PARKING THE BLAME

[An exploratory analysis of commercial off-street parking standards in Oregon cities with populations under 10,000]

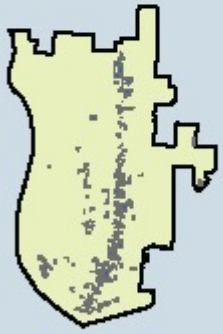
2016

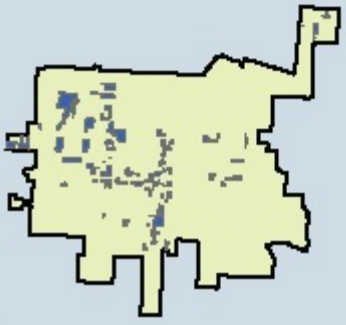
UNIVERSITY OF OREGON

DEVELOPMENT CODE

EMPLOYMENT

ZONING





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Contents

Abstract:

Development codes in American cities, almost without exception, prescribe minimum off-street parking requirements for each type of urban land use. Research indicates that these standards create a feedback loop that removes barriers for drivers and enforce development patterns that further drive demand for off-street parking. The State of Oregon's Department of Land Conservation and Development has new rules which took effect in January 1, 2016, intended to simplify the Urban Growth Boundary Amendment Process for cities under 10,000 in population. When a rural city must expand, it forces a constrained municipality to undertake expensive capital projects to extend services to new properties. Despite being conveniently located for redevelopment, under-utilized parking lots often remain off limits for infill development as a result of inflexible minimum parking requirements. Using aerial imagery, ArcGIS, tax lot-level employment data from the Quarterly Census on Employment and Wages, and state-wide zoning data from the DLCD, this study measures the amount of non-residential, off-street parking in six Oregon cities with populations under 10,000. In doing so, this study seeks to establish data and knowledge surrounding how parking consumes urban land, as well as how it relates to employment, zoning, and development codes. Using the methodology employed in this study, cities could perform their own parking studies, alter parking standards, and potentially alleviate the strain placed on urban land supply by parking requirements. Perhaps parking lots in within existing urban areas could be a more attractive target for development than greenfield land on the urban fringe.

Background

Development codes in American cities, almost without exception, prescribe minimum off-street parking requirements for each type of land use. These minimum requirements are intended to ensure that developers provide enough parking spaces to satisfy the peak demand a particular land use will experience. For example, restaurants are typically required to provide more parking spaces per square foot of floor space than garden supply stores. This is because there are specific times of day when more people tend to dine; but gardening lacks an analogue to "lunch hour."

At a glance, this seems to be a natural, supply and demand model for parking provision. Several large cities have undertaken studies and developed sophisticated parking management strategies. One such example is San Francisco's SFpark, which adjusts meter and off-street parking pricing based on demand and occupancy rates. However, it is quite uncommon for small cities to conduct their own parking studies. Rather, cities looking to set minimum off-street parking standards in their development code traditionally either consult the Institute of Traffic Engineers (ITE) handbooks, look to model development codes, or consult nearby cities (who likely gathered at least some of their figures from the ITE handbooks)[1].

The method of surveying nearby cities and adopting similar standards is merely an attempt to take a safe approach, but does not reveal the true logic behind minimum parking requirements. Planning officials looking to take a precise approach sometimes rely upon the Institute of Traffic Engineers *Parking Generation Report*[2].

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[1] Willson, R., 1996. Local jurisdiction parking requirements: a survey of policies and attitudes. Working Paper, Department of Urban and Regional Planning, California State Polytechnic University, Pomona, California.

[2] Institute of Transportation Engineers, 2010 Parking generation: An informational report of the Institute of Transportation Engineers, 4th ed. Washington, DC

The Parking Generation Report, on its fourth edition as of 2010, began publishing parking generation rates in 1987. However, the ITE reports parking generation rates as defined by the peak parking occupancy observed by transportation engineers.

> *A vast majority of the data… is derived from suburban developments with little or no significant transit ridership… The ideal site for obtaining reliable parking generation data would… contain ample, convenient parking facilities for the exclusive use of the traffic generated by the site… The objective of the survey is to count the number of vehicles parked at the time of peak parking demand.*[3]

Donald Shoup criticized the parameters of this method for determining parking need in great detail with his 1999 paper, *The Trouble with Minimum Parking Requirements*[4] and furthered his endeavor of skepticism with his prolific 2005 book, *The High Cost of Free Parking*. Primarily, his criticisms revolved around the cost of the land needed to accommodate the peak off-street parking demand at each individual land use- suggesting that the total value of all parking spaces in a city probably exceeds the total value of all the vehicles in the city[4].

Although these are not the only two pieces of literature that aim criticism toward both the ITE and conventional minimum parking standards, they are enough to understand that there is too little empirical evidence supporting the practice of requiring off-street parking for every land use, and much less evidence supporting the precision with which minimum requirements are prescribed.

America's urban centers are repopulating in this modern era of urban renaissance. Americans are beginning to embrace modes of transit other than automobile ownership and daily usage, evidenced by the increasing popularity of bicycle commuting, car-sharing services, and app-centric transportation companies such as Uber and Lyft. Parking remains an essential part of many urban uses, but after

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[3] Institute of Transportation Engineers, 1987a. Parking Generation, Institute of Transportation Engineers, 2nd ed. Washington, DC.

[4] Shoup, D., 1999. The Trouble with Minimum Parking Requirements. Department of Urban Planning, University of California, Los Angeles.

several decades of urban development under the automobile-catered paradigm instituted by minimum off-street parking requirements, there are still very few academic investigations regarding parking's cumulative impacts on urban land, especially in small cities.

At its functional level, non-residential off-street parking serves to accommodate demand for automobile trips generated by employment, shopping, and services. When certain land uses experience peaks in demand, automobile trips from multiple users coincide and require additional space. Either the cars remain in the streets and cause congestion, or find accommodation in the form of off-street parking at their destination or in nearby public lots. In commercial zones, where each type of use is a primary use throughout the day, this effects of peak demand can become amplified. The common solution to this issue has historically been to plan commercial parking around peak demand so neither employment nor patronage are constrained by congestion or lack of available parking. However, peak demand only occurs at certain times on certain days, and at different times and different days for different uses. By requiring full accommodation of peak demand with off-street parking adjacent to the uses in question, cities are implicitly requiring each use to own and maintain a paved swath of land that will remain vacant at all but the most demanding times. In this way, development codes require significant amounts of commercial land to remain undeveloped for the sake of accommodating and encouraging automobile trips. With this idea of off-street parking as semi-permanently occupied, yet undevelopable commercial land in mind, I seek to investigate the aggregate effects of minimum parking requirements with the following questions:

- How much commercial land is dedicated to parking?
- How do parking standards affect the provision of parking in commercial zones?
- How does parking affect the density of employment in commercial zones?

Context

After freeways effectively turned city streets into the narrow end of a funnel, city centers experienced the acute impacts of traffic congestion. A major cause of this congestion was drivers circling the block in search of on-street parking. Although they were near their destinations, drivers would accumulate at intersections seeking the best, cheapest parking spot. As drivers parallel parked, crowded red lights, and jockeyed for the most convenient spaces, city streets and sidewalks became increasingly unpleasant places due to the noise, stress, and impacts on air quality. To curb this effect, public officials began requiring each urban use to provide its own off-street parking. The unintended consequence of this action was similar to what happens when a freeway adds an extra lane.

Anthony Downs described the phenomenon in his 1992 book, *Stuck in Traffic*[5]*:*

> *"Nearly every vehicle driver normally searches for the quickest route, one that is shorter or less encumbered by obstacles (such as traffic signals or cross-streets) than most other routes. These direct routes are usually limited-access roads (freeways, expressways, or beltways) that are faster than local streets if they are not congested. Since most drivers know this, they converge on such 'best' routes from many points of origin….*
>
> *…Now suppose that the limited-access route undergoes a vast improvement – its four lands are expanded to eight. Once its carrying capacity is increased, the drivers using it move much faster than those using alternative routes. But this disequilibrium does not last long because word soon gets around that conditions on the expressway are superior.*
>
> *In response, three types of convergence occur on the improved expressway: (1) many drivers who formerly used alternative routes during peak hours switch to the improved expressway (spatial convergence); (2) many drivers who formerly traveled just before or after peak hours start traveling during those hours (time convergence); and (3) some commuters who used to take public transportation during peak hours now switch to driving, since it has become faster (modal convergence)."*

[5]Downs, A. (1992). *Stuck in traffic: Coping with peak-hour traffic congestion*. Washington, D.C.: Brookings Institution.

The "Principle of Triple Convergence," described in the context of freeway congestion by Anthony Downs, could also apply to parking provision. As parking became more abundantly available in urban areas throughout the 20th century, the distance between parking areas and destinations began to decrease (spatial convergence); the times when drivers expected or relied upon free or cheap parking expanded (time convergence); and commuters who had reasonable alternatives to driving ceased to have a reason not to drive (modal convergence).

In regards to modal convergence, the effect of off-street parking on commercial zone density is perhaps best observed as a pedestrian. Many studies on transit-supportive land use planning have defined a reasonable walking distance by the average person's willingness to walk between five and fifteen minutes to get between a transit stop and a destination. This duration corresponds to a quarter to a half mile walk, varying based on topography, sense of safety and security, and presence of interesting activities.[6] When each activity in commercial zones is attached to a parking area, the density of interesting activities decreases and a person's tolerance for walking diminishes. Another study found that a person's tolerance for walking in a highly-attractive environment with moderate protection from the elements was about ten minutes- versus about two minutes when walking across a parking lot without pedestrian amenities.[7] When off-street parking is abundant, walking becomes less attractive.

Furthermore, as each land use began to be accompanied by a tract of paved land commensurate to its expected parking demand, the paved space between businesses began to separate uses such that walking was an unattractive, even laborious experience. Owing to the heat island effect of asphalt, lack of vegetation, and lack of interesting activities – plentiful off-street parking degraded and de-prioritized

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[6] NJTransit (1994) Planning for Transit-Friendly Land Use A Handbook for New Jersey Communities.

[7] Gruen, Victor, The Heart of Our Cities. The Urban Crisis: Diagnosis and Cure. Simon and Schuster 1964, New York, p. 250: (used in Fairfax County Metro Station Areas Study, 1982)

the pedestrian experience until it gradually became irrelevant in many parts of cities. As cities zoned for single-use commercial zones intended for single-mode usage (automobiles), the unpleasant effects of required off-street parking stacked the odds in favor of commuters choosing to drive.

Despite being a relatively new trend in planning in the mid-1960's, parking requirements had already begun to draw the ire of urbanists such as W. H. Whyte. In his 1968 book, *The Last Landscape*, Whyte noted that shopping center parking lots make "an under-use of high-cost land that would be more functional for the environment if it were used for almost any other purpose, including plain grass."[8] [9]

While urban features were dispersing to allow for ample parking, Americans were migrating from city centers to suburbia – relying on their car to bridge the spatial gap, and relying on their city planners to ensure they had a free land upon which to park their car when they arrived. Meanwhile, the excess paved areas were negatively impacting storm runoff and increasing contaminant loads in watersheds.[10] Despite all of the externalities borne by municipalities on behalf of parking, little has changed in the way cities regulate parking- due perhaps to modal dominance of automobiles and the general convenience of free parking. Upon recognition that minimum off street parking is detrimental to density, many cities have made their central business districts exempt from the requirements. However, by continuing to require off-street parking for all but a small portion of urban land, the cycle of providing more parking and attracting more vehicles has proceeded unchecked.

