AGENDA
Bend Metropolitan Planning Organization
Technical Advisory Committee

Date: June 3, 2015
Time: 10:00 am to 12:00 noon
Location: Deschutes Services Center, DeArmond Room (1st Floor)
1300 NW Wall Street, Bend
Contact: Tyler Deke, BMPO (541) 693-2113
Jovi Anderson, BMPO (541) 693-2122

1. **Call Order/Introductions**

Action Items

2. **Review and approve the February 4, 2015 meeting summary** (Attachment A) **and April 8, 2015 meeting summary** (Attachment B)

3. **STP Funding**

   Background: The MPO receives an annual allocation of federal Surface Transportation Program (STP) funds. Staff will discuss Policy Board direction on potential uses of the 2015 funding.

   Attachments: None. Information will be distributed at the meeting

   Action Requested: Develop draft recommendation for 2015 funding

Information Items

4. **MPO Boundary**

   Background: After each Census, the Census Bureau adjusts the Urbanized Area (UZA) boundary for each MPO to reflect population growth and land use changes. The MPO boundary must include all areas identified within the UZA. It should also include areas that may become urbanized over the next 20 years. The Policy Board adopted a revised MPO boundary at its May 21 meeting. MPO staff will briefly review the revised MPO boundary.

   Attachments: None. Information may be distributed at the meeting

   Action Requested: None. Information item

5. **Bend UGB Remand Project – Draft Scenarios**

Background: The City of Bend received a remand order from the Oregon Land Conservation and Development Commission (LCDC) in 2010. The remand order directed the City to address a number of issues related to a proposed 2009 expansion of the Bend Urban Growth Boundary (UGB). Since 2011, the City has made progress completing the various work tasks under the Remand Order, and has developed draft UGB expansion scenarios based on the input received at an April 30, 2015 UGB scenarios workshop. City Growth Management staff will present three draft scenarios to the MPO TAC to start the process of agency coordination with a particular focus on transportation.

Attachments: None. The scenarios will be included in the June 9, 2015 meeting packet for the Boundary and Growth Scenarios TAC. This packet will be available on June 2 and posted to the City's website that same day. GMD Staff will bring packet copies to the meeting.

Action Requested: None. Information Item. GMD Staff will follow up with County, ODOT, COIC, and CET staff to obtain comments on the draft scenarios.

6. **Other Business**

As time allows, staff will provide updates on other MPO business

7. **Roundtable/Member Updates**

8. **Next TAC meeting**

The next regular meeting of the Bend MPO TAC is tentatively scheduled for July 1st, 2015 at 10 a.m. in the DeArmond Room at the Deschutes Services Center (1300 NW Wall, Bend)

9. **Adjourn**

Additional Attachments

- 2015-18 MTIP amendment (Attachment C)

Accessible Meeting Information

This meeting event/location is accessible. Sign language, interpreter service, assistive listening devices, materials in alternate format, such as Braille, large print, electronic formats and audio cassette tape, or any other accommodations are available upon advance request. Please contact Jovi Anderson at (541) 693-2122, janderson@ci.bend.or.us and/or (541) 389-2245. Providing at least 3 days' notice prior to the event will help ensure availability.

BEND METROPOLITAN PLANNING ORGANIZATION
TECHNICAL ADVISORY COMMITTEE
Draft Meeting Summary
February 4, 2015
DeArmond Room, Deschutes Services Center, 1300 NW Wall Street, Bend, Oregon

1. Call to Order – Introductions

Mr. Deke called the meeting of the BMPO Technical Advisory Committee (TAC) to order at 10:07 a.m. with 6 of 11 members present, establishing a quorum. Attending during the meeting were:

TAC Voting Members

1. Cascades East Transit (CET) ..... Karen Friend
2. Central Oregon Community College (COCC) ..... Joe Viola
3. City of Bend Growth Management Department ..... Damian Syrnyk
4. Deschutes County Bike/Pedestrian Advisory Committee (BPAC) ..... Rick Root
5. Deschutes County ..... Peter Russell
6. Oregon Department of Transportation (ODOT) ..... Amy Pfeiffer
7. Bend Park and Recreation District (BPRD) ..... *absent*
8. BMPO Citizens Advisory Committee (CAC) ..... *absent*
9. Central Oregon Intergovernmental Council (COIC) ..... *absent*
10. Commute Options ..... *absent*
11. Oregon Department of Land Conservation & Development (DLCD) ..... *absent*

Ex Officio Members

1. Bend Metropolitan Planning Organization (BMPO) ..... *Manager*, Tyler Deke
2. Federal Highway Administration (FHWA) ..... Nick Fortey
3. Bend-La Pine School District (BLSD) ..... *absent*
4. Deschutes County Road Department ..... *absent*
5. Federal Transit Administration (FTA) ..... *absent*

MPO Staff
Cameron Prow, TYPE-*Write* II

Visitors
Gary Vodden
Michael Duncan, *ODOT Region 4*

(The 3-digit number following a motion title shows the number of members voting in favor/against/abstaining.)

ACTION ITEMS

2. Review and Approve TAC Meeting Summary

Motion 1 (6/0/0): Mr. Root moved to approve the TAC meeting summary for December 3, 2014. Mr. Syrnyk seconded the motion which passed unanimously.

3. MPO Boundary

Mr. Deke said the U.S. Census Bureau adjusts the Urbanized Area (UZA) boundary for MPOs to reflect population growth and land use changes after each census. The BMPO boundary must be amended to include new UZA lands identified in the 2010 Census.

TAC concerns included potential boundary expansion areas, expansion options, pros and cons of including the Tumalo area in the Bend MPO boundary (potential for more funding vs. obligation to include new areas in planning activities), and inclusion of the new Transportation Analysis Zone boundary on the map. Following discussion, TAC members

agreed by consensus to recommend that the Policy Board realign the MPO boundary with the travel demand model and include a complete Transportation Analysis Zone in the areas proposed for inclusion.

Mr. Deke said the MPO will revisit this issue after completion of the urban growth boundary (UGB) remand. He will send a revised map to the TAC within two weeks.

INFORMATION ITEMS

4. Annual Listing of Federally Funded Transportation Projects

Documents: Annual Listing for Federal Fiscal Year 2014 and PowerPoint presentation

Mr. Deke provided an overview of the background, funding summary, federal funding by type, federally funded projects 2014, state and local funding by type. Per federal law, the Annual Obligation Report for October 1, 2013, through September 30, 2014, includes all projects/programs for which federal transportation funds were obligated. As directed by the Policy Board, staff are also including state and local funding in this report. Total obligated funding for FFY 2014 was $31,389,984: $2,901,812 federal plus $28,488,172 state and local. He thanked Mr. Russell for his editing assistance.

Mr. Fortey noted that Oregon has one of the lowest levels of not obligating federal funds. He recommended the MPO track planned expenditures vs. obligated dollars to show progress toward targeted percentages.

TAC concerns included how unspent obligated funds were treated and the difficulty of aligning federally obligated funding with state and local project schedules. Members recommended tracking funds obligated for bicycle, pedestrian, and transit projects within roadway projects to show progress toward funding goals.

5. ODOT Gorge Hubs Projects

Document: PowerPoint presentation

Mr. Duncan provided an overview of a project he has been working on along Historic Columbia River Highway 30 to establish "hubs" for cyclists, pedestrians, and other highway users. He discussed hub amenities, coalition partners, and benefits of coalition (coordinating tourism efforts, consistent mapping and wayfinding signage, connections to trails and businesses, potential grant funding). Prineville and Sisters have indicated interest in establishing bike hubs. Steps needed to develop this type of project in Central Oregon would include identifying a project sponsor and potential partners, refining the scope, and selecting a consultant. Anyone interested in more details should contact him as no website is available at this time.

TAC members expressed concern about local land use approvals, liability insurance, maintenance responsibility, costs, and funding.

6. Other Business

Triangle Transportation Study: Ms. Pfeiffer said the Bend MPO, City of Bend, and ODOT will work together to develop short- and mid-range strategies to manage traffic in the North Corridor area. The area used to test development scenarios on the city, county, and ODOT transportation systems will be from the "triangle" to Butler Market Road and from O. B. Riley Road to 18th Street. This effort will be launched in February 2015 and completed by June 30, 2015. She will share interim results with the TAC.

Ms. Friend said this information could be useful to CET in transit route planning. Ms. Pfeiffer invited Ms. Friend to join the project team.

Surface Transportation Program: Mr. Deke said the MPO received its STP funding award last week. He will present draft allocation recommendations for the next fiscal year (July 1, 2015, through June 30, 2016) at a future TAC meeting.

Safety Funding: Mr. Deke said federal safety funding now has to be used on all roads, not just the state highway system. The Bend MPO is working with the City of Bend and ODOT Region 4 to apply for federal safety funds. He is expecting the BMPO to receive about $300,000 in transition funding for Bend projects over the next couple years. Criteria for awarding the funds will be based on safety needs, improvements that can be done, and the benefit cost ratio. Projects which should be funded over the next year or so included pedestrian timers for traffic signals, intersection lighting (3rd Street/Powers Road, 27th Street/Bear Creek Road), and the safe crossings project led by Robin Lewis. He will send a draft summary to TAC members.

Mr. Russell asked why pedestrian signals downtown were all automatic except for the ones on Greenwood Avenue. Mr. Deke responded that push-button pedestrian signals was the new standard. Planning work to potentially remove the two traffic signals on Oregon Avenue is expected to start in the next few months.

7. Roundtable – Member Updates

BMPO CAC: No report.

BPRD: No report.

CET: Ms. Friend requested assistance in recruiting new members for CET's Public Transit Advisory Committee. The transit funding workgroup is making progress and expects to be doing outreach soon. The outcome of work done to create sustainable funding for transit indicated the community was not willing to support a transit district, so COIC is continuing to operate the transit system. Since COIC does not have the authority to levy property tax when the time comes to do so, it is seeking to modify ORS 190. The proposed modification would allow COIC to phase in (with voter approval) property tax funding for transit on a community-by-community basis. COIC is working with the City of Bend on what it would take to expand transit in Bend. The Governor's Carbon 14 advisor met with COIC and rode the bus up to COCC (standing room only).

City of Bend: Mr. Syrnyk announced the next round of UGB TAC meetings to be held at Bend City Hall: *Residential TAC,* February 23, 10 a.m.-12:30 p.m.; *Employment TAC,* February 23, 2:30-5 p.m., and *Boundary TAC,* February 24, 10 a.m.-12:30 p.m. A drop-in meeting will be held on Tuesday, February 24, 2-4 p.m., for those people who couldn't make the earlier meetings or want to find out what's going on.

COCC: Mr. Viola reported that Bend enrollment has been decreasing slightly each term. New on-campus housing will open in the fall of 2015, which is expected to triple or quadruple the number of people living on campus.

COIC: No report.

Commute Options: No report.

Deschutes County: Mr. Russell said design work is continuing for the Powell Butte/Alfalfa Market roundabout. The county is holding a work session at 1:30 p.m. today (February 4) on what to do about someone who built illegally on a county right-of-way.

Deschutes County BPAC: Mr. Root said the next BPAC meeting will be a February 5 summit in Redmond. Rebranding was one of the topics discussed at the February 3, 2015, meeting of the Road Users Safety Task Force which is chaired by Jovi Anderson, Bend MPO staff.

DLCD: No report.

ODOT: Ms. Pfeiffer announced that the preapplication process for TGM (transportation growth management) grants will start in February 2015. She encouraged BMPO members to contact ODOT regarding potential projects. ODOT was able to plow the McKenzie Highway up to the Dee Wright Observatory last weekend.

FHWA: Mr. Fortey said he will soon be reviewing Unified Planning Work Program for various MPOs.

Mr. Deke said he will begin developing the 2015-2016 UPWP in March 2015. The Bend MPO has been working with other Oregon MPOs to update the funding distribution formula. He is expecting BMPO funding to decrease significantly due to the new formula. One of the budget reduction measures he has implemented will impact staffing. For the rest of fiscal year 2014-2015, Ms. Anderson will work 75% for the Bend MPO and 25% for the City of Bend. Depending on available funding, this employment split may change to 50% BMPO/50% City starting July 1, 2015. These reductions in staff time will impact what MPO staff can accomplish.

9. Next TAC Meeting

The next TAC meeting is scheduled for Wednesday, March 4, 2015, 10 a.m.

10. Adjourn

There being no further business, Mr. Deke adjourned the meeting at 11:38 a.m.

BEND METROPOLITAN PLANNING ORGANIZATION
TECHNICAL ADVISORY COMMITTEE
Draft Meeting Summary
April 8, 2015
DeArmond Room, Deschutes Services Center, 1300 NW Wall Street, Bend, Oregon

1. Call to Order – Introductions

Mr. Deke called the BMPO TAC meeting to order at 10:04 a.m. without a quorum of members (5 of 12) present. Attending during the meeting were:

TAC voting members

1. Oregon Department of Transportation (ODOT) ..... Amy Pfeiffer
2. City of Bend, *Growth Management* ..... Damian Syrnyk
3. Commute Options ..... Jeff Monson
4. Central Oregon Community College (COCC) ..... Joe Viola
5. Deschutes County Bike/Pedestrian Advisory Committee (BPAC) ..... Rick Root
6. Bend Park and Recreation District (BPRD) ..... absent
7. BMPO Citizens Advisory Committee (CAC) ..... absent
8. Cascades East Transit (CET) ..... absent
9. Central Oregon Intergovernmental Council (COIC) ..... absent
10. City of Bend, *Growth Management:* Nick Arnis ..... absent
11. Deschutes County ..... absent
12. Oregon Department of Land Conservation & Development (DLCD) ..... absent

Ex officio members

1. Bend Metropolitan Planning Organization (BMPO): ..... *Manager,* Tyler Deke
2. Bend-La Pine School District (BLSD) ..... absent
3. Deschutes County Road Department ..... absent
4. Federal Highway Administration (FHWA) ..... absent
5. Federal Transit Administration (FTA) ..... absent

MPO staff
Jovi Anderson, *Program Technician*
Cameron Prow, TYPE-*Write* II

Visitors (None)

ACTION ITEMS

2. Review and Approve TAC Meeting Summary

Due to lack of a quorum, Mr. Deke postponed approval of the February 4, 2015, meeting summary to the next meeting.

INFORMATION ITEMS

4. MPO Boundary

Document: Proposed MPO boundary map

Mr. Deke recapped discussions to date about the MPO's need to realign its boundary to include new Urbanized Areas, due to population growth and land use changes, recognized by the 2010 U.S. Census. He presented a third option for the proposed expansion of the Bend MPO boundary. Option 3 arose out of discussions with Mr. Syrnyk and Peter Russell and direction from the Policy Board at its March 18 meeting. Option 3 proposes to include the unincorporated community of Tumalo as defined in the Deschutes County Comprehensive Plan plus Cascade Highlands at Broken Top and the Tetherow area. He, Mr. Russell, and Deschutes County Commissioner Tony DeBone will talk to

Tumalo business owners about the proposed boundary change before Option 3 is presented for Policy Board approval. The MPO will revisit the boundary issue after the UGB (urban growth boundary) process has been completed. He will distribute copies of the MPO Boundary FAQ (frequently asked questions) when he meets with Tumalo businesses and will post these on the Bend MPO website.

TAC discussion covered changes proposed in Option 3 that were not part of Options 1 and 2 and how Tumalo businesses were organized.

5. Draft 2015-2016 UPWP

Document: Copy of PowerPoint presentation

Mr. Deke summarized major tasks completed and underway from the Unified Planning Work Program (UPWP) for fiscal year (FY) 2014-2015. The UPWP's four primary tasks are (1) Development and Program Management, (2) Short Range Planning, (3) Long Range Planning, and (4) Travel Demand Model and Data Collection. Annual funding decreased by 1-2% in both FY 2013-2014 and FY 2014-2015; funding for FY 2015-2016 is expected to decrease 11% from the 2014-2015 level. He discussed funding challenges and changes in MAP-21 (Moving Ahead for Progress in the 21st Century Act) requirements. To address federal funding uncertainty, subtasks will be classified as "required" or "optional" to facilitate reprioritization during the mid-year check-in with the TAC and Board. If more funding becomes available, optional items could move higher on the priority list. The BMPO Budget Committee will meet on April 28 and the Board will consider adoption of the new UPWP and Budget at its May 21, 2015, meeting.

TAC concerns covered including ADA (Americans with Disabilities Act), bike, and pedestrian facilities in street preservation plans; impact on MPO funding from the City's proposed gas tax and/or transportation utility fee; influence/impact of the federal transportation package on the proposed City gas tax; other funding options; impact of the county's natural hazards mitigation plan and the Oregon Resiliency Plan (post-Cascadia event); consistency of the UPWP with other state plans; impact of the proposed reduction in MPO staffing from 2.0 FTE (full-time equivalents) to 1.5 FTE; and MPO Budget Committee membership and process.

6. MPO Funding Update

Document: Copy of PowerPoint presentation

Mr. Deke reviewed the Bend MPO's funding history. Extensive negotiation between ODOT and Oregon MPOs has resulted in a new formula for how the state will allocate discretionary federal funding to MPOs. Factors considered in the new formula included model costs, data costs, population/population factor, and complexity factors. The Oregon Transportation Commission will take action later this month on the revised funding formula. Under the new formula, the Bend MPO would receive $198,727 for FY 2015-2016, about 11% less than the $223,445 received for FY 2014-2015. While this reduction is significant, Mr. Deke stated the process used to derive the new formula was fair. Portland State University's population forecasts were done only for cities and counties in the past, but will now also be done for MPOs every two years. This change should help Bend which is growing rapidly. Population added within the new (proposed) MPO boundary will be reflected in the formula for FY 2016-2017. Staff plans to ask the Policy Board to allocate some of the STP (Surface Transportation Program) funds to help offset expected funding losses.

3. 2015-2018 Metropolitan Transportation Improvement Program Amendment
Document: 2015-18 MTIP Administrative Amendments

Ms Anderson presented two administrative MTIP amendments. Key 19162: the City withdrew its application for funding due to cancellation of its project to construct a compressed natural gas fueling station. Key 17807: ODOT requested addition of $150,000 to Land Purchase from the ODOT Region 4 Financial Program. This project calls for widening the median and installing a concrete median barrier on US 97 from Romaine Village Way to Lava Butte.

7. Other Business
None.

8. Roundtable – Member Updates
BMPO CAC: No report.

BPRD: No report.

CET: No report.

City of Bend: Mr. Syrnyk reported the City has hit key milestones in its UGB process. On March 19, 2015, the UGB Steering Committee (City Council, Planning Commissioners Bill Wagner and Rex Wolf, Deschutes County Commissioner Tony DeBone) approved all recommendations from its three Phase 1 technical advisory committees. The Boundary TAC met on April 7. Land need estimates for housing and employment and "bookends" (1,911-2,195 acres) are done. The UGB Steering Committee and all three UGB TACs will do scenario mapping exercises at their workshop on April 30, 2-5 p.m. Results from that workshop will be provided to the consultant team for transportation scenario modeling and water/sewer optimization.

COCC: Mr. Viola announced a public celebration on May 14, 2015, for the Bend campus turning 50 years old. The new name for the campus center will be announced at this event. The new $22 million, self-funded residence hall is done. No major construction is expected on the Bend campus for the next ten years, though some of the older buildings may undergo remodeling.

COIC: No report.

Commute Options: No report.

Deschutes County: No report.

Deschutes County BPAC: Mr. Root reported results of the last feedback meeting in Sisters on April 2, 2015. Due to public pressure, the City of Sisters has decided to change its back-in diagonal parking practice back to the former system.

DLCD: No report.

ODOT: Ms. Pfeiffer said ODOT will embark on a Bend Parkway Plan starting in 2016. Now that the North Corridor planning project is done, ODOT is focused on priorities and implementation which should be done by June-July 2015. ODOT settled the lawsuit about the Reed Market pedestrian crossing of the parkway and planning will start in 2016.

Mr. Root requested a status report on connecting the sidewalk system to the existing canal undercrossing. Ms. Pfeiffer replied that the public will be involved in planning how to resolve grading complexities. ODOT is likely to be heavily involved in the City's planning efforts around east-west pedestrian connectivity.

9. Next TAC Meeting

The next regular TAC meeting is scheduled for Wednesday, May 6, 2015, 10 a.m., in the DeArmond Room, Deschutes Services Center, 1300 NW Wall Street, Bend, Oregon.

10. Adjourn

There being no further business, Mr. Deke adjourned the meeting at 11:20 p.m.

Bend Metropolitan Planning Organization

2015-2018 Metropolitan Transportation Improvement Plan Amendment Notice

Attachment C

Oregon Department of Transportation

Key # 19166		Year	1st Fund	Share	2nd Fund	Share	3rd Fund	Share	Total
	Planning	2014	HSIP	$66,602	ODOT	$5,619		$0	**$72,221**
MPO Project #	*Design*			$0		$0		$0	**$0**
Project Name REGION 4 HSIP TRANSITION URBAN	*Land Purchase*			$0		$0		$0	**$0**
	Utility Relocate			$0		$0		$0	**$0**
	Construction	2015	HSIP	$396,984	ODOT	$33,491		$0	**$430,475**
	Other			$0		$0		$0	**$0**
									Project Total
Description SIGNAL UPGRADES									**$502,696**

Amendment *6/25/15-001 Full Amend.*

REGION 4 HSIP TRANSITION URBAN- Add to MTIP, currently in STIP under Various Counties, More than 50% of projects are in Bend MPO. Other projects are in The Dalles and Klamath Falls

23 CFR § 450.316 requires explicit consideration and response to public comment received during the program development process. Public, staff, agency, and other interested party comments received prior to the adoption hearing are first reviewed by staff. Comments requiring minor revisions are addressed by staff. Such comments might include requests for additional information or clarification of information. Comments on policy issues or specific projects will be considered by the Policy Board at the public hearing. Comment received during the public hearing will be discussed at the public hearing. The Policy Board and staff will determine the most appropriate manner to respond to comments received. If significant changes to the proposed MTIP are recommended as a consequence, a revised final draft document will be resubmitted to the public for an additional review and comment period.Copies are free of charge and, upon request, will be made available in CD, print, and accessible formats. Upon request, in advance of the meeting, through any of the means listed above, every effort will be made to prepare materials in other formats and in languages other than English, and to provide interpreters in American Sign Language and other languages. Assistive listening devices and large-print materials will be available at the meeting upon request. The Central Oregon Intergovernmental Council (COIC), which is the FTA Section 5307(c) applicant, has consulted with the MPO and concurs that the public involvement process adopted by the MPO for the development of the TIP satisfies the public hearing requirements that pertain to the development of the Program of Projects for regular Section 5307, Urbanized Area Formula Program, grant applications, including the provision for public notice and the time established for public review and comment

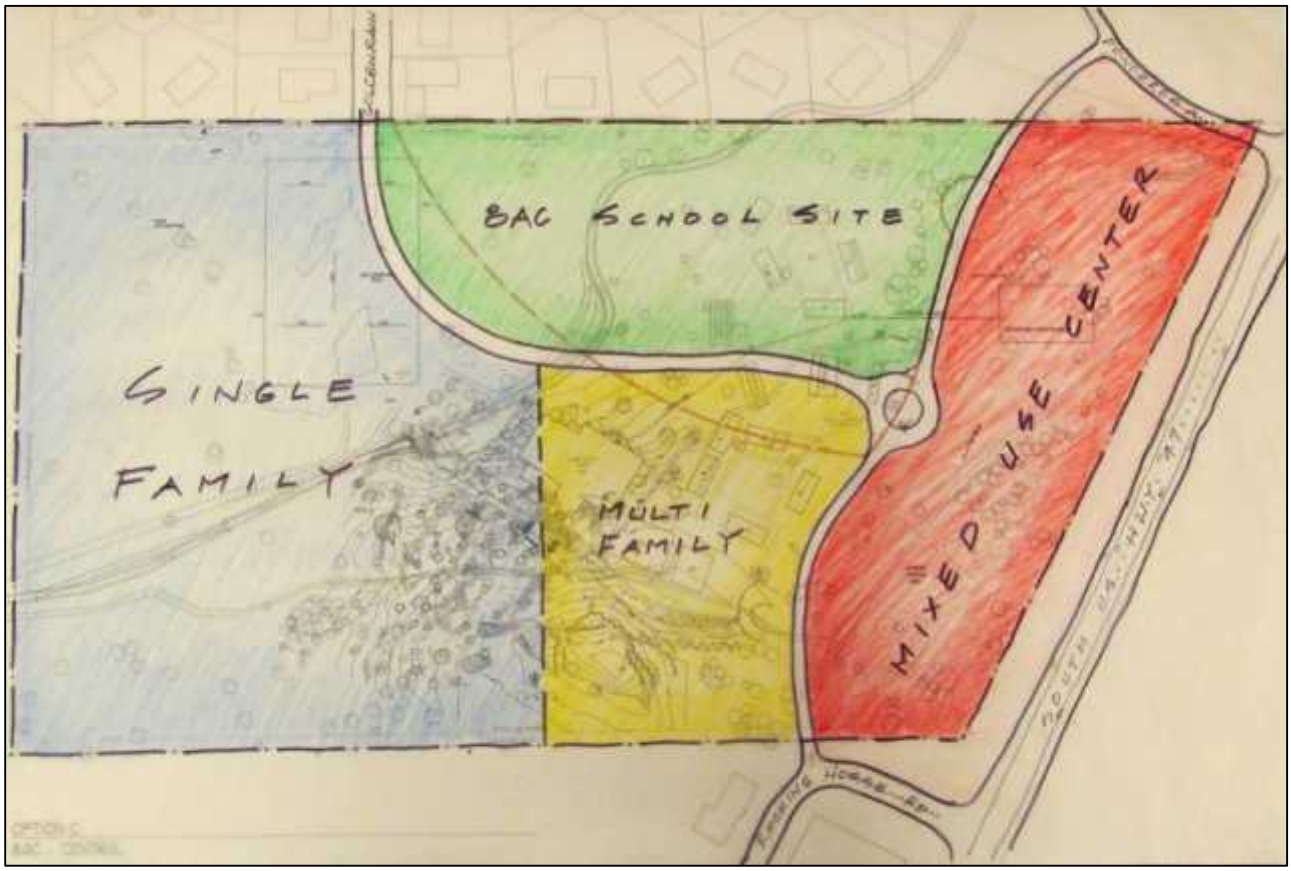
Contact Bend MPO staff at (541) 693-2122 or email janderson@bendoregon.gov for additonal details.
Review amendments at www.bendoregon.gov/mtip

OXFORD
Hotel Group
BEND, OREGON

Date: June 5, 2015

To: Boundary & Growth Scenarios Technical Advisory Committee, APG Consultants, and City Staff
From: Curt Baney, President

Greetings: We have been participating in the City UGB process for many years now and truly appreciate the comprehensive effort to evaluate the many candidate areas. Our property abuts the UGB, is zoned RR-10 Exception Land, is over 38 acres in size and the former site of the Sunriver Preparatory School. The school buildings have been removed and only temporary buildings remain for the Waldorf School. We are ready to move forward with development on this parcel with a mixed use project as shown below. The site has access points from Rocking Horse Road, Goldenrain Drive, and possibly Ponderosa. The site is designed for mixed-use development and we have provided a concept layout as shown below. This site scored well in the various recent map exercises.



Concept Layout of Site

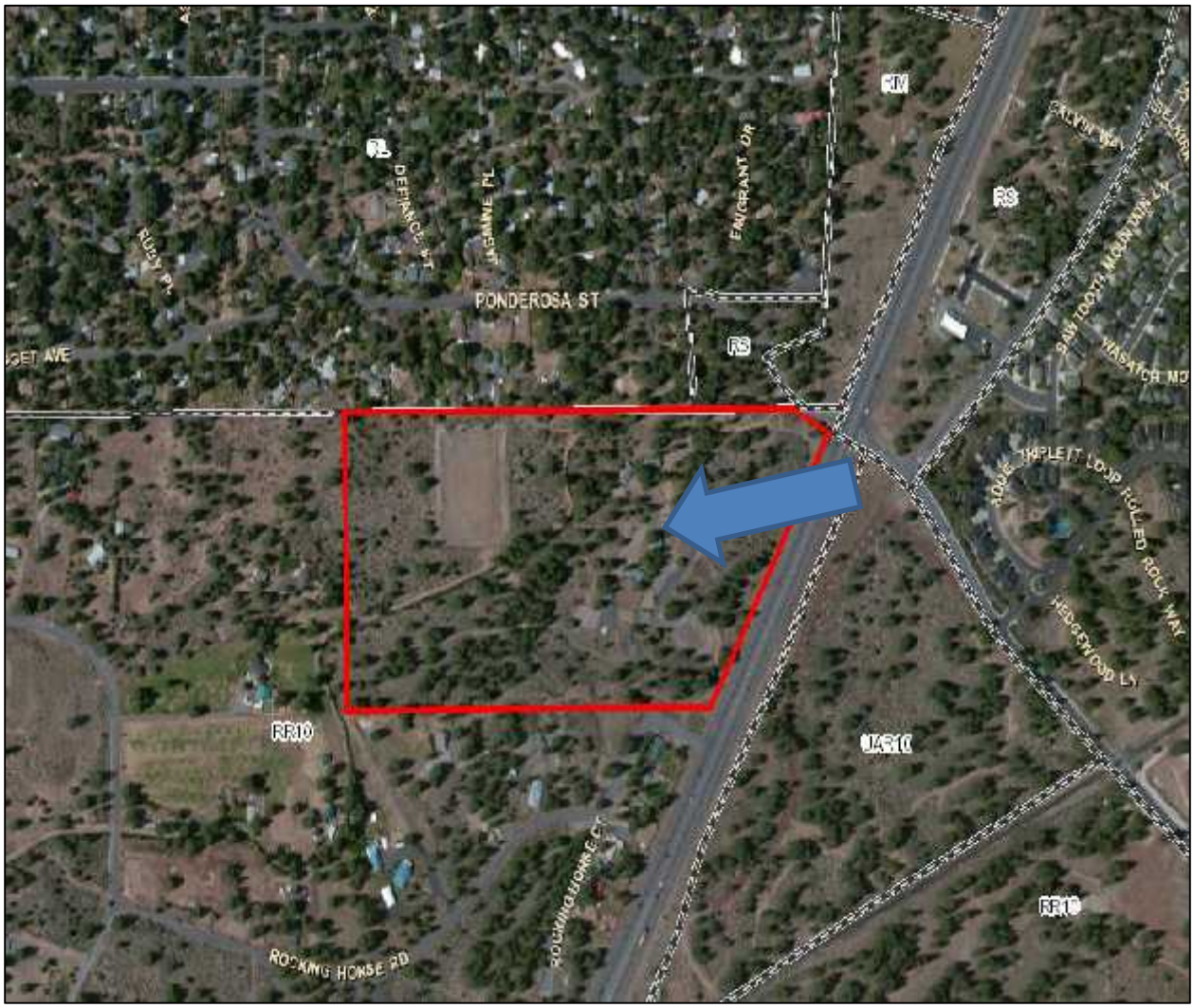
Importantly, this project would provide:

- a "kick-start" for reinvigorating the nearby neighborhood with a blend of land uses, extension of utilities, and connecting open spaces to other community facilities
- extension of needed sewer mains necessary to connect many existing septic fields within the city, just north of our property – this is a huge benefit to the community
- the components to create a complete neighborhood and accrue many benefits to other nearby neighborhoods.

