revisions.
- Promote the construction of multi-family housing and diverse amenities to enrich the walkability and livability of neighborhoods.
- Implement clear, enforceable standards within the Redmond Development Code to ensure consistent application of the Great Neighborhood Principles.
- Regularly review and update development policies to maintain alignment with evolving neighborhood needs and community goals.

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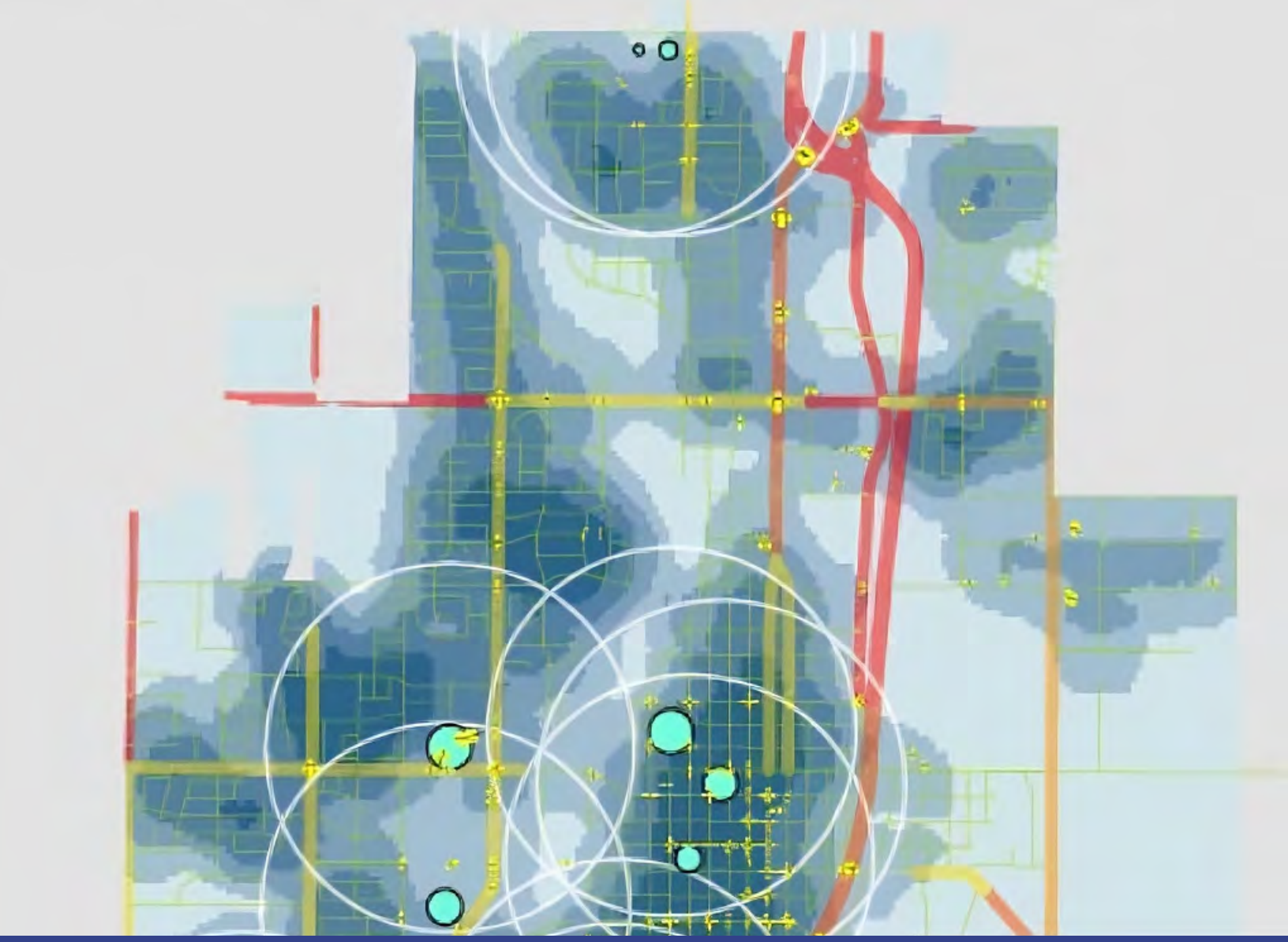

FALL 2015

Map Credit: Andreea Torjescu

Creating a 20-Minute Neighborhood: Assessing Walkability in Redmond, Oregon

Partner: City of Redmond
Instructor: Nick Kohler

Project Description: Students used GIS technology to identify gaps in pedestrian infrastructure and assess accessibility to essential amenities within a 20-minute walking distance. They conducted a comprehensive walkability study around various points of interest, such as schools, restaurants, parks, and places of worship. Students then generated maps to highlight areas needing improvement.