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[8] Whyte, W. H. (1968). *The Last Landscape*. Garden City, NY: Doubleday.

[9] Witheford, D. K., & Kanaan, G. E. (1972). *Zoning, parking, and traffic*. Saugatuck, CT: Eno Foundation for Transportation.

[10] Jakle, J.A., Sculle, K.A., 2005. Lots of Parking: Land Use in a Car Culture. University of Virginia Press, Charlottesville, North Carolina.

There is no debate as to whether it is necessary to consider and plan for the traffic impacts of a development. Providing ample parking on site is a natural solution to prevent cars from stacking up in the streets outside a popular destination. However, many development codes ensure that the total supply of parking increases steadily with development. While it is indeed necessary to consider parking in the development process, it is also necessary to consider the aggregate effects of maintaining a surplus supply of parking. Akbari et al. (2003) found that parking covered about 16% of Sacramento's developed urban land.[11] Other studies have observed similarly significant amounts of urban land consumed by parking in major metropolitan areas such as Los Angeles and San Francisco. However, little attention has been paid to the impact of parking on the urban land mix in smaller communities.

Therefore, this work serves as an exploratory attempt to generate knowledge around the subject of off-street parking in the commercial areas of small, growing cities in Oregon. It seeks to test the associations between parking and zoning, development codes (e.g., parking standards), and employment; and to question the need for parking standards that require multiple undeveloped, paved lots in commercial areas. Given the smaller tax bases of these municipalities, expanding urban services outward, rather than utilizing existing service areas, could create extenuating circumstances related to infrastructure finance and maintenance. Extending roads, water, and sewer services outward is often less expensive in the short-term than modifying existing services in already-developed areas, municipalities must bear the long-term costs associated with maintaining a larger network of public facilities and utilities[12].

Ultimately, this work can serve as a methodological foundation for a relatively simple means for assessing the distribution of a rural city's parking supply in a land use context. Using this study's

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[11] Akbari, H., Rose, L.S., Taha, H., 2003. Analyzing the land cover of an urban environment using high resolution orthophotos. Landscape and Urban Planning 63, 1–14.

[12] Burchell, R. W., & Mukherji, S. 2003. Conventional Development Versus Managed Growth: The Costs of Sprawl. Am J Public Health American Journal of Public Health, 93(9), 1534-1540. doi:10.2105/ajph.93.9.1534

methodology, cities may begin to conduct their own parking studies instead of relying upon data that was collected for cities with little in common with rural Oregon. Ideally, cities will utilize this sort of information to take a more intentional approach to parking requirements in attempts to leverage parking areas as an opportunity for increased efficiency instead of a constraint on growth.

Methodology

Overview

I investigated three primary factors that drive a city's parking distribution; zone designation, parking standards for the individual uses within a zone, and the need to accommodate employment. Zoning, whose implementation is debatably traced to Los Angeles in 1909, gave rise to single-use commercial areas whose traffic impacts would eventually necessitate parking requirements. In 1939, Fresno California became potentially the first city to implement minimum parking requirements for non-residential uses[13]. By the early 1940's, more than 70 cities utilized such requirements, and by 1951, more than 200 cities were requiring off-street parking for non-residential uses[14]. Since the 1950's and especially since the original publishing of ITE's Parking Generation Handbook in 1987, minimum parking standards have become ubiquitous. However, when standards do not cover a use within code, municipalities evaluate the parking demand for a use based largely on employment and expected patronage. As such, this study utilized available data sources related to zoning, development codes, and employment to evaluate their relationship to off-street parking. To illustrate this information, I utilized a case-study approach. Each case study features data collected and organized by the following topics:

Parking and Commercial Zoning

Zoning has a de-facto impact on the distribution of a city's parking supply. Although parking requirements are not typically prescribed by zone, zone designations inevitably dictate where particular

[13] Charles S. LeCraw, Jr. and Wilbur S. Smith, 1947. *Zoning Applied to Parking.* Saugatuck, CT: Eno Foundation for Highway Traffic Control. p. 10

[14] Witheford, D. K., & Kanaan, G. E. (1972). *Zoning, parking, and traffic*. Saugatuck, CT: Eno Foundation for Transportation. p. 14

uses will locate. Development code parking requirements are typically based on specific uses which are identified by zoning. Thus, parking standards are typically more use specific than zoning.

When an area is zoned for commercial usage, a municipality is exerting a stabilizing influence on the future of that land and implicitly promoting some concentration of employment and retail activity. The traffic impacts and parking occupancy patterns of these uses are fundamentally different from residential or industrial uses in that different user groups will simultaneously occupy parking for different, and multiple uses. Employees will park for the duration of their shift, but might also eat a meal or run personal errands. Simultaneously, shoppers may park once to visit multiple retail locations. By comparison, industrial uses and residential uses will see increased demand for parking at times that more directly coincide with people's work schedules.

This study focuses exclusively on commercial zones in the case study cities due to the concentration of multiple uses and multiple users. The density and diversity of uses and users encouraged by commercial zoning, combined with the varying days and times these uses experience peak use, results in parking demand patterns that are difficult to accurately encapsulate with precise figures tied to the square footage of floor space at the site in question. By connecting floor area square footage with a predicted peak demand for off-street parking for that use, cities are making a lot of unexplained assumptions about nature and intensity of land uses. To move beyond the assumptions into a realm of objectivity, I simply measure the amount of non-residential, off-street parking found within commercial zones. By isolating commercial zones, I illustrate how much of a city's non-residential, off-street parking supply is found within commercial zones.

Parking and Development Code

Development codes are the next level of detail with which cities address land use planning, as well as the next level of detail with which I address my research questions. Development codes are used to

apply specific standards to the uses which are allowed within a zone. Development code standards only apply to land use activities occurring after the date of implementation, so the extent to which they are reflected in development patterns is dependent upon how much new development and redevelopment has occurred after the codes' implementation. Accepting the partial limitation of development code applicability, I performed a content analysis of development codes to summarize parking requirements for uses which are typically allowed within commercial zones. Examples of such uses are office buildings, restaurants, and general retail.

Parking in these areas is nearly always prescribed in proportion to the square footage of buildings. For example, a city might require restaurants to provide four spaces per 1,000 square feet of floor area. By performing a content analysis on cities' codes and averaging the parking requirements across commercial uses, I will find a broad estimate of how much parking a city requires for each 1,000 square feet of structure in commercial zones. It is important to note, however, that this method does not control for the frequency with which certain uses appear in a city, thus triggering different levels of parking requirements at varying frequencies.

Parking and Employment

In regards to the minimum amount of parking a development must include under standard zoning, developers have little choice. However, if a developer envisions parking as a constraint to their development's ability to return on its investment, they may see fit to provide parking in excess of the minimum requirements put forth in the development code. Reasons a developer might do this would presumably be to accommodate a higher number of employees than is typical for a particular use; a higher number of patrons; or some combination of the two. Of course, the provision of surplus parking also implies the assumption that the employees and patrons of a development have a preference toward driving cars.

By calculating the amount of employment within commercial zones, I can calculate the number of parking spaces per employee and draw comparisons between cities to determine whether and how different development code standards affect the ratio of parking spaces to employees. Using multiple study areas, I find a mean number of spaces per employee and determine how closely cities' parking supply relates to the amount of employment present. A city that provides a higher than average number of parking spaces per employee could potentially be overprescribing parking within their development code; or perhaps hosts developments with high expectations for patronage.

My methods address the relationship between parking and zoning, development code standards, and employment with the following steps:

1. Select case study cities
2. Digitize all non-residential parking in study cities
3. Identify which parking falls within commercial zones
4. Determine the amount of employment within commercial zones
5. Analyze results

Study Areas

In order to test the connections between parking and zoning, development code, and employment in cities under 10,000 in population, I selected six study cities (Table 1). Selections were made based first on population, then narrowed down by availability of data related to zoning and employment data from the Department of Land Conservation and Development and the Quarterly Census of Employment and Wages. The cities selected for the study are shown below, along with some basic comparisons of population, area, and commuter trends.

City Name	Population Estimate	Land Area, City Limits, sq mi	Population per square mile	QCEW Covered Employment	Commercially Zoned Area, sq mi	% of Urban Land in Commercial Zone	Drove alone %
Astoria	9,521	6.2	1545.6	2748	0.46	7%	64%
Cottage Grove	9,845	3.8	2618.4	1704	0.47	12%	71%
Creswell	5,065	1.7	2948.2	558	0.37	22%	84%
Eagle Point	8,753	3.0	2957.1	498	0.16	5%	88%
Independence	8,768	2.7	3211.7	619	0.12	4%	69%
Monmouth	9,950	2.2	4442.0	864	0.10	4%	68%
Sources: US Census American Communities Survey, 2014; ESRI; Department of Land Conservation and Development; Quarterly Census of Employment and Wages.							

Table 1- General information on study sites

For each of the six selected cities, a case study approach was taken to illustrate how land is zoned, how parking is prescribed, how parking is distributed, and how those traits are related to employment.

This exploratory analysis draws from four main sources: 1) Quarterly Census on Employment and Wages (QCEW); 2) development codes from the six study sites; 3) statewide zoning data from Oregon's Department of Land Conservation and Development (DLCD); and 4) aerial imagery from ESRI and Google Earth. US Census and American Communities Surveys data were used to gather various population characteristics such as population and commuter habits.