This is an exciting opportunity and we would like you to consider this property for inclusion as you refine your UGB expansion boundary.

Sincerely,

Curt Baney, President
Baney Corporation
Tel.: 541-382-2188 Email: curtb@oxfordsuites.com



The aerial photo of site

CARL W. HOPP, JR.
ATTORNEY AT LAW, LLC

June 8, 2015

To: UGB Technical Advisory Committees
From: Carl W. Hopp, Jr., Attorney for PacWest Development, LLC

Subject: Inclusion of Property in the Urban Growth Boundary

I am writing to discuss the property located at 21455 East Hwy 20 in Bend and its potential inclusion in the Urban Growth Boundary. The property is a 36.39 acre lot that abuts the current UGB. A portion of the property is zoned UAR10, as seen on the attached map from Deschutes County, and the owner is willing to have the property rezoned if necessary. The property is bordered on the north by Highway 20, the south by Bear Creek Rd., the west by residential properties, and undeveloped land to the east. The residential land to the west includes houses that abut the property as well as Livingston Dr., an east-west oriented road that terminates at the property line. This is important because of the ease with which utilities (sewer and water) could be connected to the property. The property is currently being used as a large residential lot. The only structures on the property at this time include a house built in 1940, a manufactured home built in 1959, and a shed.

My client is ready to move forward with a development of affordable housing on the property. The property has access from Hwy 20 and Bear Creek Rd., but development could allow the property to be accessed from Livingston Dr. on the west and the gravel road on the east. Land on the east side of Bend is more affordable than many other lots in the area which translates into more affordable housing for the community. Furthermore, the development costs of the property are expected to be reasonable based on the close proximity to utilities and minimal impacts on irrigation infrastructure. Also, extending sewer and water connections through this property will simplify connecting nearby lots that do not abut the UGB yet still score high on the suitability composites. This will lower development costs on those lands which translate into more affordable housing and a benefit to the community. Finally, the risk of forest fire is minimal as trees are sparse in the area and there is little history of fires in the area.

The property has strong arguments for inclusion in the UGB. Bend UGB Suitability Composites prepared March 31, 2015 show that land to the southeast of the property is in the highest quantile or the next highest quantile for land to be included in the UGB, depending on how the four Bend UGB Goal 14 Factors are weighted. Including the

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property in the UGB would greatly simplify connecting these lands to city water and sewer via Livingston Dr.

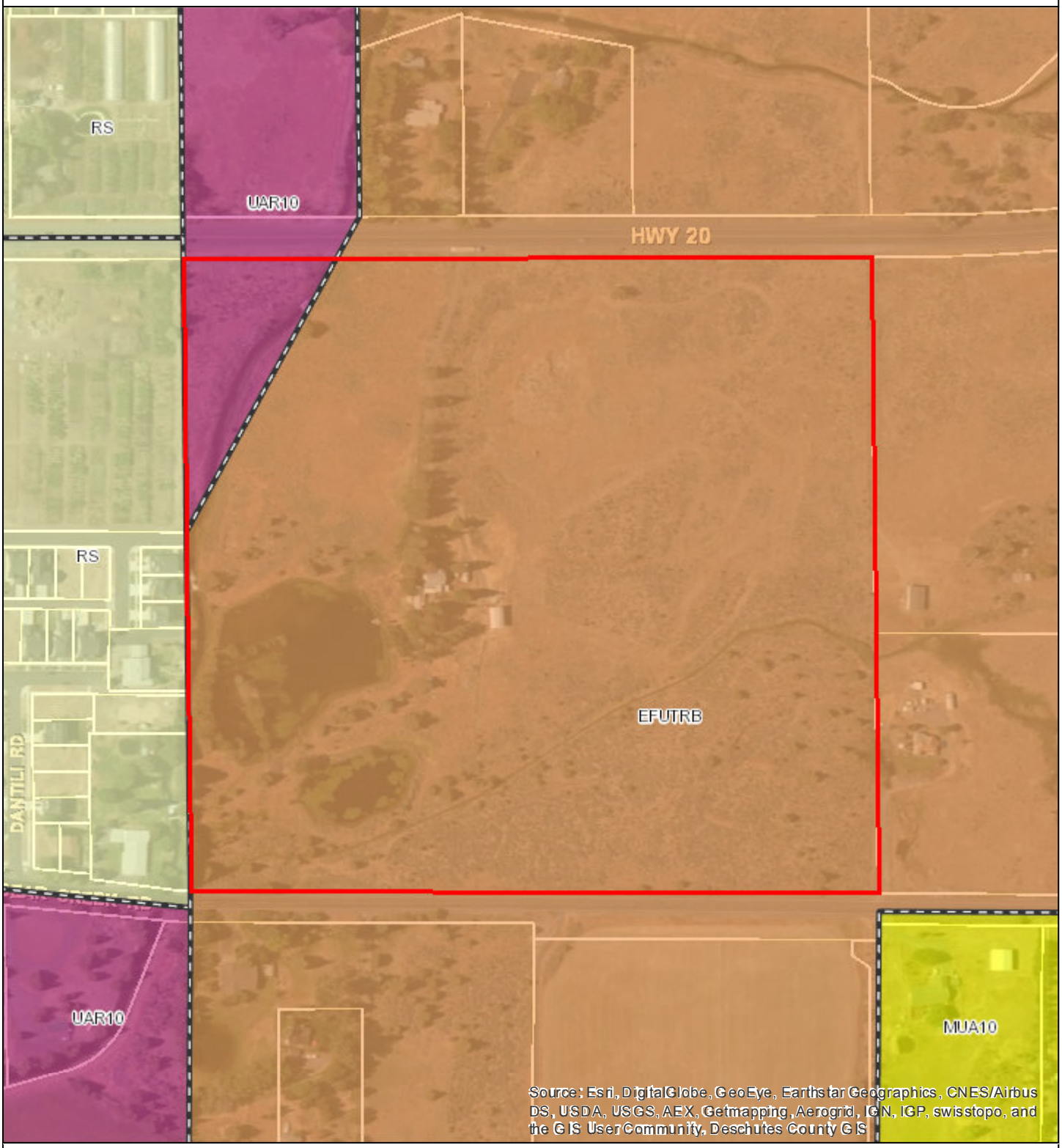
Please contact my office with any questions that you may have.

Sincerely,

CARL W. HOPP, JR.
dh
Enc.

Deschutes County Property Information - Dial

Zoning Map for account 119047



Map and Taxlot: 1712350001500

DESCHUTES COUNTY

Wendy Robinson

From: Damian Syrnyk
Sent: Monday, June 08, 2015 4:46 PM
To: Joe Dills; Brian Rankin
Cc: Becky Hewitt
Subject: FW: UGB EXPANSION
Attachments: BEND BMV maps 06 08 15.pdf; BMV city of bend ltr 03 21 07.pdf

Boundary TAC members, you will find enclosed an email from Rick Lane that also includes two attachments: 1) two maps, and; 2) a letter from March 21, 2007.

I will also email you shortly after 5pm to let you know if any additional materials came in before 5pm tonight.

Thanks, Damian

From: Rick Lane [mailto:rlane47439@gmail.com]
Sent: Monday, June 08, 2015 4:36 PM
To: Damian Syrnyk; Brian Rankin
Subject: UGB EXPANSION

Subject: Bend UGB expansion

Dear Mr. Syrnyk, et al:

As a landowner with property at 21620 NE Butler Market Rd. on the east side of Bend, we wanted to make sure the UGB TAC, staff and facilitators are aware that we (along with a substantial number of the landowners who own properties shown on the attached map) are strong advocates to have our properties be included the UGB expansion.

We originally came together back in 2007 and had our attorney Tia Lewis draft a letter to the city outlining our collective position. Prior to submission of the letter the City of Bend's proposal was remanded back to the city and consequently we thought it fruitless to submit the letter at the time. I have attached a copy of that letter as well for your review.

It just came to my attention that we needed to make our voices heard, soon. However, with such short notice it was not possible to collect all of the signatures of those interested landowners, but I will contact them and suggest they make their voices heard if they have not done so already.

In addition to the points made by Tia Lewis in the attached letter, we would like to mention briefly some but not all of the reasons we feel these NE Bend lands should be included.

1. The exception zoning in the northeast ranks these parcels as first priority land to be included.

2. The northeast area is considered least wildfire risk compared with other areas under consideration. Large open areas, significant water rights and irrigated pastures all mitigate wildfire risk.

3. Much of the area is flat and very affordable in terms of construction costs.

4.The area is closer to all necessary infrastructure to support expansion ie. sewer, water,transportation etc.

5. The subject area is close to the Bend airport. A NE Bend core community would enhance living and service options related to the airport, city sewer plant,and even Juniper Ridge.

6. It would appear that the new process has over valued large parcels at the expense of smaller property owners. The parcels in the 240 acre block shown in the attached map average 5-10 acres, but several owners have multiple parcels in this area, so collectively there is up to a 240+ acre block available for inclusion. NE Bend should not be penalized simply because of smaller individual lot sizes.

Thank you for your consideration,

Rick Lane

Sage Wind Farms, LLC

541-815-9041

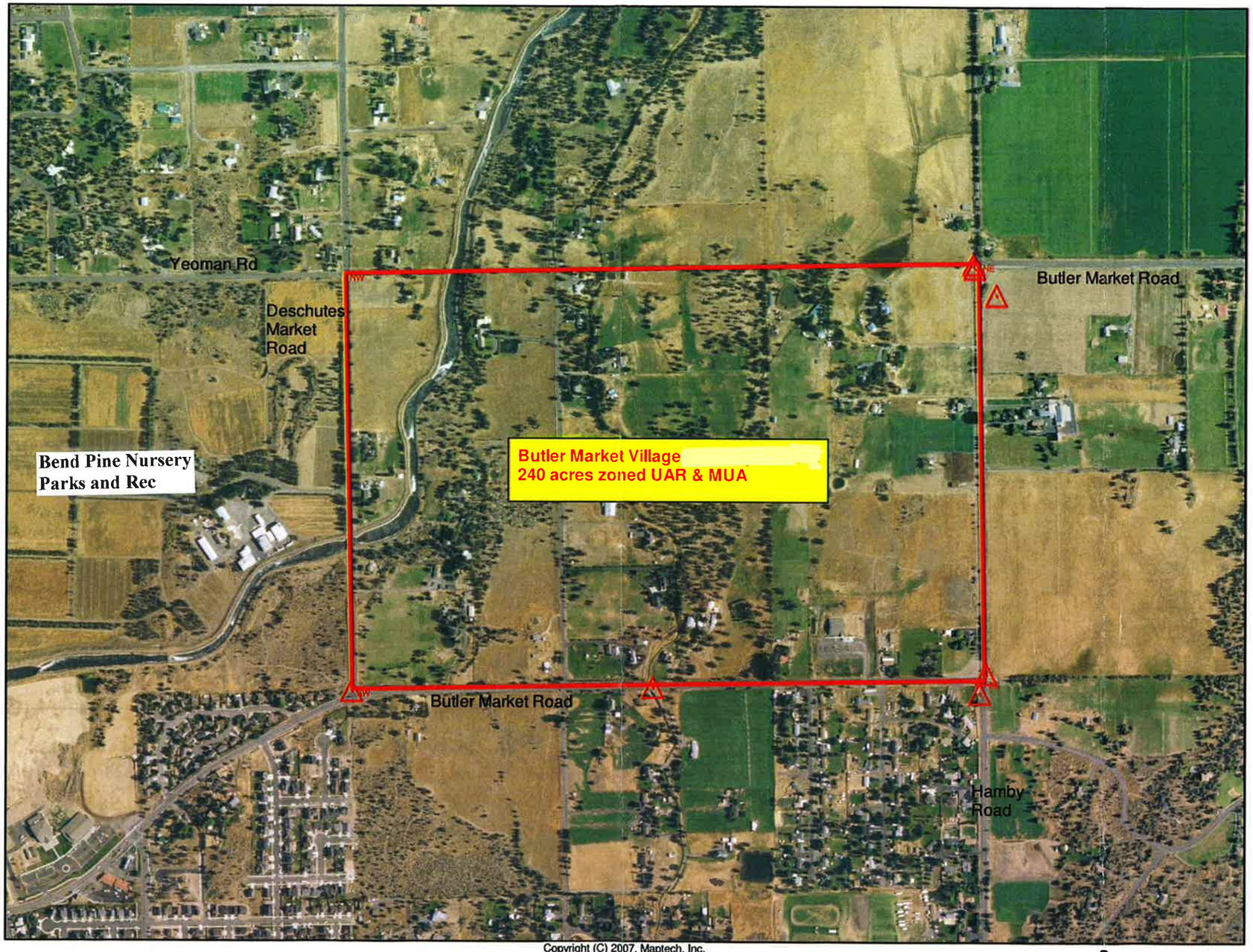
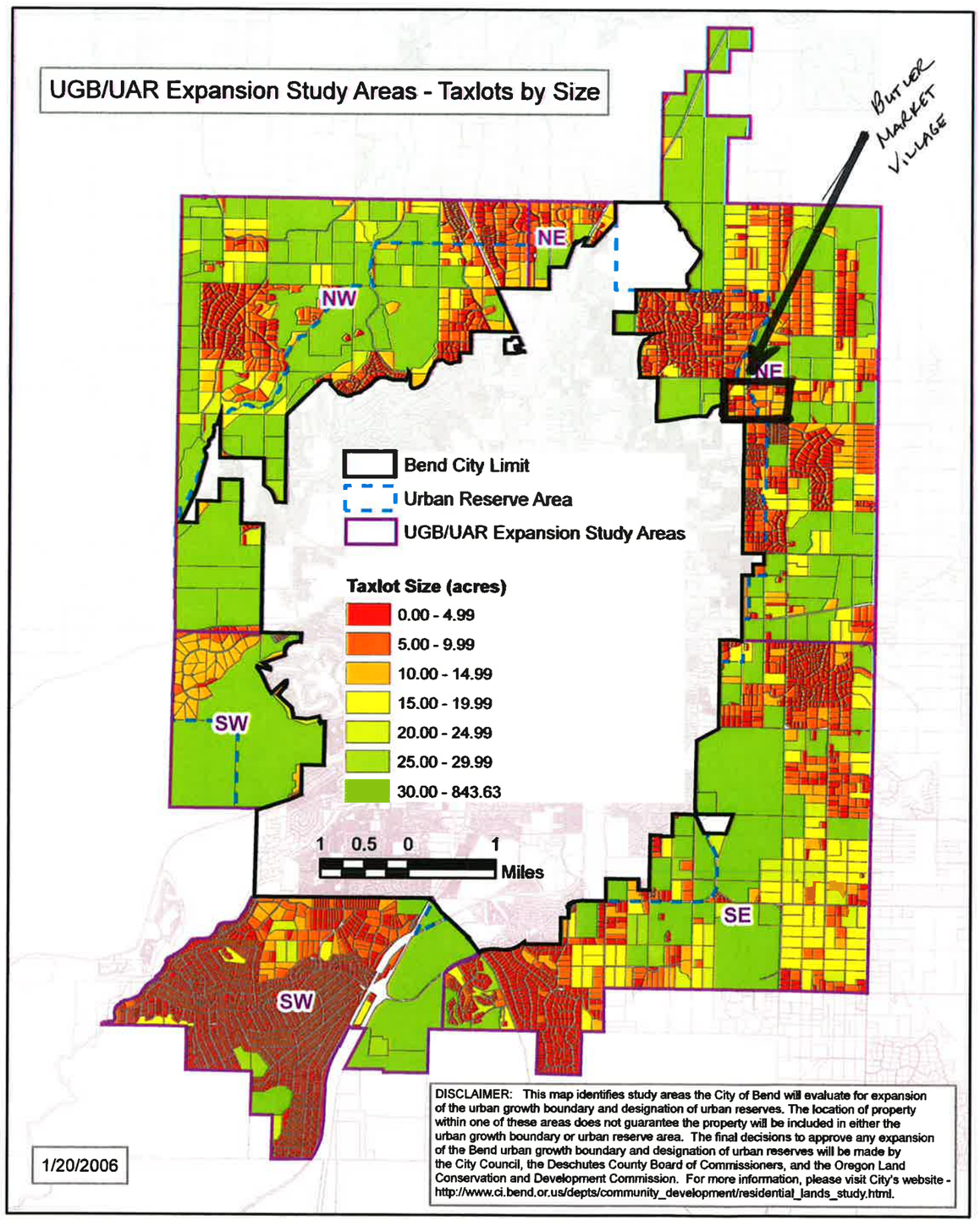


EXHIBIT A

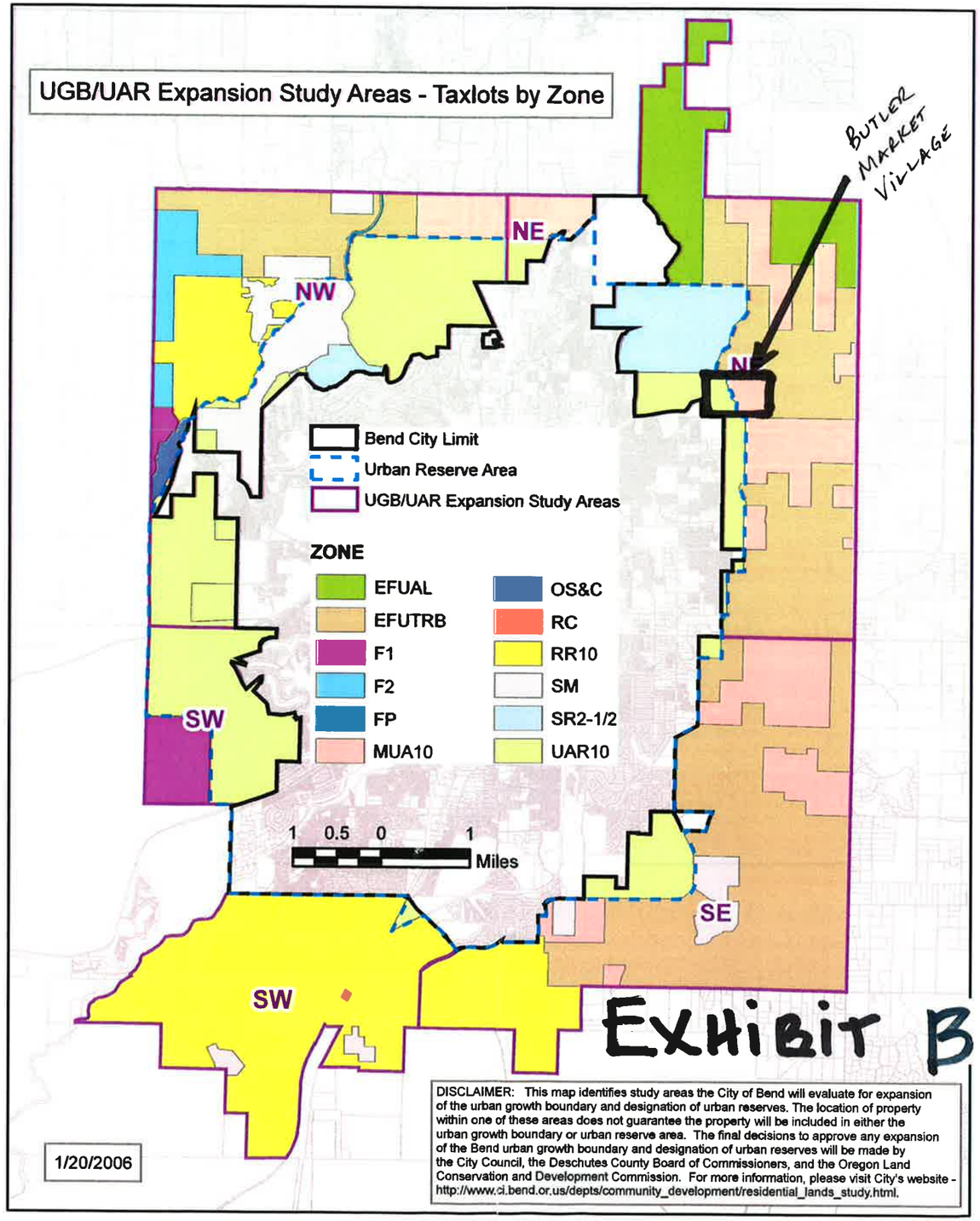
UGB/UAR Expansion Study Areas - Taxlots by Size



1/20/2006

DISCLAIMER: This map identifies study areas the City of Bend will evaluate for expansion of the urban growth boundary and designation of urban reserves. The location of property within one of these areas does not guarantee the property will be included in either the urban growth boundary or urban reserve area. The final decisions to approve any expansion of the Bend urban growth boundary and designation of urban reserves will be made by the City Council, the Deschutes County Board of Commissioners, and the Oregon Land Conservation and Development Commission. For more information, please visit City's website - http://www.ci.bend.or.us/depts/community_development/residential_lands_study.html.

UGB/UAR Expansion Study Areas - Taxlots by Zone



1/20/2006

DISCLAIMER: This map identifies study areas the City of Bend will evaluate for expansion of the urban growth boundary and designation of urban reserves. The location of property within one of these areas does not guarantee the property will be included in either the urban growth boundary or urban reserve area. The final decisions to approve any expansion of the Bend urban growth boundary and designation of urban reserves will be made by the City Council, the Deschutes County Board of Commissioners, and the Oregon Land Conservation and Development Commission. For more information, please visit City's website - http://www.ci.bend.or.us/depts/community_development/residential_lands_study.html.

EXHIBIT B

March 21,2007

Damian Syrnyk
Residential Lands Study
City of Bend
710 Wall Street
Bend, Oregon 97701

RE: City of Bend Residential Lands Study
Butler Market Village

Dear Mr. Syrnyk:

We have been following the process to expand the city limits, urban growth boundary, and essentially at the same time create a larger Urban Reserve Area for the City of Bend. The purpose of this letter is to provide evidence and argument in support of inclusion of the properties described below into the Bend UGB and City limits.

1. Location and Properties Represented

Each of the properties described below is part of a 240 acre area discussed in this letter that we will refer to as Butler Market Village. See aerial of this area, Exhibit A.

Please reference the attached tax maps #17-12-23 (including 23AB): This is a 240 acre block in the NE corner 0f 17-12-23 (all highlighted). This 240 acre block of land is bounded by Deschutes Market Road on the west, Butler Market Road on the south and east, and the future extension of Yeoman Road to the east will bound this block of land on the north.

The undersigned property owners, all of which own property in the Butler Market Village study area, hereby advise the City of Bend that they are in favor of annexation of this land area, Butler Market Village, into the Bend City limits and urban growth boundary at the earliest possible date. We are also in favor of a master plan concept for growth in the area which combines the principles of smart growth to create a unique new neighborhood.

Please reference the attached maps (Exhibits B and C): the green parcels are in favor of annexation…Those with an "L" by their respective tax lot number have signed the attached letter in support of annexation; the blue parcels are either ambivalent, non committal, or could not be contacted; and the two red parcels expressed opposition to annexation.

With all of the issues discussed herein in mind, the undersigned property owners request that the land area herein known as Butler Market Village as shown on Exhibits A, B, and C be upgraded during the Residential Land Study to show a predominant developable lot area of 40 acres or more and somewhere between 500 and 1500 potential residential dwelling units. See the related City of Bend map, Exhibit D, dating back to 01/20/2006.

2. Master Plan Opportunities.

As a 240 acre area, Butler Market Village has opportunities to master plan residential neighborhoods, commercial areas, infrastructure corridors and the like more efficiently than smaller individual parcels.

Our collective vision is for a complete neighborhood with parks, schools, commercial and economic centers, and hopefully some cultural component(s). Additional issues such as traffic continuity, affordable housing options, "green" construction practices, and "stay/work close to home" design concepts can be considered during the master plan and design process. Whether Butler Market Village is developed as one 240 acre community or as several 50-100 acre components that fit together into one larger vision, these parcels offer a unique opportunity for master planning of a large land area in a controlled and orderly fashion.

3. Orderly and Economic Provisions of Service.

The development of property through master plan opportunities creates the framework necessary over a large tract to provide efficient and economical street, water and sewer connections.

Because of the existing road layout and proposed extension of Yeoman Road towards the Bend Airport, this area of land is ideally suited to control traffic continuity and access into and out of the development. Other reasons that this property is ideal for annexation include the close proximity to the sewer plant and the new Avion water reservoir being built just NE area of Butler Market Village. Inclusion of Butler Market Village creates the opportunity to protect valuable infrastructure corridors and facilitates developer funded infrastructure construction to serve the newly urban and "urbanizable" areas.

4. Priorities for Inclusion

As shown on the attached maps, Butler Market Village is contiguous to the existing city limits and includes only exception zoned parcels including UAR and MUA. These parcels rank above resource zoned lands for UGB inclusion.

Thank you for your time and consideration. We remain available at your convenience to discuss any questions or issues that you, the city council, city staff, or your technical advisory committee may have relating to Butler Market Village.

Tia Lewis, Attorney
Butler Market Village Property Owners

Damian Syrnyk

From: Brian Meece <brianmeece@bendbroadband.com>
Sent: Monday, June 08, 2015 2:55 PM
To: Damian Syrnyk
Cc: Brian Rankin
Subject: RE: UGB TAC Meeting June 9, 2015
Attachments: only 2000 acre map ... 04 27 15.pdf

Follow Up Flag: Follow Up
Due By: Monday, June 08, 2015 3:11 PM
Flag Status: Completed

Brian, Damian, et al:

Unfortunately I couldn't make it, but created this map a couple of days before the workshop.
So here is my map … did not have direction as to % of specific uses, nor the time to go there.
I have titled it "only 2000 acre map" but it could have been titled "ring around the city" as well …

I would like to address the question marks that I noted on this map to the TAC tomorrow.

Thanks,
Brian

From: Damian Syrnyk [mailto:dsyrnyk@bendoregon.gov]
Sent: Monday, June 08, 2015 12:03 PM
To: Joe Dills; Brian Rankin
Cc: Becky Hewitt; derek@cwhopp.com
Subject: FW: UGB TAC Meeting June 9, 2015

Boundary TAC members, please find enclosed testimony from Carl Hopp. We will forward any additional testimony that comes in today before 5 is forwarded on electronically.

Thanks, Damian

Damian Syrnyk, AICP | Senior Planner
Growth Management | City of Bend
541-312-4919
dsyrnyk@bendoregon.gov
www.bendoregon.gov

From: Derek Hopp Attorney [mailto:derek@cwhopp.com]
Sent: Monday, June 08, 2015 11:54 AM

To: Damian Syrnyk
Cc: Carl Hopp
Subject: UGB TAC Meeting June 9, 2015

Mr. Syrnyk,

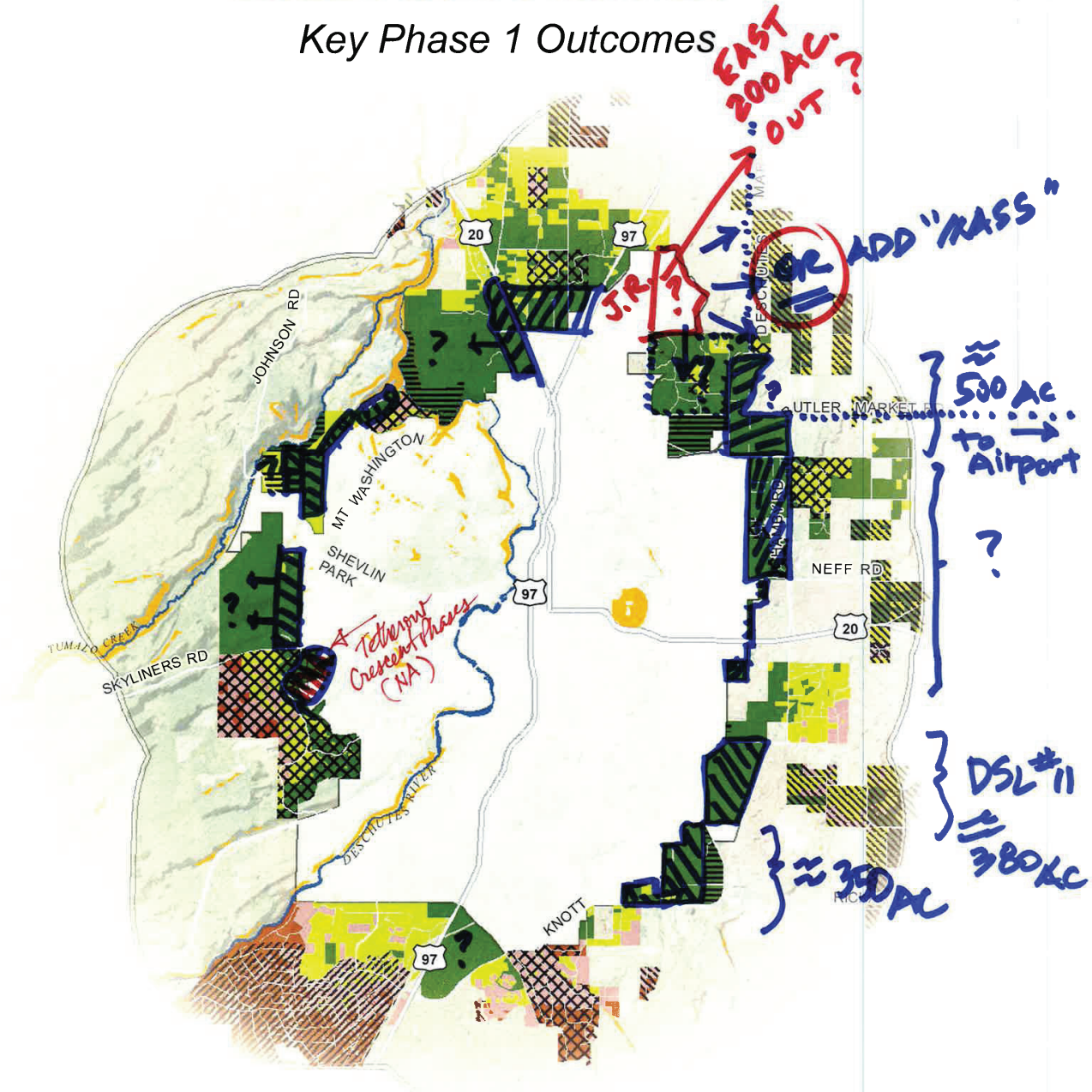
Attached please find a letter to the UGB TAC. Please provide this letter to the UGB TAC members for consideration in their meeting tomorrow if at all possible.

