

Exurban growth inside the urban growth boundary? An examination of development in Oregon cities

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Abstract

Oregon has relied on urban growth boundaries (UGBs) to contain growth in incorporated cities since it established a statewide planning program in 1973. Oregon state law requires that UGBs have enough land to accommodate 20 years of population and employment growth. Land inside the UGB is not immediately available for urban development until it is annexed and urban level infrastructure is available. This study focuses on policies and development patterns in the “urbanizable area”—land within the unincorporated areas inside the UGB that is reserved for future urban use. We examined planning documents, conducted GIS analysis, and administered a survey in 29 cities in five case study counties in Oregon. Our threefold analysis examined: (a) the agreements for managing growth in the urbanizable area; (b) trends in development and density in the urbanizable area, and (c) perceptions of managing growth from planning directors. Results show that development at low densities (around 1.5 dwelling units per acre) is occurring within the urbanizable area. These results have important implications for future development patterns and UGB expansions affecting rural areas. Low-density development inside the UGB may constrain available land supply, cause more frequent UGB expansions, and lead to noncontiguous, leapfrog development.

1 | INTRODUCTION

Since the early 1900s, cities around the world have relied on greenbelts and service or growth boundaries to manage urban expansion, provide for the orderly provision of urban services, and prevent fragmentation. The renowned Oregon statewide planning program has been in place for over 40 years. The Oregon approach requires every city in the state to establish an urban growth boundary (UGB) and adopt a comprehensive plan and implementing ordinances compliant with the 19 statewide planning goals. Comprehensive plans and implementing ordinances must be acknowledged by the Land Conservation and Development Commission (OAR 660-015-0000(14); ORS 197.005). The program also requires coordination among local governments (ORS 195). Urban Growth Management Agreements (UGMAs) are one tool that helps establish planning authority between cities and counties.

Oregon state law requires that UGBs have enough land to accommodate 20 years of population and employment growth. But, all land inside the UGB is not immediately available for urban density development. Land is not automatically annexed to city limits or zoned for urban densities when it is added to the UGB which precludes most urban services (water, wastewater, and transportation). The idea is that land will be annexed to cities over time, and UGBs will expand over time to ensure that there is continuous land supply for 20 years of growth. The primary intent of the UGB is to protect farmland and forestland for environmental and economic reasons and to contain urban development within incorporated cities. This study focuses on the “urbanizable area”—land within the unincorporated areas within the UGB that is reserved for future urban use but is mostly undeveloped and lacks urban services.

Since the Oregon program's inception, several studies have been written about land values, housing affordability, and development patterns (Knaap, 1985; Nelson & Moore, 1993, 1996). Many of these studies focus on the Portland metropolitan area. In an early study of development in UGBs, Weitz and Moore (1998) examine the contiguity of development inside the urban growth boundary in four case study cities. This study adds to the existing literature on Oregon by examining the pattern of development of lands in the urbanizable areas inside UGBs in a variety of cities outside of the Portland metropolitan area.

Our research focuses on residential development in the urbanizable area inside UGBs. We focus on three key research questions: (a) How do cities manage growth in the urbanizable area through Urban Growth Management Agreements (UGMAs)?; (b) What is the rate and density of residential development within the urbanizable area between 1997 and 2012?; (c) What do city planners think about the effectiveness of the policies used to manage development in the urbanizable area (Urban Growth Management Agreements)?

We proceed as follows. In Section 2, we describe the policy context related to UGBs and the urbanizable area in Oregon. We describe how the urbanizable area is treated in Oregon statutes. In Section 3, we summarize previous literature on UGBs in Oregon. In Section 4, we describe materials and methods. We rely on content analysis of UGMAs, GIS analysis of development to examine the patterns of development in the urbanizable areas within UGBs, and a survey of planning directors. In Section 5, we describe results from content analysis of UGMAs, trends in development patterns, and survey results. In Section 6, we offer discussion and recommendations for minimizing low-density residential development in the urbanizable area. Finally, in Section 7, we offer conclusions. This study is important for cities in Oregon using UGBs to manage growth in addition to cities around the world using greenbelts, urban service areas, and UGBs to contain urban growth using containment policies.

2 | POLICY CONTEXT

In 1973, Oregon enacted the landmark land use legislation, Senate Bill 100 (codified in Oregon Revised Statutes Chapter 197, 2021). The legislation established the Land Conservation and Development Commission (LCDC), a seven-member panel appointed by the governor to establish land use policy, and the Department of Land Conservation and Development (DLCD), the state agency that implements the statewide planning program. Its iconic requirement is that every city establishes an urban growth boundary (UGB) to (a) protect resource (i.e., farm and forest) lands outside the UGB, and (b) encourage more efficient (denser) development patterns inside the boundary. Cities are required to provide enough land in the UGB to accommodate 20 years of population and employment growth. As such, most cities have substantial unincorporated areas within their UGBs. These lands inside the UGB are considered “urbanizable” and are reserved for future urban development. In Figure 1, we illustrate the schematic of these boundaries and convey a real example of city limits, urbanizable area, and underlying taxlot data (to illustrate our GIS analysis.).

From a procedural perspective, cities that incorporate must establish a municipal boundary (the city limit) and an urban growth boundary. Because UGBs are part of the comprehensive planning process and must include a 20-year land supply, establishing the boundary requires considerable technical analysis. Very few Oregon cities have a joint city limit/UGB. Most have unincorporated areas within the UGB that are managed by the county. These *urbanizable* lands are typically managed to limit development and retain a rural character until they are annexed, at which point urban development can occur.

In the context of the Oregon system, urban land is land within city limits that receives the full range of urban services. Urbanizable land—land between the city limit and UGB—generally does not receive urban services such as community wastewater treatment (though cities ultimately decide whether to extend services to urbanizable areas). The Oregon system intends these lands to be held in reserve for future urban development but does not preclude rural development patterns. In this context, urban land is intended for development at or close to urban densities as defined in city development codes. Lower density development of urban lands can result in higher per unit infrastructure costs and the need to expand the UGB more frequently (Nelson & Moore, 1996).

Several statewide planning goals, statutes, and administrative rules guide the management of lands in the urbanizable area. Goal 2 requires coordination between the city and county in comprehensive planning. Management of the “urbanizable area” (or unincorporated area inside the UGB) is thus guided by cooperative agreements between the city and the county which are designed to ensure that development actions or public service extensions that conflict with the city’s comprehensive plan will not occur in the urbanizable area within the UGB. These urban growth management agreements guide zoning and urban service provision in the urbanizable area inside the UGB. ORS 195.065 requires counties to develop agreements with service providers inside UGBs to specify roles and responsibilities for service provision. These so-called “urban growth management agreements” (UGMAs) typically require annexation of lands before they can receive urban services and develop at urban densities. Oregon Administrative Rule (OAR) 660-003-0010 requires cities to submit a plan for the management of the incorporated area within the UGB (Oregon Administrative Rule 660, 2021).

Oregon’s system of urbanization—the requirement for UGBs combined with municipal incorporated boundaries—is unique. Cities spend considerable effort and resources in establishing UGBs and working through the implications of servicing and developing land. That effort is all based on a presumption that urbanizable land will be annexed for development within the 20-year planning horizon to accommodate population growth and that the UGB will be periodically reviewed and expanded.