Study Areas

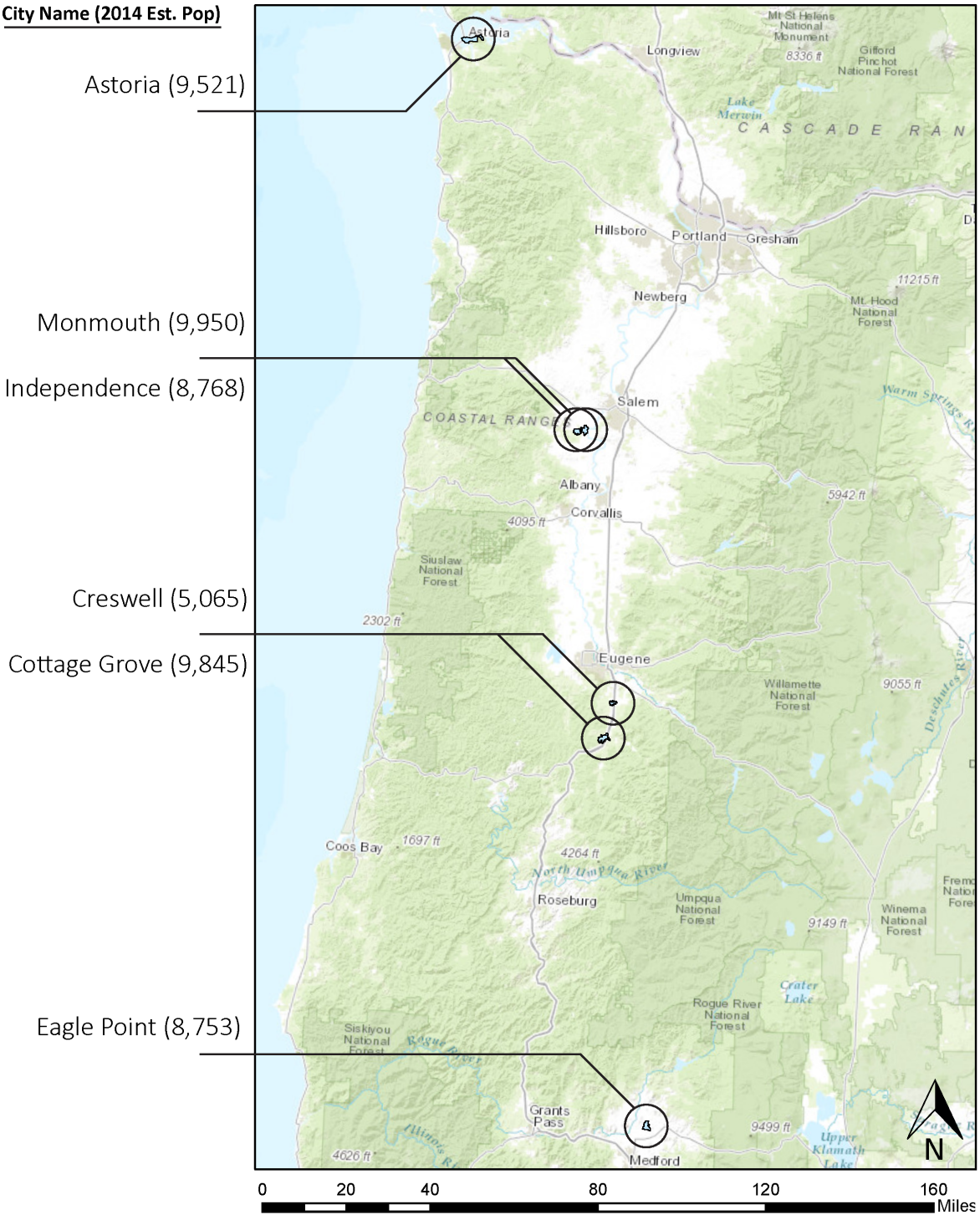

Figure 1- Map of study areas

GIS Analysis

Hand-Digitized Parking (polygon layer)

In a manner similar to Davis et al (2009)[15], I digitized all off-street areas that are clearly parking lots. If an area could be visually identified through aerial photography (ESRI and Google) as having painted parking lines, or was clearly used for parking in conjunction with a corresponding QCEW data point- I digitized its footprint. Deciding which areas to digitize and which to leave out of the analysis required consistency and discretion. Broadly, I digitized all land dedicated to non-residential off-street parking for non-fleet vehicles- including landscaping islands, turnaround areas, and, in some cases, access roads (if they provided access to an area which was exclusively comprised of parking. E.g. overflow lots with long driveways) (Figure 2**Error! Reference source not found.**).

I did not include some types of paved areas, even if they contained marked parking spaces. Such instances include, but are not limited to; gas stations, car dealerships, auto mechanics, car washes, fleet vehicle areas, and drive-thru lanes (at banks and fast food, I measured parking, but left out the lanes). Similarly, on large industrial properties, I limited digitized parking to the frontage areas where staff and visitors typically park (commonly, this area is delineated by a chain-link fence).

By using ESRI base maps of my selected cities, and by narrowing my geographic focus to areas directly associated with retail and commercial activities, I built a layer of hand-drawn polygons to represent off-street surface parking. I utilized ArcMap's "Calculate Geometry" tool to determine the total amount of parking available in the city. The digitized parking areas from this step inform the rest of the analysis by informing comparisons with zoning and employment data.

[15] Davis, A. et al, 2009. The environmental and economic costs of sprawling parking lots in the United States. Land Use Policy.

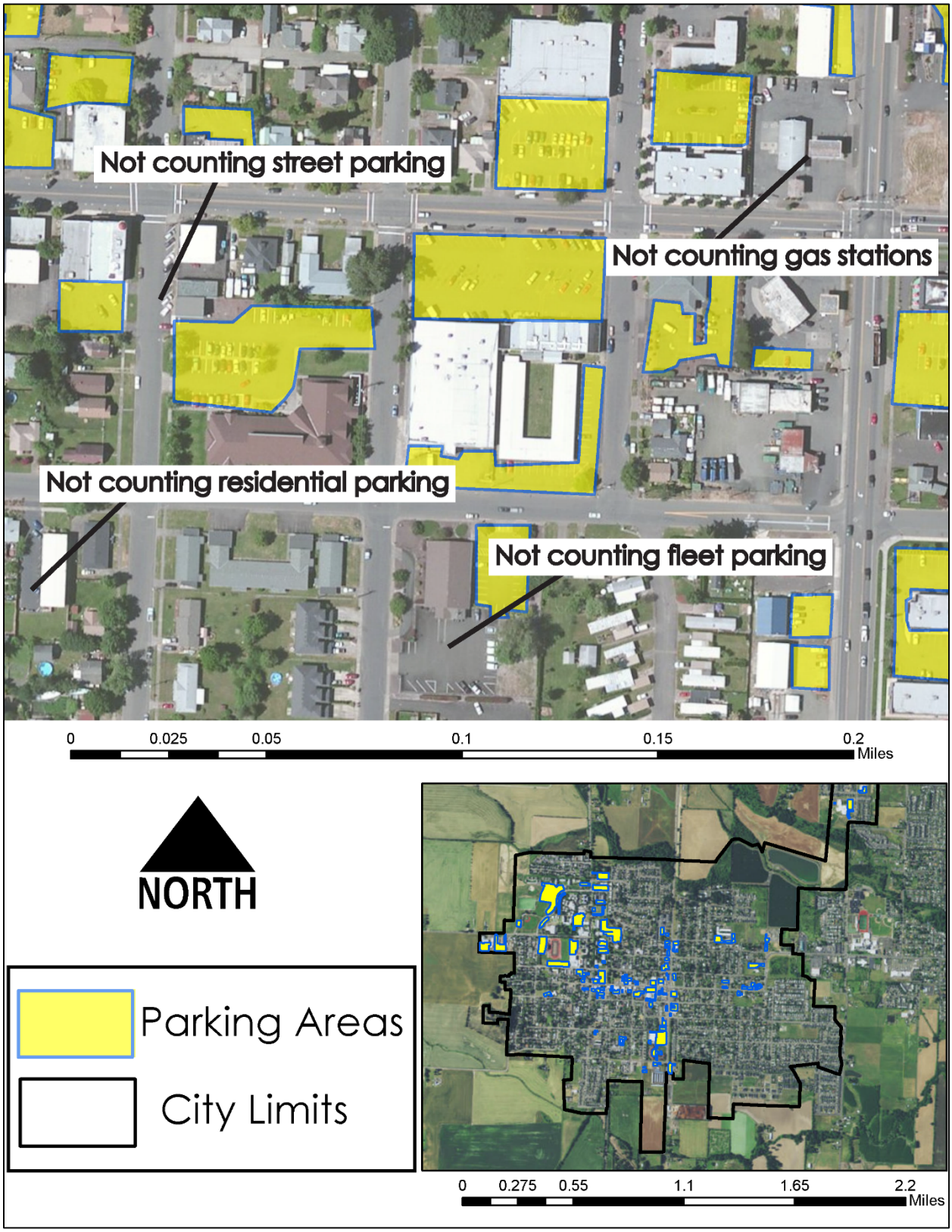

Figure 2- Example of methodology used to digitize parking areas featuring orthogonal imagery and parking areas in Monmouth, OR.

Statewide Generalized Zoning

The State of Oregon's Department of Land Conservation and Development collected and compiled zoning information from numerous Oregon cities (largely in the western half of the state- data from the eastern half is incomplete). The zoning represented within this dataset is not precisely reflective of the specific zone designations that may be unique to some cities, rather, DLCD generalized the data to lend parity to statewide analyses.

Using GIS, I clipped this layer to my study areas, and clipped again to specifically investigate the zone designations present in the parking polygons. These two steps provided an estimate for 1) the percentage of land within each zone designation, 2) the percentage of each city's parking supply contained within each zone designation, and 3) the percentage of land in each zone occupied by parking areas. This third element provides a basis for generalized comparison with development code parking requirements. This information was gathered, analyzed, and presented for each individual city, as well as in aggregate to determine whether patterns exist across all study sites.

Quarterly Census of Employment and Wage data (point data)

Quarterly Census of Employment and Wage (QCEW) data is point-based and was attached to tax lot-level information from the State of Oregon Employment Department by UO InfoGraphics Lab. This layer augmented aerial imagery to assist in locating business locations. When QCEW data was inconclusive, I resorted to Google Maps and Street View to verify the presence of parking lots associated with non-residential uses.

Quarterly Census of Employment and Wage data (point data, joined to tax lot polygons)

University of Oregon faculty and the University of Oregon InfoGraphics Lab made QCEW data available in a useful format. The data was available as point and polygon data, depending on whether the original point data could be reliably associated with a specific street address. The precision of available data was

a major factor in selecting study cities, as geographically imprecise data could not be accurately attributed to a specific zone designation. In the study cities, tax lot polygons were spatially joined to zoning data to establish measurements for employment by zone designation.

Employment figures within the QCEW data represent the average amount of employment covered by unemployment insurance across an entire year. In a study for the Department of Land Conservation and Development, Parker and Lewis estimated that total employment is typically about 25% higher than covered employment, which underrepresents agricultural, real estate, and services-based employment which often locate outside of commercial areas.[16]

Analysis

Using this total employment count, I compared it to the amount of parking present within each zone. Using this information, geometry calculations, as well as a baseline assumption of 330 square feet per parking space[17]; I calculated the number of available parking spaces per employee within each zone. Simple GIS spatial analysis techniques such as clipping, joining, and dissolving, along with tabular manipulations yielded the vast majority of data presented in this analysis.

When data was available, I utilized structural square footage information from tax lot polygons to compare digitized parking totals to the square-footage derived parking standards within a city's development code. Unfortunately, this data column was either incomplete or missing for all but two study sites.

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[16] Parker, R., Lewis, R., 2015. Analysis of Land Use Efficiency in Oregon Cities. University of Oregon Community Service Center, Eugene, Oregon

[17] Shoup, D. (2014). The High Cost of Minimum Parking Requirements. Parking Issues and Policies (Transport and Sustainability, Volume 5) Emerald Group Publishing Limited, 5, 87-113.

Development Code Review

Minimum parking requirements are prescribed by a parcel's use, rather than its zone designation. However, certain uses gravitate toward specific zones more than others- depending on the specificity of a city's zoning. I performed a broad content analysis on study cities' development codes to establish which uses were most commonly associated with commercial zoning.

Public Use and Open Space
Beaches and Dunes
Open Space/Conservation
Parks & Open Space
Public & semi-public Uses
Public Use and Open Space Zones
Commercial
Commercial - Central
Commercial - General
Commercial - Neighborhood
Commercial - Office
Mixed-Use Com. & Res. Med-high
Rural Commercial
Commercial Zones
Industrial
Industrial - Heavy
Industrial - Light
UC Rural Industrial
Industrial Zones
Residential
High-density Res.
Low-density Res.
Medium-density Res.
Mixed-Use Com. & Res. Med-high
Mixed-Use Com. & Res. Medium
Residential Zones

Figure 3- Zones generalized into their major groups

Generalized Zoning

To allow for comparison, zone types were generalized into four categories within each of the six cities for which full data was available (Figure 4). This step was necessary because some cities contain six or more types of commercial zoning, while others have as few as one. Mixed-use residential/commercial areas were included within both residential and commercial zone categories, but typically only accounted for fractions of a percentage of the total urban land supply. Although this analysis focuses primarily on commercial zones, data on all zones was collected for the sake of comparison.