Sincerely,
Derek

Derek Hopp, Esq.
Carl W Hopp Jr. Attorney at Law, LLC
168 NW Greenwood Ave
Bend, Oregon 97701
phone 541-388-3606 fax 541-330-1519
email derek@cwhopp.com

BRIEFING PACKET 1

Key Phase 1 Outcomes



URBAN GROWTH BOUNDARY REMAND

MAKING BEND EVEN BETTER

UGB SCENARIOS WORKSHOP

April 22, 2015

6/9/15
Boundary TAC

SCHWABE, WILLIAMSON & WYATT®
ATTORNEYS AT LAW

360 SW Bond Street, Suite 500, Bend, OR 97702 | Phone 541.749.4044 | Fax 541.330.1153 | www.schwabe.com

TIA M. LEWIS
Direct Line: 541-749-4048
E-Mail: tlewis@schwabe.com

June 8, 2015

Brian Rankin
Planning Manager / Growth Management
City of Bend
710 NW Wall Street
Bend, OR 97701

Re: UGB - Boundary & Growth Scenario Maps
Evidence for Inclusion of Coats UAR Property
Our File No.: 125457-188345

Dear Brian:

Our office represents the Joyce Coats Revocable Trust, Eric and Robin Coats, Shevlin Sand & Gravel and CCCC, LLC.

Please present the enclosed materials to the Boundary TAC and include them in the record for the UGB remand. This evidence addresses the suitability of the land shown on the map attached as Exhibit A for inclusion in the UGB. Specifically, the property (including 33 acres owned by the school district) comprises approximately 449 acres and is identified as the following tax map and lot numbers:

Map / Taxlot	Account	Owner Name	Acreage
1711240000100	117406	CCCC LLC	35.47
1711240000700	117415	CCCC LLC	40.00
1711240000600	117416	CCCC LLC	40.00
1711250000300	117427	CCCC LLC	28.55
1711250000200	117428	CCCC LLC	40.00
1711230000500	131969	CCCC LLC	40.00
1711240000403	209812	CCCC LLC	18.63
1711230000502	268801	CCCC LLC	25.00
1711230000503	268802	CCCC LLC	40.00

1711130000500	112750	ERMK LLC	55.44
1711130000100	106885	ERMK LLC	15.82
1712180000100	109018	ERMK LLC	35.78
1711230000600	150925	School Dist #1	33.73

1. History and Ownership.

The Coats family owns approximately 700 acres in the Urban Reserve on the west side of Bend as shown on Exhibit B. The property is held in several different record owners' names for tax and business purposes but all acreage shown on the Exhibit A and B maps (except the 34 acres owned by the school district) is controlled by Eric and Robin Coats. The Coats family has held this UAR designated property as urban reserve to be included in the UGB since its UAR designation in 1976.

The Coats family seeks to have approximately 416 acres of its land together with the 33 acres owned by the School District included in the UGB for urban development including residential, employment and mixed use lands as shown on the Exhibit A map. As discussed more fully below, this property is suitable for inclusion into the UGB and vital to City of Bend for park, trail, transportation and sewer connections on the west side of Bend.

2. Improvement to Land Value Ratio.

The majority of the Coats property has no structures and has been partially mined for aggregate, sand and gravel over the past 50+ years. However, it is not now nor has it ever been a listed or protected Goal 5 resource so residential development surrounds the property to the south and east. The Factor 1 Map for Improvement to Land Value Ratio shows Tax Lot 300 on Assessor's Map 17-11-25 with a higher improvement than land value. However, this improvement value is based on the structures and improvements associated with the Ready Mix Plant located on Tax Lot 300. Despite a high assessed value, these improvements have a remaining useful life of approximately 3 years. The material used for the ready mix will be mined out of the larger pit to the north in less than 18 months. At that time, the operators will abandon the Ready Mix Plant site on Tax Lot 300 and move the scales and any remaining operations to the pit site to the north. This property is planned to be ready for redevelopment by the end of 2018.

3. Surface Mine Zoning.

The Coats property identified for inclusion in the UGB is designated UAR but is zoned Surface Mining. The active sand and gravel mining operations comprise approximately 200 acres in the northern area of the Exhibit B map, broken down as follows:

- Approximately 120 acres actively mined
- Approximately 40 acres used in conjunction with mining
- Approximately 40 acres currently unused but with some remaining resource.

There is approximately 5-7 years worth of resource left on the 200 acre area that can be economically mined, after which time the property will be reclaimed and available for subsequent use. The remaining 500 acres owned by the Coats family does not have sufficient resource worthy of extraction or is too close to urban uses to mine.

4. Park and Trail (Multi-Modal Transportation) Connections.

The location of the Coats acreage identified for inclusion in the UGB is crucial to the park and trail connections on the west side of Bend. As shown on the Exhibit A and B maps, the property is located between Shevlin Park / Tumalo Creek and the Deschutes River. It provides the connection between the two watercourses, the trail connections along both watercourses and the potential trail connections between Shevlin Park and the new Riley Ranch Nature Preserve. Eric and Robin Coats are working closely with the school district and Bend Parks and Recreation District to coordinate park, trail and neighborhood development and facilitate public/private partnerships. The inclusion of this property in the UGB and the removal of the Surface Mining Zoning will facilitate these important park and trail connections.

5. Sanitary Sewer Service

The majority of the subject Coats lands to be considered for UGB suitability and inclusion could be gravity served by standard gravity sewer extensions from the existing City sewer collection system adjacent the subject Coats property. A significant portion can readily gravity sewer to the existing collection system that drains to the City Awbrey Glen Sewage Pump Station. Other portions of the Coats lands can gravity sewer to other City Collection system mains already stubbed to the Coats property. The Awbrey Glen Pump station and its related pressure sewer, were originally planned for far greater sewage flows than currently reach the station, as the original planned service area largely developed at far lower densities than originally planned. Thus there is opportunity to get better utilization and efficiencies of the previous City sewer infrastructure investment by serving the Coats lands. Currently that infrastructure has been significantly under-utilized.

The City Sewer Collection System Master Plan, December 2014, including the Collection System Public Facility Plan, verifies there are no current capacity issues at the Awbrey Glen Pump station, nor none anticipated in the Master Plan planning horizon. Additionally the Master Plan indicates the City is already planning a significant upgrade to the Awbrey Glen pump station discharge sewer (the Valhalla Sewer Relocation and Odor Control project), to better serve the current UGB and address periodic odor issues in the existing sewer. The project is identified

as project ID12 in Table 1B of the Sewer Collection System Public Facility Plan, and is identified to be pursued immediately (Year 1 of the plan execution at $1.6M). The project plans a new gravity sewer to replace a portion of the existing pressure sewer. Inclusion of Coats lands in the UGB, will help the City and public realize efficiencies and added value for this project investment that is already planned and budgeted for the current UGB service. Given the significant costs and ever increasing rates the City customers are to bear to implement the City Sewer Master Plan, it's important that the City maximize the value of each and every project investment. The addition of Coats lands will help ensure that the full value of that investment is realized for the public.

We believe the recently developed TAC Factor 2 Map titled "Preliminary Analysis of Potential UGB Expansion Wastewater Basins" is highly inaccurate with respect to sanitary sewer service potential and feasibility to the Coats lands. The Map does not reflect the significant opportunities for efficient gravity service to the existing collection system for the majority of the Coats lands. On this TAC Map -Preliminary Analysis, the Coats lands are inexplicably included with huge portions of land west of Tumalo Creek and Johnson Road even though all such lands are currently outside the UAR. This "Preliminary Analysis" then is heavily reliant on conceptual sewer solutions that are unrealistic and unnecessary to serve the Coats Lands, (a NW interceptor, regional pump station across river, etc.), concepts that are related to serving lands west of Tumalo Creek and the UAR. This Map and Preliminary Analysis overlooks many other more practical and efficient sewer solutions to the Coats lands. There is no justification or evidence base in the record or the TAC processes, to warrant the "poor" categorization for sewer service to the Coats lands as indicated on this TAC map, nor that supports the implication that Coats lands must be served by such unrealistic infrastructure that would be needed to serve lands west of Tumalo Creek and the UAR.

Given these clear and profound shortcomings, we strongly encourage the TAC and UGB Steering Committee to disregard this TAC Factor 2 Map titled "Preliminary Analysis of Potential UGB Expansion Wastewater Basins", in the relative consideration of UGB inclusion lands with respect to sewer service to the Coats lands.

6. Multi-modal Transportation Connectivity.

Urban development of the Coats land will provide the opportunity to accomplish numerous significant and important multi-modal transportation elements and connections, which will serve to complete transportation links and connectivity that has been planned for decades, and that can serve to relieve impacts and pressure on the existing City transportation system, as well as serve the urban development of the subject land.

Currently no fewer than 8 urban public roads have been constructed (stubbed) to the boundary of the Coats lands, in anticipation of the urbanization of the Coats lands. Each of these road connections also include substantial utility infrastructure normally associated with urbanization; domestic water and fire protection water supply infrastructure, sanitary sewers, power, natural gas, and/or communications utilities. The 8 existing road and utility connections

are shown on the attached Exhibit A, and are listed below along with the subdivision or local urban development within which that infrastructure was extended to the Coats land:

- Chiloquin Drive (Renaissance at Shevlin Park)
- Mehama Drive (Renaissance at Shevlin Park)
- Imbler Drive (Renaissance at Shevlin Park)
- Shevlin Bluffs Road (Shevlin Estates)
- Skyline Ranch Road (Westside Meadows)
- Polarstar Avenue (Shevlin Court)
- Nordic Avenue (Valhalla Heights)
- Regency Street (Awbrey Ridge)

Urbanization of the Coats lands will allow for the orderly extension of these long-planned stubbed public roads, the completion of several transportation links and grid connections, that will allow for the dispersion of traffic to reduce impacts on the City primary transportation routes, and thus preserve capacity on those primary routes.

The Coats lands are strategically critical to accomplish the long-planned extension of Skyline Ranch Road (a City Major Collector Road) northerly from Shevlin Park Road, as shown on the City's current Urban Area Transportation System Plan. This planned extension of Skyline Ranch Road northerly, will offer an alternative route for northerly and easterly bound traffic in west Bend, that will relieve pressure and impacts on the existing City arterial and collector road network through west Bend, and the downtown core area. Skyline Ranch Road can extend northerly through the Coats lands, cross an existing bridge at Tumalo Creek, and connect to Tumalo Park Road.

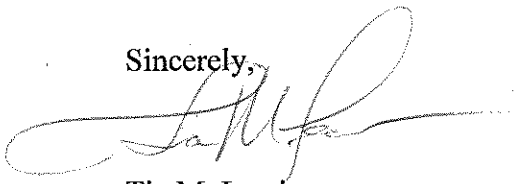
In addition the City Transportation Plan includes another planned east-west Collector Road, crossing Coats Lands from Putnam Road to Buck Drive. This important transportation link would provide substantial additional connectivity to existing City areas east of the Coats lands, provide important secondary access for lands west of Coats, and again afford the opportunity for alternate routes that can relive pressure on the existing City arterial and collector road network through west Bend, and the downtown core area.

7. Conclusion.

For the reasons set forth herein, the inclusion of the Coats property identified on Exhibit A in the UGB provides important transportation, park and trail connections, the opportunity for master planning to develop open space, public uses and a variety of compatible neighborhood and employment uses which can be easily served by City infrastructure, urbanize efficiently and provide protections for valuable natural areas.

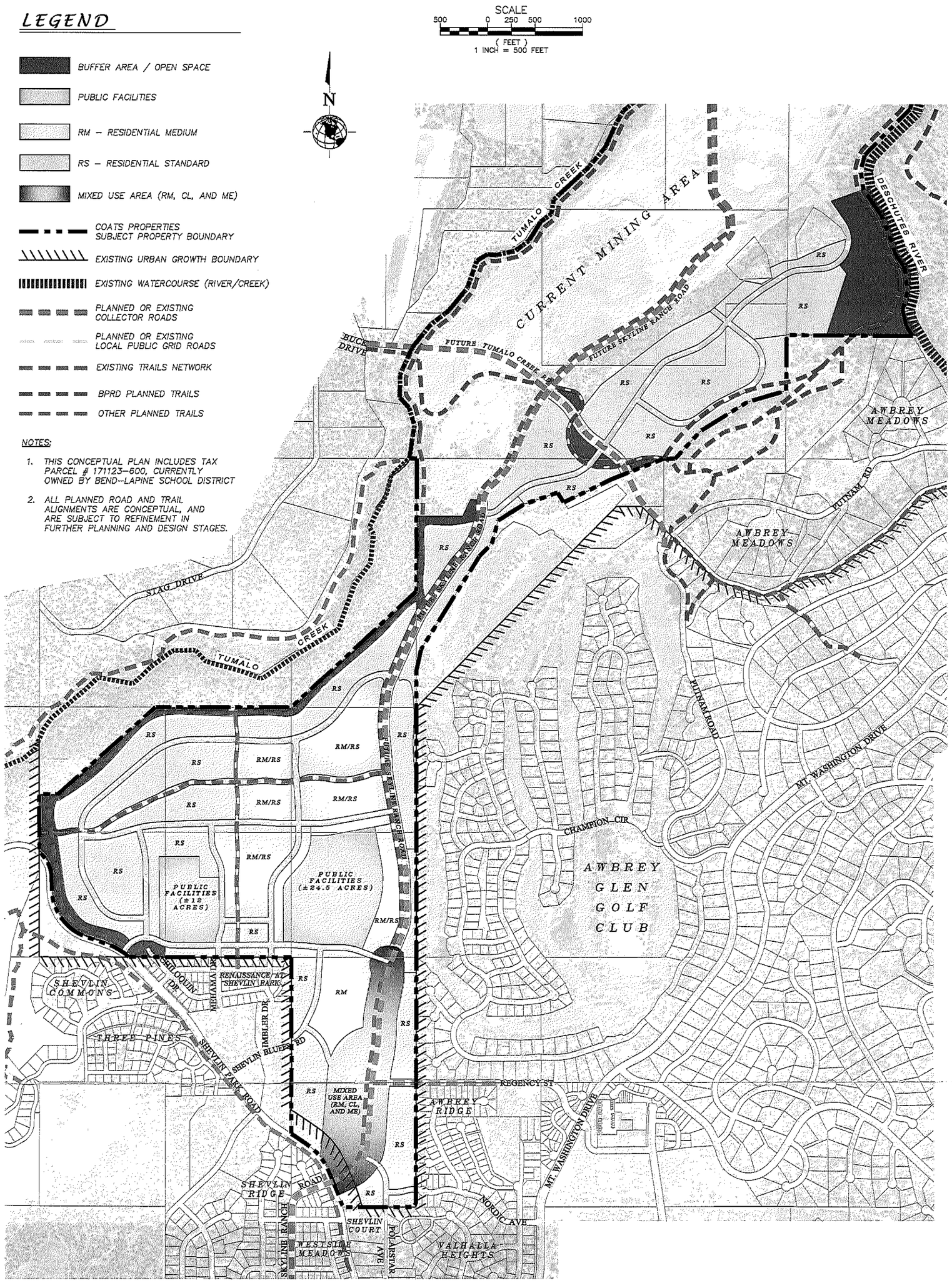
Thank you for the opportunity to submit evidence supporting inclusion of this property in the UGB.

Sincerely,



Tia M. Lewis

TML:ls



DESIGNED BY: KD/AE	CHECKED BY: KD				
DRAWN BY: AE/CB	APPROVED BY: KD				
LAST EDIT: 06/08/15	PLOT DATE: 06/08/2015				
DATE	BY	REV#	REVISION	CK'D	APPR.

SHEET EX-A

REGISTERED PROFESSIONAL ENGINEER 19,558 OREGON JAN. 20, 1998 KEITH S. DAGOSTINO EXPIRES 12/31/15

COATS PROPERTIES

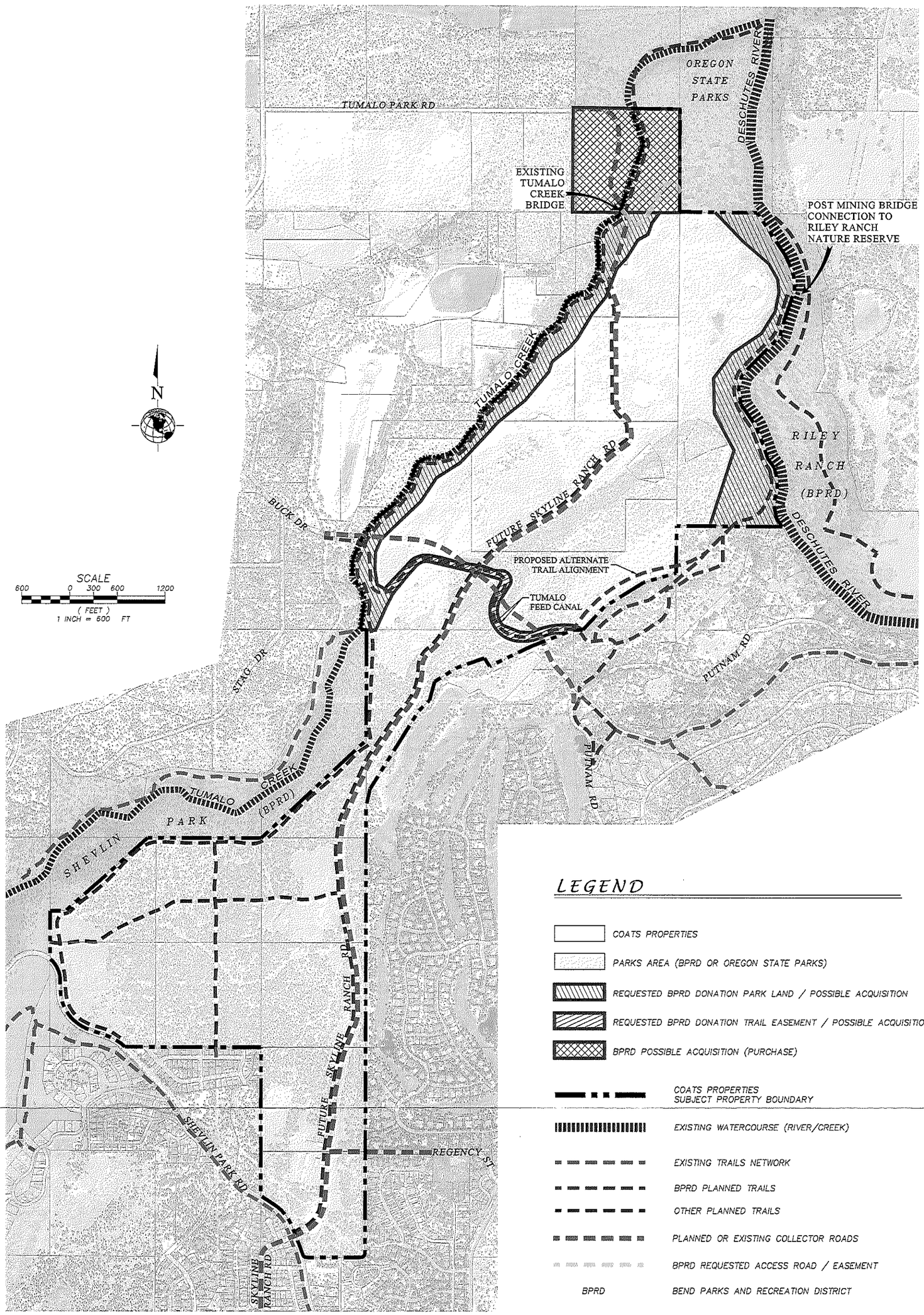
CONCEPTUAL MASTER PLAN

BEND/DESCHUTES OREGON

SCALE:	PROJECT NO.	DRAWING FILE NAME:
1" = 500'	COAT001	COATS BASE 052015

D'Agostino Parker, LLC
CIVIL ENGINEERING / PLANNING / LAND SURVEYING / CONSTRUCTION MANAGEMENT
185 SHEVLIN HIXON DR., SUITE 101
BEND, OR 97702
P: (541) 322-8807

03932



SHEET EX-B

DESIGNED BY: KSD CHECKED BY: KSD
DRAWN BY: CAB APPROVED BY: KSD
LAST EDIT: 06/08/15 PLOT DATE: 06/08/2015

DATE	BY	REV#	REVISION	CK'D	APPR.

REGISTERED PROFESSIONAL ENGINEER 19,559 OREGON JUNE 20, 1989 KEITH S. DAGOSTINO EXPIRES 12/31/15

COATS PROPERTIES

OVERALL PROPERTY SETTING MAP

BEND/DESCHUTES OREGON

SCALE: 1" = 600' PROJECT NO. COAT001 DRAWING FILE NAME: COATS BASE 052015

D'Agostino Parker, LLC
CIVIL ENGINEERING / PLANNING / LAND SURVEYING / CONSTRUCTION MANAGEMENT
185 SHEVLIN HIXON DR., SUITE 101
BEND, OR 97702
P: (541) 322-6807

03933

Meeting Agenda

Urban Growth Boundary Technical Advisory Committee – Meeting 9
Tuesday, June 9, 2015 9:00 AM – 1:00 PM
Municipal Court Room – Bend Police Department
555 NE 15th Street
PLEASE NOTE THE 9 AM START TIME AND THE LOCATION

Meeting Purpose and What is Needed from the TAC

The purposes of this meeting are to:

- Receive information on TAC minority reports from the City Attorney
- Discuss updates on Wildfire assessment and mitigation, and work to be done to evaluate the scenarios this Summer
- Discuss and direct UGB expansion scenarios:
  - Discuss outcomes from the April 30th workshop, and how they have been organized into draft scenarios
  - Identify refinements as needed and approve a slate of alternatives for consideration by the UGB Steering Committee on June 25th

The specific discussion recommendations, i.e. the feedback we would like from the TAC, are listed in the packet materials.

1. Welcome and Introductory Items — 9:00 AM

a.	Convene and welcome	Co-chairs
b.	Approval of minutes (Meeting 8 – page 4 of packet)	
c.	Where we are in the process – a brief look back and look forward	Joe Dills, Brian Rankin
d.	TAC protocols for minority reports – please see memo (page 9 of packet)	City Attorney
e.	Irrigation District comments	Irrigation District
f.	Public comment – for comment other than Scenarios input under agenda item 4c.	Chair moderates

For additional project information, visit the project website at http://bend.or.us or contact Brian Rankin, City of Bend, at brankin@bendoregon.gov or 541-388-5584

Accessible Meeting/Alternate Format Notification
This meeting/event location is accessible. Sign and other language interpreter service, assistive listening devices, materials in alternate format such as Braille, large print, electronic formats, language translations or any other accommodations are available upon advance request at no cost. Please contact the City Recorder no later than 24 hours in advance of the meeting at rchristie@ci.bend.or.us, or fax 385-6676. Providing at least 2 days notice prior to the event will help ensure availability.

2. Wildfire — 9:30 AM

Briefing and TAC Discussion and Action

a. Briefing – Wildfire Risks, Assessment, & Mitigation – please see memo (page 13 of packet) — Craig Letz and Brian Rankin
b. TAC discussion – working from the memo
c. Action: discussion and action on the recommendations (pages 14-15 of packet)

3. Optional Break — 10:20 AM

Time permitting.

4. Draft UGB Expansion Scenarios — 10:30 AM

Briefing and TAC Discussion

a. Briefing – Draft scenarios – please see memo (page 21 of packet) — Andrew Parish, APG
b. TAC discussion – working from the memo and through to the recommendations
c. Public comment – for input on this agenda item — Chair moderates
d. Action: discussion and action on the recommendations (page 47 of packet). The preliminary plan for this action item is to identify refinements for each scenario, working through them one at time. The discussion will also allow for TAC members to propose a new or hybrid scenario.

    As a way to think about refinements, TAC members may wish to propose:

    - Spatial changes that would refine a mapped area
    - Use changes that would refine the intended uses for an area
    - Evaluation notes: not a specific change, but rather an item that should be addressed during the evaluation process this summer.

5. Project Information, Next Steps — 12:45 PM

Brian Rankin

Joe Dills

a. Project information

b. Next meeting – October 2015 (tentative date: October 8)

c. Other upcoming meetings and outreach activities

- June 25 – UGB Steering Committee
- July 21 – Residential and Employment TACs
- August 25 – Residential and Employment TACs
- September (tentative date: Sept 23) – MetroQuest on-line survey launch
- Late September – Community meeting
- Briefings and presentations for community groups – on-going

6. Adjourn — 1:00 PM

Attachments in separate packet:

- Swalley Irrigation District Comment on UGB Scenarios, June 1 2015
- Email and attached materials from Robin Vora, May 31 2015

City of Bend
Boundary & Growth Scenarios Technical Advisory Committee – Phase 2
Meeting Notes
Date: April 7, 2015

The Boundary & Growth Scenarios TAC held its first meeting of Phase 2 of the Remand Project at 10:00 am on Tuesday, April 7, 2015 in the Municipal Court Hearing Room of the Bend Police Department.

Roll Call

- ☐ Toby Bayard
- ☐ Susan Brody
- ☐ Jim Bryant
- ☐ John Dotson
- ☐ Scott Edelman
- ☐ Ellen Grover
- ☐ Steve Hultberg
- ☐ Tom Kemper
- ☐ Nick Lelack
- ☐ Brian Meece
- ☐ Charlie Miller
- ☐ Mike Riley
- ☐ Wes Price
- ☐ Ron Ross
- ☐ John Russell
- ☐ Sharon Smith
- ☐ Gary Timm
- ☐ Rod Tomcho
- ☐ Dale Van Valkenburg
- ☐ Robin Vora

Discussion

1. Welcome

a. Convene and welcome new members. Joe Dills of the APG Team called the meeting to order at 10:01 am. He welcomed new TAC Members Wes Price, who also served on the Employment Lands TAC in Phase 1 and Tom Kemper who served on the Residential Lands TAC.

Brian informed the TAC that Wes and Tom Kemper were assigned as representatives to the Boundary TAC from Employment and Residential TACS

At this time, Rod asked if we're here to reach consensus, achieve a majority vote and recommendation to the city council. Brian responded by informing the TAC that he is working with legal counsel on establishing minority reports and a process for developing such reports. With respect to last meeting of the UGB Steering Committee, Brian indicated the TAC should not conduct discussions by group emails – that type of discussion is discouraged under Oregon's public meetings law.

b. Minutes of February 24, 2015 Boundary TAC meeting. Ron moved to approve the minutes; Dale provided a second to the motion. Minutes were approved unanimously.

c. Where are we in the process – a brief look back and look forward. Joe provided the TAC with a recap and report on our current status in the project. The project is now nine months to a boundary. The upcoming meetings include today's (April 7, 2015) Boundary TAC meeting; April 30, 2015 Boundary workshop from 2pm to 5pm, and; a June 9, 2015 Boundary TAC meeting. By end of June 2015, the project team will be back before the UGB Steering Committee (USC) seeking their approval of scenarios for UGB expansion. The team will then take these recommendations into the modeling process. Boundary TAC will be on hiatus in July and August while modeling is ongoing. Residential and Employment TACs will be reviewing technical documents during this period.

2. Stage 2 – Proposed Composite Maps and Process

Andrew Parish of APG gave a powerpoint presentation on the Stage 2 maps included in the meeting packet. The presentation referred to Table 1 in the packet (See page 11) and series of maps for each Goal 14 Factor (Factors 1 through 4) starting on page 12 of the packet. Table 1 summarized the variables considered under each Factor and the corresponding Figure in the packet. Joe clarified that the approach used for this round of maps is still unweighted: no variables are given more weight than others. The presentation reviewed the maps for each factor, and highlighted that the Factor 3 map was presented in several versions. One version has both the wildfire and deer winter range habitat ratings toggled off per the USC's direction from their March meeting. The maps included:

Figure	Description
1	Factor 1: Efficient Accommodation of Land Needs
2	Factor 2: Provision of Public Facilities and Services
3	Factor 3: ESEE Consequences
4	Farm/Forest Compatibility
5	Bend UGB Land Suitability Composite
6	Bend UGB Land Suitability Composite (Annotated)

The maps also included an Appendix A, which consisted of several versions of Figure 3:

- Factor 3: ESEE Consequences
- Factor 3: ESEE Consequences (Including Fire Risk Rating)
- Factor 3: ESEE Consequences (Excluding Proximity to Winter Range)
- Factor 3: ESEE Consequences (Excluding Proximity to Winter Range and Including Wildfire Risk Rating).

After the team presentation, the TAC members had several questions for discussion, including whether to include schools and identify those already located outside the UGB, treating the covenants, conditions, and restrictions (CCR's) of the Tetherow resort like those of other adjacent subdivisions which prohibit further land divisions (e.g. subdivision or partition), and whether the composite maps should include versions with the wildlife and the wildfire data toggled "on" and "off." The TAC discussed wildfire further by considering actual risk, the Community Wildfire Protection Plan (CWPP) ratings for each area outside of Bend, and what effect urbanization might have on wildfire risk. Craig Letz, the wildfire consultant on the UGB team, offered that a meeting was being organized with the different fire agencies to consider the risk of wildfire and how this could be considered in the UGB Remand Project. The meeting was scheduled for April 20, 2015 from 1pm to 5pm in the Council Chambers. The team further mentioned that the fire stakeholders would include representatives from the Bend Fire Department, Deschutes County Rural Fire Protection District #2, Oregon Department of Forestry, Bureau of Land Management, and the County Forester.