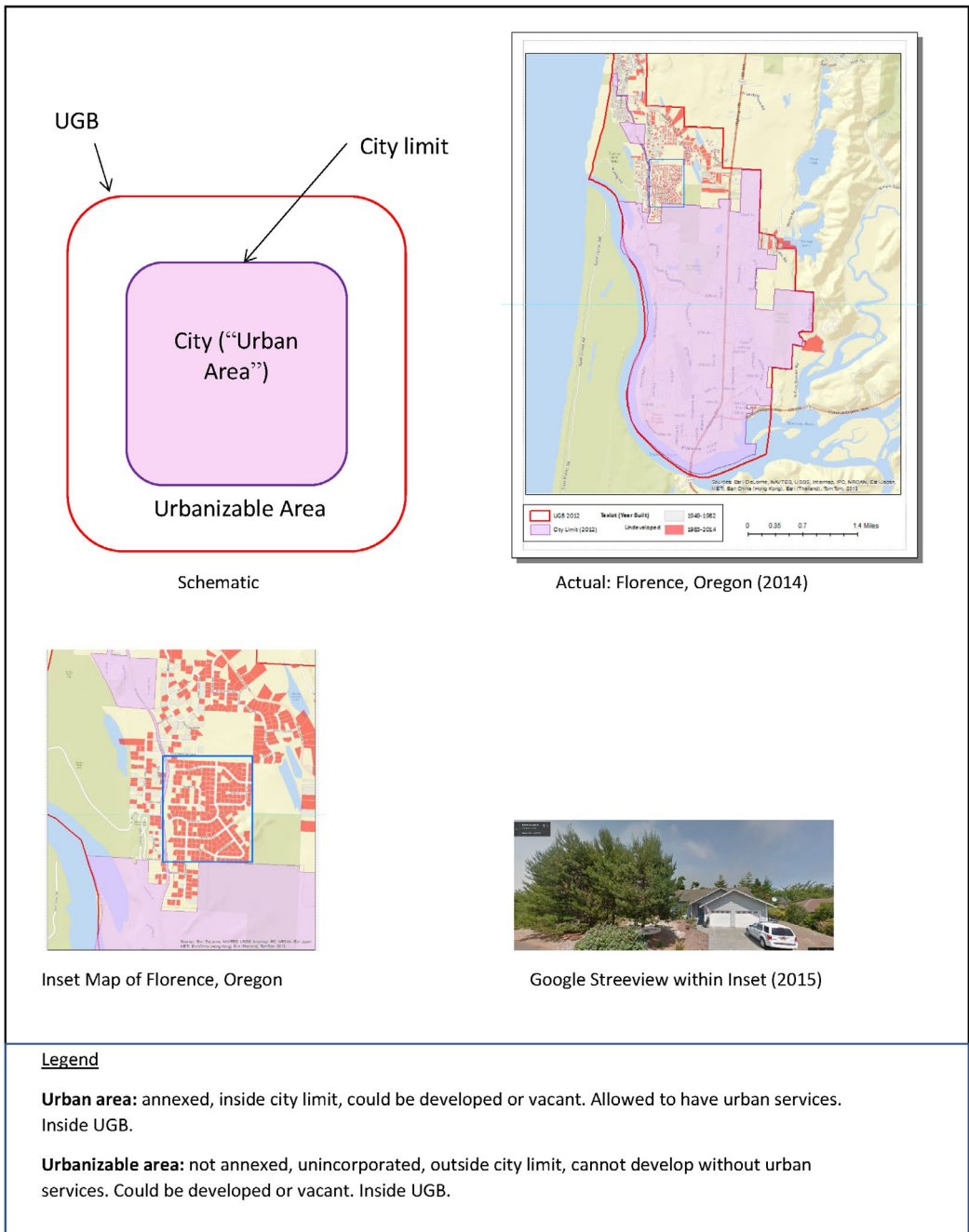


FIGURE 1 Depiction of urban growth boundary, urbanizable area and city limit (Schematic and example of Florence, Oregon). *Source:* Oregon Data Explorer, county taxlot and assessment data, Google Streetview, author's analysis

Development in the “urbanizable area” within the UGB is important for understanding how land is annexed into cities and how frequently cities need to expand their UGBs. If counties are approving permits for large-lot residential development in the urbanizable area before it is annexed and provided services, overall densities at full build-out in the urbanizable area may be lower than cities planned.

That could mean that cities cannot accommodate 20 years of population growth within boundaries and must add land to UGBs more frequently. Because the Oregon land use program prioritizes preserving farm and forest land, this could be detrimental to the overall intent of the statewide planning program. Further, this can negatively impact the rural communities beyond the UGBs, causing leapfrog development and impacting the economies of scale and viability of farming.

Large-lot residential development of urbanizable lands can frustrate efforts to achieve urban densities over the long term as owners of large-lots (1 acre or larger) may be reluctant to subdivide or annex their land (Parker et al., 2015). Moreover, the provision of services needed to support urban densities can become more difficult and expensive. Thus, an implicit objective of the Oregon system is to preserve urbanizable lands for future development at urban densities.

3 | LITERATURE REVIEW

This literature review is divided into three parts. First, we describe how development patterns influence landscapes and why fragmentation of landscapes is important for rural communities. Then, we describe the history and logic of managing growth with urban containment policies. Finally, we describe research on Oregon's use of urban growth boundaries and describe where our research fits into the existing literature.

3.1 | Development patterns and fragmentation

Uncontrolled development has been shown to have significant environmental consequences, particularly for environmentally sensitive lands and habitat. Fragmented development also negatively impacts the economies of scale and viability of agriculture. The environmental consequences of sprawl include: loss of environmentally fragile lands, reduced open space, greater pollution, higher energy consumption, decreased esthetic appeal of landscapes, loss of farmland, reduced diversity of species, increased stormwater runoff, increased risk of flooding, excessive removal of native vegetation, and ecosystem fragmentation (Johnson, 2001). Several scholars have examined how urban sprawl causes a decline in the extent and connectivity of wetlands and fragmentation of habitat (Buchanan & Acevedo, 1997; Civco et al., 2000; Croissant & Munroe, 2016).

Contiguous farmland is important to the economics of farming, explaining how urbanization causes nuisance complaints, increased property taxes, air pollution from automobiles, and the destruction of crops. (Nelson, 1992). Negative spillovers negatively influence the productivity of agriculture. But not all farmland losses are the result of lands converted to urban uses. In addition to direct conversion, higher population densities near farmland can reduce agricultural output due to reduced productivity of the remaining agricultural tracts. (Cornelius, 2000). Further, movement of non-farmers seeking rural lifestyles adversely affects agricultural outputs through decreased productivity.

As many cities and states recognize the negative consequences of uncontained development, including fragmentation, these governments have enacted policies to contain and manage growth.

3.2 | Managing growth with urban containment policies

Many policy options exist for containing growth in urban areas. Scholars identify three primary policies for containing growth: greenbelts, urban growth boundaries, and urban service areas

(Pendall et al., 2002). Greenbelts are a physical area of open space (like farm or forestland) that is intended to be a permanent barrier to urban expansion. Urban growth boundaries are dividing lines rather than physical spaces and separate urban from rural areas. Urban service areas designate where urban services (e.g., water and sewer) will not be provided, thus, limiting development by limiting the expansion of urban services. While urban service areas are designed to limit the expansion of urban services, the purpose of using greenbelts and urban growth boundaries to manage growth is: (a) to protect open space and (b) to separate urban land from rural land. Oregon uses urban growth boundaries to manage growth.