Generalized Parking Requirements

Parking requirements for uses typically found within commercial zones were collected from each city's development code and averaged to establish a baseline for comparison with other cities. Restaurants, general retail, and office buildings were the uses most commonly identified in development codes. (Figure 4)

Commercial Parking Standards	
Use	Spaces per 1,000 SF
Office	2
Restaurant	4
General Retail	2
Average	2.67

Figure 4- (Example) Development code minimum parking standards from Astoria, OR

Case Studies and Findings

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The following tables are a summary of the data generated to inform the case studies.

Commercial Zone Summary	Astoria	Creswell	Cottage Grove	Eagle Point	Independence	Monmouth	Average (All Cities)
Area in Zone (acres)	293.1	237.8	300.2	100.8	75.1	63.4	**178.4**
% of City in Zone	9.4%	30.9%	15.8%	6.2%	6.1%	6.4%	**12.5%**
Area Parked (acres)	38.0	16.5	49.8	15.0	15.5	15.1	**25.0**
% of Zone Parked	13.0%	6.9%	16.6%	14.9%	20.6%	23.8%	**16.0%**
% of City's Parking Supply	57.1%	54.3%	62.3%	51.1%	35.9%	30.6%	**48.6%**
Zone Parking as % of Urban Land	1.6%	2.2%	2.6%	1.0%	1.3%	1.5%	**1.7%**

Table 2- Summary of land within commercial zone designations in study areas

The most consistent measurements within commercial zones are the percentage of commercial zoning comprised of parking, and the percentage of each city's total parking supply provided within commercial zones. In most of the case study cities, between 13% and 25% of commercial land is consumed by parking; and commercial zones provide roughly half of cities' total parking supply. Perhaps the most remarkable trait of commercial land visible from this comparison is the fact that, despite large variations in the percentage of land dedicated to commercial zoning (between 6% and 31%), each of the commercial zones still provides a similar proportion of parking- around 50% of the city's total supply.

The majority of standards provided by cities are similar, within a space or so per thousand square feet of one another. However, some parking standards stand out from the rest. Creswell and Cottage Grove have much higher than average standards for restaurant parking. Eagle Point has remarkably high

Parking Spaces Required per 1,000 square feet of Floor Area	Astoria	Creswell	Cottage Grove	Eagle Point	Independence	Monmouth	Average (All Cities)
Office	2.0	2.0	2.0	2.5	PC Review	2.5	**2.2**
Restaurant	4.0	8.0	8.0	seats + employees	4.0	5.0	**5.8**
Retail (general)	2.0	2.0	2.0	3.3	2.0	2.5	**2.3**
Retail (other)	1.0	1.0	1.0	13.3	n/a	1.5	**3.6**
Average (All Uses)	**2.3**	**3.3**	**3.3**	**6.4**	**3.0**	**2.9**	**3.5**

Table 3- Summary of development code parking requirements for uses most commonly associated with commercial zoning in study areas

standards for Retail (other), which in this case refers to “community or regional stores” over 4,000 square feet. Eagle point also utilizes employment as a means for estimating parking demand for restaurants, which is unique among study cities.

Employment distribution and density traits	Astoria	Creswell	Cottage Grove	Eagle Point	Independence	Monmouth	Average
QCEW Employees	2,748.0	558.0	1,704.0	498.0	619.0	864.0	**1,165.2**
Spaces/Employee	1.8	3.9	3.9	4.0	3.3	2.3	**3.2**
Employees per acre	9.4	2.3	5.7	4.9	8.2	13.6	**7.4**
% of City's Employment	60.6%	56.8%	65.5%	44.3%	36.9%	36.8%	**50.2%**

Table 4- Summary of employment trends in study areas

With regards to employment distribution across zones, commercial zones host between 36% and 65% of covered employment across the study sites. The number of parking spaces per employee within commercial zones is lowest for Astoria, at 1.8 spaces per employee; and highest for Eagle Point, at 4.0 spaces per employee. Employment density is measured in terms of employees per acre. Astoria, who has the lowest number of spaces per employee, has the highest number of employees per acre. A trend is evident in that cities with 3.3 of fewer spaces per employee in commercial zones have employment densities of 8.2 employees per acre and higher. Conversely, cities with more than 3.3 spaces per employee have employment densities of 5.7 employees per acre and lower.

Figure 6 presents a summary of employment and parking data across all zones which reveals both the true significance of commercial zoning, and the proportionality between parking and employment.

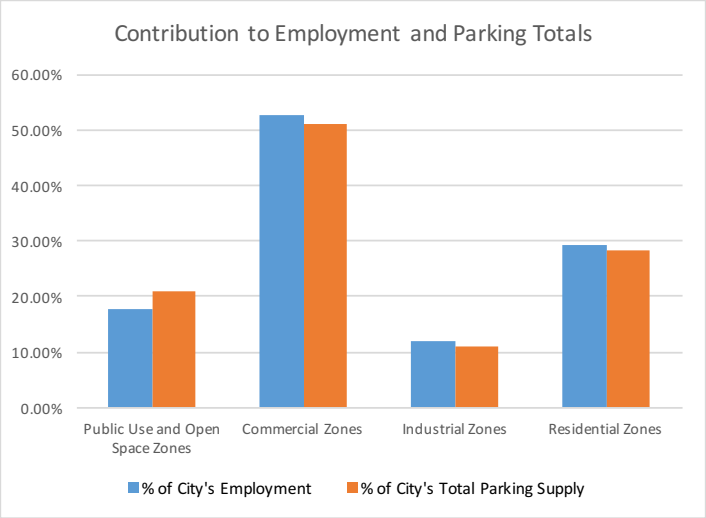

Figure 5- Comparison across all study cities of each general zone's contribution to parking supply and total employment.

Astoria, OR

Zoning

	Astoria	Average (All Cities)
Area in Zone (acres)	293.1	178.4
% of City in Zone	9.4%	12.5%
Area Parked (acres)	38.0	25.0
% of Zone Parked	13.0%	16.0%
% of City's Parking Supply	57.1%	48.6%
Zone Parking as % of Urban Land	1.6%	1.7%

Table 5- Commercially zoned land characteristics, Astoria, OR

When compared to the other five study areas, Astoria has designated a slightly smaller proportion of urban land as commercially zoned, as well as a proportionally smaller than average amount of commercial land dedicated to parking. Despite a below-average proportion of land dedicated to both commercial land and parking land in commercial zones, Astoria's commercial land provides more than half of the city's non-residential off-street parking. This relationship is perhaps best visualized by Figure 6.

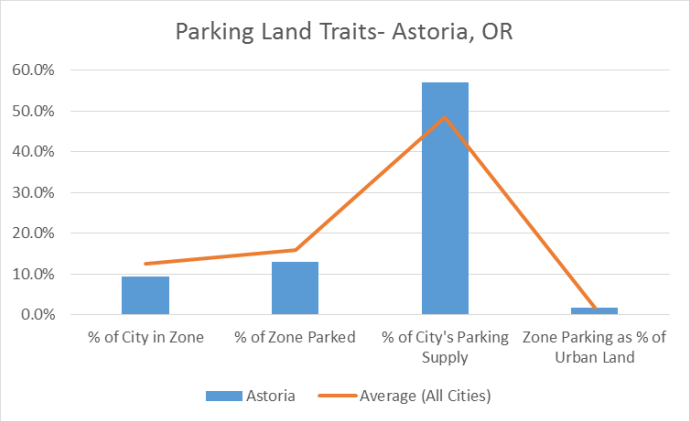

Figure 6- Commercial zone parking traits compared to study area averages, Astoria, OR

Development Code

Astoria's development code parking standards for commercial uses are below the study area average in each category. This adds further interest to the fact that Astoria's commercially-designated lands provide a greater than average contribution to the city's total parking supply despite occupying proportionally less land and requiring fewer spaces per 1,000 square feet of floor space.

Astoria	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	2.0	2.2
Restaurant	4.0	5.8
Retail (general)	2.0	2.3
Retail (other)	1.0	3.6
Average (All Uses)	**2.3**	**3.5**

Table 6- Development code minimum parking standards, Astoria, OR

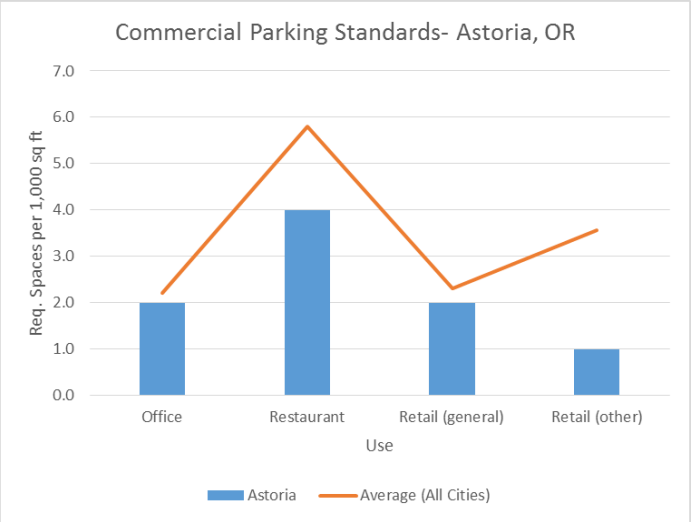

Figure 7- Development code minimum parking standards compared to study area averages, Astoria, OR

Employment

Astoria's commercial areas accommodate more employment and a higher employment density than any other study area. This comes in spite of the fact that the city's minimum parking requirements are below the study average and there are fewer spaces per employee than in any of the study cities. This may be related to the fact that Astoria's residents report the lowest percentage of individuals whose daily commutes are achieved by driving alone (Table 1- General information on study sites). Regardless of the explanation, the fact pattern evident in Astoria

	Astoria	Average
QCEW Employees	2,748.0	1,165.2
Spaces/Employee	1.8	3.2
Employees per acre	9.4	7.4
% of City's Employment	60.6%	50.2%

Table 7- Employment trends in commercial zones, Astoria, OR

seems to indicate that fewer parking spaces per employee are tentatively associated with higher employment density.

	Creswell	Average (All Cities)
Area in Zone (acres)	237.8	178.4
% of City in Zone	30.9%	12.5%
Area Parked (acres)	16.5	25.0
% of Zone Parked	6.9%	16.0%
% of City's Parking Supply	54.3%	48.6%
Zone Parking as % of Urban Land	2.2%	1.7%

Table 8- Commercially zoned land characteristics, Creswell, OR

Creswell, OR

Zoning

Creswell's commercially-designated lands occupy roughly a third of the city, and provide more than half of the city's total parking. Despite providing more than half of the city's parking supply, the proportion of commercial land covered by parking in Creswell is significantly lower than the average across cities in this study. Furthermore, despite Creswell having a much smaller land area than other cities, the total amount of land designated for commercial use is well above the study average.