The remaining TAC discussion of wildfire considered whether comprehensive plan policies and code language would be useful to mitigate wildfire, the historical fires that have occurred close to Bend, and whether to pursue more updated information on wildfire before proceeding. Joe mentioned that the 4/20 meeting of fire agency staff would be helpful and that a summary of their discussion would be included in the materials for the April 30 scenarios workshop. The TAC further discussed and agreed to use the summary of the 4/20 fire agency meeting as a resource at the 4/30/2015 UGB scenarios workshop.

Motion: With respect to the wildfire data, Sharon moved to not toggle this layer on and off and go with the existing annotated map. Steve provided a second to this motion. The motion passed with 12 votes in Favor and 5 votes Opposed.

The TAC then proceeded to take votes on the decisions list on page 20 of the packet, which are reproduced below:

1. *Stay with the un-weighted approach*. The TAC should consider the Bend UGB Land Suitability Composite (Figure 5), together with the Factor Maps (Figures 1-4) and any other Stage 2 maps members wish to use, as a data base informing qualitative judgments of most and least suitable lands. It will not be worthwhile to spend further time and resources trying to create the "perfect" Stage 2 composite map of best and worst performing lands.

Motion: Before a motion was made Scott Edelman raised a question of whether each factor had a highest possible score. The team confirmed that all factors were equally weighted. Dale Van Valkenburg asked for clarification on the Factor 2 maps and the last two bullets regarding welded tuft, distance from drinking water protection area (DWPA) and industrial development. After this discussion, Ellen moved approval of No. 1, Susan provided a second to the motion. The motion passed with 15 votes in Favor and one vote Opposed.

2. *Use the Annotated Land Suitability Composite (Figure 6) as the basis for narrowing the pool of lands to be considered for UGB expansion.* Figure 6 identifies the least suitable lands, based on GIS analysis of the Goal 14 factors and additional indicators of low suitability (CCR lands, islands, and irregular edge parcels). When the low suitability lands are removed, the remaining pool of lands is roughly 9,700 acres, a reasonable starting point for identifying the 1,000-3,000 acres needed to complete Bend's land supply for 2028.

Motion: Rod asked for clarification that the motion was to leave this map as is and adopt it and the 4/7 table. Brian moved approval of this motion with Sharon providing a second. Discussion on the motion – Robin discussed the area north of Mt. Washington Drive (west) as bright green, and whether to look at individual maps for sewer and wildlife. Motion passed with 13 votes in Favor, one vote Opposed, and no abstentions.

3. *Use the Annotated Land Suitability Composite (Figure 6) in the upcoming scenario workshop.* Participants at the workshop should use Figure 6, plus additional Stage 2 maps as information, as the basis for building scenarios. In this way, they will select – in the workshop – what areas are most suitable using their own value judgments about what are the best lands for urbanization in the 9,700 acres under consideration.

Motion: Before the motion was made, Alex Joyce gave a brief presentation on how the workshop would work, including the chip menu exercise, reporting back to the larger group, and the goal of looking for three distinct scenarios. The TAC also asked for clarification on the focus of the workshop being where and how to grow, discussing what lands are suitable for urbanization at the workshop; the experience from the prior (December 2014) workshop, the opportunity for a guided and self-guided tours of the UGB, and background materials to review before the workshop. No motion was made as the TAC came to consensus in support of this recommendation.

4. *Supplement the Stage 2 map set with new information (forthcoming) from the irrigation districts.* In addition to the information shown to date, city staff is working with surrounding irrigation districts to provide mapping information which will show their key facilities and irrigated parcels for use in the upcoming scenario workshop. Up to now, this information has been difficult to assemble due to time constraints. This additional information will allow the workshop

participants to consider the location of irrigated lands and irrigation district infrastructure alongside information in the existing map series.

Brian provided a quick update on the City's work with the four irrigation districts with serviced territory and irrigation facilities (e.g. canals, laterals) in the UGB study area. He had given a presentation on the project to the Deschutes Basin Board of Control, which consists of the managers of each basin irrigation district. The City is coordinating with the districts to bring this type of information into the workshop discussion on the 30th. No motions or votes were taken on this topic.

4. Calculation of the Range of Acreage Needed for UGB Expansion

Andrew Parish of the consultant team gave a presentation of the acreage calculations presented in the packet in Table 3 (See pages 33 and 34). He also touched on how the calculations for other lands were addressed and elaborated on the discussion presented on page 34. The total "bookends" for each scenario was 2,195 acres for Scenario 4b and 1,911 acres for Scenario 5c. After the presentation, the TAC discussion touched on a vacancy factor for residential lands, the proportion of housing in Juniper Ridge under each scenario, and second homes and how they were included in the residential acreage calculation. In addition, the TAC discussion also included several factors that were considered by the Residential and the Employment TACs in their prior work, including aspirational land needs, efficiency measures, special site needs (such as those considered in 2008), and the amount of developable acres in Juniper Ridge.

Motion: After the close of the discussion, Joe asked for a motion on the acreage calculations presented on page 35, which is reproduced below.

The team recommends that the preliminary land needs in Table 3 be used as "bookends" for the April 30th scenario workshop. As noted, the total land need estimates will likely be revised downward slightly to account for schools and parks developed in the 2008-2014 period.

Tom Kemper moved approval of this motion, with John Russell providing a second. The motion passed unanimously.

5. Public Comment.

No public comment was provided at this time.

Ellen Grover offered an announcement of an event of potential interest to the TAC on 4/15/15.

6. Project Information, Next Steps

Joe adjourned the meeting at 12:25 pm.

Action Items/Next Steps

Action	Assigned To
Approved the use of the annotated composite map	✓ Done
Approved staying with an un-weighted approach for the Land Suitability Composite	✓ Done

Approved the use of the Annotated Land Suitability Composite (Figure 6) for narrowing pool of land to consider for expansion	✓ Done
Approved use of Annotated Land Suitability Composite (Figure 6) for Use in the April 30 Scenarios Workshop	✓ Done
Approved the acreage calculation "bookends" of 2,195 acres for Scenario 4b and 1,911 acres for Scenario 5c.	✓ Done

ATTORNEY/PLANNER MEMORANDUM

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To: UGB Technical Advisory Committees
From: Mary Alice Winters, City Attorney
Brian Rankin, Planning Manager
Subject: Open Meetings Law/Email Exchanges and Minority Reports
Date: May 26, 2015

As we've gone through this process, several procedural issues have been raised and we wanted to give you legal and policy background to aid the discussion. Most of you know these points, but to be sure we are all on the same page, please review the discussion below.

Open Meetings Law, TACs and Subcommittees:

The policy behind Oregon Public Meetings Law (ORS 192.610 to 192.690) is:

> The Oregon form of government requires an informed public aware of the deliberations and decisions of governing bodies and the information upon which such decisions were made. It is the intent of ORS 192.610 to 192.690 that decisions of governing bodies be arrived at openly. ORS 192.620.

Two of the terms in this policy are important to understand the scope of Oregon Public Meetings Law. The first is "governing body." As defined under the Oregon Public Meeting Law, "governing body" includes not only the City Council, but every other board, committee, commission, task force or subcommittee that makes a decision for the City or makes a recommendation to any other "governing body". The UGB Technical Advisory Committees (TACs) are charged with making recommendations to the UGB Steering Committee, which in turn is charged with making recommendations to the City Council. The TACs are therefore considered "governing bodies" and are subject to public meeting law. Whenever a quorum gathers, it is a meeting. If a subcommittee is formed, the quorum rules then apply to the subcommittee.

Successive Conversations and Electronic Communications as "Meetings". The main point of public meeting law is to require that all decisions and deliberations toward a decision by a "governing body" must be made in a public meeting. The term "deliberate" or "deliberation" is not defined, but the terms are applied very broadly. Any discussion or communication regarding a subject that is before (or could be before) the committee constitutes deliberation. *See* Attorney General's Public Meeting Manual at 139-40. Not only that, information may not be conveyed to a quorum of the board at a

meeting unless the meeting complies with public meeting law.[1] *Oregonian Publishing Co. v. Oregon State Board of* Parole, 95 Or App 501 (1988); *see also* ORS 192.620 (policy that the public has the right to know the "information" that a body is basing its deliberations or actions on). As long as an advisory body is itself a governing body, the fact that its members may be private citizens is irrelevant. The public meetings law extends to privates citizens without any decision-making authority when they serve on a group that is authorized to furnish advice to a public body.

While some personal discussion between persons of less than a quorum of a "governing body" is allowed, any communications between two members of a committee regarding a substantive matter before the committee creates some risk of a Public Meeting Law violation. There are two main ways this can happen. The first is a series of conversations that eventually involve a quorum of the body. If one member suggests a course of action to two other members of a seven member committee, and then each of those has a follow-up conversation with another member, the conversation has now included a quorum of the committee and is a Public Meeting Law violation if the conversations constitute deliberation. If a decision is made in this manner, that decision is void.

The other common way that Public Meeting Law can easily be violated is by electronic communication. A substantive email sent by one member of a committee to all or a quorum of the committee may constitute deliberation or conveying of information that can only be done in a public meeting. A "reply all" message on the same substantive subject could likely be found to be a violation. Furthermore, a series of emails, even if none of them involve a quorum, may constitute a meeting. *See Dumdi v. Handi*, Findings of Fact and Conclusions of Law, Lane County Circuit Court No 16-02760 (Jan. 14, 2011) (series of meetings and emails among or at the direction of certain Lane County Commissioners constituted a meeting that should have been public).

Emails are not the only potential means of violating public meeting law – texts and social media posts may also constitute deliberation.

The safest approach to compliance with Public Meeting Law by committee members is simply to not have any substantive communication with other members of the committee outside of public meetings. Communication with staff is normally not a violation of public meeting law,[2] so all substantive communication should be with staff.

[1] This does not mean that there can be no written communications to a governing body by staff or outside sources; however if there are, those communications need to be made available to the public and included as part of the record of the proceeding. Any discussion or comment on those communications by members of the governing body must be in a public meeting.

[2] Committee members cannot use staff to communicate with other members of the committee – the communications have to be directed solely to staff.

Information for TACs and Public Records

Information—documents, reports, etc., shared by TAC members either directly or through staff are public records since they contain information related to the conduct of the public's business. ORS 192.410(4)(a) and .420. The thornier question is whether they are part of the legislative record for the UGB process. Staff does not track all email exchanges for the UGB record, and it would be difficult and burdensome to do so. Therefore, staff requests that if a task member wants a particular substantive email to be placed into the public record for the UGB process, the member make a specific written request. This way, there is no ambiguity as to the author's intent.

Minority Reports or Statements

We have had some discussion of minority reports to the UGB task force—when they are appropriate, how they should be used, what constitutes a minority. As you all know, the task forces were formed to represent a wide variety of community views as well as individual expertise. The idea is to encourage compromise, with the understanding that individuals can always testify as to their own views separately as citizens or part of other groups. Minority reports, while at times useful, to a certain extent undermine the value of the task force process as a whole IF they distract members from reaching compromise. They also should not be a substitute for elevating the position of a small number of individual's view simply because they are task force members. Again, members will have every right to testify, write letters and make their views known if they choose during the public process.

With a task force of 15-20 members, a minority position should be on a key substantive topic that has been debated and discussed, where it would aid the review of the UGB steering committee to be formally informed of the minority view. To meet this end, at least 4-5 people should be in the minority. As with the majority view, any minority position should be drafted or reviewed by staff (consultant and/or city staff) for accuracy and fact-checking.

Procedurally, if a minority becomes a subcommittee with the authority to make a recommendation to the governing body (in this case the UGB steering committee), it becomes a "governing body" itself, subject to the Open Meetings Act. Thus, for example, a three member committee of a 7 member board is a "government body" if it is authorized to make decisions for or to advise the full board or another public body. If the subcommittee is only gathering and reporting information for the full committee it is not a governing body. Therefore, if a group of TAC members meets to formulate a minority report/recommendation, it is likely forming a subcommittee subject to the Open Meetings Act, so the gathering should occur subject to the public meeting and notice requirements. No public participation is required, but the discussion cannot be held out of the right of the public to attend and listen (i.e., by phone, email, or at a coffee shop of pub--sorry).

Our recommendation: To the extent a strong minority position exists on a key issue, and there is time for the drafting of a minority position, the discussion should occur at the time of the vote on the topic. Thus, no separate process (scheduling/notice) of a meeting is then required and the minority position can become part of the written report to the UGB steering committee. For the reasons discussed at the beginning of this section, this approach should be used sparingly and wisely by the TACs.

Memorandum

May 18, 2015

To: UGB Boundary TAC

From: Craig Letz, Wildfire Consultant and City Staff

Re: Wildfire Risks, Assessment, & Mitigation: Recommendations to the Boundary TAC

PROJECT BACKGROUND

The 2009 Urban Growth Boundary proposal did not assess fire risk. In their 2010Remand Order, the Land Conservation and Development Commission (LCDC) told the City that it was not specifically required to examine wildfire risk but strongly suggested consideration of wildfire risk through the balancing lens of Goal 14. To that end, the City has been working to gather the best available information on risk and mitigation approaches and is using that information to make these recommendations for Boundary TAC consideration and approval.

WILDFIRE RISK ASSESSMENT TOOLS

The City initially proposed using the Greater Bend Area Community Wildfire Protection Plan (CWPP) (http://www.projectwildfire.org/index.php/cwpp). The Boundary TAC had concerns with the CWPP as a tool due to outdated data and artificial boundaries for risk. In response, the City pulled together a Wildfire Focus Group, consisting of local experts on wildfire, to discuss the appropriateness of the CWPP (See attached summary). The Focus Group was asked if the CWPP is an appropriate tool to use for assessing relative wildfire risk in Bend, and whether there are there other tools that might be more effective.

Deschutes County Forester Ed Keith offered a series of maps based on West Wide Risk Assessment data (see 2013 version for the Bend area, attached), a mapping effort coordinated through the council of Western States Foresters. These maps provide a finer grained analysis of risk that is not constrained by artificial geographic boundaries (one of the TAC concerns) but that essentially supports the conclusions of the CWPP: **wildfire risk is high all around the City**. The only areas outside of Bend that are not at a high risk of wildfire are irrigated fields (e.g. pasture) or rocky areas (e.g. surface mines, pressure ridges).

The Focus Group agreed that there are many models for wildfire out there, all of which suffer from the dynamic nature of the resource, but agreed that the CWPP is the best tool to use, particularly because it is possible to dig into the assumptions and see what conclusions were used to assess the risk. In other words, risk is high all around the City but might be high in one area because of threats to structures and in another because of topography. The Fire Risk Index provides a finer grain mapping that is not artificially constrained by parcel or other geographic boundaries to illustrate the risks presented by the CWPP.

All members of the Focus Group agreed that an onsite assessment of the actual land proposed for inclusion into the UGB would be feasible and provide valuable information to the Boundary TAC.

❖ ***Recommendation to TAC:*** *Use the CWPP, as illustrated by the Fire Risk Index Map, as the basis for determining wildfire risk. Proceed to onsite assessments, as described below.*

WILDFIRE RISK ASSESSMENT METHODOLOGY

Since the CWPP and West Wide Risk Assessment maps identify almost all of the potential UGB expansion areas as at high risk of wildfire, the Focus Group recommended onsite assessments to provide the TAC with useful decision-making information. The Group recommended considering two different assessment tools: Firewise Community Assessment (www.firewise.org) and the Oregon Forestland-Urban Interface Fire Protection Act (also called Senate Bill 360) Risk Assessment (www.oregon.gov/odf/fire/docs/wildfireriskassessment.pdf)[1].

A review of these two methodologies reveals very different approaches to the analysis. The Firewise approach is mainly qualitative and descriptive. The SB360 method is more analytical and is quantitative. This provides two benefits: (1) it allows a clearer comparison of one site against another, and (2) provides an objective basis for Goal 14 findings. In either case, the assessment should be performed by experts or trained staff. The assessment will be completed during the Spring of 2015 so the results can be used in the evaluation of UGB scenarios.

The Focus Group recommended assessing the wildfire risk on adjacent parcels when it appears that there is a difference in fire management regimes on land adjoining the proposed UGB expansion lands. The Group also suggested that an on-site assessment would be helpful in determining appropriate mitigation measures for lands selected to include in the UGB.

❖ ***Recommendation to TAC:*** *Assess wildfire risk on land within the UGB Scenarios using the SB360 Risk Assessment. Utilize willing members of the Focus Group or trained staff for the site assessments. Assess adjacent land if deemed necessary. Use the results of the on-site risk assessments for (1) determining suitability for inclusion in the UGB under Goal 14 Factor 3, and (2) determining appropriate mitigation for lands that are selected to be included in the UGB.*

WILDFIRE MITIGATION STRATEGIES

Finally, the Focus Group was asked to discuss appropriate mitigation for development, considering that almost all lands being considered for the UGB present some level of high fire risk. The consensus of the group was that the foundation for wildfire mitigations should begin with Firewise recommendations as outlined in National Fire Protection Association (NFPA) Standards 1141 and 1144 http://www.nfpa.org/codes-and-standards/document-information-pagesNFPA 1141: This standard provides requirements for the development of fire protection and emergency services infrastructure to make sure that wildland, rural, and suburban areas undergoing land use changes or land development have the resources and strategies in place to protect people and property from fire dangers, and allow fire fighters to do their jobs safety and effectively.

- NFPA 1144: This standard provides a methodology for assessing wildland fire ignition hazards around existing structures and provides requirements for new construction to reduce the potential of structure ignition from wildland fires.

[1] Senate Bill 360 was passed by the Legislature in the 1997 Session.

Other communities around the fire-prone west, such as Flagstaff, Arizona, have adopted wildfire mitigation programs that go beyond the Firewise standards but which may be appropriate for Bend.

The City's ultimate goal is to adopt effective mitigations through policy and codification. However, not all Firewise recommendations are in line with the City's urbanization goals. For example, Firewise recommends 30 feet of clearance between homes, which wouldhave the effect of limiting the development type to a low density. Therefore, an alternative approach may be necessary, which would identify alternative mitigations to accomplish similar protections.

Some initial thoughts for consideration include, but are not limited to:

- Requiring internal or external sprinkler systems in structures within the interface zone.
- Prohibiting combustibles (fences, vegetation, mulch, etc.) between structures.
- Creating a managed buffer zone between the UGB and homes. This would be an area managed expressly with the intent of reducing wildfire hazard and providing a place where firefighters can work safely in the event of an approaching wildfire. A variety of ownership and management models could be considered.

Identifying appropriate standards for policy and codification could be accomplished by a task force consisting of the agencies responsible for wildfire mitigation and protection and a subgroup of the Boundary TAC. The task force would go through the existing Bend code and the NFPA Standards to identify those that are appropriate for codification and develop alternatives to the standards that are not consistent with the City's urbanization goals.

❖ ***Recommendation to TAC:*** *Form a Task Force to review Firewise recommendations as outlined in NFPA Standards 1141 and 1144, as well as programs adopted in other communities, and make recommendations to the City regarding mitigation measures appropriate for adoption as policy and codification.*

WILDFIRE RISK FOCUS GROUP DISCUSSION SUMMARY

Monday, April 20, 2015 City Hall Council Chambers

Focus Group:

- Stu Otto, Department of Forestry
- Ed Keith, Deschutes County Forester
- Alex Robertson, US Forest Service
- Robert Madden, Bend Fire Department
- Craig Letz, Wildfire Consultant

Boundary TAC members in attendance:

- Paul Dewey
- Gary Timm
- Charley Miller
- Dale Van Valkenburg
- Brian Meece
- Rod Tomcho
- Robin Vora
- Mike Riley
- Tom Kemper

Project Background

The original UGB proposal did not assess fire risk. In the Remand, DLCD told the City that it was not specifically required to examine wildfire risk but strongly suggested that a look at wildfire risk through the balancing lens of Goal 14. To that end, the City gathering the best available information on risk and mitigation approaches and is using that information to make the best decisions for the UGB expansion.

The City started by using the Deschutes County Community Wildfire Protection Plan (CWPP). The Boundary TAC struggled with the CWPP as a tool, mainly due to outdated data and artificial boundaries for risk. This focus group was pulled together to discuss the appropriateness of the CWPP and to get ideas for analyzing wildfire for specific UGB expansion scenarios; ideas for mitigation strategies and policy development; and direction on how best to move forward with multi-agency involvement and coordination.

Panel Discussion

Is the CWPP an appropriate tool to use for assessing relative wildfire risk? Are there other tools?

Ed Keith offered the West Wide Risk Assessment (2013), a mapping effort coordinated through council of Western States Foresters. He provided three maps (attached). These maps provide a finer grained analysis of risk that is not constrained by artificial geographic boundaries (one of the TAC concerns) but that essentially supports the conclusions of the CWPP: wildfire risk is high all around the City. The only places that there isn't high risk is where there are irrigated fields or rock. The West Wide Risk Assessment has the same constraints as the CWPP in that the data is several years old and does not include some recent fires and fire treatments. This is a challenge with all models because the fire landscape is dynamic.

Alex Robertson said that there are many models for wildfire out there, all of them suffer from the dynamic nature of the resource. Most federal models are focused on how to manage lands within the boundaries of the management agency.

All panelists agreed that the CWPP is a decent tool to use, particularly because it is possible to dig into the assumptions and see what conclusions were used to assess the risk. In other words, risk is high all around the City but might be high in one area because of threats to structures and in another because of topography.

Does the panel have ideas for analyzing wildfire risk for specific UGB expansion scenarios?

The panel generally agreed that some level of site specific analysis would be appropriate. GIS will reveal topographical issues (i.e., steep slopes, saddles), aerial photography will provide some information on vegetation, but boots on the ground at eye level may be the most useful.

Susie Maniscalco from the City of Bend offered that there are existing assessment tools, such as NFPA and Firewise, which would be useful for property specific assessments.

Does the panel have ideas for mitigation strategies and policy development?

The panel generally agreed that there's always risk and that some kind of codification of mitigation to minimize risk will most likely be appropriate. Firewise appears to be an excellent starting point for mitigation tools. Defensible space around individual homes or clusters of home is critical. The concept of larger managed buffers at the urban/wildland interface was discussed. The panel emphasized the need for constant management of any kind of defensible space or urban buffer. Access (i.e. maintained and ungated roadways) is also important. It may be necessary to require structural standards (i.e., sprinklering buildings) in some areas.

The panel suggested that the City look at what other communities, such as Flagstaff, Arizona, are doing to manage wildfire risk.

The panel cautioned that, to the extent we can, we also need to make sure that adjacent property owners outside the urban area – private or public – can continue to use appropriate tools to manage their lands, including prescribed burning.

Multi-agency involvement and coordination – is this the right group, are we missing anyone?

The panel agreed that they represented the appropriate agencies. Craig Letz suggested that the Bend Police Department and Deschutes County Sheriff be invited to the table to discuss mitigation, since they are the agencies that handle evacuations during a fire emergency.

Boundary TAC Discussion and Questions

In what parts of the UGB expansion study area is wildfire risk the highest? Which parts the lowest?

Risk is high everywhere except for irrigated land or rock.

What major fires in recorded history have threatened the north, northeast or east parts of Bend (Rickard Road north to Hwy 97 around the northeast perimeter)?

There have been no fires larger than 20 to 40 acres north of Rickard road.

Please address spotting in major fires such as occurred during the B&B Complex and how that affects fire risk within potential UGB expansion areas?

Spotting is an issue with all wildfires, is not specific to any geographic area. Protection is provided by good vegetation management.

What are the most common wind directions during extreme fire conditions, especially stronger winds?

Wildfires create their own wind conditions. Catastrophic fires have a tendency to move north and south, which has been demonstrated to be the result upper level winds.

If development is built as fire-resistant (i.e. with defensible zones and fire resistant materials), can it actually help provide fire breaks in the case of a wildland fire?

Yes.

The Westside Fire Management Plan that is being executed along Skyliners Road and on forest lands is part of a larger National Strategy and National Plan to reduce fire fuels and provide a healthier forest that is more resilient in the case of wildfire. Would you agree with this work being performed that Bend is in a better position now and more of a fire resilient community that it has been in the past 15-20 years?

Yes.

When we are doing mitigation along the urban edge, are there things we need to do differently for transportation and water infrastructure?

We definitely need to build in smart transportation infrastructure and consider emergency response and evacuation need. Water supply is critical, but urban levels will be sufficient.

Does Bend Fire have maps and information on response times for different parts of the City?

Our fire stations are basically located towards the outer edges of time – in fact, the Fire Department is currently focusing on improving response times to the central part of Bend.

If a property urbanizes, what mitigation would you recommend? What should we do everywhere?

Project Wildfire (Firewise) is the best approach. It includes the mitigation measures discussed today: building materials, roofing materials, decking, vegetation management, and appropriate buffer zones.

In your fire planning, do you take into account climate change factors?

Yes. Longer summers, hotter and dryer summers; it is an unrealistic expectation to rely on the past and assume it won't change.

Considering climate change, worst case scenario – fire coming into a residential area -- is there an area where you'd be least likely want to see new homes?

There are no geographic regions (i.e. west vs. east) that are necessarily worse or better – but proper attention is needed for specific areas. Terrain features should be taken into consideration; for example, it would be preferable to not locate houses in a saddle or at the top of a draw.

What are the most sources of ignition for fires outside the existing UGB?

There is about a 50/50 split between human-caused and lightning fire starts.

Public Comments

1. John Jackson – retired from wildland fire business. Instead of avoiding development; target those areas of areas to mitigate; make it a condition of approval to require fuels mitigation and fire buffering. Tie these areas together so there's consistent treatment, similar to what Flagstaff and other communities have done. Go west and attack the problem to the west. Think about putting the onus on developers to mitigate.

2. Gary Marshall – retired Bend fire marshal, currently working for Sisters Camp Sherman and NFPA and Fire Wise advisor. The root of the fire risk problem is development standards – work with developers before they purchase the property. Develop mitigation standards – SB 360 development standards are working.

Fire Risk Index

Expected loss based on likelihood of an acre burning and potential effect on values and suppression costs.

Legend

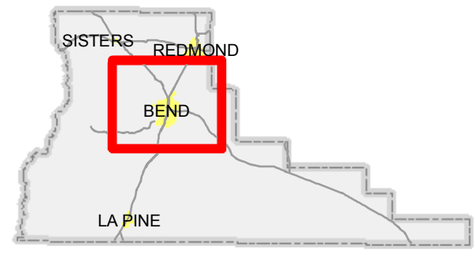
- ODF Protection Boundary
- Rural Fire District
- Lake
- River
- Urban_Growth_Boundary
- Roads

Fire Risk Index

<VALUE>

- >= -1.54
- -1.541 to -4.73
- -4.731 to -6.64
- -6.641 to -10.6
- -10.601 to -21.03
- -21.031 to -51.46
- -51.461 to -122.52
- -122.521 to -284.77
- < -284.77

Vicinity Map



0 1 2 4 Miles

NORTH

Map Prepared by Deschutes County
Forestry
Ed Keith
61150 SE 27th St., Bend, OR
541-322-7117

Date: 4/14/2015

Memorandum

June 2, 2015

To: Urban Growth Boundary and Growth Scenarios Technical Advisory Committee

Cc: Project Team

From: Angelo Planning Group Team

Re: Draft Urban Growth Boundary Expansion Scenarios

INTRODUCTION

Purpose

The purpose of this memorandum is to propose and describe three draft expansion scenarios for the Bend Urban Growth Boundary (UGB). These are working drafts for the Urban Growth Boundary and Growth Scenarios Technical Advisory Committee (Boundary TAC) to review, comment on, and refine at its meeting on June 9, 2015. The scenarios have been prepared based on the results of the workshop held on April 30th, as described below. Our goal is for the TAC to forward a recommendation regarding the scenarios to the UGB Steering Committee (USC) for consideration at their meeting on June 25th.

Process

The June Boundary TAC and USC meetings are intended to create a slate of alternative scenarios that will be modeled and evaluated in detail over the summer. The following table summarizes the major steps to create the alternative scenarios, evaluate them, and approve a proposed UGB.

Steps	Approximate Timing
Draft scenarios for UGB presented to TAC	Early June 2015
Adjustments if needed	Mid-June 2015
Approval by USC	Late June 2015
Detailed evaluation, including infrastructure modeling	July through September 2015
Public outreach	Late September / early October 2015
Presentation of evaluation results to TAC & direction to preferred/hybrid scenario for UGB	Early October 2015
Creation of preferred/hybrid scenario for UGB	October 2015
Evaluation updates for preferred/hybrid scenario for UGB	November 2015
Refinement / approval of preferred/hybrid scenario for UGB	December 2015 to February 2016

KEY THEMES FROM WORKSHOP

A detailed workshop summary is provided in Appendix A. This section identifies the key themes from the workshop. The next section provides highlights of results by subarea.

The project team reviewed the workshop maps and notes in a series of discussions following the workshop. A chip count was also prepared. From these reviews, the project team identified the following key themes from the workshop.