Recommendations: Recommendations to make Redmond a more walkable city include:

- Add new sidewalks and crosswalks, particularly near schools.
- Develop a connected street network.
- Reduce speed limits in school zones.
- Improve city streets with vegetation and art
- Encourage local restaurants and coffee shops to provide outdoor seating.
- Add bike lanes.
- Mix land uses.
- Implement new programs that promote walking to and from school, such as a “walking school bus.”

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SPRING 2015

Downtown Gresham Walkability Study

Partner: City of Gresham
Instructor: Yizhao Yang

Project Description: Students collaborated with the City of Gresham to enhance downtown walkability. Using Census data and GIS tools, students analyzed downtown areas and their land uses, transportation infrastructure, and population density. Students traveled to Gresham to conduct on-site walkability assessments and gather feedback from pedestrians and bicyclists. The report identifies five study areas and proposes specific street improvement ideas to enhance pedestrian and bicyclist accessibility.

Recommendations: Each team provided analysis and recommendations for each study area based on the spatial analysis and walkability assessments. Key recommendations include:

- Enhance urban design elements with street trees, landscaping, public street art, and outdoor dining to create an interesting and enjoyable pedestrian experience.
- Increase accessibility and safety with additional wayfinding signage, pedestrian crosswalks, well-marked and continuous bike lanes, and traffic calming techniques to high traffic streets.
- Improve MAX transit station experiences with additional lighting, landscaping, and wayfinding signage.
- Encourage mixed land uses/density including additional park or public space in vacant lots.

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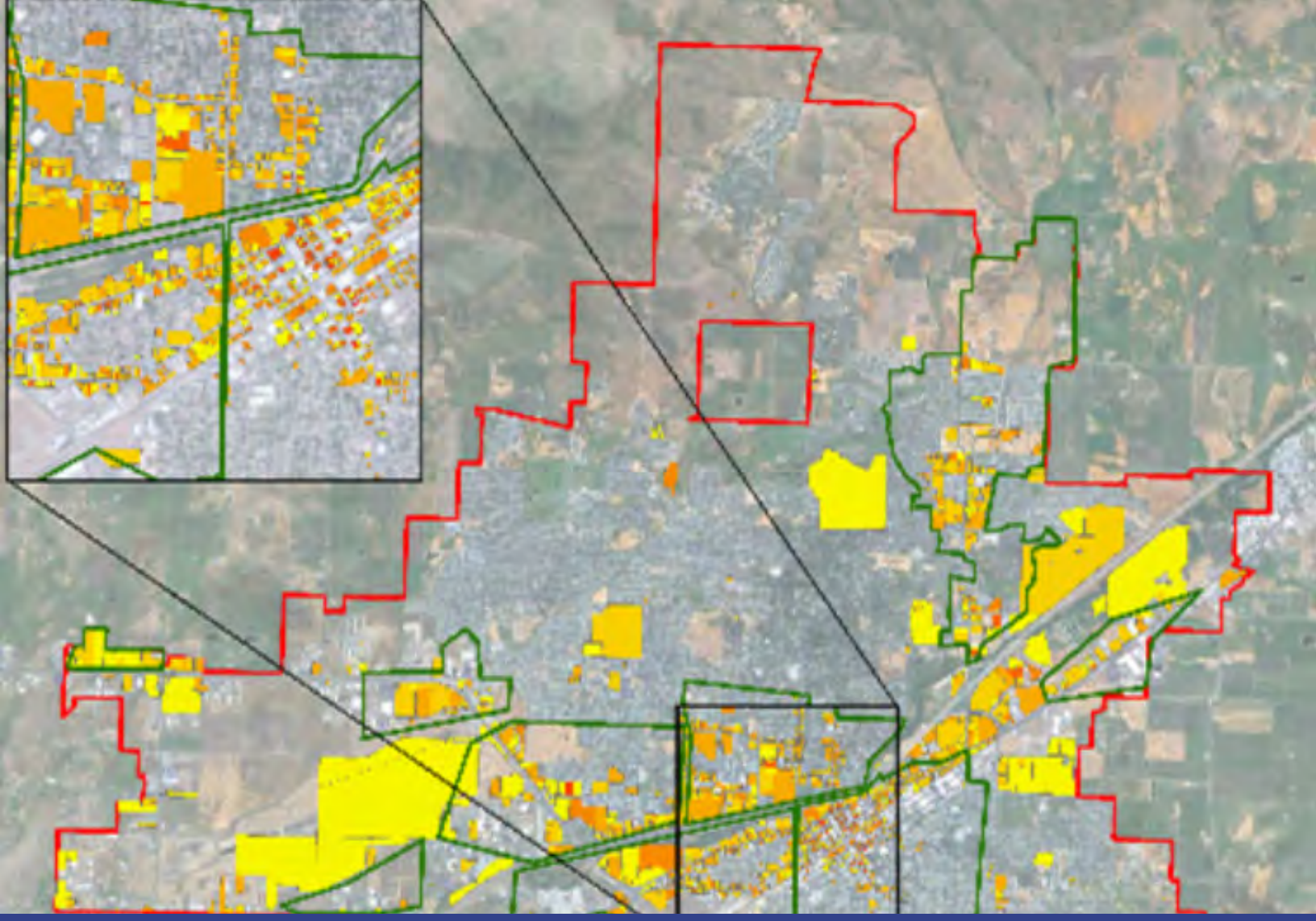