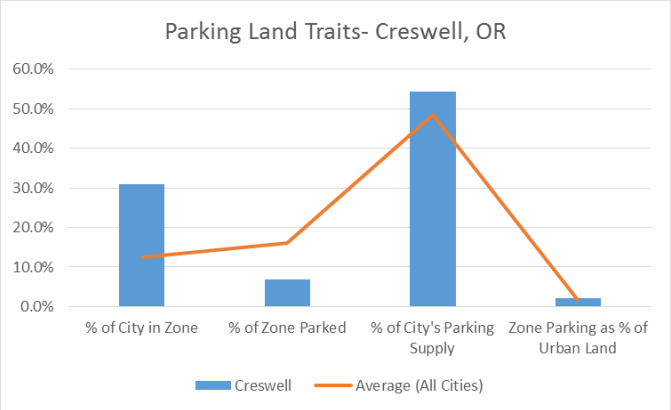

Figure 8- Commercial zone parking traits compared to study area averages, Creswell, OR

Creswell	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	2.0	2.2
Restaurant	8.0	5.8
Retail (general)	2.0	2.3
Retail (other)	1.0	3.6
Average (All Uses)	**3.3**	**3.5**

Table 9- Development code minimum parking standards, Creswell, OR

Development Code

Creswell's parking requirements fall just below the averages across the study, with the exception of restaurants, which require

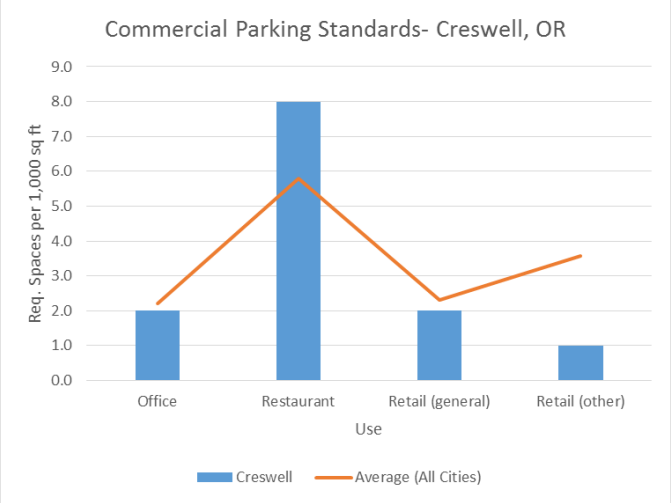

Figure 9- Development code minimum parking standards compared to study area averages, Creswell, OR

eight spaces per 1,000 square feet of floor space compared to the study average of about six spaces. This trait is perhaps an effort to mitigate the potential traffic impacts caused by peak demand experienced by restaurants at lunch and dinner hours.

Employment

	Creswell	Average
QCEW Employees	558.0	1,165.2
Spaces/Employee	3.9	3.2
Employees per acre	2.3	7.4
% of City's Employment	56.8%	50.2%

Table 10- Employment trends in commercial zones, Creswell, OR

Creswell's commercial zones report the lowest employment density among all study areas and the second highest number of parking spaces per employee. Due to having the smallest population in the study, a close proximity to Eugene, and a higher than average total amount of commercial land, a low employment density could be anticipated. However, this association is the inverse of what was seen in Astoria- where a low spaces/employee ratio was associated with the highest employment density.

Cottage Grove, OR

Zoning

	Cottage Grove	Average (All Cities)
Area in Zone (acres)	300.2	178.4
% of City in Zone	15.8%	12.5%
Area Parked (acres)	49.8	25.0
% of Zone Parked	16.6%	16.0%
% of City's Parking Supply	62.3%	48.6%
Zone Parking as % of Urban Land	2.6%	1.7%

Table 11- Commercially zoned land characteristics, Cottage Grove, OR

Cottage Grove's commercial land accounts for a greater than average total area, and contains roughly twice the average amount of land dedicated to parking. Parking on commercial land occupies 2.6% of Cottage Grove's urban land, which is the highest percentage of any of the study cities.

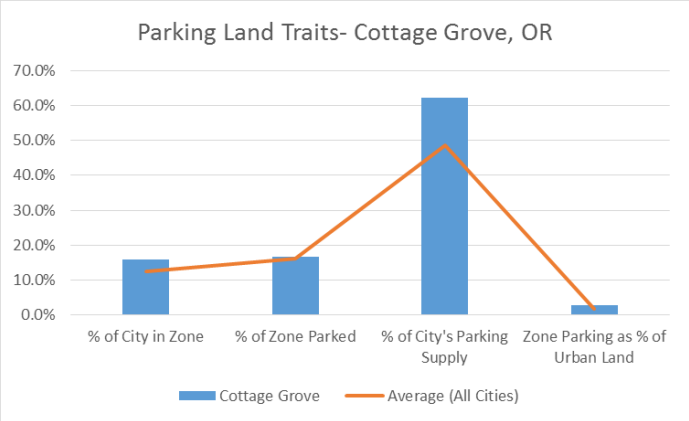

Figure 10- Commercial zone parking traits compared to study area averages, Cottage Grove, OR

Development Code

Cottage Grove and Creswell have almost identical development code parking requirements, likely owing to the fact that they are neighbors. Cottage Grove's restaurant parking requirements, like Creswell, are higher than average while the rest of the city's standards are fairly modest in comparison to the other study areas.

Cottage Grove	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	2.0	2.2
Restaurant	8.0	5.8
Retail (general)	2.0	2.3
Retail (other)	1.0	3.6
Average (All Uses)	**3.3**	**3.5**

Table 12- Development code minimum parking standards, Cottage Grove, OR

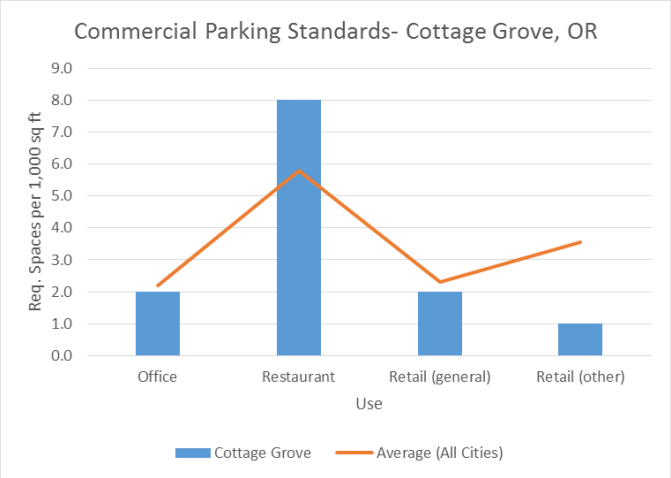

Figure 11- Development code minimum parking standards compared to study area averages, Cottage Grove, OR

Employment

Cottage Grove's commercial area hosts a higher than average amount of employment, and a higher than average percentage of the city's total employment. Employment density is just below average, and the city provides an above average number of spaces per employee on commercial land. As the city has both a higher than average number of employees working in the zone and a higher than average amount of land in the zone, the low employment density could be either attributed to excessive parking or a stock of undeveloped commercial land. In Cottage Grove's case, parked commercial land's contribution to the urban land mix is indeed higher than average, but a look at aerial imagery reveals an abundance of undeveloped commercial land(Appendix C: Undeveloped

	Cottage Grove	Average
QCEW Employees	1,704.0	1,165.2
Spaces/Employee	3.9	3.2
Employees per acre	5.7	7.4
% of City's Employment	65.5%	50.2%

Table 13- Employment trends in commercial zones, Cottage Grove, OR

Commercial Land in Cottage Grove, OR). Regardless of the explanation, the relationship between an above average number of spaces per employee and a below average employment density remains.

Eagle Point, OR

Zoning

Eagle point contains a lower than average amount of land in its commercial zones, and it occupies a much lower percentage of total urban land than the study average. Nonetheless, the city's commercial land provides a percentage of the city's total parking supply that exceeds the study average.

	Eagle Point	Average (All Cities)
Area in Zone (acres)	100.8	178.4
% of City in Zone	6.2%	12.5%
Area Parked (acres)	15.0	25.0
% of Zone Parked	14.9%	16.0%
% of City's Parking Supply	51.1%	48.6%
Zone Parking as % of Urban Land	1.0%	1.7%

Table 14- Commercially zoned land characteristics, Eagle Point, OR

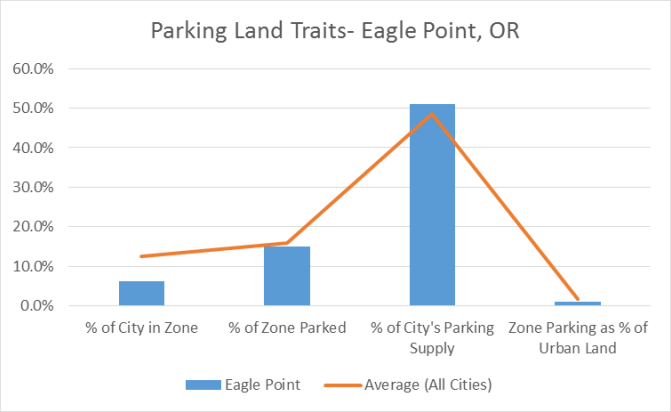

Figure 12- Commercial zone parking traits compared to study area averages, Eagle Point, OR

Development Code

Eagle Point's parking requirements are just above average for general retail and office space, but "Retail (other)" contains a requirement of 13.3 spaces per 1,000 square feet of floor space. This applies to large chain grocery stores, and represents the highest parking requirement for any use observed across the entire study.

Eagle Point	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	2.5	2.2
Restaurant	seats + employees	5.8
Retail (general)	3.3	2.3
Retail (other)	13.3	3.6
Average (All Uses)	**6.4**	**3.5**

Table 15- Development code minimum parking standards, Eagle Point, OR

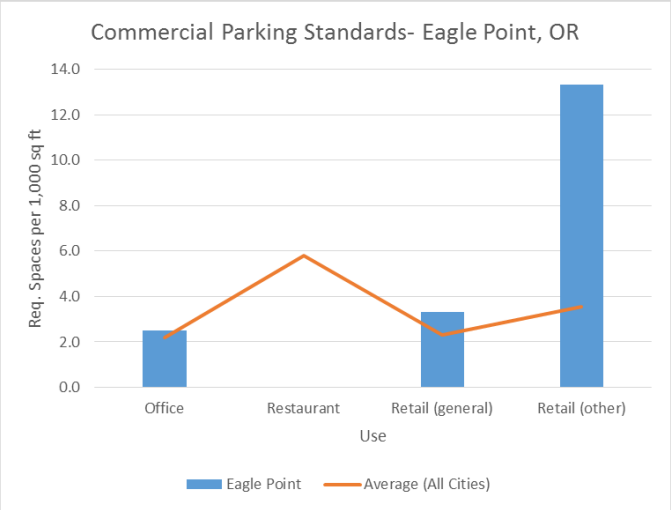

Figure 13- Development code minimum parking standards compared to study area averages, Eagle Point, OR

Employment

	Eagle Point	Average
QCEW Employees	498.0	1,165.2
Spaces/Employee	4.0	3.2
Employees per acre	4.9	7.4
% of City's Employment	44.3%	50.2%

Table 16- Employment trends in commercial zones, Eagle Point, OR

Eagle Point hosts the lowest employment totals in its commercial zones of any city in the study, and the second lowest employment density- ranking ahead of only Creswell. This statistic comes in light of the fact that Creswell and Eagle Point both function as "bedroom" communities to Eugene and Medford, respectively. Eagle Point provides the greatest number of parking spaces per employee in commercial zones, which may be due to the fact that parking appears to be more oriented toward accommodating peak loads of shoppers than to accommodate employment- much of which is in Medford. Once again, a lower than average employment density is associated with a higher than average measurement of parking spaces per employee.

Independence, OR

Zoning

	Independence	Average (All Cities)
Area in Zone (acres)	75.1	178.4
% of City in Zone	6.1%	12.5%
Area Parked (acres)	15.5	25.0
% of Zone Parked	20.6%	16.0%
% of City's Parking Supply	35.9%	48.6%
Zone Parking as % of Urban Land	1.3%	1.7%

Table 17- Commercially zoned land characteristics, Independence, OR

Independence, with about 75 acres of commercially-designated land, has the second lowest total amount of commercial land in the study and the lowest percentage of urban land dedicated to commercial activity. Although the percentage of this land dedicated to parking is above average, Independence's commercial parking occupies the second smallest percentage of urban land in the study.