As discussed in the next section, Oregon relies on UGBs to contain growth, as well as strict development restrictions on lands outside UGBs, zoned for farm and forest use. Urban growth boundaries (UGBs) serve as a development stop line with the intent to divide urban land from rural land and accommodate urban growth without permitting urban sprawl (Knaap & Nelson, 1992). Unlike other growth management tools, UGBs are designed to manage the location of growth, not to limit growth (Knaap & Nelson, 1992). One of the reasons UGBs are an attractive growth management tool for cities relates to minimizing the fragmentation of farmland and natural landscapes.

Scholars have examined how UGBs have impacted development inside and outside of the boundary. In multiple countries, scholars have found evidence of the effectiveness of UGBs in containing and concentrating growth within UGBs (Carlson & Dierwechter, 2007; Gennaio et al., 2009). Despite the effectiveness at containing growth, some scholars note troubling trends in low-density development outside the boundary. Scholars call for better coordination and oversight of this zone (Gennaio et al., 2009).

Some scholars have examined whether boundaries cause spillovers in development, which may cause fragmentation in other areas. Several studies have found evidence of population spillover from the Portland, Oregon metropolitan area across the river to Clark County, Washington (Jun, 2004; Kim, 2013). Studies in other states like California and Maryland have suggested development spillovers as an outcome of uncoordinated local land use decisions as well (Byun et al., 2005; Towe et al., 2017).

3.3 | Managing growth in Oregon

Since Oregon's landmark legislation in 1973, there have been several studies on land value, housing affordability, and development patterns. Many of these studies focus on the Portland metropolitan area. Many studies of UGBs focus on land and housing value impacts rather than examining the rate and density of development inside UGBs. Since the mid-1980s, scholars have addressed the land market and housing markets inside and outside UGBs. Early studies showed a "dual land market," as land outside UGBs lost speculative value and prices dropped to values similar to agricultural land (Knaap, 1985; Nelson, 1986a). More recent studies examine housing values find no evidence of a significant price difference between housing prices inside and outside the UGB (Jun, 2006). The changes in housing prices are attributed to rapid growth in employment and income rather than the UGB (Phillips & Goodstein, 2000). Other scholars conclude that the relationship between containment programs like UGBs and housing prices is complex rather than unequivocal in impact. (Downs, 2002). These studies suggest that the UGB is not to blame for rising housing costs, but that it is important to consider adding land supply to the UGB to preserve affordability (Downs, 2002; Phillips & Goodstein, 2000).

A primary intent of Oregon's statewide planning program is preserving farm and forestland. Several studies have found that Oregon's UGBs are indeed effective at protecting forestland and

avoiding conversion to nonfarm uses (Kline, 2005; Nelson, 1986). However, the presence of small hobby farms elicits concerns about the viability of commercial farming (Daniels & Nelson, 1986; Gosnell et al. 2011). Further, Gosnell and colleagues (2011) suggest that empirical evidence on the impacts of farm and forestland is limited and studies on this topic may be methodologically weak. Therefore, more investigation is needed to determine whether the original goal of open land preservation has been met.

Nearly as soon as UGBs were drawn on maps, scholars began examining the impacts of UGBs on land values, housing prices, and farm and forestland protection. Much of the research conducted on Oregon's statewide program has focused on the Portland area (Downs, 2002; Jun, 2006; Knaap, 1985; Phillips & Goodstein, 2000). Debates continue on how and whether UGBs affect housing prices, but most literature affirms that the UGB is not the only factor affecting housing prices. Research on the impacts on farm and forestland has been more geographically diverse but falls short in considering how regional variation affects differences in policy and has leaned toward descriptive analysis (Gosnell et al., 2011). Much of the literature studies Portland and focuses on the impacts inside the UGB or outside the UGB while ignoring the gray areas of "exceptions lands" and "urbanizable lands," which are in between in terms of legal structure and density.

Few articles have discussed the development of the urbanizable area, but these existing studies provide a framework for examining development patterns in the urbanizable area. Below, we describe previous work relevant to our research questions. Early research on UGBs highlighted the importance of nonurban land inside UGBs and suggested that if development in urbanizable areas is not properly regulated, urban-scale development may not occur as planned and UGBs may need to be expanded sooner than anticipated (Knaap, 1985; Nelson, 1992; Nelson & Moore, 1996).

In one of the earliest studies of UGBs mentioned above, Knaap (1985) examined the price effects of UGBs on vacant single-family land in metropolitan Portland, finding that existing nonurban land has higher value than outside the UGB because of expectations about future urban zoning and future urban rents. Early research suggested that nonurban land inside UGBs will be prepared for conversion to urban use and used less intensively for nonurban use (Knaap, 1985).

Relevant to this work, Nelson (1992) offers a diagram to explain the various categories of land that exist in Oregon's UGBs (p. 480, Figure 5). As Nelson describes, "future urbanizable" land will be expected to be developed within 20 years but will not be developed until land inside the intermediate boundary (or city limit) is suitably developed. Nelson describes how minimum lot size zoning of at least 10 acres should apply to future urbanizable land to keep it in sizes and shapes to accommodate efficient future development. However, Nelson notes that urbanizable areas allow for subdivision of future urbanizable land into 1 or 2-acre tracts, which he notes may impact future urban development in these areas.

Two prior empirical studies on Oregon's UGBs and the urbanizable area are relevant to this work. One study used four case study cities between 1985 and 1989 to examine urban growth in four areas: (a) urban, (b) urbanizable, (c) urban fringe, and (d) exurban. The scholars divided the amount of development by category, reporting units developed and density per net acre. Examining Portland, Bend, Brookings, and Medford, the scholars found that density in urban areas fell considerably short of allowed densities. However, the study found that Portland and Medford were more effective at limiting land divisions and low-density development inside UGBs without urban service than Bend and Brookings (Nelson & Moore, 1996).

In the second study, scholars examine the contiguity of development inside the urban growth boundary (Weitz & Moore, 1998). This study examining the pattern of development inside the UGB in a variety of cities outside of the Portland metropolitan area including Florence, McMinnville, and Medford. Weitz and Moore (1998) found that the UGB alone was not a sufficient instrument to

achieve urban form desired within Oregon's statewide goals. Florence showed leapfrog development while McMinnville and Medford showed string development; the authors note that these patterns are counter to the goals of the Oregon program. The authors explain that topography and environmental constraints generally explain the noncontiguous development patterns in the three cities but the authors did not study how policies affected development patterns. The authors recommend stronger tools for urban growth management within UGBs to encourage contiguous, compact development.

Previous research on development in the urbanizable area has clearly outlined the problems caused by low-density development in urbanizable areas, but previous research was case study based and focused on the period immediately after Oregon's landmark program went into effect. This study provides an update of early studies in the 1990s and expands the cities and regions considered. Additionally, this study expands the methods of earlier studies by relying on content analysis of policies (UGMAs), GIS analysis of development, and a survey of planning directors.