WINTER 2014

Map Credit: Taylor Eidt

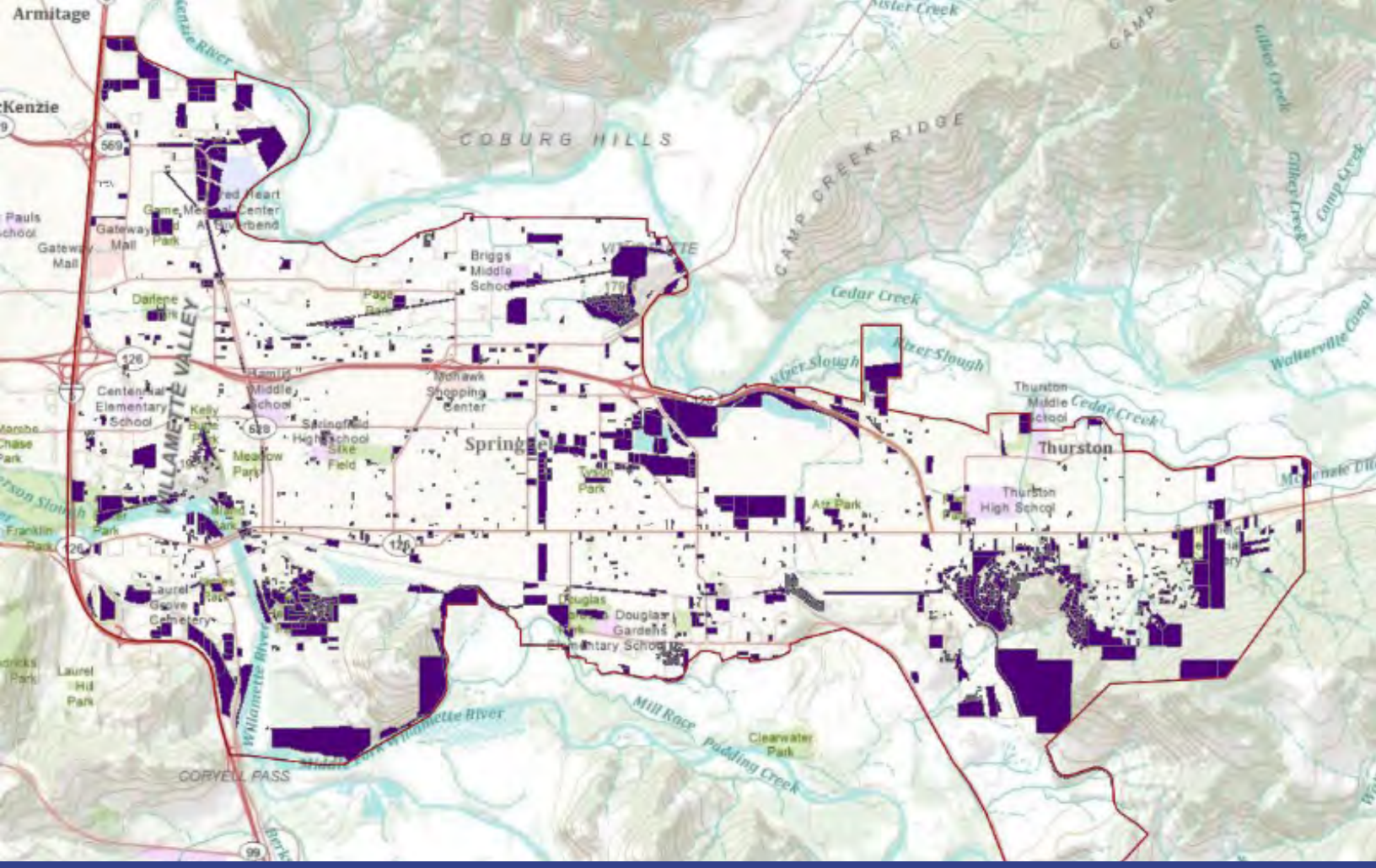
Activity Center Identification in Medford, OR