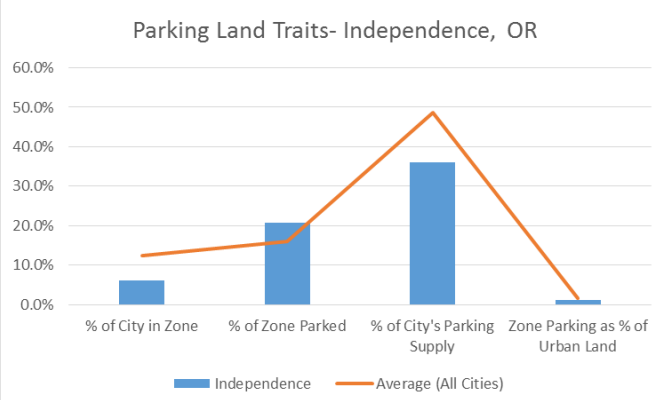

Figure 14- Commercial zone parking traits compared to study area averages, Independence, OR

Development Code

Independence	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	PC Review	2.2
Restaurant	4.0	5.8
Retail (general)	2.0	2.3
Retail (other)	n/a	3.6
Average (All Uses)	**3.0**	**3.5**
	Provided Spaces per 1,000 sq ft floor space	
All uses	**3.2**	n/a

Table 18- Development code minimum parking standards, Independence, OR

Independence, in addition to having below-average requirements for each of its specified commercial uses, prescribes minimum standards to the fewest types of uses.

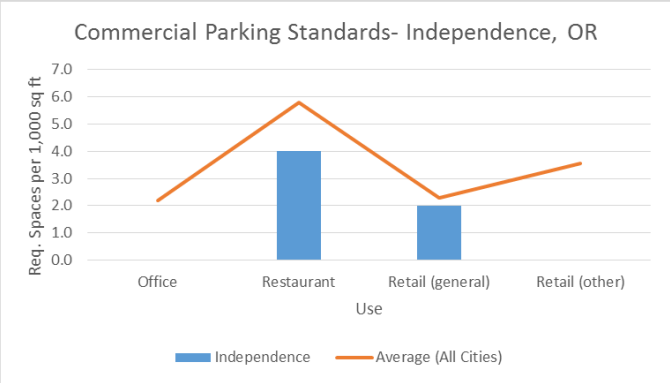

Figure 15- Development code minimum parking standards compared to study area averages, Independence, OR

Independence and Monmouth were the only two cities for which structural square footage data was fully available. For all other cities, the data was either incomplete or non-existent. This allows for comparison between existing parking and prescribed minimum standards. As Table 18 shows, Independence's commercial areas provide about 3.2 spaces per 1,000 square feet of floor space. This figure falls directly between the minimum standards for general retail and restaurant usage. Judging from this information, it would appear that developers are adhering to the minimum requirements. This may be due to land constraints imposed by the small acreage of Independence's commercial land supply. It can be inferred from this that developers in commercial areas are not providing much surplus parking beyond code requirements.

Employment

	Independence	Average
QCEW Employees	619.0	1,165.2
Spaces/Employee	3.3	3.2
Employees per acre	8.2	7.4
% of City's Employment	36.9%	50.2%

Table 19- Employment trends in commercial zones, Independence, OR

Independence hosts only 36% of its employment in commercially-designated areas, well below the

study average. However, the city's employment density in commercial areas is above average and the number of parking spaces provided per employee is just at the average.

Monmouth, OR

Zoning

Home to Western Oregon University, Monmouth has the least land area dedicated to commercial designations in the study, and the highest percentage of its commercial land dedicated to parking.

	Monmouth	Average (All Cities)
Area in Zone (acres)	63.4	178.4
% of City in Zone	6.4%	12.5%
Area Parked (acres)	15.1	25.0
% of Zone Parked	23.8%	16.0%
% of City's Parking Supply	30.6%	48.6%
Zone Parking as % of Urban Land	1.5%	1.7%

Table 20- Commercially zoned land characteristics, Monmouth, OR

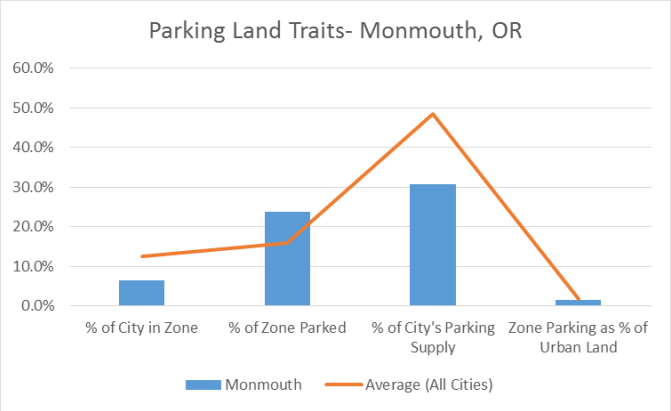

Figure 16- Commercial zone parking traits compared to study area averages, Monmouth, OR

Development Code

Monmouth's minimum parking requirements are about average for the study, with its mean parking requirement falling slightly below that of the entire study.

As the only other study area with complete data for structural square footage, Monmouth is calculated as providing 3.6 parking spaces per 1,000 square feet of built space in commercial areas. While this figure is higher than the mean parking requirement, it is between the minimum and maximum commercial use requirements so as to represent the

Monmouth	Required Spaces per 1,000 sq ft floor space	Average (All Cities)
Office	2.5	2.2
Restaurant	5.0	5.8
Retail (general)	2.5	2.3
Retail (other)	1.5	3.6
Average (All Uses)	**2.9**	**3.5**
	Provided Spaces per 1,000 sq ft floor space	
All uses	**3.6**	n/a

Table 21- Development code minimum parking standards, Monmouth, OR

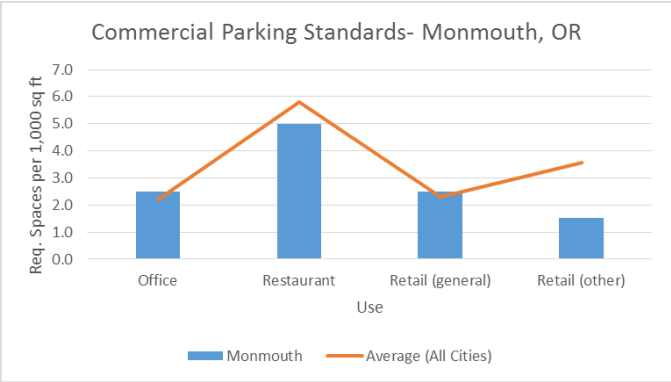

Figure 17- Development code minimum parking standards compared to study area averages, Monmouth, OR

implementation of each minimum standard. Some developers in may be providing surplus parking, but not enough to exceed the highest minimum standard specified in development code; Restaurants (5 spaces per 1,000 sq ft).

Employment

Commercial land's share of employment in Monmouth is well below the study area average. Additionally, the association between below-average parking per employee and above average employment density is once again evident.

	Monmouth	Average
QCEW Employees	864.0	1,165.2
Spaces/Employee	2.3	3.2
Employees per acre	13.6	7.4
% of City's Employment	36.8%	50.2%

Table 22- Employment trends in commercial zones, Monmouth, OR

Discussion

This research focused on three research questions:

- How much commercial land is dedicated to parking?
- How do parking standards affect the provision of parking in commercial zones?
- How does parking affect the density of employment in commercial zones?

By performing a GIS analysis and breaking results into case studies, this research suggests several connections between off-street parking and zoning, employment, and development code standards. Broadly speaking, commercial zones provide the greatest percentage of off-street parking and employment; differences in development code parking standards are reflected in an inverse relationship between employment density and the number of parking spaces per employee; and measurements of employment and parking are very closely related.

Commercial Zones: little land, lots of parking

Commercial zone designations in this study dedicated between 7% and 24% of their land to parking. Despite only accounting for around 12% of the average study area's land, commercial zones contributed almost half of cities' total parking supplies as well as about half of cities' employment. This finding stands to reason, given that commercial zones are intended for several different types of uses and users whose peak demand periods occur on multiple days at multiple times.

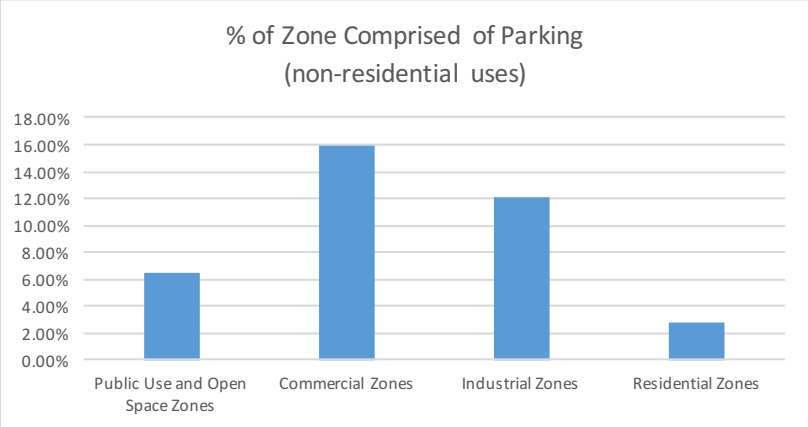

Figure 18- Percentages of each generalized zone comprised of non-residential, off-street parking. Summarized across all study cities.

Minimum requirements make a difference

All cities in the study had largely similar parking standards for office, restaurant, and retail uses. However, cities that possessed standards for a particular use that were remarkably higher than peers' standards demonstrated the effects of the standards in terms of decreased employment density and an increased number of parking spaces per employee (Table 3, Table 4). Although the effect of these standards is more difficult to measure due to their specificity on the ground, it is not difficult to extrapolate the land consumption resulting from their implementation on a singular basis (Table 23). For an additional 1,000 square feet of regional retail in Eagle point, an additional paved area more than four times that size must be set aside.

City	Outstanding parking requirement (spaces per 1,000 sq ft)	Additional square feet of parking land (requirement * 330 sq ft)
Eagle Point	13.3	4389
Creswell	8	2640
Cottage Grove	8	2640

Table 23- Outstanding parking requirements and the amount of parking proportional to 1,000 sq ft of development. Eagle Point, OR, Creswell, OR, Cottage Grove, OR

When data was available, I used building square footage information to compare structural area to the average parking requirements in the area. Tax lot level polygon data for Monmouth and Independence both contained columns denoting the square footage of built structures. This data provided an opportunity to directly compare parking standards that were prescribed on an *"x spaces per 1000 square feet"* basis to the amount of parking spaces that exist on the ground. In the case of both cities, the number of spaces on the ground quite closely reflected the minimum parking standard from the development code(Table 18, Table 21).

In Independence, commercial areas contained around 3.2 parking spaces per 1,000 square feet of built space. This measurement was between the high and low minimum standards set forth in the development code, and only .2 spaces per 1,000 square feet of structure more than the calculated mean

parking requirement that did not control for frequency of appearance for different uses. In Monmouth, slightly more spaces per 1,000 square feet were measured, 3.6 spaces per 1,000 square feet of structure. Although 0.7 spaces per 1,000 square feet higher than the mean minimum requirement, the measurement lies within the high and low minimum standards in the zone. Differences between the requirements and the observed parking fit easily within the error of the data. While this cannot necessarily prove that developers certainly gave deference to the parking standards, both cities' average requirements are reflected in the on-the-ground parking totals.