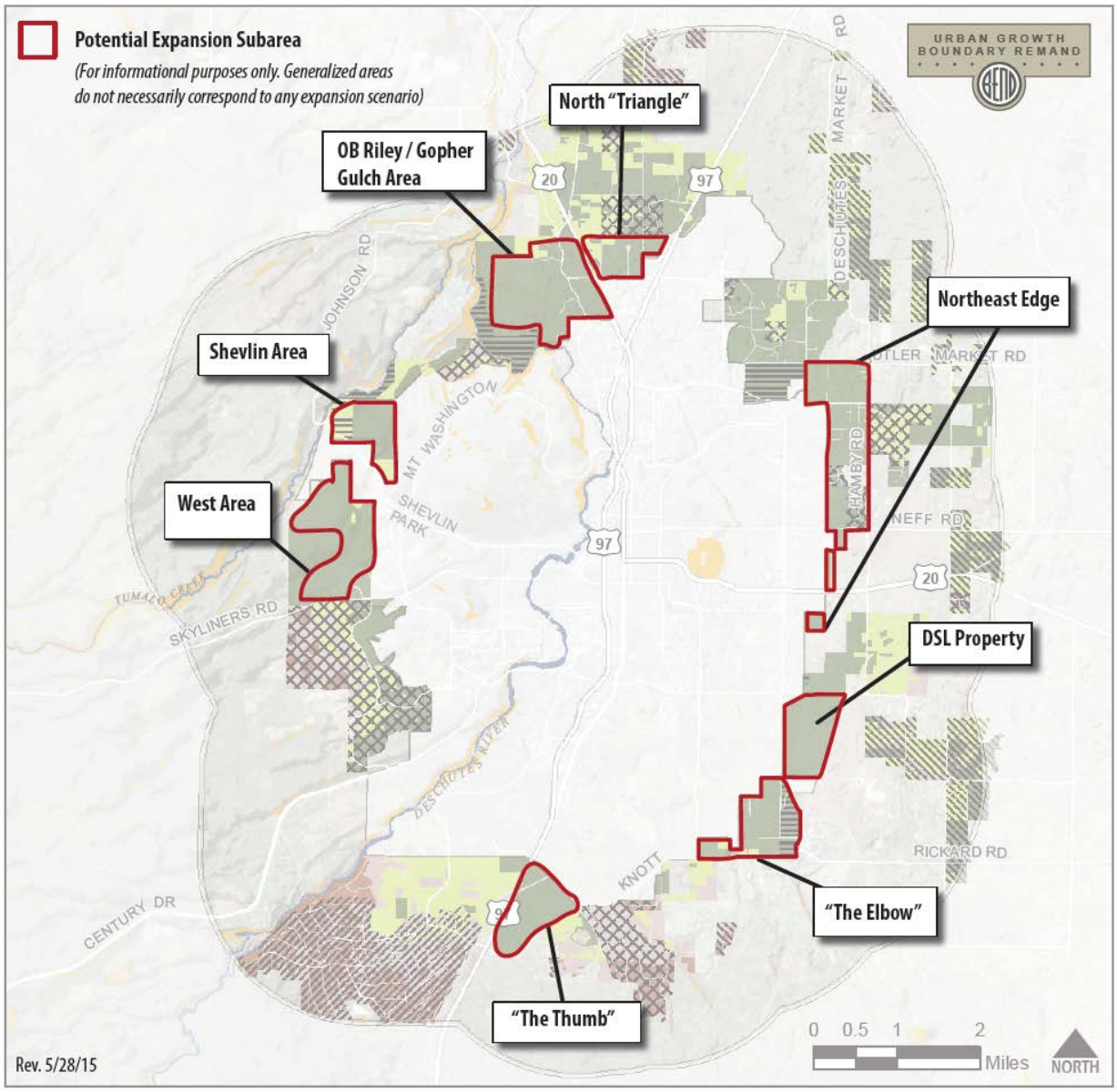
General consensus on the lands to be considered in this UGB expansion

Eight general geographic areas were identified as the most suitable to meet the identified land needs. The selection of these areas builds on suitability mapping approved by the Boundary TAC in preparation for the workshop. Participants selected lands that ranked in the highest quartile "best" category of the Bend UGB Land Suitability Composite (Annotated) Map. The eight areas are listed below and shown on Figure 1. The following section, "Themes and Considerations by Subarea," beginning on page 4, describes each area and its location.

- West Area
- Shevlin Area
- OB Riley/Gopher Gulch Area
- North "Triangle"
- Northeast Edge
- DSL Property
- "The Elbow"
- "The Thumb"

While there were similar geographies identified, there was considerable mixing of different uses within the different expansion areas. Workshop participants were following a guideline of "concepts not precision," and this is reflected in the varied layouts of chips within the above-listed sub-areas.

Figure 1: Potential UGB Expansion Subareas



Use of the larger, vacant properties adjacent to the UGB, except on the Northeast Edge

Most of the subareas listed above are the larger, vacant properties at the edge of the current UGB. Participants said they selected these areas, in part, because they had the potential for master planning new, complete neighborhoods and communities for Bend. The notable exception to this concept is the inclusion of the small properties in the Northeast Edge area. In this area, participants noted that even though these properties are smaller and partially developed with rural housing, there was potential for additional housing or locally serving commercial that would complement the adjacent neighborhoods, schools, parks and transportation facilities. Generally speaking, areas identified for urbanization in this area tend to be outside of subdivisions and exhibit low intensity development on medium sized parcels.

A preference for complete neighborhoods and complete communities

All of the workshop maps include residential development, employment uses, parks, and schools that are co-located to comprise complete neighborhoods (where residential is the predominant use) or complete communities (where the mix of uses is extensive). This concept was reported out by many groups as an organizing theme for their placement of chips.

Staying the course with employment for Juniper Ridge

There was strong consensus in the workshop to continue to plan Juniper Ridge as an employment area within the City. Participants commented that the cost of infrastructure raised uncertainties for the level of development between now and 2028, and that they were more supportive of employment as a land use that would minimize this concern. Some workshop participants placed some commercial chips in this area, but as a secondary use to large lot industrial or industrial/professional office.

Recognition that this process is a stepping stone to future development

In the discussion at the tables, and in the large group discussion at the end of the workshop, it was noted that the current UGB process is a step toward future planning for urban reserves adjacent to Bend. One participant mentioned that the relatively short time period from now to 2028 means this process is more likely to select “low hanging fruit” expansion areas that are the prelude to future urban reserves.

THEMES AND CONSIDERATIONS BY SUBAREA

Below are workshop highlights for each subarea, along with urban design considerations that guided the placement of land uses within each area for the three scenarios.

West Area

Urban Form Considerations

The West Area is a transitional area between the existing UGB and the resource lands defined by Tumalo Creek and Deschutes National Forest.[1] The area has relatively good connectivity to the western part of the city, but lacks major highway connections to other parts of the city and region - making it more suitable for residential and mixed use development and less suitable for office and industrial use. The area is adjacent to existing schools and Northwest Crossing inside the UGB.

Workshop Themes

The lands lying generally north of Skyliners Road and west of Northwest Crossing were identified by all groups. Land uses and the spatial extent of urban growth varied between groups, with some level of complete neighborhoods being a recurrent theme. All tables included traditional neighborhood, open space neighborhood, and multifamily housing in this area.

[1] A rural cluster subdivision is currently under review between the expansion area considered by the TAC and the hard edges described.

Shevlin Area

Urban Form Considerations

Similar to the West Area, the Shevlin area is bounded to the northwest by Tumalo Creek, a physical barrier that is likely to be a "hard edge" to the city's urban form for the long term. The other edges are contiguous to the current UGB and existing neighborhoods.

Workshop Themes

Lands north of Shevlin Park Road were selected by five out of six groups. Two of the groups identified only a limited amount of employment or neighborhood use, while the rest identified a greater amount and mix of development. As with the West Area, land uses and spatial extent of the expansion area varied between the tables. However, most tables included some open space neighborhood and half included industrial/professional office, neighborhood commercial center, and/or a school.

OB Riley/Gopher Gulch Area

Urban Form Considerations

This area is bounded to the east by Highway 20 and to the west/south by the Deschutes River and Archie Briggs Canyon Open Space. The presence of Highway 20 and the intersection at Cooley Road drive the land use pattern on the east side of this area, where employment uses are suitable. The eastern portion of this area is also adjacent to the existing employment area in the north of Bend. The western portion ("Gopher Gulch") is more suitable for residential uses due to its distance from major roads, beautiful setting and proximity to natural areas. If this area is selected as an expansion area, one of the urban form spatial: should the area growth from the south to the north or from the east to the west? The area was examined in conceptual site studies prior to the April workshop.

Workshop Themes

Most tables identified industrial/professional office between US 20 and OB Riley Road, and most also included commercial in this area. Many tables identified housing for portions of the adjacent Gopher Gulch area or immediately east of OB Riley Road. One table identified a large lot industrial site between US 20 and OB Riley Road; another identified housing in this area with no industrial use.

North "Triangle"

Urban Form Considerations

Located between Highway 97 and Highway 20, and adjacent to significant employment inside the UGB, this area is a clear candidate for additional employment uses. It would also be suitable for medium to high density residential use in combination with a commercial center. To the north is a rural subdivision with contracts, covenants and restrictions (CC&Rs) and the western portion of the triangle (particularly west of Scenic Drive) is somewhat parcelized, with lots generally under five acres. These areas may require some considerations for compatibility with the adjacent/remaining residential uses.

Workshop Themes

Chips were mostly located along the northern edge of the UGB (north of Cooley Road) and/or clustered in the eastern part of this area. Industrial/professional office and multifamily housing were the most common uses identified for this area – some groups included only industrial/professional office, though most included some mix of uses. Other residential uses were generally not identified for this area. Two tables identified this area for commercial uses.

Northeast Edge

Urban Form Considerations

The Northeast Edge was examined in conceptual site studies prior to the April workshop. Areas with little existing development would be suitable for residential subdivisions, and small commercial areas along Butler Market Road, Neff Road, and/or Bear Creek Road could potentially serve existing neighborhoods inside the UGB. However, adjacent low density development may not support retail viability in this area. Land along Eagle Road is contiguous to the current UGB and connected to existing neighborhoods inside the boundary, making it a relatively easy to extend current development patterns onto the less developed land in this area, between the existing subdivisions. Land with access onto Hamby Road generally is less connected to the current UGB, has less suitable exception land, and faces onto a mix of resource land and rural subdivisions with CC&Rs. North-south connectivity between Neff Road and Butler Market Road would be challenging due to the existing development pattern.

Workshop Themes

Chips were placed in a dispersed pattern along the northeastern edge of the UGB, reflecting the checkered pattern of smaller, buildable lands in this area. Most tables placed some chips, including some commercial use, along Butler Market Road. All tables included neighborhood commercial center(s), suburban single family neighborhood(s), and multifamily housing in this area. In the discussion following the chip exercise, participants mentioned that they saw potential for this area to complement the existing low density development, parks and schools to the west.

DSL Property

Urban Form Considerations

This large, vacant site is bounded to the west by 27th Street and to the north by Stevens Road. Stevens Road is planned to connect to Reed Market Road in a four-way intersection in the future (based on a project identified in the city's TSP). The eastern edge of the exception area is formed by a major utility easement. To the south lie the Humane Society and County public works buildings. Bat habitat has been identified on roughly 90 acres of the interior of the exception area on the property. The north and west edges are potentially suitable for retail areas due to this visibility and potential for relatively large customer base with a half-mile radius. The southern edge is potentially suitable for other employment uses. The interior of the property is most suitable for residential uses, with natural area protection for the bat habitat.

Workshop Themes

Most tables utilized the majority of the exception land on the DSL property. All groups included multifamily housing, suburban single family neighborhood(s), and industrial/professional office. Most also included at least one park and school, traditional neighborhood(s), and a neighborhood commercial center. Two groups included a large lot industrial site in this area.

The "Elbow"

Urban Design Considerations

This area is adjacent to an opportunity area inside the UGB identified for significant new residential development. 27th Street / Knott Road, which provide easy access to Highway 97 to the south, form the eastern and southern edges of this area. On the far side of 27th Street / Knott Road are resource lands and a county landfill. An existing school and undeveloped park land lie along the west side of 27th Street. There is little other existing development in this area – a few businesses and a handful of homes.

Workshop Themes

The placement of chips in this area varied from table to table, with some fully utilizing the area and others using only a portion. All tables identified suburban single family neighborhood and one neighborhood commercial center in this area. Most also included multifamily, one or more parks and schools, and/or some community commercial center.

The "Thumb"

Urban Form Considerations

This area has two access points to Highway 97: via Knott Road with a full access interchange and via China Hat Road, which is "Right-In Right-Out" only. The northwest corner of the Thumb is bisected by a railroad right-of-way. The area is the site of the "Old Back Nine" golf course, and there is no existing development. To the northeast, across China Hat Road, are residential subdivisions and a golf course; to the south, across Knott Road, are resource land and another golf course subdivision; to the west, across Highway 97, is Deschutes River Woods. The full interchange makes the area suitable for employment uses. At 300+ acres, there is opportunity for a wide range of uses. The property serves as part of the southern gateway to Bend.

Workshop Themes

All tables utilized this area fairly fully, and all identified a complete community that included industrial/professional office, a community commercial center, suburban single family neighborhood(s), and multifamily housing. Most also included a park and/or school, neighborhood commercial center(s) and traditional neighborhood(s). A few tables located a large lot industrial site here.

Juniper Ridge

Urban Form Considerations

This area is already inside the UGB, but was included in the workshop exercise because there has been on-going discussion about what uses should be planned for this area. It has access

to Highway 97 via Cooley Road. To the east are resource lands; to the south is a rural subdivision; to the west is a designated employment area on the western portion of Juniper Ridge. Additional information about Juniper Ridge has been provided in several memoranda to the TACs over the course of the process to date.

Workshop Themes

Not all tables filled this area, as was intended in the exercise (because it is already inside the UGB). However, all tables included at least one large lot industrial site, and most tables also included industrial/professional office and a neighborhood commercial center. No groups identified residential uses or schools in this area.

DRAFT SCENARIOS

How the scenarios were created

The scenarios were created through several iterations of team discussion and review, as summarized below.

- Team work session on May 1 to discuss workshop results and identify key themes
- Team work session to "paint" initial land uses in Envision Tomorrow, following the themes
- Urban design work session to evaluate localized land uses, multi-modal transportation needs of the various areas, scale of retail, and other urban form issues
- Preparation of initial scenarios in Envision Tomorrow, with calibration of land uses to match housing and employment needs
- Review of the preliminary scenarios with agency representatives from the Bend La Pine School District, Bend Fire Department, Deschutes County Library District, US Forest Service, Oregon Department of Forestry, 911 Emergency Services, and Bend Park and Recreation District
- Refinements of the scenarios (several iterations) and calculation of basic metrics for each subarea (gross acres, # housing units, # jobs, etc.)

Scenarios Overview

The three scenarios share many common elements because, as discussed above, there was a lot of consensus in the workshop. Some of the key similarities include:

- *Size of Expansion*: The scenarios all accommodate the identified residual housing and employment needs (see Table 1 and Table 2, respectively), which lean towards multifamily housing, retail and industrial employment needs. As a result, they all have similar total acres of expansion.
- *Top Choice Expansion Areas:* The scenarios consistently include some or all of the acreage in seven of the eight sub-areas that were fairly consistently identified by workshop participants: West Area, OB Riley/Gopher Gulch Area, North "Triangle", Northeast Edge, DSL Property, "The Elbow", and "The Thumb."

- *Complementing land use inside the UGB:* The scenarios all build upon the arrangement of land uses inside the existing UGB to strengthen and support existing land use patterns. New employment areas to the south and southeast provide employment and mixed uses where these are generally absent. Existing employment areas to the north are extended and mixed. Small employment areas are added to the east where such services are not currently available. The master planned communities to the west are complemented with additional residential development and some smaller scale employment. Together, the scenarios build upon existing strengths and provide more mixing of land uses to create new complete communities both within, and outside the current UGB.
- *Complete New Neighborhoods and Complete Communities:* The scenarios share a focus on providing complete neighborhoods with a mix of housing types and amenities, as recommended by most workshop participants. For the larger vacant properties where major employment is possible, the potential for co-location of complete neighborhoods and employment, resulting in a complete community.
- *Major New/Expanded Employment Areas:* All three scenarios have significant employment areas at the north and south end of the City proximate to larger transportation facilities, consistent with the site characteristics typically needed for those uses.

The next section briefly describes each scenario and notes key distinctions among them. For details on the assumptions that underlie each of the scenarios, please see Appendix B. Note that the locations and types of schools identified will be further refined based on coordination with Bend-La Pine Schools, which is currently underway.

The scenario maps on the following pages group expansion areas into three generalized categories:

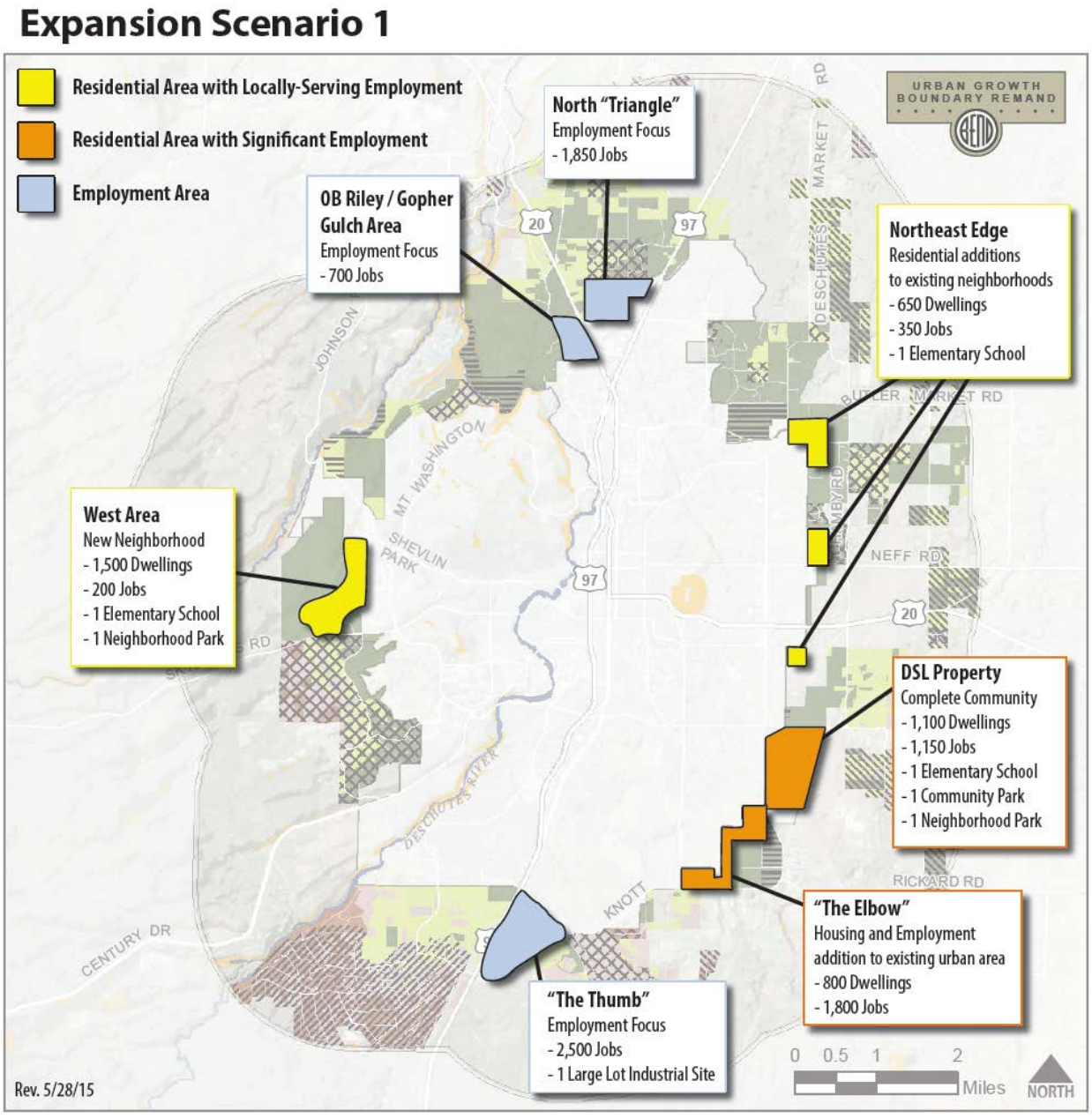
- *Residential area with locally-serving employment*: Predominately residential uses, with supportive uses such as parks, schools, and local commercial centers. Employment uses in the area are estimated to provide fewer than roughly 400 jobs.
- *Residential area with significant employment*: A full mix with residential uses, parks and/or schools, and commercial and employment areas. Employment uses in the area are projected to provide roughly 400 jobs or greater.
- *Employment area*: Employment-focused area providing for a mix of jobs (retail, office, and/or industrial) with little or no residential use.

Note that these categories are used for communication purposes only, and do not necessarily reflect official land use designations that would be applied to expansion areas.

Expansion Scenario 1

This scenario focuses large new employment districts in the North “Triangle” and in “The Thumb” along Highway 97. This picks up on a workshop idea from a few tables of keeping the North “Triangle” non-residential, and tests a non-residential option for “The Thumb” in order to test residential use in other areas identified in the workshop. Residential uses are focused in the West Area between Skyliners Road and Shevlin Park Road and in large new mixed-use areas to the Southeast. This scenario also tests the workshop idea of including residential uses in pockets of the Northeast Edge. The Large Lot Industrial need is met in “The Thumb", picking up on an idea from one of the workshop groups.

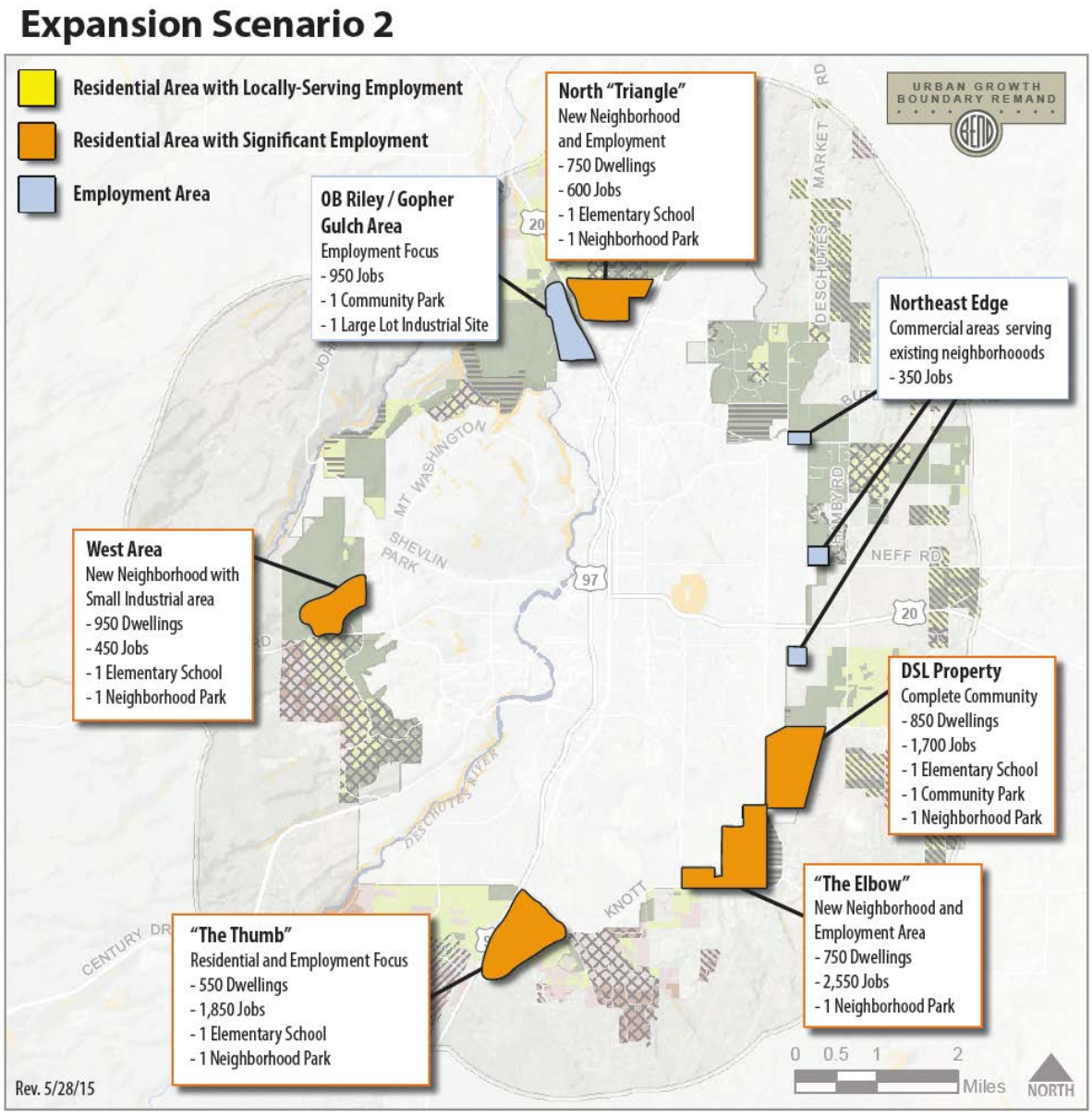
Figure 2: Expansion Scenario 1 Overview Map



Expansion Scenario 2

This scenario focuses on creating new "complete communities" with a mix of housing and employment in all quadrants. The geography is similar to Expansion Scenario 1, but land uses are mixed to a greater extent within each subarea. Nearly all expansion areas provide a full mix of uses, including housing, employment areas, shopping/services, and schools and parks. This scenario emphasizes southeastern expansion, including significant growth in the DSL Property, “The Elbow,” and “The Thumb.” This scenario tests workshop ideas including fully utilizing “The Elbow” to create a new complete community, incorporating residential uses (predominately multifamily housing) in the North “Triangle”, and placing some industrial/professional office in the West Area. The Large Lot Industrial Site is located between Highway 20 and OB Riley Road in this scenario, picking up on an idea from one of the workshop groups.

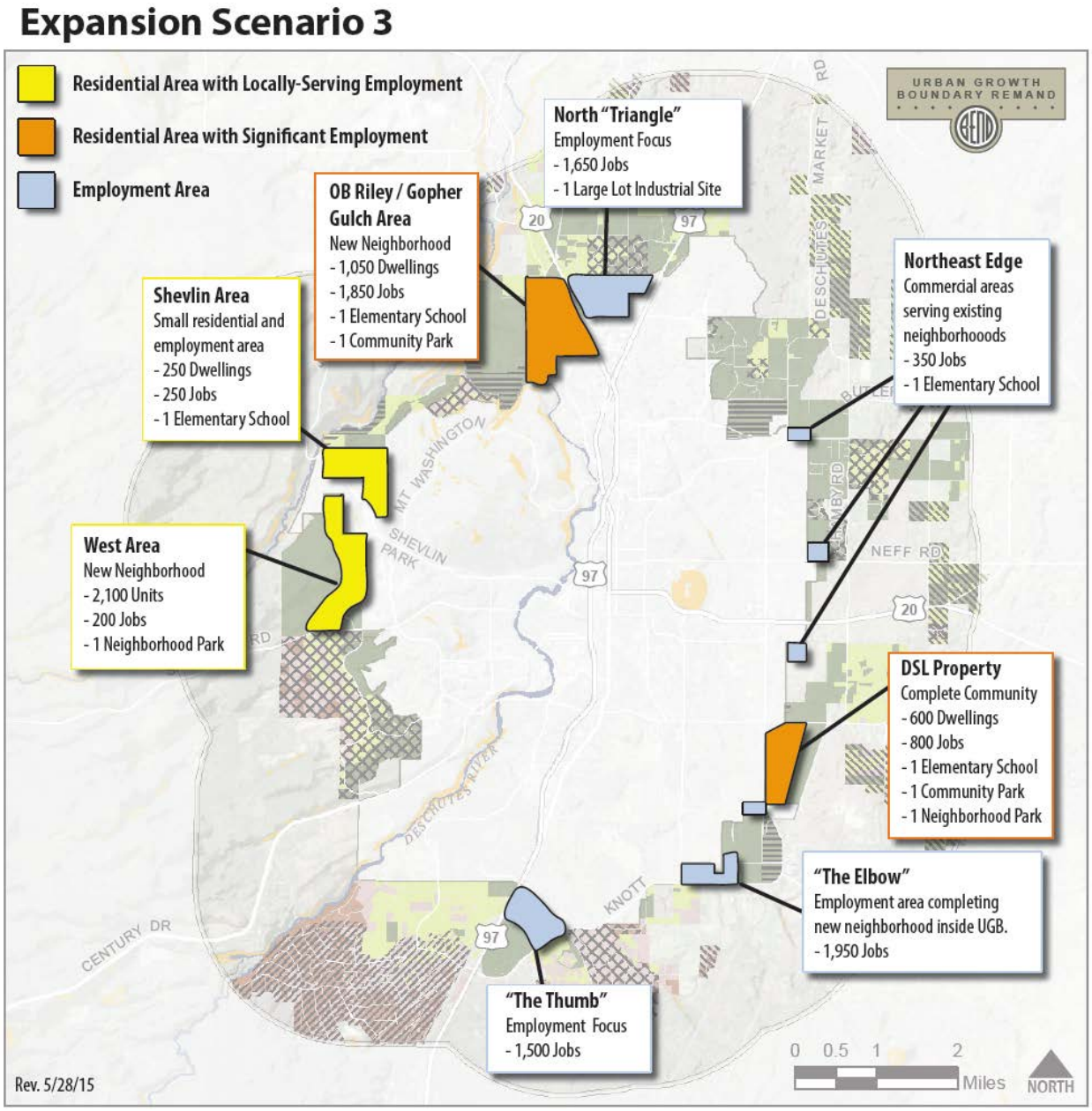
Figure 3: Expansion Scenario 2 Overview Map



Expansion Scenario 3

This scenario focuses a larger amount of expansion to the north and west of the city, and includes a large area along OB Riley adjacent to Gopher Gulch. Only portions of large vacant sites in the southeast (DSL Property, “The Elbow” and “The Thumb”) are included. The Large Lot Industrial Site is located in the North “Triangle” – this area, though not selected by any of the workshop groups, appears to meet the site characteristics needed for that use, and has an employment focus in this scenario. This scenario tests other workshop ideas, including bringing in the Shevlin area for a mix of uses and bringing in the area west of OB Riley Road for residential uses.

Figure 4: Expansion Scenario 3 Overview Map



What's Inside the Boundary?

All three scenarios start from a consistent set of assumptions about development capacity inside the UGB. The assumptions inside the UGB reflect a set of code-based efficiency measures (generally "Package C" as presented to the Residential and Employment TACs in January, which makes the most efficient use of land through amendments to the Development Code) and a set of changes to land use in key opportunity areas (generally like inside UGB scenario 4 as presented to the Residential and Employment TACs in January, with Juniper Ridge planned for employment uses). A few refinements have been made to assumptions since January that affect the estimated capacity of the existing UGB to a small degree. Details of what is assumed inside the UGB are documented in Appendix B.

The efficiency measures will be further evaluated by city staff and the Residential and Employment TACs in July and August and may be refined as part of the creation of the hybrid scenario. To the extent such refinements affect capacity, they could also affect the amount of UGB expansion needed or the mix of uses that must be accommodated outside the current boundary.

Based on the current set of assumed efficiency measures and refinements, the existing UGB capacity estimate and residual housing and employment needs are summarized in Table 1 and Table 2 below.

Table 1: Estimated Housing Capacity of Existing UGB and Residual Need[2]

Housing Type	Estimated UGB Capacity	Total Need	Residual Need
SFD	7,670	9,220	1,550
SFA	1,070	1,680	610
MF	4,650[3]	6,330	1,680
Total	**13,390**	**17,230**	**3,840**

[2] Capacity and need estimates have been rounded to the nearest ten units.

[3] Includes 165 ADUs on existing residential properties within the UGB.