4 | FRAMEWORK: STUDY AREA, MATERIALS, AND METHODS

Managing growth in the urbanizable area is important so that cities can maintain large parcels in the urbanizable area, thus, allowing a logical expansion of city limits and UGBs over time, and to prevent landscape fragmentation and leapfrogging of development. We are interested in how cities are managing growth in the urbanizable area, how much development has occurred, and how the effectiveness of growth management is perceived by professionals.

This research focuses on development in the urbanizable areas within Oregon. We use data from 29 cities in five counties to address our research questions. Our research questions are threefold:

1. How do cities manage growth in the urbanizable area through Urban Growth Management Agreements (UGMAs)?
2. What is the rate and density of residential development within the urbanizable area between 1997 and 2012?
3. What do planners think about the effectiveness of UGMAs?

For this analysis, we define the "urbanizable area" as lands outside municipal boundaries (city limits) within the UGB (see Figure 1).

We focus on cities in five Oregon counties outside of the Portland metropolitan area including Deschutes, Jackson, Lane, Linn, and Marion. To provide context related to our case study counties, population, land area, region, and growth rates from 1990 to 2010 for these five counties are summarized in Table 1 and compared to the percent change in the state's population and counties outside of the Portland Metro region. These counties are the five largest counties in population outside of Portland Metro (as of the 2010 Census). Our sample includes the two largest cities in the state outside of Portland (Eugene and Salem) and includes the fast-growing central Oregon County of Deschutes and includes cities in the Central Coastal region (Florence). We examine UGMAs and GIS data for 1996 and 2012 for 29 of the 47 cities within these counties. We administered the survey to all cities in the state, but only report results from case study cities. We omitted cities that were under a population of 5,000 and had an average annual growth rate of less than 1% between 1993 and 2012 (faster growing cities <5,000 are included in the study). We also omitted cities for which UGMAs were not available.

TABLE 1 Case study counties

Geographic area	Land area (Sq. Mi.)	Region	1990	2000	2010	% Change in population 1990–2010 (%)
Oregon	95,988		2,842,321	3,421,436	3,831,074	35
Outside of Portland metro counties	92,962		1,668,030	1,977,217	2,190,038	31
Deschutes county	3,018	Central	74,958	115,367	157,733	110
Jackson county	2,784	Southern	146,389	181,273	203,206	39
Lane county	4,553	Willamette Valley/ Central Coastal	282,912	322,977	351,715	24
Linn county	2,291	Willamette Valley	91,227	103,069	116,672	28
Marion county	1,181	Willamette Valley	228,483	284,838	315,335	38

Source: U.S. Census, 2012; Portland state university population estimates, 2018.

To investigate development patterns in urbanizable areas within Oregon, we rely on three methods and data sources: (a) content analysis of Urban Growth Management Agreements, (b) spatial analysis of GIS data showing development in the urbanizable area, and (c) a survey administered to planning directors in the case study cities.

4.1 | Urban growth management agreements

Goal 2 (Land Use) of Oregon's statewide planning program requires coordination among local governments in the adoption and implementation of comprehensive land use plans. Goal 14 requires municipalities to adopt an urban growth boundary (UGB) as a cooperative process: "Establishment and change of urban growth boundaries shall be a cooperative process among cities, counties and, where applicable, regional governments." The UGB requirement creates a unique relationship between counties and municipalities: land inside the boundary is slated for future urbanization but is under county jurisdiction because it is outside the incorporated municipal boundary.

Thus, the Oregon system presents a coordination dilemma. Land in the urbanizable area is zoned and managed by counties. The objectives of these two local government entities are frequently at odds—cities want efficient development patterns and services built to city standards; counties do not necessarily share the objective of efficient development (nor do private property owners within unincorporated areas of UGBs).

To address what is ultimately a key growth management issue, many cities and counties have entered into Urban Growth Management Agreements (UGMAs). These agreements are broadly enabled by ORS Chapter 190, which grants authority of local governments to enter into intergovernmental agreements. Using web-search and contacting planning staff, we obtained urban growth management agreements for the 29 case study cities in our five case study counties. The "case study sample" cities are summarized in Table 2. We read and coded UGMAs for specific criteria based on guidance from Nelson and Moore (1996).

Nelson and Moore (1996) identified two key issues related to development in the urbanizable areas within UGBs: (a) that urban land should be developed at or close to allowable densities; and (b) low-density development can create issues with efficient future use of land and stifle the expansion of urban services. Nelson and Moore identify several policies that may improve the efficiency of land use and land use patterns in urbanizable areas:

- Establishing urban reserves that identify a 50-year supply of land.
- Minimum lot size standards.
- Minimum density standards.
- Consideration of the location of future urban service.
- Establishing public facility requirements for land divisions.
- Prohibiting single-family housing on land designated for multifamily housing.
- Establishing minimum and maximum densities for multifamily housing.

We use the Nelson and Moore policies as a framework for review of UGMAs. We identified additional growth management policies/strategies codified in state rules and through preliminary review of UGMAs. As a part of the review, we identified several other common elements of UGMAs which we document in the analysis.

After developing the list of growth management policies/strategies based on Nelson and Moore, we developed a coding system for the review. The review was based on nominal and ordinal scales to

TABLE 2 Case study sample cities

City	County	Region	Population Class	Population (2012)
Bend	Deschutes County	Central Oregon	>50,000	77,455
Redmond	Deschutes County	Central Oregon	25,000–49,999	26,345
Ashland	Jackson County	Southern Oregon	10,000–24,999	20,325
Central Point	Jackson County	Southern Oregon	10,000–24,999	17,275
Eagle Point	Jackson County	Southern Oregon	5,000–9,999	8,550
Medford	Jackson County	Southern Oregon	>50,000	75,545
Phoenix	Jackson County	Southern Oregon	1,000–4,999	4,570
Shady Cove	Jackson County	Southern Oregon	1,000–4,999	2,920
Coburg	Lane County	Willamette Valley	1,000–4,999	1,045
Cottage Grove	Lane County	Willamette Valley	5,000–9,999	9,770
Creswell	Lane County	Willamette Valley	1,000–4,999	4,990
Eugene	Lane County	Willamette Valley	>50,000	158,335
Florence	Lane County	South Coastal Oregon	5,000–9,999	8,470
Junction City	Lane County	Willamette Valley	5,000–9,999	5,445
Springfield	Lane County	Willamette Valley	>50,000	59,840
Veneta	Lane County	Willamette Valley	1,000–4,999	4,610
Albany	Linn County	Willamette Valley	25,000–49,999	50,710
Harrisburg	Linn County	Willamette Valley	1,000–4,999	3,630
Scio	Linn County	Willamette Valley	<1,000	830
Aumsville	Marion County	Willamette Valley	1,000–4,999	3,700
Aurora	Marion County	Willamette Valley	<1,000	930
Gervais	Marion County	Willamette Valley	<1,000	2,520
Hubbard	Marion County	Willamette Valley	1,000–4,999	3,185
Jefferson	Marion County	Willamette Valley	1,000–4,999	3,140
Salem	Marion County	Willamette Valley	>50,000	156,455
Stayton	Marion County	Willamette Valley	5,000–9,999	7,660
Sublimity	Marion County	Willamette Valley	1,000–4,999	2,680
Turner	Marion County	Willamette Valley	1,000–4,999	1,865
Woodburn	Marion County	Willamette Valley	10,000–24,999	24,090

Note: We omitted cities that were under a population of 5,000 and had an average annual growth rate of less than 1% between 1993 and 2012.