Parking requirements are intertwined with employment distribution and employment density

Though it is difficult to establish a causal relationship between these two with the information in this study, there is some evidence of a relationship between parking requirements and employment density. Across the study, cities with average parking requirements below 3.3 space per 1,000 sq. ft. all had employment densities at or above 8.2 employees per acre[18] (Table 3, Table 4). Meanwhile, cities with average parking requirements of 3.3 and above all had employment densities of less than 6 per acre. This relationship stands to reason because parking requirements not only require developers to purchase additional land to pave and park upon. Additionally, or conversely, a developer may intentionally reduce the size of a planned building if they cannot find enough land for the additional parking a larger building might require.

In all three cities where higher average parking requirements coincided with lower employment density, a single subzone required eight or more spaces per 1,000 square feet of floor area. In the case of Eagle Point, a regional retail store is required to provide 13.3 spaces per 1,000 square feet. In these cities,

[18] Employees per acre measured as # of employees/total acres of land in zone designation. Other studies, such as Parker, Lewis (2015) find higher densities with a measurement that only includes land within tax lot boundaries.

every unit of built space must be met with double or quadruple that amount of land paved for parking. On top of this requirement for land, cities have standards for access, storm water management, landscaping, and other development code provisions attached to parking areas that function as a bottom-line constraint to development.

Conclusions

This study set out to draw connections between parking as it exists within small Oregon cities' commercial zones, the development code which regulates it, and the employment which it accommodates. In doing so, I uncovered associations between minimum requirements and employment density that pointed to the fluctuations of a single use as the likely perpetrator for diminishing land use efficiency.

Along the way, I developed a simple methodology that could be implemented by municipalities to measure their parking supply, employment density, and, ultimately, inform more sound policy decisions surrounding parking requirements.

I uncovered the pivotal nature of commercial zones for small towns. These zones provide the majority of parking and employment, and are designed to accommodate a majority of uses, users, and parking on a minority supply of land. Despite this, some cities still are enforcing policies that decrease the potential efficiency of this unique area to cater to the predicted peak demand for off-street parking a use in the zone might experience.

As small cities begin to re-examine their urban growth boundaries for the opportunity to grow outward, I would urge them to utilize the methodology included within this study. Rather than stretching tax bases by extending urban services to greenfield land on the urban fringe, a small city might find the development opportunity they seek covered in asphalt and waiting for peak parking demand.

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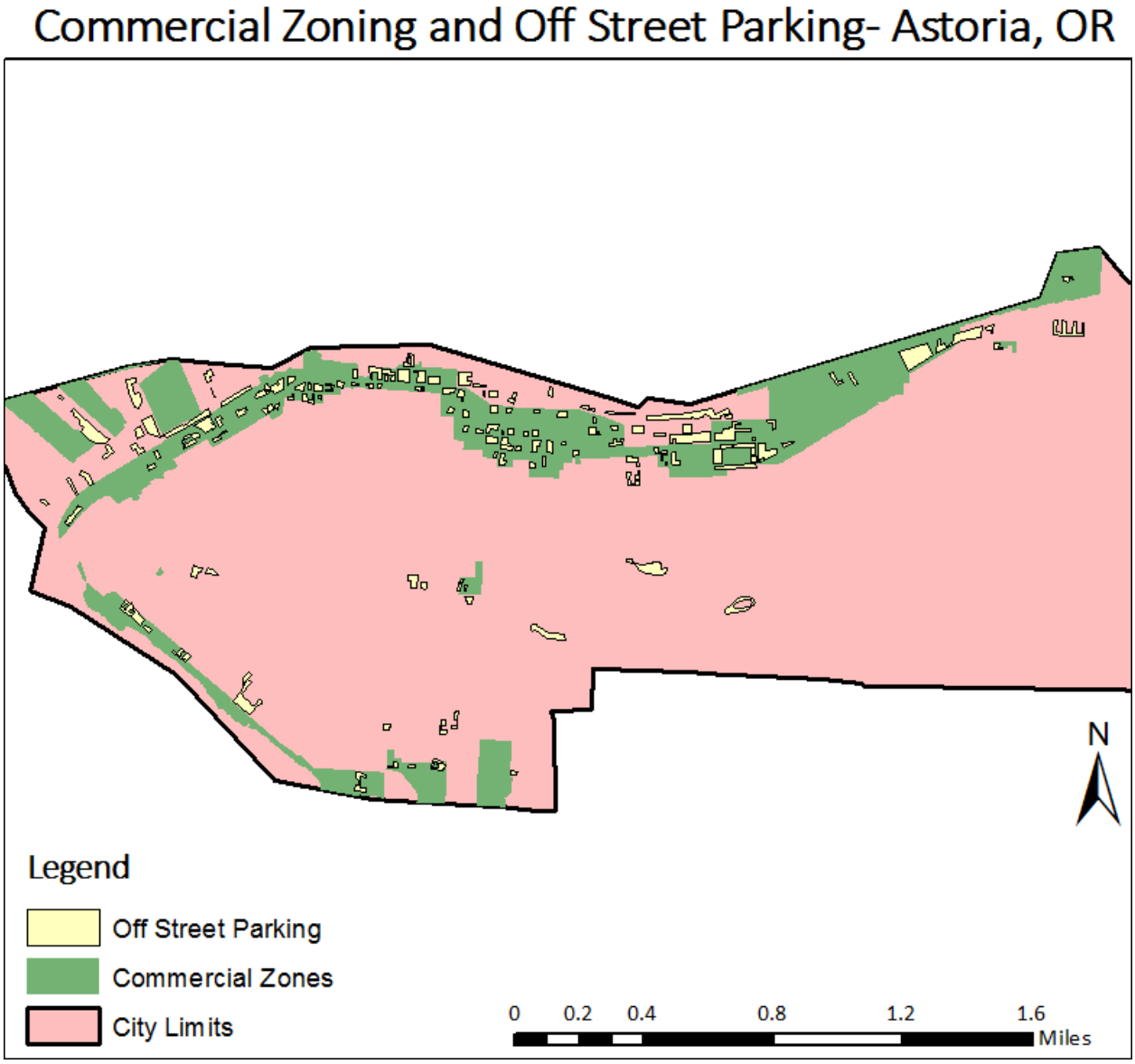
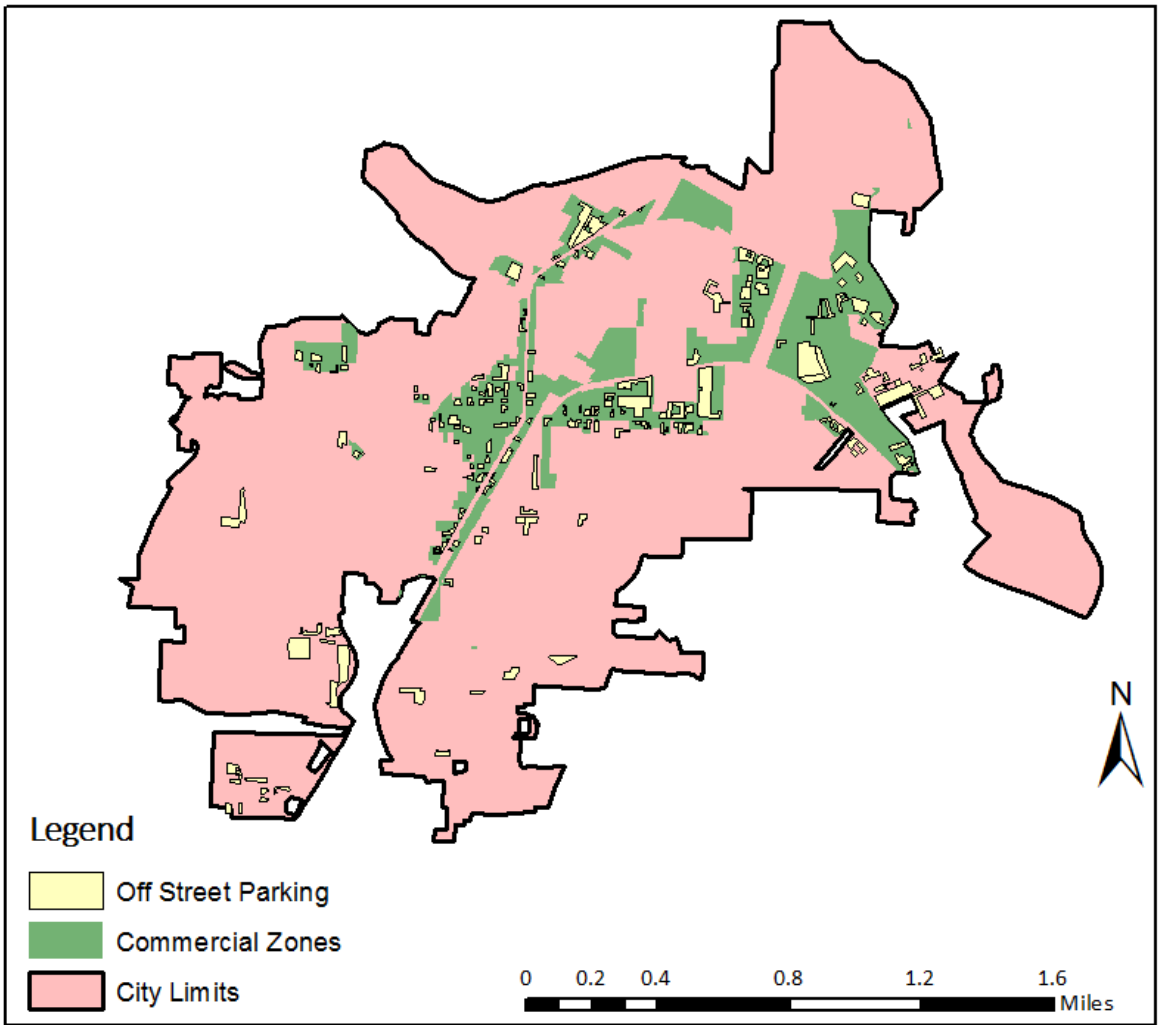
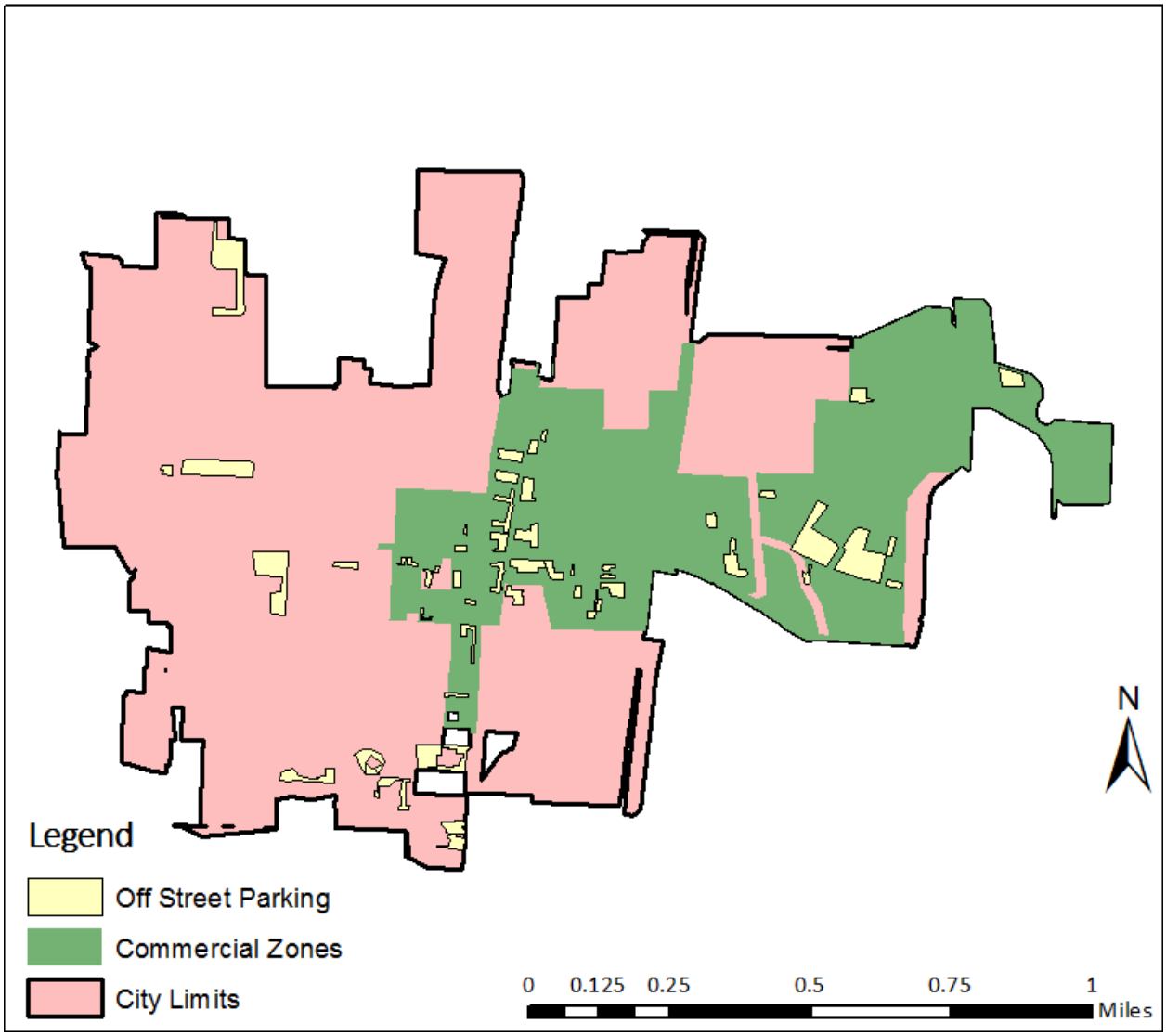
Appendix A: Maps of Digitized Parking and Commercial Zoning in Study Cities