Table 2: Estimated Employment Capacity of Existing UGB and Residual Need[4]

Employment Category	Estimated UGB Capacity	Total Need	Residual Need
Retail & Hospitality	2,740	6,520	3,780
Office	5,250	6,540	1,290
Industrial	3,650	7,160	3,510
Public	1,930	1,720	None[5]
Total	**13,570**	**21,940**	**8,580**

These revised capacity estimates provide the basis for the amount of residual expansion need for housing units and jobs, based on a number of factors such as determined needs and the supply of lands to accommodate needs within the current UGB. Note that the residual housing need is relatively small (less than 25% of the total need) and is slightly tipped towards multifamily housing. This will likely mean that densities in some expansion areas are higher than in the current city limits in order to meet this need. It will make planning for future transit service to these expansion areas especially important, since multifamily housing is generally a transit-supportive use. It also increases the importance of providing the types of local amenities and services that are needed to support medium/high density residential uses (e.g. shops, public open space, bike paths).

The residual employment need is relatively large (nearly 40% of the total need) and tipped towards retail and industrial jobs. Both retailers and industrial businesses have particular location requirements that dictate where they can feasibly locate, which limits the potential options to accommodate these needs. For example, retailers generally need to be supported by a certain number of “rooftops” and have fairly good visibility for pass-by traffic in order to be viable. To what extent the identified expansion areas truly meet these location requirements will be evaluated as part of the scenario evaluation process.

[4] Capacity and need estimates have been rounded to the nearest ten jobs.

[5] Public jobs do not include school-based employment in actual school facilities which tend to be located in residential areas. There will be a need for schools to serve the expansion areas, but that is not based on projected employment growth. The surplus of capacity for public jobs inside the UGB does not subtract from the need for employment capacity of other types, since land designated Public Facilities (where most of the public employment capacity comes from) generally will not provide opportunities for private-sector retail, office, or industrial development.

Scenario Comparison: Key Metrics and Subarea Differences

Overview

As mentioned earlier and expected, the scenarios are nearly identical in their total housing and employment capacity and mix, so that they meet the total needs identified in the Housing Needs Analysis and Employment Opportunities Analysis. However, they do vary in the amount and type of development in each subarea outside the current UGB. Results are presented by scenario in this section; however, for ease of comparison, a set of the charts for all three scenarios arranged side-by-side is included in Appendix C. Appendix C also includes tables showing acres by generalized land use category and housing units (total and by type) and jobs by subarea for each scenario.

Expansion Scenario 1

The housing capacity in Expansion Scenario 1 is almost exclusively on the west and east (including the Northeast Edge, DSL Property, and “The Elbow”), with the West Area adding the most new homes. Minimal housing is added in the north or south. The residential areas all have a mix of housing types that reflects the overall residual housing need, which is slightly skewed towards multifamily.

Employment growth is concentrated in the north and south, with “The Thumb” adding the most employment land (especially in the commercial category) and the most new jobs. (As noted previously, “The Thumb" property contains a Large Lot Industrial site, which is treated as a separate land need and does not count toward job capacity within the model.)

Figure 5: Expansion Scenario 1 Acreage by Land Use Category

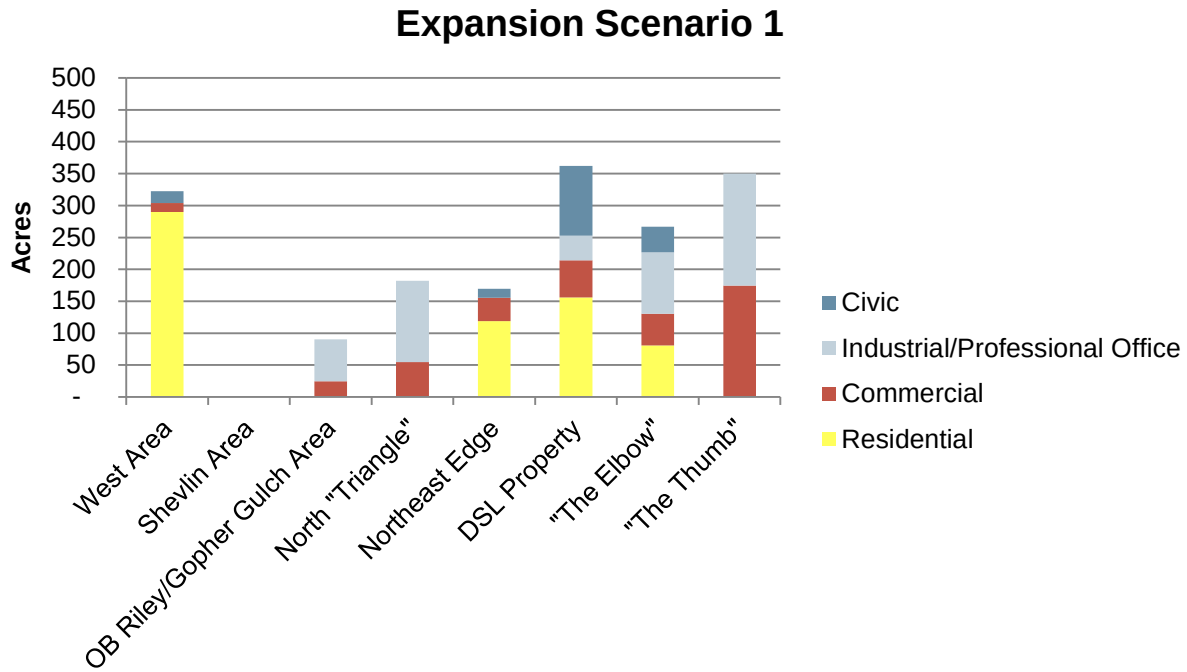


Figure 6: Expansion Scenario 1 Housing and Employment Capacity

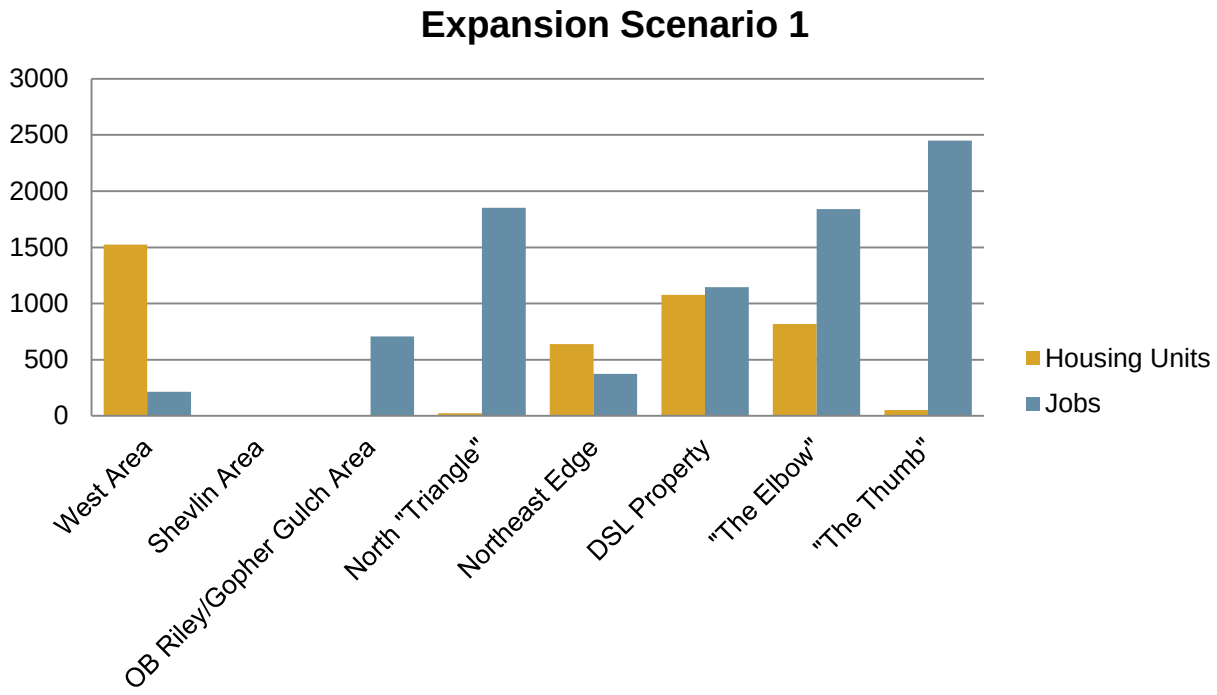


Figure 7: Expansion Scenario 1 Housing Unit Mix by Subarea

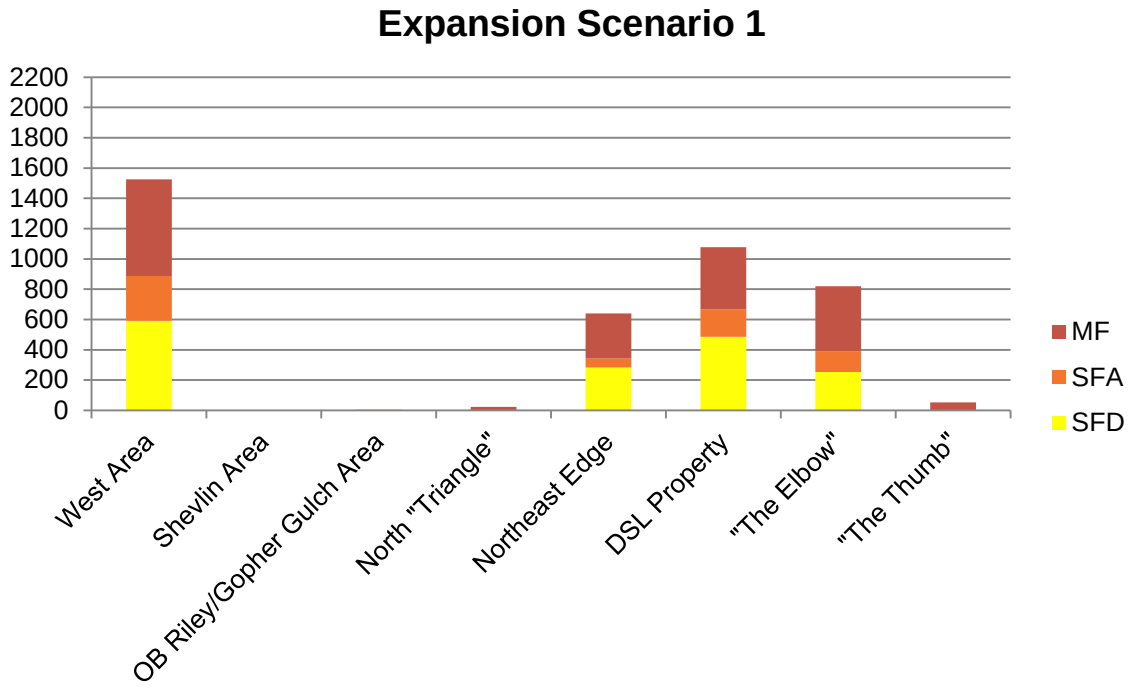


Figure 8: Heat map of housing growth in Expansion Scenario 1

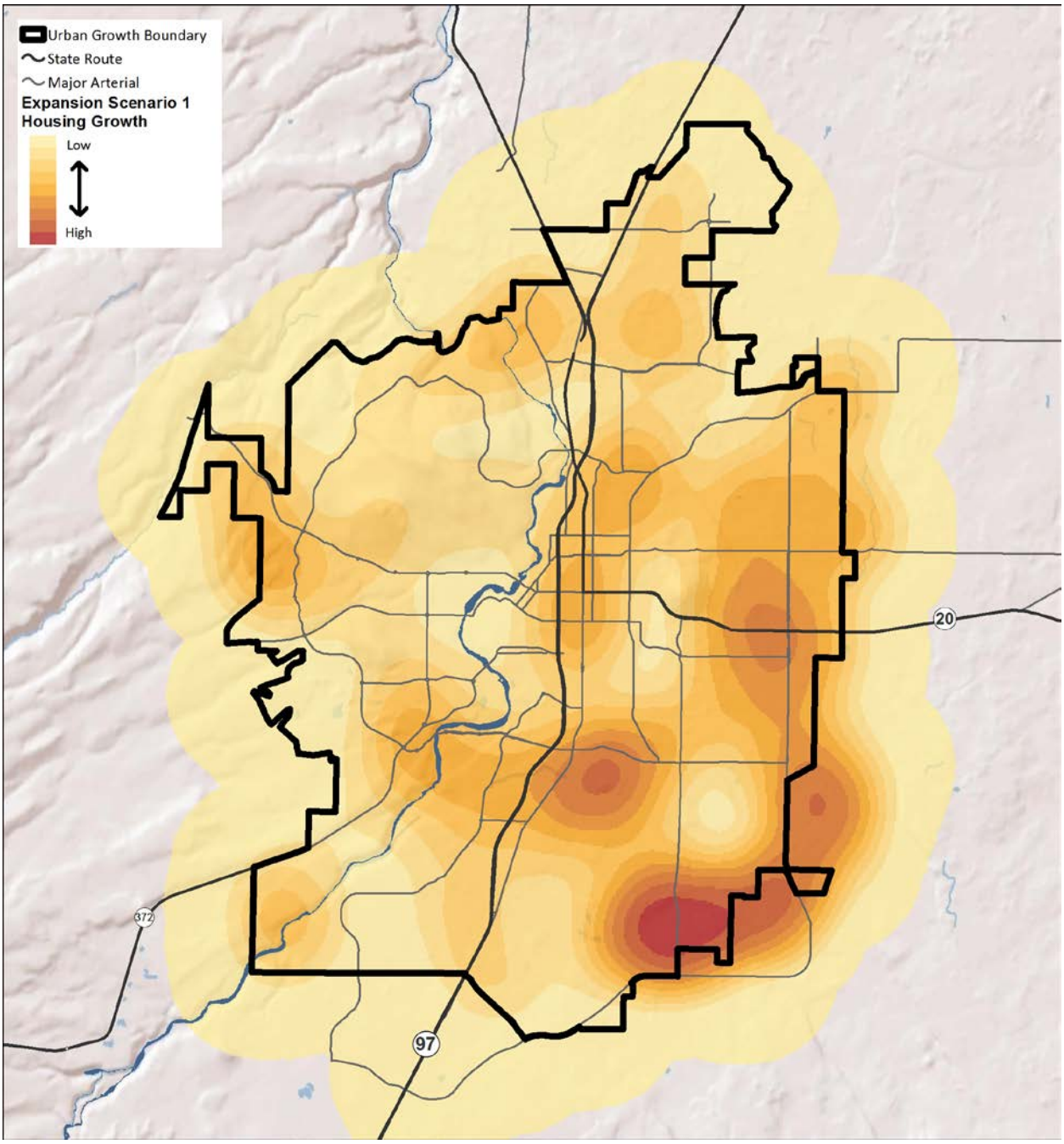
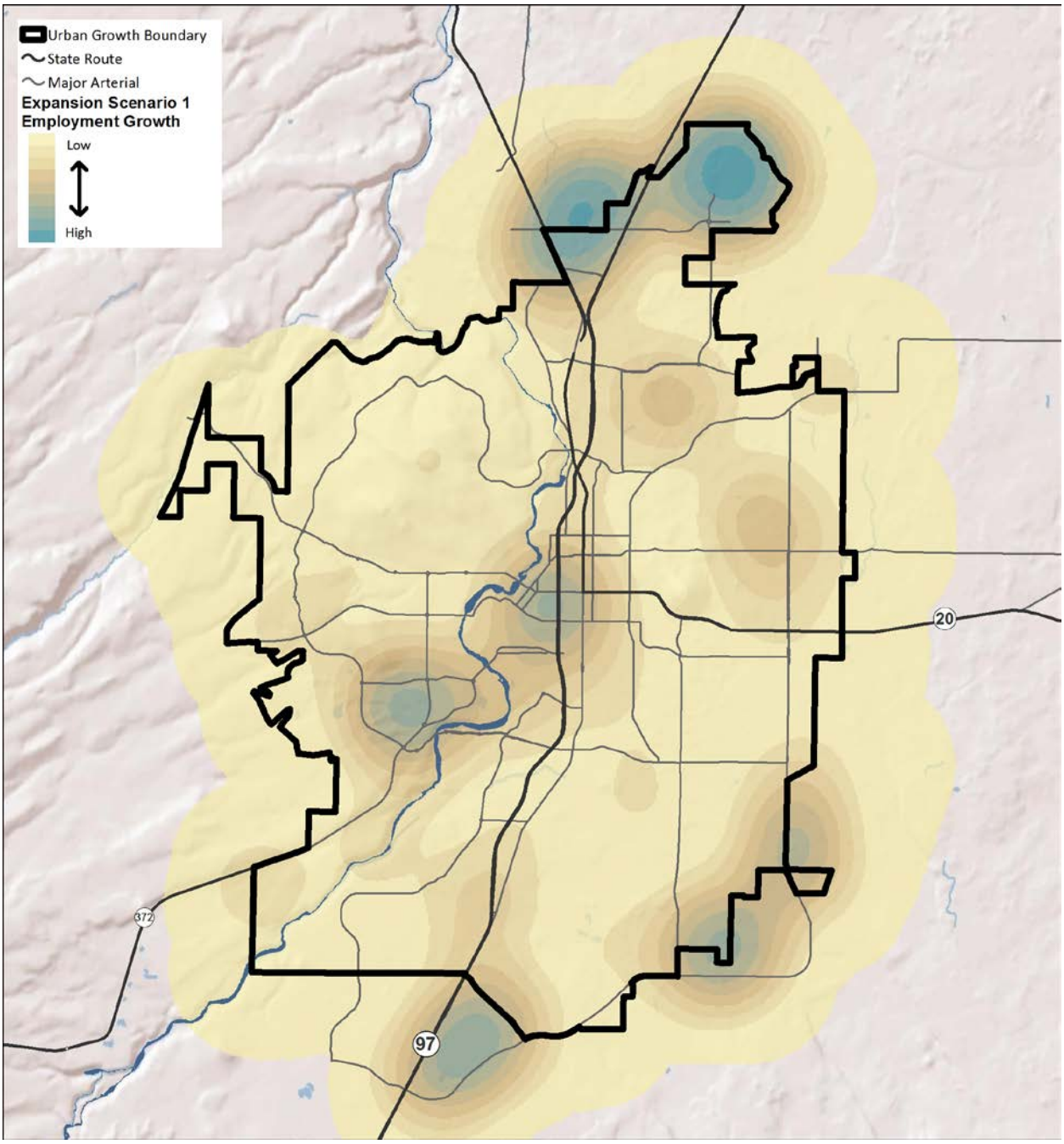


Figure 9: Heat map of employment growth in Expansion Scenario 1



Expansion Scenario 2

Expansion Scenario 2 mixes employment and residential capacity within subareas to a greater extent than Expansion Scenario. The West Area has somewhat more employment in this scenario than in Expansion Scenario 1, and the North “Triangle” and "The Thumb" have significant residential components. The OB Riley/Gopher Gulch Area is the only major expansion area that does not include a residential component. All areas that do include residential development include a mix of housing types, with the North “Triangle” providing the most multifamily capacity and “The Thumb” being somewhat more balanced towards single family housing. “The Elbow" has the greatest amount of jobs and overall development in this scenario. The North “Triangle” also contains a Large Lot Industrial site, which is treated as a separate land need and does not count toward job capacity within the model.

Figure 10: Expansion Scenario 2 Acreage by Plan Designation

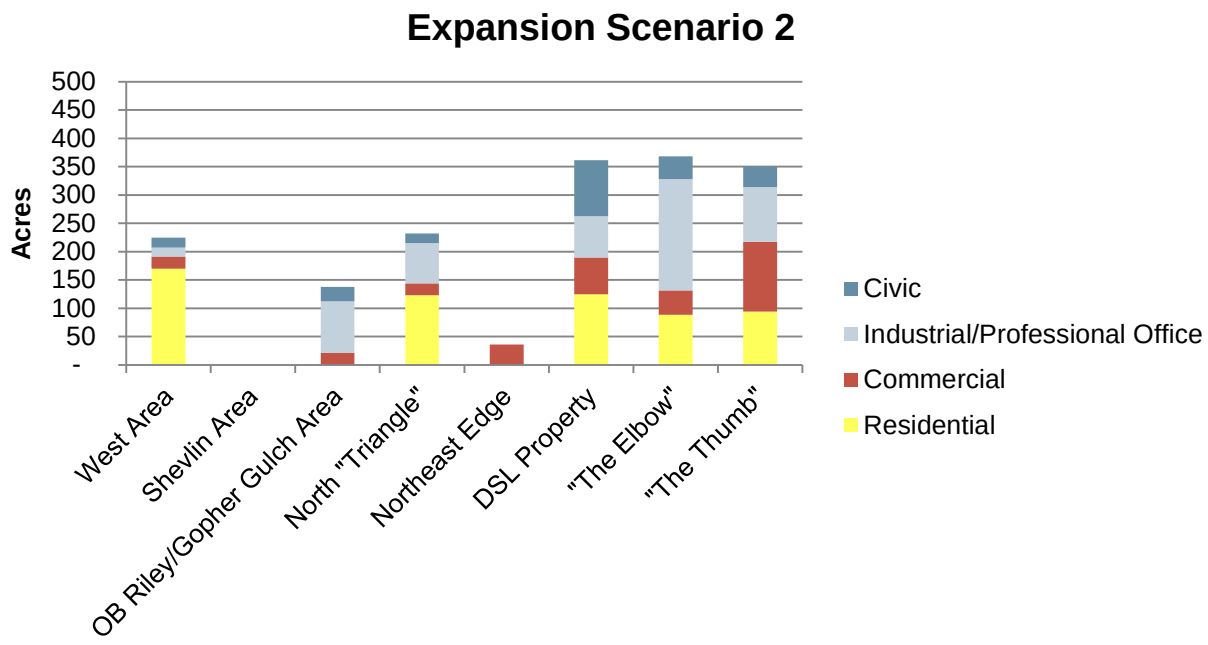


Figure 11: Expansion Scenario 2 Housing and Employment Capacity

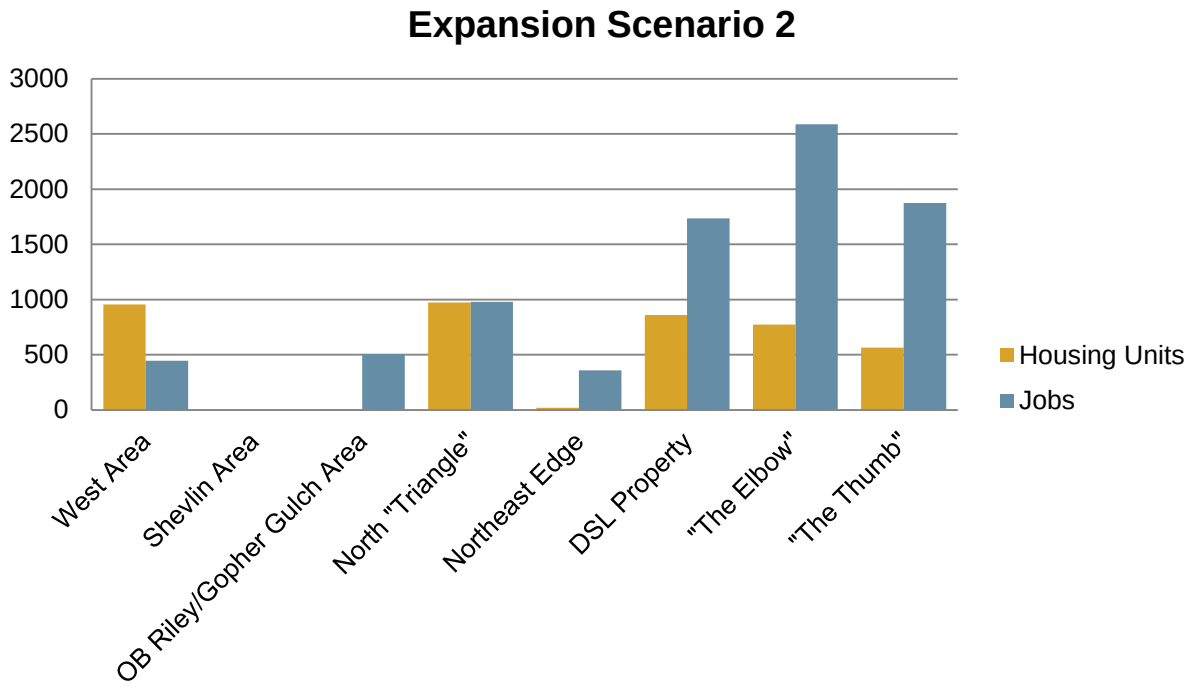


Figure 12: Expansion Scenario 2 Housing Unit Mix by Subarea

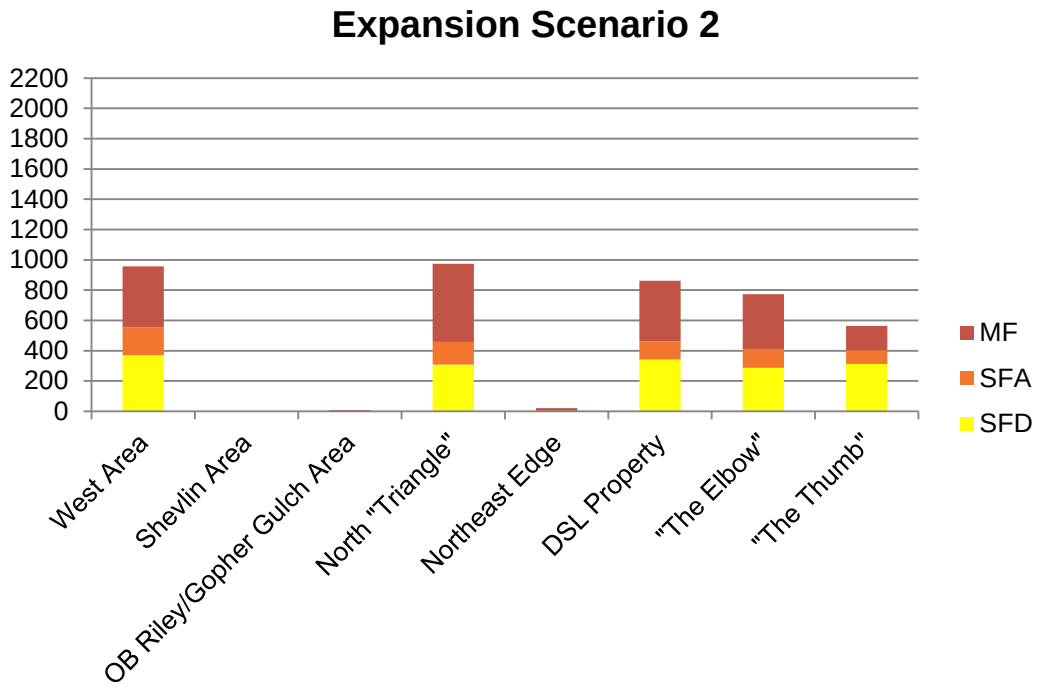


Figure 13: Heat map of Housing Growth in Expansion Scenario 2

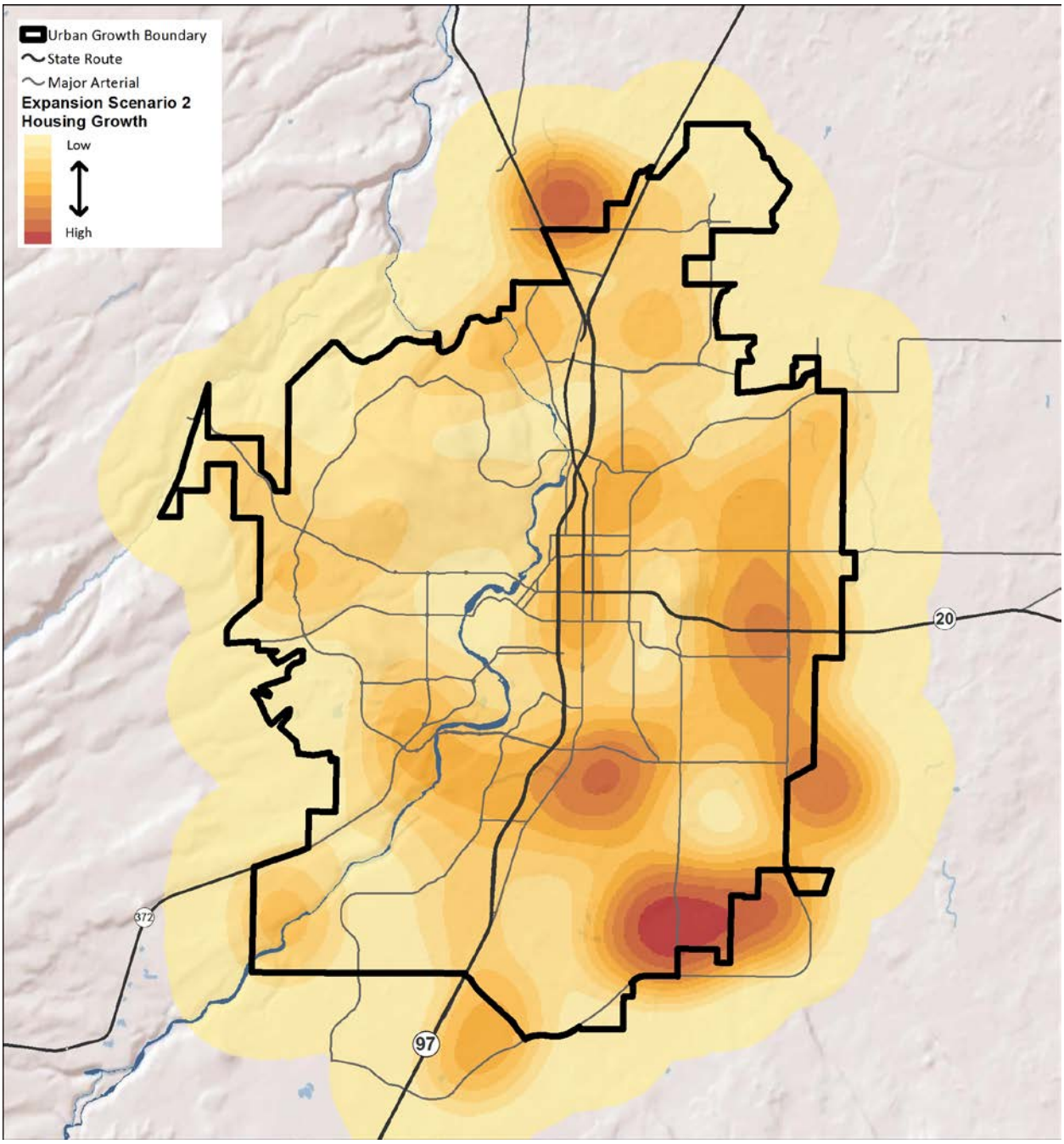
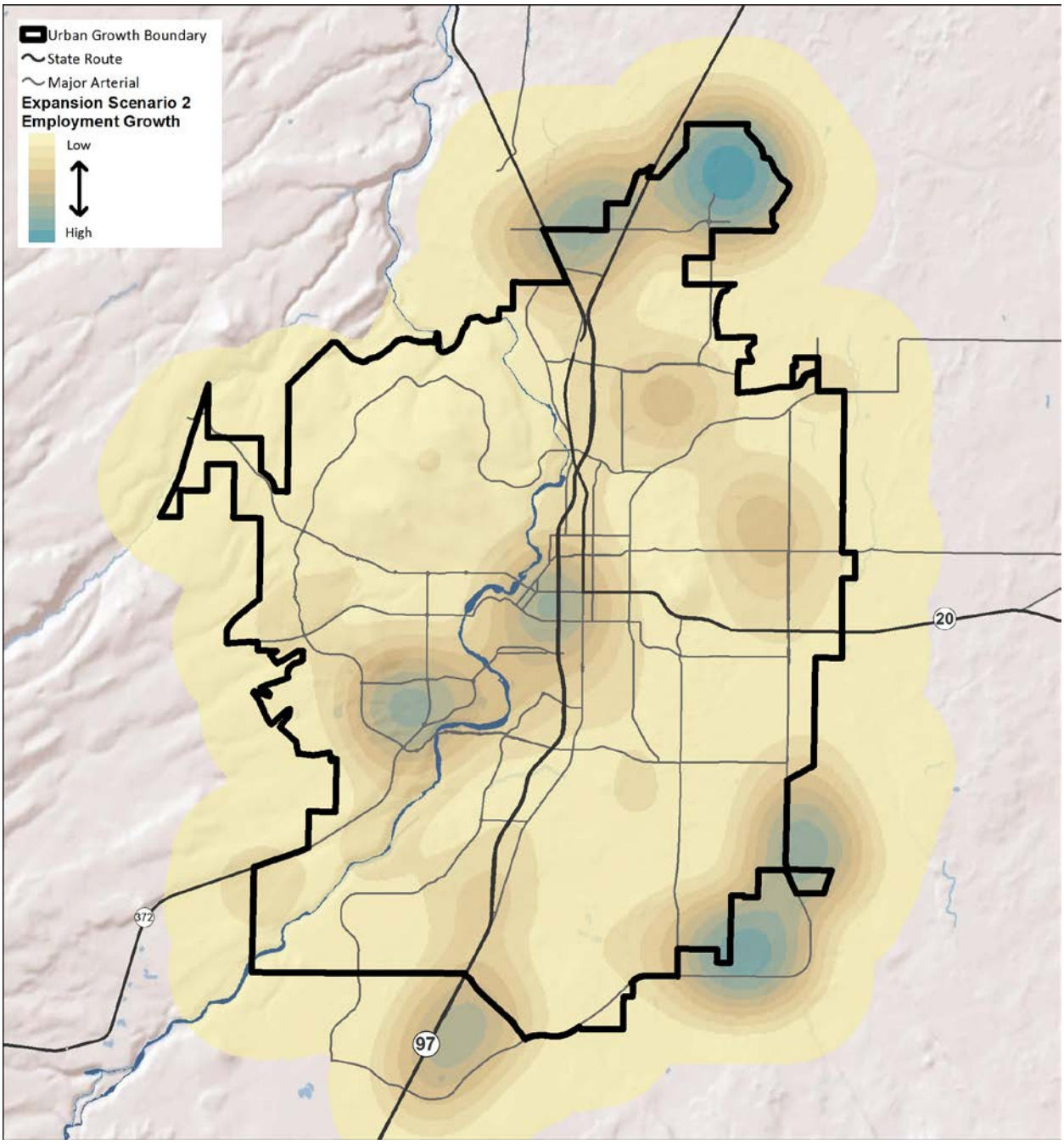


Figure 14: Heat map of Employment Growth in Expansion Scenario 2



Expansion Scenario 3

In Expansion Scenario 3, more of the expansion occurs in the areas North and West of the city. The West Area and Shevlin Area are large new residential expansions, and the OB Riley / Gopher Gulch Area contains new residential, commercial, industrial/professional office, and civic acres. Only half of the DSL Property is included, and the expansion into "The Elbow" and "The Thumb" properties is also limited.