Partner: City of Medford
Instructor: Yizhao Yang

Project Description: The City of Medford collaborated with students to identify activity centers that align with city policy goals of nodal development, increased residential density, and alternative transportation. Students used a cluster-based analysis to understand population density, employment density, and commercial activity concentrations. After their analysis, students conducted walkability assessments of the areas that most closely resembled activity centers. These assessments informed four new activity centers and their boundaries, along with their strengths and weaknesses.

Recommendations: Each student team provided recommendations to enhance the new activity centers, including redesigning streets to improve pedestrian connectivity and creating more public spaces or increasing density in underutilized land within these areas. Students also suggested policy measures such as overlay zones to encourage urban design and mixed-use development in these areas, along with further analysis of additional activity centers. Key recommendations include:

- Provide incentives and services needed to increase residential density.
- Retrofit buildings for residential use and promote mixed-use developments that include residential space.
- Redesign streets to calm traffic and encourage alternate transportation.
- Improve transportation options, especially along the Barnett Road corridor.
- Use underutilized land to create more public spaces and increase density.
- Increase residential density and explore the feasibility of transit-oriented development.



WINTER + SPRING 2012

Map Credit: UO Geography Students

A Spatial Analysis of Lane Transit District in Springfield, Oregon

Partner: City of Springfield
Instructor: Nick Kohler and Chris Bone

Project Description: Students analyzed Lane Transit District's ridership and route spatial data into three themes: Route and Ridership, Socioeconomic Factors, and Social Media and Crowd Sourcing.

Recommendations:

Route and Ridership:

- Utilize GIS tools to identify consistently late areas at bus stops
- Consider adding routes on 42nd Street or 28th Street to serve low-density residential areas with potential population growth.
- Implement half loops along main routes to better connect northern and southern parts of Springfield to downtown.

Socioeconomic Factors:

- Target low-income areas for new route additions due to growth potential and transportation needs.
- Convert existing routes to EmX to enhance service efficiency.
- Identify increased land values near LTD stops and routes, which could have potential implications for future planning.

Social Media and Crowd Sourcing:

- Advocate for leveraging user feedback through social media and geotagging to inform bus system improvements.
- Empower riders to share areas that need better transportation access to increase ridership.

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FALL 2010

Downtown Parks Connectivity Analysis with Geographic Information Systems (GIS)

Partner: City of Salem
Instructor: Trafton Bean

Project Description: The City of Salem sought to improve pedestrian and bicycle accessibility to enhance the recreational potential of the parks system and the enjoyment of park patrons. Students were asked to propose a system of urban pedestrian trails and bicycle routes to connect Salem's core area parks. Research was primarily conducted using GIS, and students put an emphasis on ideas for improving transportation and downtown connectivity.

Recommendations: Student recommendations addressed three specific aspects of walkability:

Utilize New Tools for Transportation Planning

- Develop GIS-based tools to improve bicycle and pedestrian network analysis.
- Create network analysis, mobile GIS tools, and methods to address barriers to connectivity.

Implement Bicycle and Pedestrian-Oriented Policies

- Develop accessibility standards for street intersections and park entrances.
- Integrate these into Salem's Comprehensive Parks and Recreation Master Plan

Emphasize Bicycle and Pedestrian Corridors

- Retrofit infrastructure to create safer, efficient corridors for non-automobile traffic.
- Implement changes like added signage and bike-friendly streets in phases.

Transit Improvements

- Improve public transit to boost connectivity and reduce vehicle reliance.
- Proposals include reinstating weekend service, adding bike maps at bus stops, and improving bike routes near transit.

Engage the Community

- Utilize tools to increase community involvement in transportation planning.
- Develop network tools specifically for public use.

Funding and Economic Development

- Secure funding through initiatives like Safe Routes to School, the Salem Marathon, and bicycle tourism.
- Focus on making transportation improvements economically viable, especially for low-income areas.