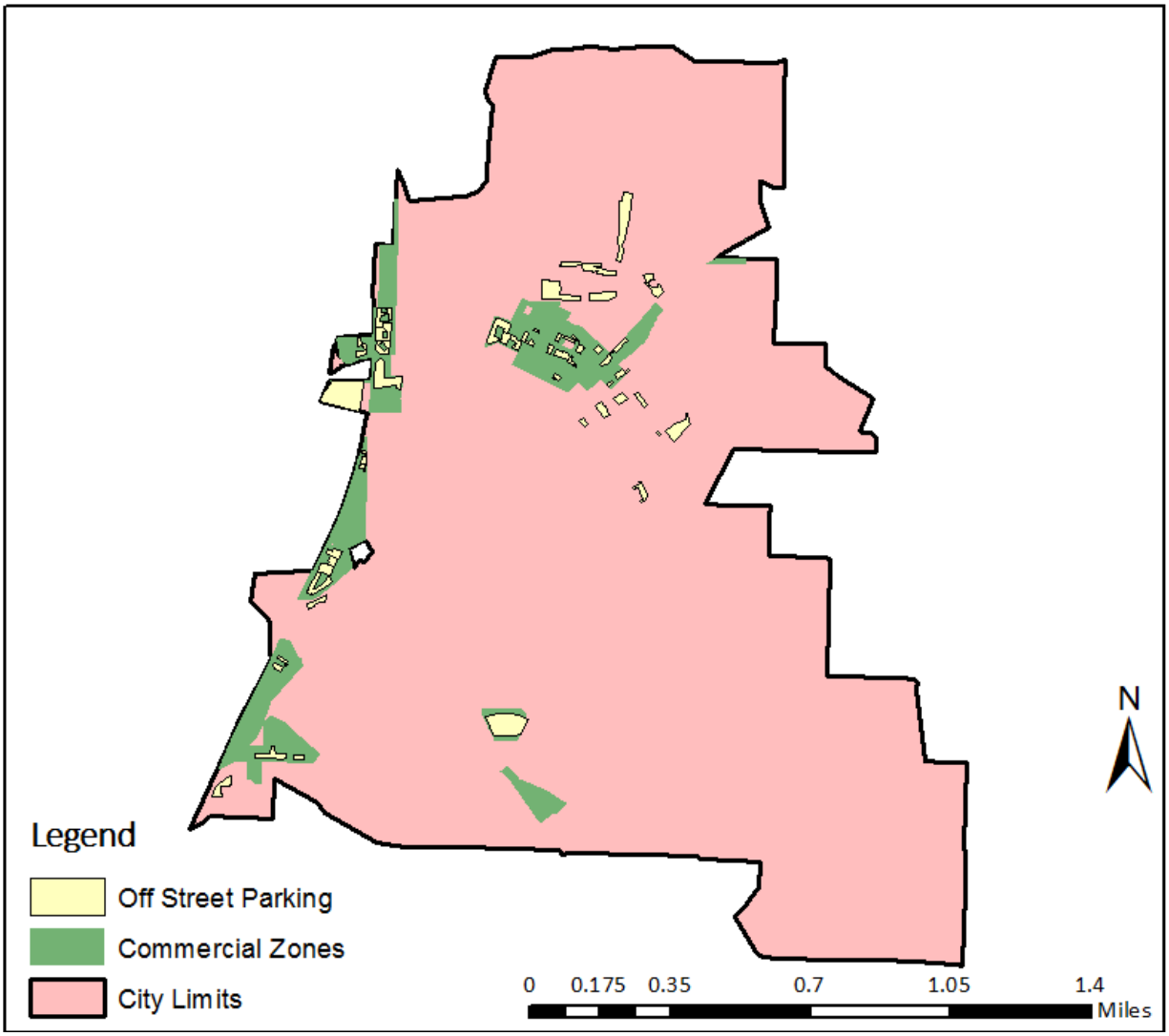
Commercial Zoning and Off Street Parking- Cottage Grove, OR



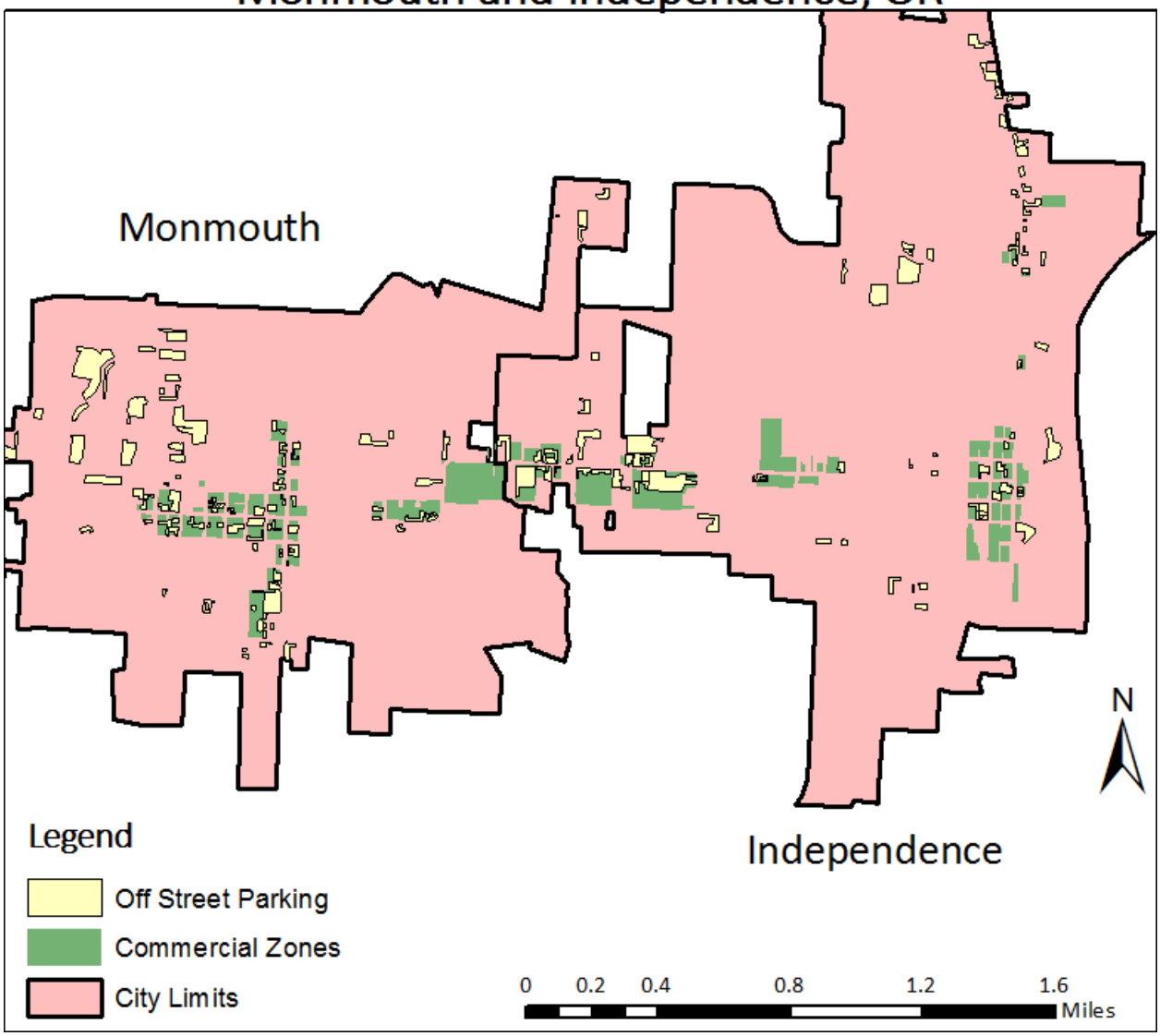
Commercial Zoning and Off Street Parking- Creswell, OR



Commercial Zoning and Off Street Parking- Eagle Point, OR



Commercial Zoning and Off Street Parking- Monmouth and Independence, OR



APPENDIX B: ADDITIONAL CENSUS DATA FOR STUDY AREAS

City Name	Drove Alone %	Transit %	Bicycle %	Walked %	Vehicle Availability for Workers 16+	Mean Commute Time to Work (minutes)
Astoria	64%	4.0%	1.0%	8.1%	93.4%	17.0
Cottage Grove	71%	2.0%	1.3%	7.7%	96.7%	22.8
Creswell	84%	3.3%	0.5%	2.1%	99.9%	23.8
Eagle Point	88%	2.1%	0.7%	1.6%	99.7%	23.6
Independence	69%	0.4%	0.7%	2.3%	97.4%	30.3
Monmouth	68%	1.8%	2.9%	10.9%	96.7%	22.8
Source: US Census 2014 American Community Survey						

Table 24- American Communities Survey Data on commuter trends in study areas. 2014

Appendix C: Undeveloped Commercial Land in Cottage Grove, OR

Figure 19- Example of undeveloped, commercially-zoned land in Cottage Grove, OR