Source: Portland state University population estimates, 2018; DLCD regions.

examine whether the policy or strategy was incorporated into the UGMA. We followed guidance for plan quality evaluation from the planning literature (Berke & Godschalk, 2009; Stevens et al., 2014). Two independent coders examined each of the 29 UGMAs for 22 distinct elements. We examined UGMAs for each city and report results by county due to consistency within counties. Coders established a coding sheet with guidance about interpreting each element and then convened after analyzing a sample of plans from each county to ensure a consistent approach to coding. The reviewers refined the coding criteria to reflect the different approaches reflected in different counties. After coding all

29 UGMAs, coders met to reconcile differences and generate the final data set. Coders compared independent results, discussed points of disagreement, and referred to documents to determine which score should be recoded. UGMA's used widely different language and approaches to address some of the elements. These elements were areas where more disagreement existed (e.g., allowing outright use in county zones without city review and defining transition of services). Prior to reconciliation, we assessed intercoder reliability using percentage agreement (100% to 69% by item with average of 91.7%) and Krippendorff's alpha on an item-by-item basis (range 1.0 to -0.16 with average of 0.81). Consistent with Lyles et al. (2014), we opted to keep lower scoring items because of policy importance and the results of reconciliation. The overall 91.7% agreement is within the range reported in plan quality studies. (Berke & Godschalk, 2009; Berke et al., 2015).

4.2 | GIS data

GIS data are foundational in this analysis and came from a variety of sources. Administrative boundaries including city limits and UGBs were obtained from the Oregon Spatial Explorer and created by the Oregon Department of Transportation. Statewide zoning data were obtained from the Department of Land Conservation and Development. Characteristics about the land base including flood zones, hydrology, slope, and wetlands were obtained from the Department of Land Conservation and Development, National Hydrography Dataset, U.S. Geological Survey, and National Wetlands Inventory. County Tax Assessor's data for 2012 was obtained from individual tax assessors. We standardized county taxlot data to be comparable across counties.

For the five case study counties, we obtained historic zoning and parcel data from the mid-1990s to examine trends in parcelization and changes in zoning over time. We use 1996 because that was the earliest date GIS data were available. These counties include Deschutes, Jackson, Linn, Lane, and Marion counties. Figure 1 shows a schematic of urbanizable land, UGBs, and city limits next to the city of Florence GIS data to illustrate the underlying GIS analysis. We include an inset map to convey development patterns and a Google Streetview image to convey development style within the urbanizable area.

Our analysis focuses on residential development and uses "Unprohibitive" parcel area as the denominator to obtain measures of density. Prohibitive acres are defined as floodways and water features. "Unprohibitive" acres are acres remaining after subtracting floodways and water features.

4.3 | Survey of city staff

We administered an online survey of planning directors (or city managers) through Qualtrics during the Spring of 2015 with assistance from the Oregon City Planning Directors Association and the League of Oregon Cities. The survey was administered to all Oregon cities outside of Portland Metro, but we only report results for our case study cities. Most smaller cities in Oregon do not have planning staff; for those cities, we solicited responses from city managers, administrators, or clerks. The purpose of the survey was to gather information about: (a) UGB expansion; (b) annexation; and (c) development on rural residential lands. Additionally, the survey included Likert scale questions about development in unincorporated areas and urban growth management agreements. We received responses from 17 of the 29 cities in the study. We acknowledge that our findings are limited by sample size. Our statewide survey yielded 111 responses (a 51% response rate) and provided results

consistent with those shown in Table 5. In order to maintain consistency with our GIS and content analysis results, we only report findings from the 17 of 29 cities within our case study counties.

5 | FINDINGS

We first describe the content analysis of the policies used to manage growth (UGMAs.) Then, we describe the rate and density of development in the urbanizable area, annexed area, and city limit. We also describe trends in parcelization within the urbanizable area. Finally, we report survey results from our survey of planning directors.

5.1 | Managing growth in the urbanizable area

Oregon's statewide planning program requires cities and counties to draft agreements that guide the management of land inside the UGB but not yet annexed to city limits. We examined UGMAs for the presence of features that Nelson (1992) described as critical components for ensuring a logical transition to urban land. Nelson noted that minimum lot size zoning of 10 acres should be used in future urban zones (both inside and outside the UGB, including the urbanizable area) to keep it in the appropriate shape and size to facilitate efficient future development (Nelson, 1992).

Urban growth management agreements (UGMAs) provide a platform for cities and counties to establish growth management policies that preserve land in urbanizable areas for future urban uses. The authors collected UGMAs from the 29 case study cities and analyzed the agreements for growth management elements consistent with those recommended by Nelson and Moore, as well as additional elements that were common across UGMAs.

Table 3 summarizes findings from the analysis of UGMA growth management elements. The results are organized by county and the percentages are calculated by county as well as for all case study cities. One observation is that UGMAs show some degree of consistency within counties. This may be because many of the UGMAs were developed during similar time periods and follow similar templates (e.g., Lane County UGMAs were all adopted in 2002).

Despite the consistency in some areas of the agreements (e.g., applying county zoning in urbanizable areas), the review shows that cities and counties have a broad range of differences in growth management strategies incorporated into UGMAs.

For annexation requirements, cities in Deschutes and Jackson counties showed a higher incidence of policies that address annexation. For example, 100% of the cities in Deschutes County and 67% in Jackson County have requirements for annexation before providing urban services. Two-thirds of the cities in Jackson County encourage development in the city limit before annexing land from the urbanizable area.

Most UGMAs included provisions related to zoning, land use, or land divisions. For zoning, all of the cities apply county zoning to urbanizable lands. This reflects the importance of counties in overseeing the development inside the urbanizable area. From a growth management perspective, this partially addresses Nelson and Moore's recommendations related to minimum lot sizes. In Oregon, lands zoned Exclusive Farm Use (EFU) typically have large minimum lot sizes (20 to 80 acres). So-called "exception" lands (lands that were granted exceptions to statewide planning goals 3 and 4: forest and agricultural lands) are rural residential, commercial, or industrial and tend to have less stringent development standards and are smaller. Both cities reviewed in Deschutes County have a requirement that the county adopts the city plan designations in the urbanizable area. This presumably ensures

TABLE 3 Analysis of urban growth management agreements (UGMA) growth management elements