Figure 15 shows that the housing capacity in Expansion Scenario 3 is almost exclusively on the west and northwest (the West Area, the Shevlin Area, and the OB Riley / Gopher Gulch Area). The only noticeable residential capacity added on the south or east is on the DSL Property. The West Area has the greatest number of housing units, with a mix that mirrors the overall residual with a large multifamily component in addition to a large amount of single family housing.

The OB Riley / Gopher Gulch area contains the most overall development in this scenario, including a significant employment component. “The Elbow" and "The Thumb" properties are large new employment areas, as is the North “Triangle” (which also includes the Large Lot Industrial site).

Figure 15: Expansion Scenario 3 Acreage by Plan Designation

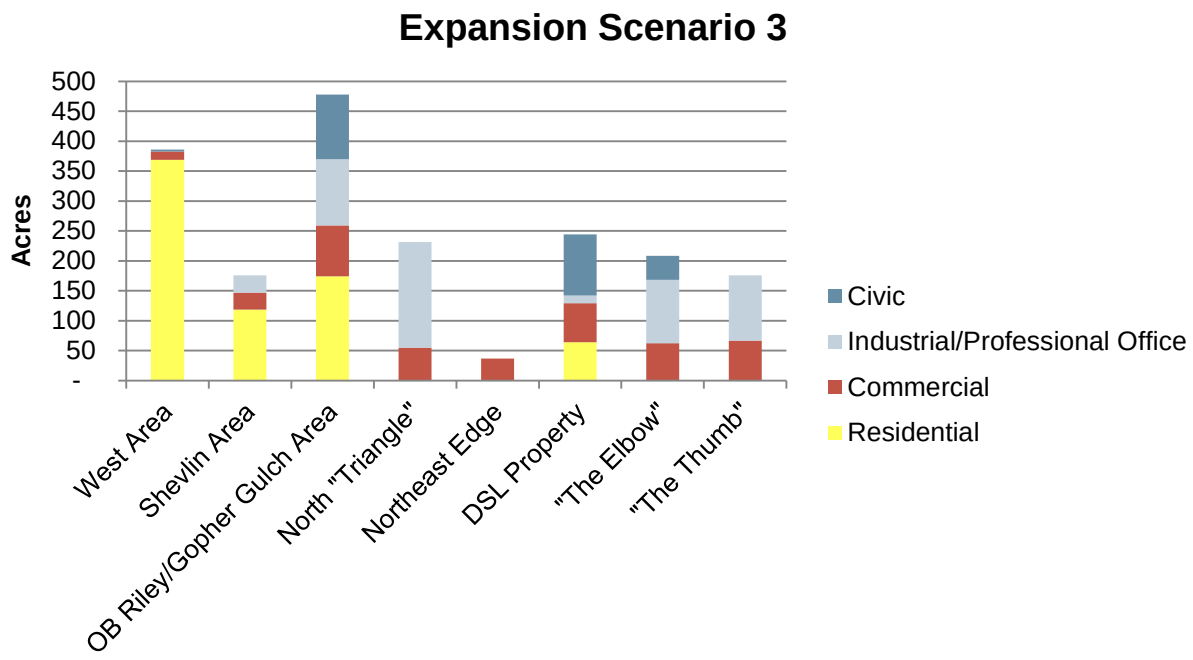


Figure 16: Expansion Scenario 3 Housing and Employment Capacity

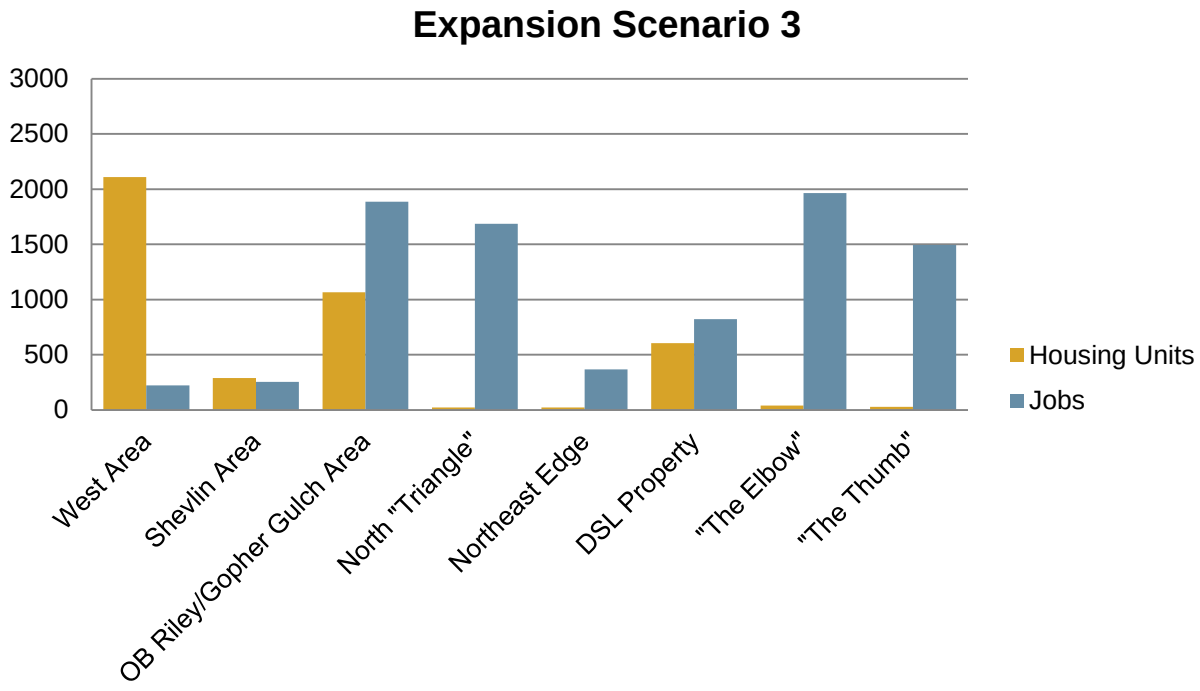


Figure 17: Expansion Scenario 3 Housing Unit Mix by Subarea

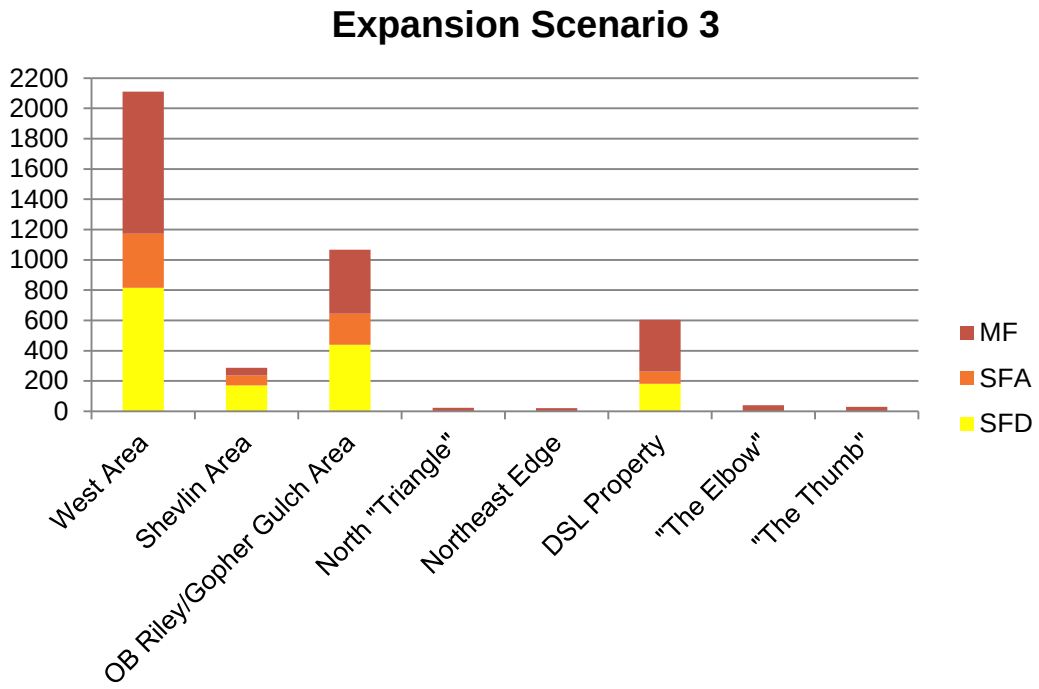


Figure 18: Heat map of Housing Growth in Expansion Scenario 3

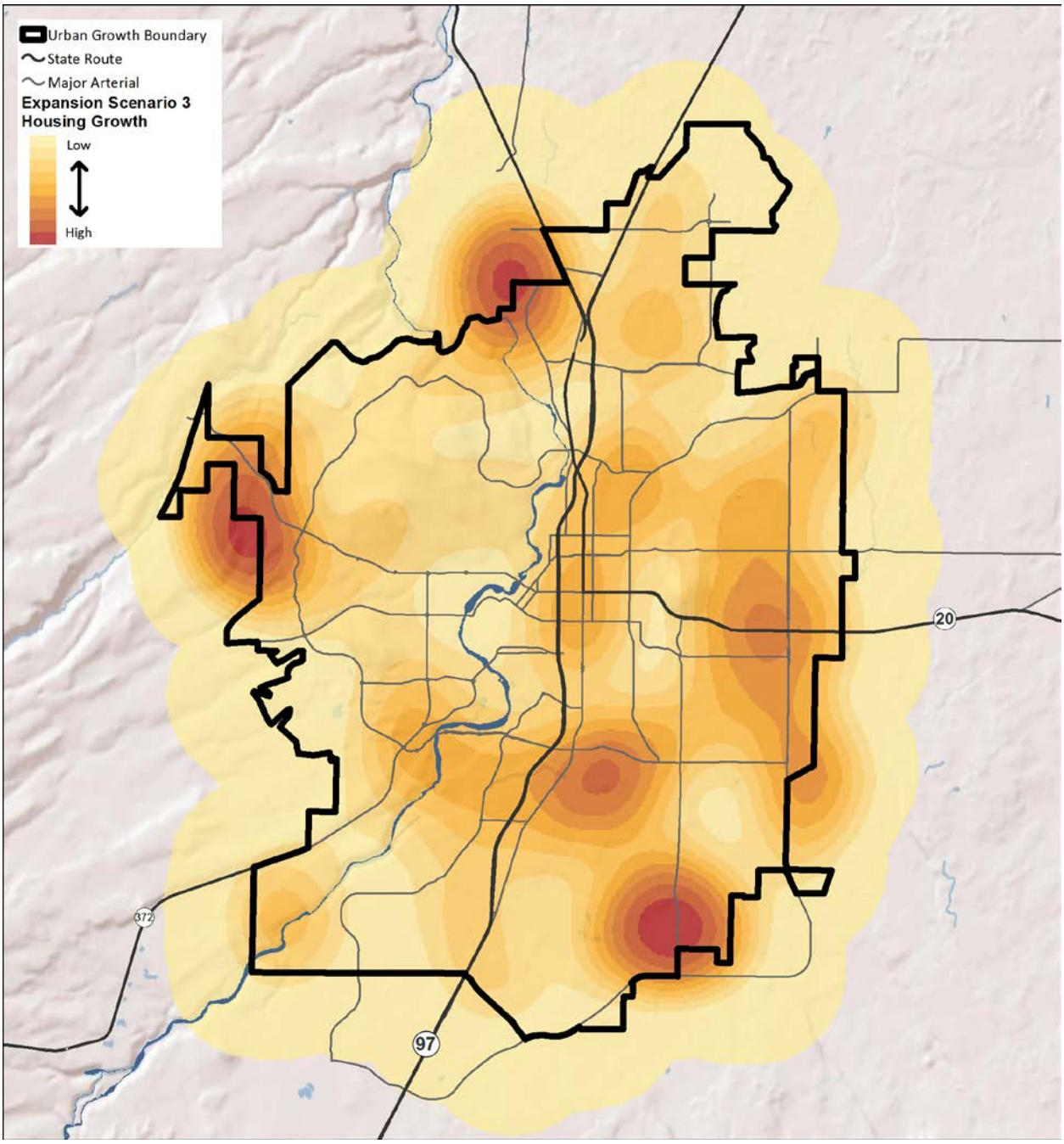
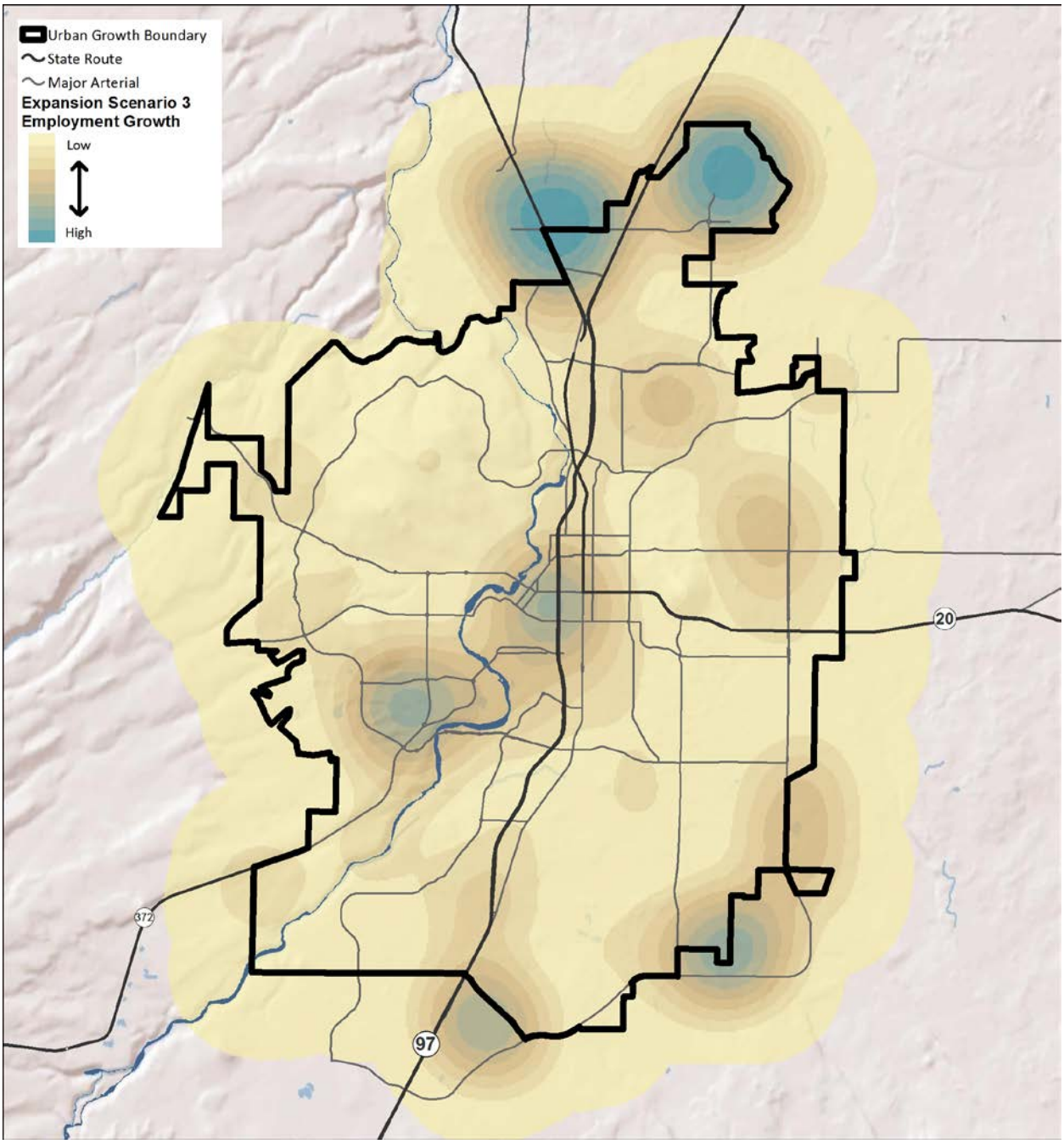


Figure 19: Heat map of Employment Growth in Expansion Scenario 3



QUESTIONS FOR THE TAC

1. Are there any changes the TAC wishes to propose to Expansion Scenario 1?
2. Are there any changes the TAC wishes to propose to Expansion Scenario 2?
3. Are there any changes the TAC wishes to propose to Expansion Scenario 3?
4. Are there any different scenarios a TAC member wishes to propose?
5. Motion: forward the slate of scenarios, as revised, to the USC.

The above questions can include comments, such as specific items to include in the evaluation.

APPENDIX A:

Boundary Expansion Scenario Workshop Results

Memorandum

June 3, 2015

To:	Urban Growth Boundary and Growth Scenarios Technical Advisory Committee
Cc:	Project Team
From:	Angelo Planning Group Team
Re:	Boundary Expansion Scenario Workshop Results

KEY THEMES FROM WORKSHOP

The project team reviewed the workshop maps and notes in a series of discussions following the workshop. A chip count was also prepared. From these reviews, we have identified the following key themes from the workshop.

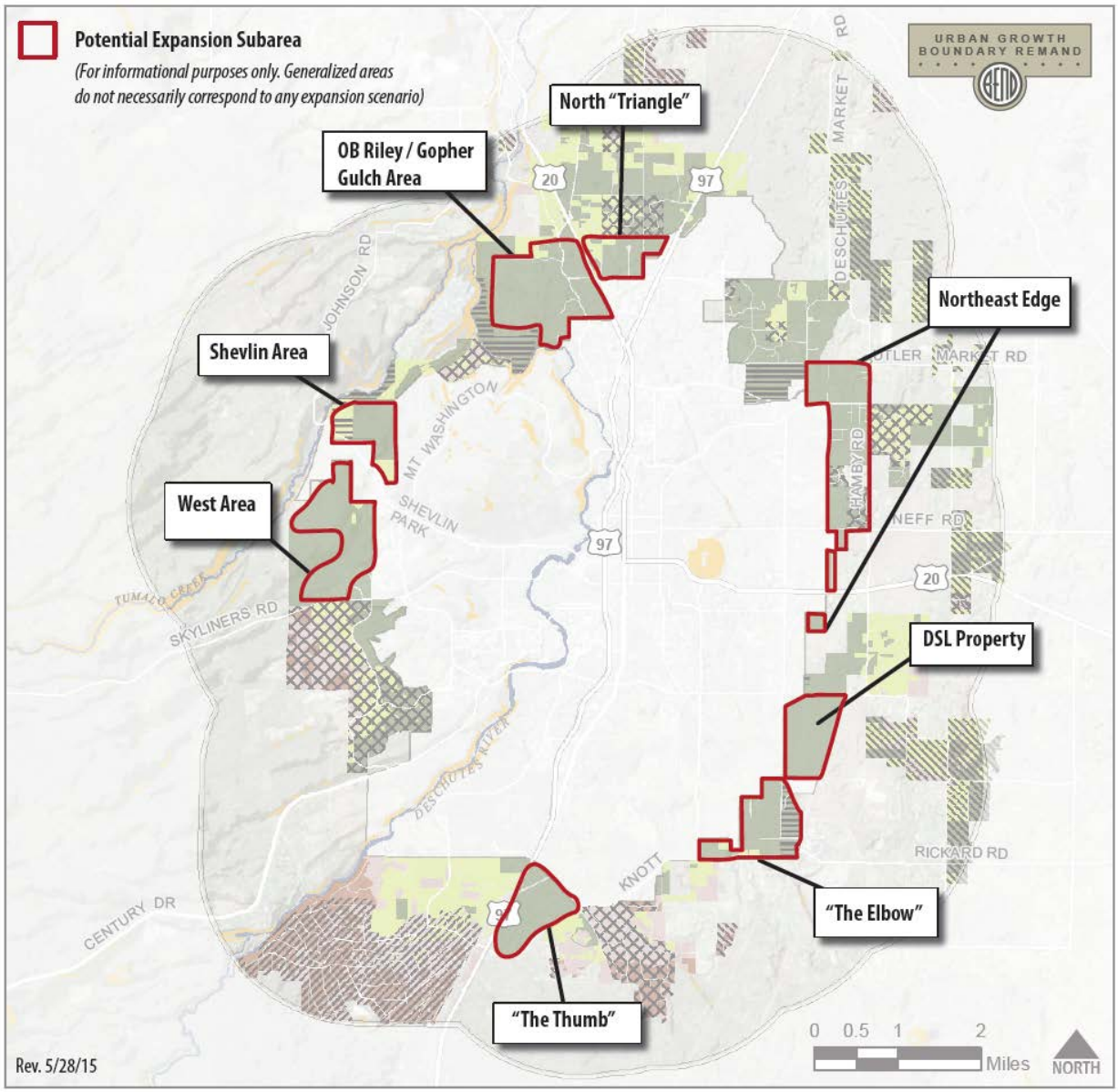
General consensus on the lands to be considered in this UGB expansion

Eight general geographic areas were identified as the most suitable to meet the identified land needs. The selection of these areas builds on suitability mapping approved by the Boundary TAC in preparation for the workshop. Participants selected lands that ranked in the highest quartile "best" category of the Bend UGB Land Suitability Composite (Annotated) Map. The eight areas are listed below and shown on Figure 1.

- West Area
- Shevlin Area
- OB Riley/Gopher Gulch Area
- North "Triangle"
- Northeast Edge
- DSL Property
- "The Elbow"
- "The Thumb"

While there were similar geographies identified, there was considerable mixing of different uses within the different expansion areas. Workshop participants were following a guideline of "concepts not precision," and this is reflected in the varied layouts of chips within the above-listed sub-areas.

Figure 1: Potential UGB Expansion Subareas



Use of the larger, vacant properties adjacent to the UGB, except on the Northeast Edge

Most of the subareas listed above are the larger, vacant properties at the edge of the current UGB. Participants said they selected these areas, in part, because they had the potential for master planning new, complete neighborhoods and communities for Bend. The notable exception to this concept is the inclusion of the small properties in the Northeast Edge area. In this area, participants noted that even though these properties are smaller and partially developed with rural housing, there was potential for additional housing or locally serving commercial that would complement the adjacent neighborhoods, schools, parks and

transportation facilities. Generally speaking, areas identified for urbanization in this area tend to be outside of subdivisions and exhibit low intensity development on medium sized parcels.

A preference for complete neighborhoods and complete communities

All of the workshop maps include residential development, employment uses, parks, and schools that are co-located to comprise complete neighborhoods (where residential is the predominant use) or complete communities (where the mix of uses is extensive). This concept was reported out by many groups as an organizing theme for their placement of chips.

Staying the course with employment for Juniper Ridge

There was strong consensus in the workshop to continue to plan Juniper Ridge as an employment area within the City. Participants commented that the cost of infrastructure raised uncertainties for the level of development between now and 2028, and that they were more supportive of employment as a land use that would minimize this concern. Some workshop participants placed some commercial chips in this area, but as a secondary use to large lot industrial or industrial/professional office.

Recognition that this process is a stepping stone to future development

In the discussion at the tables, and in the large group discussion at the end of the workshop, it was noted that the current UGB process is a step toward future planning for urban reserves adjacent to Bend. One participant mentioned that the relatively short time period from now to 2028 means this process is more likely to select “low hanging fruit” expansion areas that are the prelude to future urban reserves.

SUMMARY OF RESULTS BY SUBAREA

Below is a summary of the ideas generated for each subarea. Table 1 beginning on page 7 summarizes the number of chips of each type placed in each subarea by each table.

West Area

- Most tables clustered chips along the UGB line and in the southern portion of this area.
- All tables included at least one Traditional neighborhood, at least one open space neighborhood, and one multifamily housing chip in this area.
- Many tables also included suburban single family neighborhood, large lot neighborhood, park, and/or neighborhood commercial center.
- One or two tables included a school, community commercial center, and/or industrial/professional office.
- No tables included large lot industrial here.

Shevlin Area

- Two of the groups created a complete community in this area. Another included a limited amount of housing and neighborhood commercial.
- Two groups placed only a single chip in this area.
- One table did not use this area at all.
- Most tables included open space neighborhood.
- Half the tables included industrial/professional office, neighborhood commercial center, and/or a school.
- One or two tables included suburban single family neighborhood, multifamily, and/or a park.
- No tables included large lot industrial here.

OB Riley/Gopher Gulch Area

- Many tables included chips between US 20 and OB Riley Road south of and just north of Cooley Road. Many also extended west into the Gopher Gulch area, though several tables placed these chips loosely indicating the general area rather than a specific location and did not fill the area.
- All tables included at least one neighborhood commercial center, suburban single family neighborhood, and large lot neighborhood.
- Most tables also included at least one industrial/professional office chip and at least one school.
- A few tables included each of: parks, multifamily, open space neighborhood, and community commercial center.
- One table included a large lot industrial chip here.

North “Triangle”

- Chips were mostly located abutting the northern edge of the UGB (north of Cooley Road) and/or clustered to the eastern part of this area.
- Most tables included at least one industrial/professional office and/or at least one multifamily housing.
- A few tables located only industrial/professional office in this area, while a few others located two or more community commercial center chips in this area.
- A neighborhood commercial center, large lot neighborhood, and a park were each included by one of the tables.
- No large lot industrial, suburban single family neighborhood, open space neighborhood, traditional neighborhood, or school chips were placed in this area by any tables.

East/Northeast

- Chips generally hugged the eastern edge of the UGB, but varied in which “checkers” were included and which were not. Most tables placed some chips, including some commercial use, along Butler Market Road.
- All tables included at least one (and often several) neighborhood commercial center and suburban single family neighborhood chips, and at least one multifamily housing chip in this area.
- Two tables placed the majority of their community commercial center chips in this area.
- A few tables included each of: industrial/professional office, one or more parks or schools, and/or large lot neighborhoods.
- One table included open space neighborhood and one included traditional neighborhood.
- No groups included large lot industrial in this area.