Urban growth management agreement (UGMA) elements	Deschutes	Jackson	Lane	Linn	Marion	Total
	<i>n</i> = 2 (%)	<i>n</i> = 6 (%)	<i>n</i> = 8 (%)	<i>n</i> = 3 (%)	<i>n</i> = 10 (%)	<i>n</i> = 29 (%)
Statement of purpose/intent	100	17	25	0	20	17
<i>Annexation related</i>						
Annexation requirement to build at urban densities	0	67	13	0	90	48
Annexation requirement for providing urban services	100	67	0	0	90	52
Allows delayed annexations (because of service deficiencies)	0	50	0	33	0	10
Encourages development in city limit before annexation	0	100	0	0	50	0
<i>Zoning, land use, and land division</i>						
Restrictions on land divisions	0	17	0	0	10	3
Holding zones or plan designations/rezoning	0	17	13	0	10	10
Applies existing county zones	100	100	100	100	90	3
Explicitly establishes minimum lot sizes (beyond county zoning)	0	17	0	0	0	3
City/county land designations (does county have to adopt city land designation)	100	0	13	0	10	14
Urban Fringe (outside Urban Growth Boundary (UGB)) area or requirements	100	50	0	100	20	34
Requires deed disclosure for properties in UGB/Urban Reserve Area (URA) for future urban development	0	0	0	0	0	0
<i>Service provision</i>						
Requires service districts be consulted	100	17	0	33	10	10
Discourages establishment of new service districts in UGB	0	0	0	0	0	0
Defines transition of services	0	17	0	0	0	7
<i>Procedural requirements</i>						
Defines planning authority	100	100	25	67	100	79
Comp plan amendments (city and county)	100	100	100	100	50	86
Requires development proposal/concept plan	50	17	0	33	0	7
Allows outright use in county zones without city review	0	0	75	0	0	3
Joint Policies`	50	33	13	33	0	14

(Continues)

TABLE 3 (Continued)

	Deschutes	Jackson	Lane	Linn	Marion	Total
Urban growth management agreement (UGMA) elements	<i>n</i> = 2 (%)	<i>n</i> = 6 (%)	<i>n</i> = 8 (%)	<i>n</i> = 3 (%)	<i>n</i> = 10 (%)	<i>n</i> = 29 (%)
Requires notification to other local government agencies	100	100	100	100	100	100
Transfers Authority for land use review in the urbanizable area	50	0	25	0	0	

Note: Percentages reflect the share of cities within a county adopting policies, coded as Y/N.

development is consistent with the city's comprehensive plan. Cities in Deschutes and Linn County also had a higher incidence of policies that focus on the urban fringe (the area outside, but adjacent to the UGB). Few cities had minimum lot size policies outside of county zoning requirements.

The next set of UGMA requirements focused on policies related to public services. UGMAs were mostly silent on these requirements, possibly because other parts of the Oregon land use system require coordination and notification of service providers. One exception was that all of the cities in Deschutes County required consultation with service districts.

The final set of requirements focuses on procedural requirements. The results indicate that most UGMAs include key procedural elements such as requiring notification, establishing planning authority, and procedures for plan amendments. Very few UGMAs transfer planning authority to cities or establish joint policies. Moreover, surprisingly few UGMAs included a purpose statement.

The review of growth management elements in UGMAs suggests that few cities and counties go beyond the basic policies embedded in the Oregon land use system.

5.2 | Trends in development

In this section, we summarize GIS data that conveys development trends in the urbanizable area, parcelization in the urbanizable area, the density of land annexed into city limits, and the density of residential development overall.

Figure 2 shows the density of residential development of urbanizable lands within UGBs after 1950. We show density since 1950 to convey the drop in density upon implementation of the statewide planning program. Previous scholars (Gosnell et al., 2011) convey the importance of studying trends over decades. Density in urbanizable areas dropped from about 3.3 units per acre to 1.7 units per acre on average between the 1970s and 1980s. Across all counties, density generally decreased in the 1980s but rose in many counties after the 1990s. This was particularly evident in Jackson County where density rose from 0.5 units per acre in the 1990s to 3.5 units per acre in by 2010.

Figure 3 shows the number of residential units built on urbanizable lands within UGBs after 1950. This graphic shows a drop in density upon implementation of the statewide planning program. The total number of units developed across the five counties fell from 6,434 units in the 1970s to 1,066 units in the 1980s. Development rose slightly overall in the 1990s and 2000s. Development in Marion County and Lane County constituted 94% of all development in the urbanizable area among these five counties.

Figures 2 and 3 clearly illustrate trends across decades. However, it is also interesting to examine trends in smaller increments after the statewide planning program went into effect. Table 4 shows the total number of parcels and acres developed and density (all densities are measured in dwelling

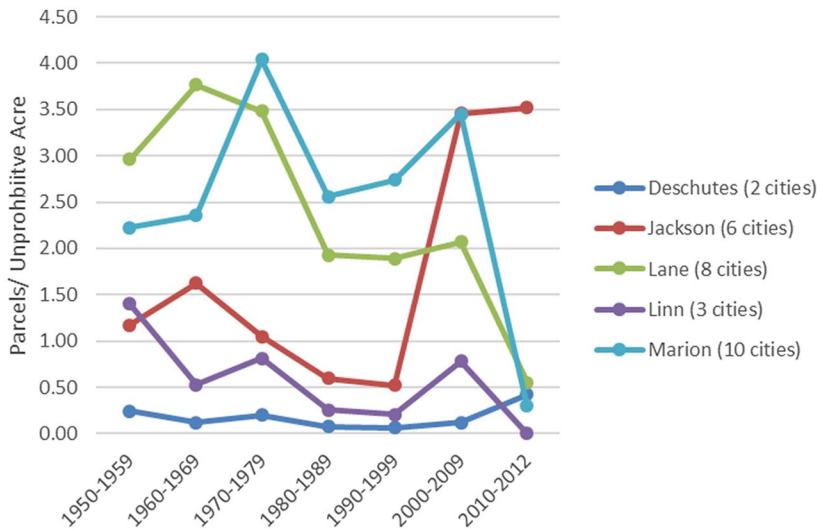


FIGURE 2 Average density of parcels (Dwelling Unit/Acre) developed in the urbanizable land by decade, 1950–2012, by county, case study cities. *Source:* Oregon Explorer; county tax lot and assessment data; analysis by University of Oregon. *Description:* Count of Parcels (Residential Classifications. Data is filtered on Year Built, Improved and General Land Classification. The Year Built Filter excludes Null and 0. Improved: property classification code improved AND assessed improved value >\$10,000. Includes Property Classification Farm, Forest, Multifamily, Residential and Tract

units per acre) in the urbanizable area (always urbanizable), annexed area (annexed between 1996 and 2012), and within city limit (inside city limit as of 1996) by county for 1997–2012. The availability of county GIS files necessitated looking at 1996–2012 so we could examine which land was added to city limits between 1996 and 2012.

In considering development in the urbanizable area, the amount of development in Deschutes and Linn counties was much lower overall while development in Lane and Marion counties was much higher overall. Densities in Jackson and Marion counties were the highest for urbanizable areas at around 2 units per acre while densities of residential development in Deschutes and Linn counties were the lowest.

It is useful to compare residential density inside city limits to density outside city limits to understand the difference in urban versus urbanizable area density. As expected, density inside city limits was three times higher than density in the urbanizable area, on average.

Oregon's statewide planning program relies on annexation to add land to city limits to develop with urban services at urban densities. Thus, examining the density of land that was annexed into city limits compared to land already inside city limits provides a useful analysis of the efficiency of development on annexed lands to understand whether the land in the urbanizable area is being used efficiently. This analysis focuses on the density of land that was unincorporated (in the urbanizable area) in the 1990s but was annexed to cities between 1996 and 2012. Table 4 shows the density of annexed parcels versus parcels already inside city limits over the time period. As shown in Table 4, the density of annexed parcels was consistently higher than land already inside city limits across all city sizes. This illustrates that land annexed between 1996 and 2012 was not constrained in density because of fragmentation in the urbanizable area. These data show that annexing land to city limits achieves urban densities, compared to the low-density development that occurs in the urbanizable area. Overall, more parcels

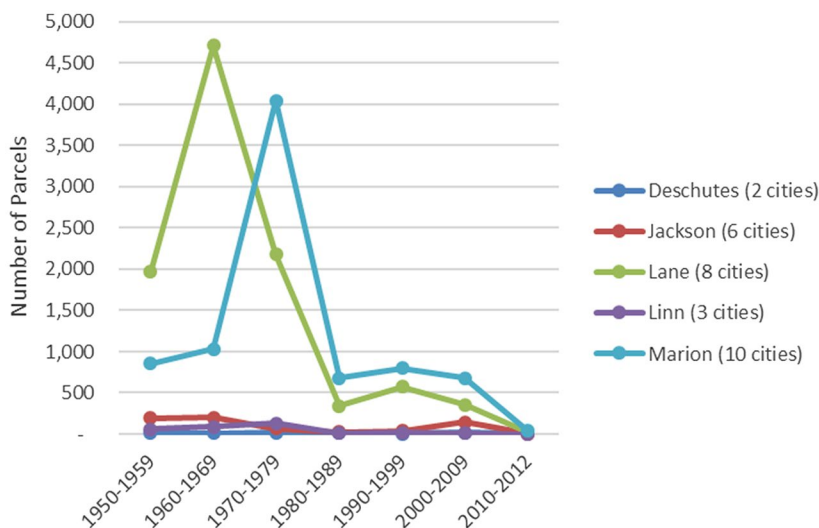


FIGURE 3 Number of parcels developed in the urbanizable land by decade, 1950–2012 by county, case study cities. *Source:* Oregon Explorer; county tax lot and assessment data; analysis by AUTHORS. *Description:* Count of Parcels (Residential Classifications)/Unprohibitive Acres. Data is filtered on Year Built, Improved and General Land Classification. The Year Built Filter excludes Null and 0. Improved: property classification code improved AND assessed improved value >\$10,000. Includes Property Classification Farm, Forest, Multifamily, Residential and Tract

were developed on land that was annexed (greenfield) than inside city limits (infill) between 1997 and 2012.

We examined the number of parcels created through subdivision by parcel size class. In total, 644 new parcels were created in urbanizable areas. Residential development constitutes the largest land use type when examining the number of parcels (rather than land area.) Most new parcels created were between 0.5 acre and 5 acres in size (53%). Parcels of this size represent large-lot farmette or estate development. The largest single category of parcels developed (23%) was over 20 acres in size, indicative of subdividing of larger parcels. However, the majority of all parcels (60%) in 1996 and 2012 in the urbanizable area are less than 12,000 square feet.

Overall, we find that development continues at low densities in the urbanizable area, especially in two counties: Lane and Marion. Across the five counties, development in the urbanizable area accounts for 2% of the parcels developed between 1997 and 2012 and 10% of the land developed between 1997 and 2012 inside the UGB in these counties. Densities of land that are annexed and were already inside city limits were much higher overall. The trends in development point to issues in managing development inside the urbanizable area to ensure that development occurs at urban densities—especially in two counties. In the next section, we consider perceptions of planners regarding development in urbanizable areas.

5.3 | Perceptions of UGMAs

We administered an online survey to better understand the experience of local planners. The survey asked a series of questions about how cities manage growth in unincorporated areas of the UGB and respondents' perceptions of the impact of development in the urbanizable area. We received responses

TABLE 4 Residential development in urbanizable, annexed, and existing city limits, 1997–2012

County	Cities	Urbanizable			Annexed after 1996			Inside CL in 1996		
		Parcels	Unpro. Acres	Parcels/Acres	Parcels	Unpro. Acres	Parcels/Acres	Parcels	Unpro. Acres	Parcels/Acres
Deschutes	2	31	259.92	0.12	13,270	2,485.55	5.34	6,476	1,639.73	3.95
Jackson	6	163	75.56	2.16	5,590	976.70	5.72	5,664	1,081.62	5.24
Lane	8	522	281.61	1.85	6,827	1,226.47	5.57	8,080	1,550.56	5.21
Linn	3	94	160.47	0.59	1,145	182.13	6.29	2,530	494.41	5.12
M Marion	10	948	430.57	2.20	4,231	763.73	5.54	5,447	1,126.74	4.83
Total	29	1,758	1,208.13	1.46	31,063	5,634.59	5.51	28,197	5,893.05	4.78

Bold for the density and the totals.

Description: Count of Parcels (Residential Classifications. Data are filtered on Year Built, Improved and General Land Classification. The Year Built Filter excludes Null and 0. Improved; property classification code improved AND assessed improved value >\$10,000. Includes Property Classification Farm, Forest, Multifamily, Residential, and Tract.

Source: Oregon Explorer; county taxlot and assessment data; analysis by AUTHORS.

TABLE 5 Level of agreement or disagreement with statements related to development in unincorporated areas of UGBs

Statement	Strongly disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)	Number of responses
Residential development in unincorporated areas reduces the potential for future urban level development	0	12	24	53	12	17
Our urban growth management agreement adequately manages residential development in the unincorporated areas of the UGB	0	14	36	50	0	14
Residential development in the unincorporated area of the UGB does not create any significant problems	7	47	13	33	0	15

from between 14 and 17 of the 29 case study cities (or between 48% and 59% of the case study cities—not all respondents answered each question). Most respondents (81% of 16) indicated that they do not monitor development in unincorporated areas of the UGB. As a follow-up question, the survey asked if they had residential development in unincorporated areas of the UGB. Of the 15 responses to this question, 13% indicated yes, 47% no, and 40% did not know. Our analysis shows that 55% of cities had some development in the urbanizable area between 2007 and 2012. Cities cede authority to county zoning for land within their UGB which speaks to a policy problem in regulating the urbanizable area within the UGB.

In surveying planning directors, we asked respondents to indicate their level of agreement or disagreement (on a 1–5 scale) with three statements that relate to the impact of residential development in unincorporated areas on UGB expansion. Specifically, we asked respondents to indicate their level of agreement or disagreement with the following statements:

- Residential development in unincorporated areas reduces the potential for future urban level development;
- Our urban growth management agreement adequately manages residential development in the unincorporated areas of the UGB; and
- Residential development in the unincorporated area of the UGB does not create any significant problems.

As shown in Table 5, 65% of respondents either agreed or strongly agreed that residential development in unincorporated areas reduces the potential for future urban development, while 12% disagreed (no respondents strongly disagreed with this statement). Fifty percent of respondents either agreed or strongly agreed that urban growth management agreements adequately managed development in unincorporated areas. Thirty-three percent indicated that residential development in unincorporated areas did not provide significant problems, while 54% indicated that residential development in unincorporated areas creates issues.

6 | DISCUSSION

The subject of development in the urbanizable area is not a new topic for scholars. Early studies of UGBs in Oregon examined case studies of development and offered suggestions for efficiently using the urbanizable area. However, in the 40 years since the creation of UGBs in Oregon, there has not yet been a comprehensive examination of development patterns in the urbanizable area. While Nelson and Moore (1996) and Weitz and Moore (1998) offered case studies of development in select Oregon cities in the 1990s, such analysis has not been produced in more than 20 years. This study offers the first broad, recent look at development patterns on the urbanizable area in Oregon cities. Now that Oregon's landmark UGB legislation has been in effect for over 40 years, it is necessary to consider how land is being used inside UGBs.

In summary, early scholars warned that development in the urbanizable area may pose challenges for cities by using land less efficiently, ramping up the cost of services, and requiring more frequent expansions of UGBs.

Our analysis shows that development in the urbanizable area varies across counties and occurs at low densities. Though development in the urbanizable area dropped significantly after the Statewide Planning Program went into effect, development continues in the urbanizable area. Though

development in the urbanizable area only constitutes 3% of total development, on average, the density of development is significantly lower than density inside city limits.

Though the average density of development is around one to two units per acre, lots of this size subdivide infrequently, subverting the potential for higher density when the land is needed for development. Parker and colleagues (2015) show that lots under 2 acres are much less likely to divide and develop at urban densities than lots over 2 acres. Further, because of low-density development in the urbanizable area, infrastructure costs may increase, and urban development may leapfrog over low-density development inside the existing UGB. Nelson and Moore (1996) concluded that if low-density development continues in the urbanizable area, it can lead to more frequent expansion of the UGB. Since that paper was written, UGB expansion in Oregon has become more contentious and litigious. Some cities have been in litigation for over 20 years, and some have given up on the process. At the same time, voter approved-annexations make it difficult to bring land into the boundaries. That makes management of these areas even more important.

Tables and graphics in previous sections explain the trends in the rate and density of development in the urbanizable area over the last several decades but do not explain why development is occurring inside the urbanizable area. The amount of development and density of development in the urbanizable area varies tremendously across cities and counties within the state. Marion and Lane counties constituted 94% of the parcels developed in urbanizable areas in case study cities. This suggests that growth management strategies in urbanizable areas are limiting development in three of the five study counties. Underlying these findings, we find evidence of Nelson (1986b) warning that Oregon failed to plan for rural residential development, despite the appetite for this type of development.

We examined UGMAs to try to understand why some cities and counties experience more low-density development in the urbanizable area than others. Our review of UGMAs shows that cities rarely use minimum lot sizes or prevent development at urban densities. Informal conversations with planners indicate that zoning, annexation policies, and historical characteristics may play a role in these trends. But, it is difficult to generalize on the extent to which UGMA policies affect the rate and type of development in urbanizable areas. Development is clearly occurring in these areas, particularly in Lane and Marion counties—two counties where cities have relatively few UGMA policies. Our findings speak to jurisdictional challenges in relying on county zoning within the UGBs, and a broader city-county coordination issue that relates back to UGMA policy. Development in urbanizable areas, however, is affected by many factors, including legacy development patterns and zoning.

6.1 | Recommendations

Based on our initial examination of trends in development in the urbanizable area and evaluation of UGMAs, we offer some recommendations for the management of land in the urbanizable area.

- Cities and counties should consider UGMAs to be tools for more than notification of development activities in the city/county. Our review of UGMAs suggests that few go further than this role. The potential implications for infrastructure costs alone should be sufficient motivation for cities to demand stronger growth management policies in UGMAs.
- The state Department of Land Conservation and Development should encourage or require cities to update UGMAs with stronger growth management provisions that give cities more oversight over land inside the UGB. Cities with the strongest provisions require annexation of land before most development in the urbanizable area. It is important for annexation to occur before parcelization

occurs. This strategy will not help cities that have allowed low-density development in the urbanizable area.

- The state Department of Land Conservation and Development should consider adopting an administrative rule requirement that cities must review their UGMAs as a component of any UGB amendment.
- Cities should amend UGMAs to create Future Urban Zones—holding zones (not necessarily annexation master plans) or stronger UGMA requirements for development in the urbanizable area. Conversely, the state could require cities/counties to adopt Future Urban Zones—zones that would provide stricter limitations on development and service extensions in the urbanizable area. We recommend these zones establish minimum lot sizes of at least 10 acres consistent with Nelson's recommendation.
- Cities should develop stronger monitoring programs—both in the urbanizable area within city limits. The vast majority of cities in our study do not monitor development in the urbanizable area and as a result, have no actionable data on land use activities other than individual building permits or other actions.
- In jurisdictions where service providers exist, cities should coordinate more closely with urban service providers to develop agreements that strictly limit the extension of services into urbanizable areas. This is already required by ORS 195.060 and would be interesting follow-up research to this effort.

7 | CONCLUSIONS

Urban growth boundaries are an instrument for managing and containing growth to prevent landscape fragmentation and preserve farm and forestland. In Oregon, UGBs have been used for over 40 years to manage growth. As designed, the Oregon program requires UGBs to include adequate land supply to accommodate 20 years of population and employment growth. But not all land inside UGBs is immediately available for development at urban densities. Land is supposed to be annexed to city limits before it is developed at urban densities. The “urbanizable area” thus serves as a holding zone for future development at urban densities. Cities and counties manage land in the “urbanizable area” using Urban Growth Management Agreements. How development occurs in the urbanizable area is crucial to the effectiveness of using a UGB to manage growth. If land is developed at low densities and parcelized in the urbanizable area, the UGB may need to be expanded to accommodate new population growth. This may cause leapfrog development and negatively influence rural communities and the economic viability of agriculture.

This study examined how 29 case study cities in five counties are managing growth in the urbanizable area, described trends in development in the urbanizable area, and presented a survey of planners from case study cities. We found that key elements addressed in UGMAs are relatively consistent within counties, but the strength of UGMAs varies across counties. For example, some cities require annexation before developing at urban densities or apply city zoning to the urbanizable area. Other cities are much less restrictive about annexation requirements before building at urban densities and lot size. It is important for annexation to occur before parcelization into 2-acre lots occurs. In general, the agreements in Lane and Marion counties are much weaker than Deschutes, Linn, or Jackson counties. Our GIS data reflected the difference in policy across counties. Development occurs at lower densities in the urbanizable area than inside the UGB. Although total development in the urbanizable area fell after the Statewide Planning Program went in place, development and parcelization continue in the urbanizable area. Lands that are annexed or were already in the city limit are developing at much higher

densities. Further, our survey of planners shows that most planners are not aware of development occurring in the urbanizable area, and only half thought UGMAs were effective instruments. Most planners thought development in the urbanizable area creates significant problems for managing growth.

We provide evidence of exurban development inside the UGB in Oregon in “urbanizable” lands, particularly in certain counties. These findings have important implications for planners and policy makers in Oregon in addition to other cities around the world using boundaries to contain urban growth. By failing to curb nonurban growth inside the urbanizable area, cities may need to expand UGBs more frequently and may cause further fragmentation of the landscape. Moreover, cities may find themselves with considerable financial obligations to upgrade infrastructure to city standards. We found that most UGMAs were adopted using boilerplate language in the early 2000s. We recommend that cities revise UGMAs to improve the management of development inside urbanizable areas. For UGBs to continue to be an effective instrument for managing growth, cities and counties must work together to strengthen their policies for approving development in the urbanizable area of the UGB.

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DATA AVAILABILITY STATEMENT

Spatial data and survey data unavailable due to data sharing and confidential agreements. Plan content analysis data available by request from authors.

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