DSL Property

- Most tables filled the majority of the exception land on the DSL property with chips.
- All groups included multifamily housing, suburban single family neighborhood, and industrial/professional office.
- Most also included at least one park and school, at least one traditional neighborhood, and at least one neighborhood commercial center.
- Community commercial center and open space neighborhood were each included by half the groups.
- Two groups included a large lot industrial site in this area.

Elbow

- The placement of chips in this area varied from table to table, with some fully utilizing the area and others using only a portion.
- All tables included at least one, and often more than one, suburban single family neighborhood and one neighborhood commercial center in this area.
- Most also included multifamily, one or more parks and schools, and/or some community commercial center.
- Industrial/professional office and traditional neighborhood were each included by half the groups.
- One table included open space neighborhood, and one included large lot neighborhood.

Thumb

- All tables filled this area with chips. A few placed a chip to the west of US 97, but some of these indicated they intended it to be located in the thumb instead.

- All tables included more than one industrial/professional office chip, at least one community commercial center chip, at least one suburban single family neighborhood, and at least one multifamily chip.
- Most also included a park and/or school, neighborhood commercial center(s) and a traditional neighborhood.
- A few tables included each of: large lot industrial, open space neighborhood, and large lot neighborhood.

Juniper Ridge

- All tables included at least one large lot industrial site.
- Most tables also included industrial/professional office and a neighborhood commercial center.
- Two tables included some community commercial center.
- One table included a park.
- No tables included residential uses or schools.

Table 1: Chip Count by Type and Subarea

Subarea	Table	Large Lot Industrial	Industrial / Professional Office	Community Commercial Center	Neighborhood Commercial Center	Suburban Single Family Neighborhood	Open Space Neighborhood	Traditional Neighborhood	Large Lot Neighborhood	Multifamily	Park	School
West Area	1				1	1	1	2	1	1	2	
	2		0.5			1	1	2		1	2	
	3		1	2		2	1	1	1	1		
	4				1	1	2	1	2	1	1	
	5				1		3	1		1		
	7				1	3	1	1	2	1	1	1
	Avg	0	0.25	0.33	0.67	1.33	1.5	1.33	1	1	1	0.17
Shevlin Area	1		1		1	1	1			1		2
	2		1									
	3						1					
	4		1		1	0.5	1			1	1	1
	5											
	7				1		2					1
	Avg	0	0.5	0	0.5	0.25	0.83	0	0	0.33	0.17	0.67
OB Riley/Gopher Gulch Area	1			2	1	1			1	1		
	2		1		2	2	1		1			
	3	1	1	2	1	2			2		2	2
	4		1		1	1.5	1		1	1	1	1
	5		2		1	2			3		1	2
	7		3		1	1			1			1
	Avg	0.17	1.33	0.67	1.17	1.58	0.33	0	1.5	0.33	0.67	1

Subarea	Table	Large Lot Industrial	Industrial / Professional Office	Community Commercial Center	Neighborhood Commercial Center	Suburban Single Family Neighborhood	Open Space Neighborhood	Traditional Neighborhood	Large Lot Neighborhood	Multifamily	Park	School
				CCC	NCC					MF	Park	School
North "Triangle"	1		2									
	2			2					2	2		
	3		1							2		
	4		2							1		
	5		2	3	1					2	1	
	7		2									
	Avg	0	1.5	0.83	0.17	0	0	0	0.33	1.17	0.17	0
Northeast Edge	1		1	4	2	1.5			2	1		
	2		1		6	3			1	1		
	3				4	2		1	1	1	2	
	4		1	4	6	3				1	1	2
	5				1	4				1		
	7				3	2	1			2		2
	Avg	0	0.5	1.33	3.67	2.58	0.17	0.17	0.67	1.17	0.5	0.67
DSL Property	1		1		1	2	1			1	2	4
	2		1.5	2	1	1	1	1		2	2	1
	3		2	2		1		2		2		
	4	1	1	2		1		1		1	1	1
	5		2		3	1	1	3		1	1	
	7	1	1		1	1		1		1	1	1
	Avg	0.33	1.42	1	1	1.17	0.5	1.33	0	1.33	1.17	1.17

Subarea	Table	Large Lot Industrial	Industrial / Professional Office	Community Commercial Center	Neighborhood Commercial Center	Suburban Single Family Neighborhood	Open Space Neighborhood	Traditional Neighborhood	Large Lot Neighborhood	Multifamily	Park	School
												
"The Elbow"	1		1	1	1	2.5	1	1		2	1	1
	2		2	2	1	2						
	3				1	2				1	2	2
	4		1	1	1	2		1	1	1		1
	5				1	1				1	1	2
	7			4	1	2		1		1	1	1
	Avg	0	.67	1.33	1	1.92	0.17	0.5	0.17	1	0.83	1.17
"The Thumb"	1	1	2	1	2	1		1		1	1	1
	2	1	2	2		1	1	1		2	1	1
	3		2	2	3	1	2			1		4
	4		3	1		1		1		1	1	2
	5		2	2	1	2			1	2	1	
	7		2	2	1	1		1	1	2	1	1
	Avg	0.33	2.17	1.67	1.17	1.17	0.5	0.67	0.33	1.5	0.83	1.5
Juniper Ridge	1	1	2		1							
	2	1	1									
	3	1	3		1							
	4	1										
	5	2	2	3	1							
	7	1	2	2	1						2	
	Avg	1.17	1.67	0.83	0.67	0	0	0	0	0	0.33	0

WORKSHOP MAPS AND NOTES

The following pages show the maps created by each table. Notes from report outs from each group and highlights of the group discussion that followed are captured below. Please consider these comments as working notes that the project team is reporting directly rather than interpreting.

Group 1

- Complete north-south mixed housing types
- Juniper Ridge – employment focus/some commercial added
- Westside – complete community on edge; larger lots near large lots

Group 2

- Intense development in southeast/south – need to be master planned
- Agreement – too many large lot neighborhood stickers
- Juniper Ridge- Considerable disagreement – spectrum from 0 to allowing residential

Group 3

- Industrial at Juniper Ridge /employment/commercial/and multi-family
- Parcelization
- Provide services within existing UGB/eastside notes
- Do you want land south of town – no go, too much change of character

Group 4

- Wide views and perspectives – from 0 westside development to complete communities focus
- Juniper Ridge – keep character/existing, recognize need for creating one
- Confusion on overall acres considered
- Master plan triangle NE…Cooley Road connection
- Practical viability of commercial
- Transportation limitations 97 and Brookswood

Group 5

- Ditto themes
- Large lot adjacencies of whole canvas of Bend – disperse neighborhood throughout
- Mixed use development/cluster cottage housing
- Light development buffer zones
- Parkland expansion
- Juniper Ridge if served
- Gopher Gulch complete neighborhood

- NW less development

Group 6

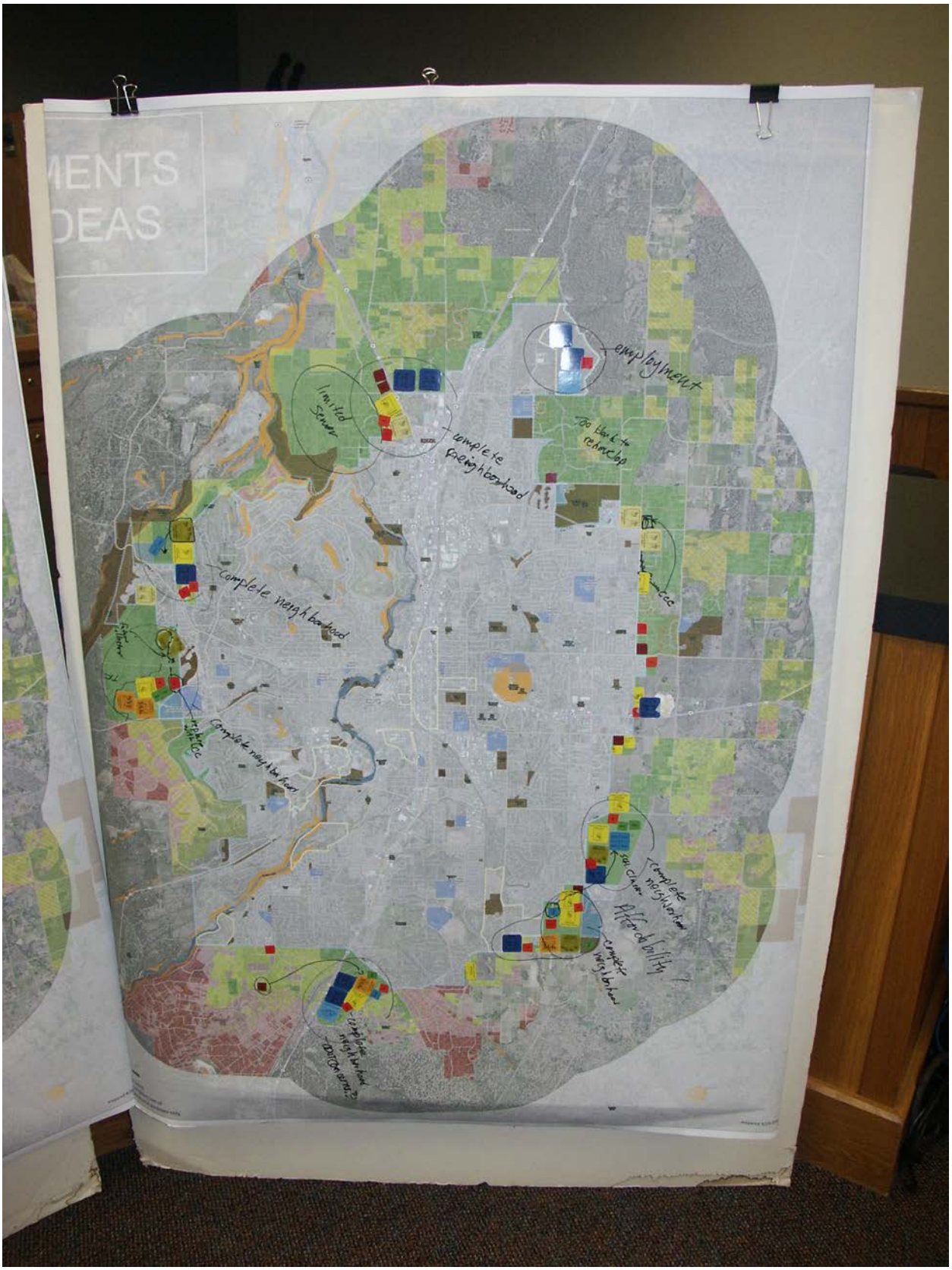
- Evenly distributed residential around Bend
- Open and larger lots as buffer for wildfire
- Juniper Ridge –more chips
- Next to dump
- Thumb area as office park
- Westside mine site
- Too much commercial on perimeter for the amount of residential need
- Consider sewer challenges at north end and transportation
- Challenge of parcelization at north end
- Nixed the sticker on EFU land

Observations from group

- Eastside parcelization influenced choices
- Adjacent uses inside to support outside choices
- This is temporary – stepping stones to future development
- 10-year build out plan influenced choices; low hanging fruit then UAR planning
- Taking Juniper Ridge out of mix – based on expectations of cost; we won't get there in planning period; keep in City of Bend
- Need Cooley intersection planning information/description
- Concern – 18 units/month won't keep up with demand for housing (affordable)
- Deschutes River Woods left out of analysis – concern about fairness/access to services
    - Some justification for logical boundaries
    - Baker Road? Transportation challenges/parcelization
    - Provide emergency access if considered (e.g. wildfire)
    - Problem – DLCD had 3,000 acres unbuildable (See 2010 Remand Order) - if you can't get yield from it why include it?
    - If bring in – measure it as absorption rate by 2028 might meet need in future
    - Legal problem with DRW after adoption; single issue by council
    - DRW infrastructure costs/serving them - all taxpayers absorb w/out adequate funding - can't allocate to developers, expensive to ratepayers
    - Balancing big picture/cost of service


OMMENTS
BIG IDEAS


COMMENTS
BIG IDEAS
7 THE BIG PICTURE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complete neighborhood
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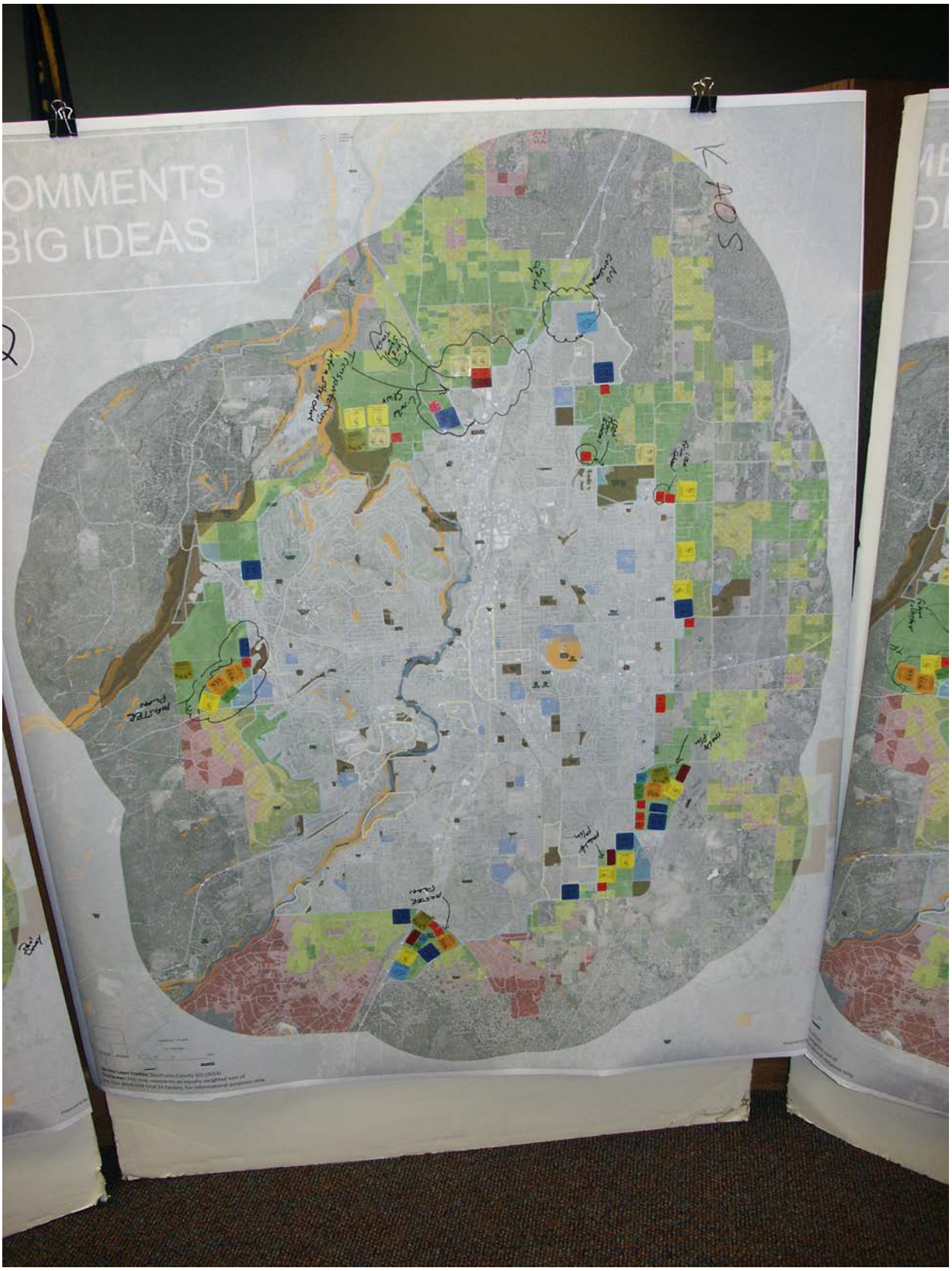
OMMENTS
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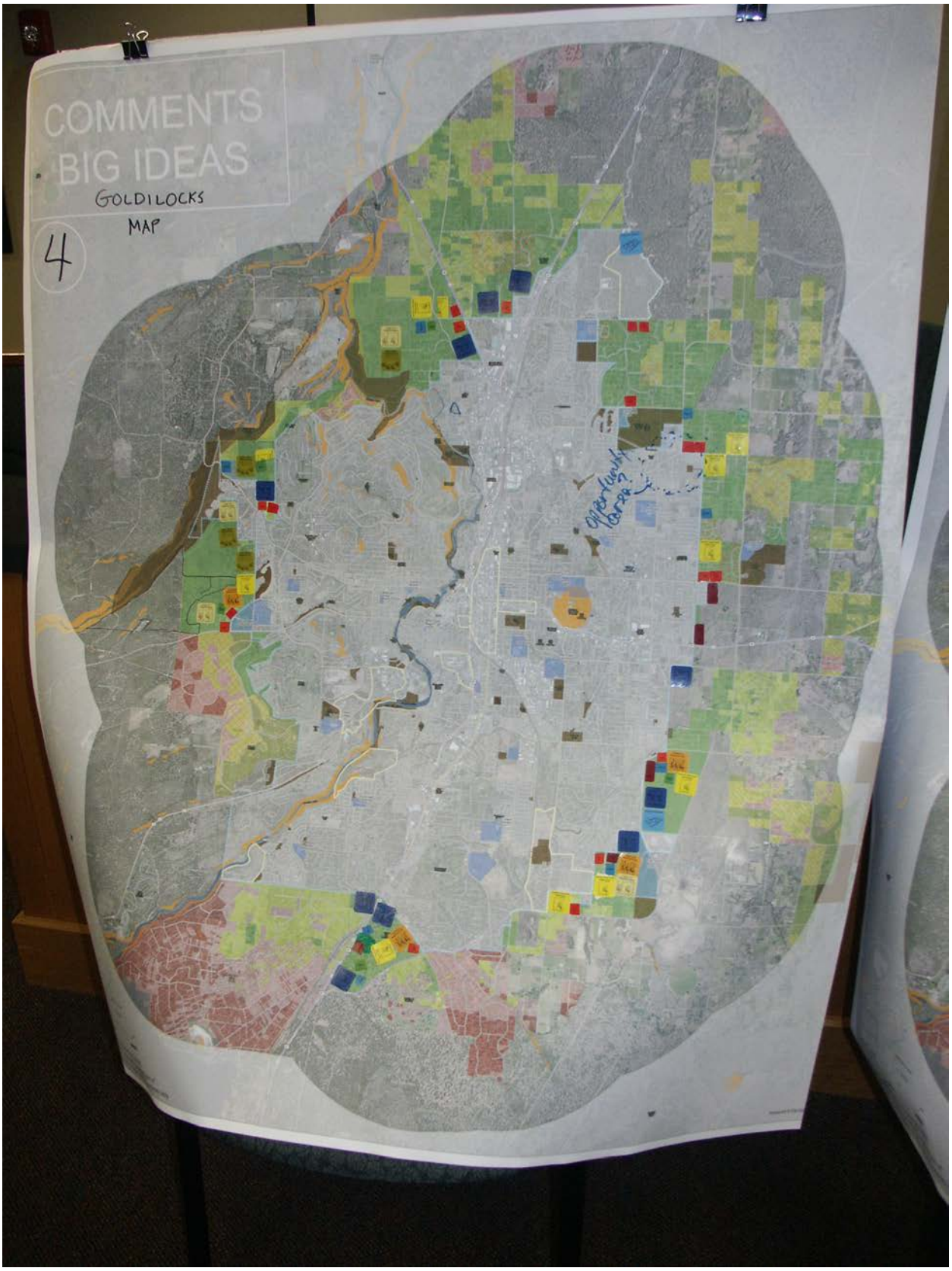
Complete
Neighborhoods
Some group members have concerns about fire
JOHN DAVSON


COMMENTS
BIG IDEAS
GOLDILOCKS
MAP
4

URBAN GROWTH BOUNDARY REMAND
MAKING BEND EVEN BETTER

APPENDIX B:

UGB Expansion Scenario Assumptions and Details

Memorandum

June 3, 2015

To: Urban Growth Boundary and Growth Scenarios Technical Advisory Committee
Cc: Project Team
From: Angelo Planning Group Team
Re: UGB Expansion Scenario Assumptions and Details

OVERVIEW

Development Types

The Urban Growth Boundary (UGB) Expansion scenarios were created using "development types" that generally represent Bend's General Plan designations. The development types contain various assumptions calibrated by the project team with the best available information and with Technical Advisory Committee (TAC) direction at various stages. Development type assumptions include:

- A mix of specific building types (using prototype buildings reviewed by the Residential and Employment TACs in August, 2014)
- Parking requirements
- Streets, neighborhood parks, and other set-asides
- Net residential density and net job density
- Rate of redevelopment

Development types were first calibrated to observed densities and land use mix in Bend's general plan designations to create the "Base Case" scenario, and then modified as needed to reflect the estimated effects of proposed efficiency measures. These modifications were documented Residential TAC and Employment TAC meetings during Phase 1 of the project, and will continue to be evaluated as committees further examine efficiency measures in Phase 2.

Development types are assigned to lands through "painting" the map. It is important to understand, however, that the analysis is not parcel specific; it does not predict precisely what would occur on a given property. Rather, the weighted averages from the development type are applied to the parcels being painted. This allows the model to do a better job of realizing the variations that happen in the real world based on factors such as developer preference, lot shape, access, views, and neighborhood compatibility. Each buildable acre of land where a development type is applied is assigned a percentage of each of the building types as well as the specified percentage set asides that comprise the development type.

Envision Tomorrow does not predict the timing of this development. In essence, it provides a snapshot of potential development projected to occur during the planning period.

Buildable Land

The scenarios take into account development constraints and existing development outside the UGB. Development constraints include:

- Floodplains
- Slopes over 25%
- Current surface mining permits
- Parks/school district ownership
- Existing development

For those parcels with existing development, a quarter of an acre per lot was identified as developed, with the remainder considered vacant and buildable.

The buildable land inside the UGB was identified as described in the February 6, 2015 memorandum titled “Draft Bend UGB Buildable Lands Inventory” that was distributed to the Residential TAC.

Lands identified as having development constraints do not generate growth in the model, even if they are painted with a development type; the constrained area is removed from the buildable land to which development assumptions are applied.

DEVELOPMENT TYPE DESCRIPTIONS

Name	Description	Residential Mix	Employment Mix	Res/Emp Density[1]	Additional Information
RL	Low Density Residential	Mostly large lot single family, small amount of duplex	None	~2 units/net acre	Reflects possible efficiency measures related to duplex/triplex
RS	Std. Density Residential	Mostly single family, various lot sizes; small amount of duplex/triplex and cottage homes	Tiny bit of office	~7 units/net acre	Reflects possible efficiency measures related to cottage homes, duplex/triplex and ADUs
RS Hillside	Std Density Residential – Clustered Development	Mostly single family, various lot sizes; small amount of duplex/triplex and townhomes	Tiny bit of office	~3 units/net acre	Used where topography or other conditions may limit density to the lower end of the allowed range, rather than the average
RS Master-plan	RS for large master-planned areas	Mostly single family, various lot sizes but emphasizing small lots; small amount of duplex/triplex and townhomes	Tiny bit of office	~8 units/net acre	Reflects possible efficiency measures affecting master plan requirements for large sites (over 20 acres)
RS-CCR	RS with Development Restrictions	All single family	None	~2 units/net acre	A designation for platted lots covered by CC&Rs that limit lot divisions to ensure just one unit per lot is projected
RM	Medium Density Residential	Mix of small-lot single family detached, single family attached, and multifamily housing	Small amount of retail and office	~15 units/net acre	Reflects possible efficiency measures related to lot dimensions, setbacks, and cluster housing
RM Master-plan	RM for large master-planned areas	Mix of small-lot single family detached, single family attached, and multifamily housing	Tiny bit of office	~21 units/net acre	Reflects possible efficiency measures affecting master plan requirements for large sites (over 20 acres)

[1] Densities are approximate and subject to change with refinement of efficiency measures.

Name	Description	Residential Mix	Employment Mix	Res/Emp Density[1]	Additional Information
RH	High Density Residential	Mostly multifamily with some single family attached	Small amount of retail and office	~28 units/net acre	Reflects possible efficiency measures including prohibiting new single family detached housing and adjustments to setback and coverage requirements
MDOZ	Medical District Overlay Zone	Some multifamily housing	Primarily office (includes medical)	~22 jobs/net acre	Captures mix of uses allowed by the MDOZ
CC	Convenience Commercial	None	Mix of retail and office plus a tiny amount of industrial	~16 jobs/net acre	Generally intended for community-serving commercial areas adjacent to residential areas
CC2	"Walkable" Convenience Commercial	None	Mix of retail and office	~22 jobs/net acre	A more dense and walkable version of the Convenience Commercial (CC) designation; reflects possible efficiency measures reducing parking ratios for certain uses
CL	Limited Commercial	Tiny amount of multifamily housing	Mix of retail and office plus a tiny amount of industrial	~20 jobs/net acre	Intended for uses serving tourists as well as residents, along highways and in new commercial centers
CG	General Commercial	Tiny amount of multifamily housing	Primarily retail with some office and a tiny amount of industrial	~13 jobs/net acre	Intended for larger sites along major roads and businesses with a larger service area
CB	Central Business District	Tiny amount of multifamily housing	Primarily office with significant retail and some public employment	~118 jobs/net acre	Intended for the downtown with storefront/mixed use character; reflects possible efficiency measures including increasing building heights

Name	Description	Residential Mix	Employment Mix	Res/Emp Density[1]	Additional Information
MR	Mixed Riverfront	Small amount of single family and multifamily housing	Primarily office with some retail and industrial	~16 jobs/net acre	Intended for creative redevelopment of mill site properties adjacent to the Deschutes River; reflects possible efficiency measures reducing parking ratios for certain uses
MU1	Neighborhood Mixed Use	Mostly multifamily housing, some single family attached	Mix of retail and office	~18 units/net acre + ~33 jobs/net acre	New neighborhood-scale mixed use development type – relationship to existing plan designations TBD
MU2a	Urban Mixed Use	Mostly multifamily housing, some single family attached	Mix of retail and office	~46 units/net acre + ~37 jobs/net acre	New urban-scale mixed use development type – relationship to existing plan designations TBD
ME	Mixed Employment	None	Mostly office and industrial with some retail	~12 jobs/net acre	Intended to provide a broad mix of uses that offer a variety of employment opportunities
IP	Industrial Park	None	Mix of industrial and office	~25 jobs/net acre	Does not exist as a zone (only a plan designation)
IL	Industrial Light	None	Mix of industrial and office with a small retail component	~11 jobs/net acre	Intended to provide for heavier commercial and light industrial uses with easy access to collector and arterial streets
IG	Industrial General	None	Primarily industrial with some office and a small retail component	~16 jobs/net acre	Intended for light and heavier industrial uses
LL Indust-rial	Large Lot Industrial	None	N/A[2]	N/A	Special designation to protect land for large lot industrial uses (50+ acre sites) to meet the identified special site need

[2] Large lot industrial users are anticipated to be targeted sector major employers, outside the employment forecast need. This was treated as a special site need rather than being part of the employment projections.

Name	Description	Residential Mix	Employment Mix	Res/Emp Density[1]	Additional Information
PF	Public Facilities	None	Primarily public with tiny amounts of retail and office	~14 jobs/net acre	Intended to provide area for buildings and facilities that are publicly owned and operated
Inst	Institutional	None[3]	Public[4]	~25 jobs/net acre	Intended to reflect COCC campus
Univ	University	N/A[5]	N/A[6]	N/A	Intended to reflect planned university campus – OSU Cascades
School	Public Schools	None	N/A[7]	N/A	Used to identify existing and potential future public K-12 school facilities (not including administrative buildings)
Park	Community Parks	None	None	N/A	Identifies planned or potential future community parks

[3] Assumes no increase in student housing at COCC.

[4] Growth in employment at the existing COCC campus is counted as part of the public job employment forecast.

[5] Future student housing at OSU Cascades is not counted towards meeting the identified housing need– this was treated as a special site need rather than through the housing need projections.

[6] Future employment at OSU Cascades is outside the employment forecast need – this was treated as a special site need rather than through the employment projections.

[7] School-based employment in actual school facilities is excluded from the employment forecast need. The need for new school facilities is driven by school service areas and population growth rather than by the need to accommodate future employment.

SET ASIDES

In order to account for right of way, neighborhood parks and trails, and "other uses" such as churches, golf courses, etc. that may occupy land in a variety of plan designations but are not employment or housing uses, the development types also include set-asides that convert from gross vacant buildable acres to net residential and employment acres. The assumptions for these set-asides are documented below.

Right of Way

As part of the analysis for the 2008 UGB expansion effort, the City of Bend calculated the amount of land used for right of way city-wide, across all plan designations, at 21%. The "development types" in Envision Tomorrow include some variation in right of way set asides based on the nature of development typical of a given plan designation (for example, industrial development typically has less land used for roads than dense single family neighborhoods), but are calibrated to approximate this overall amount of right of way.

Parks and Trails

Parks are accounted for in two different ways in Envision Tomorrow: future Community Parks are identified with their own development type and an approximate location and size, while neighborhood parks and trails are accounted for through set-asides in certain development types (described below).

The locations and sizes of potential future community parks will be further vetted with Bend Parks and Recreation District (BPRD) as part of the evaluation process for the scenarios so that the ultimate land need for parks is calibrated to their evaluation of the needs to serve growth inside and outside the UGB.

Neighborhood parks and trails are built into residential and mixed use development types, on the assumption that they will primarily be built in those areas. BPRD has adopted "Level of Service" (LOS) standards for neighborhood parks and trails that specify a target number of acres or miles to be available per 1,000 service population. In their 2012 Parks Master Plan, BPRD set a neighborhood park standard of 1.5 acres/1,000 population. However, their previous standard was 2.0 acres/1,000 population, and in discussions with city staff, BPRD indicated that they may want to revert to the higher standard in planning for higher density expansion areas. BPRD also has an adopted trails standard of 1 mile/1,000 population. Using an assumed 20' right of way for trails, this translates to 2.4 acres/1,000 population for trails.

Set asides in the development types have been calibrated to provide for a total of 4.1 acres of neighborhood parks and trails, combined, per 1,000 of new population – halfway between BPRD's adopted neighborhood park standard of 1.5 acres/1,000 population and the 2.0 acres/1,000 population they indicated they may want to use for higher density expansion areas, plus 2.4 acres/1,000 population for trails. The set asides range from 1% of land in mixed use designations and RL, to 5% in basic RS, RM and RH designations, to 8% in the "Hillside" and

"Masterplan" versions of RS and RM, on the theory that those kind of developments are more likely to be required to dedicate parks and trails.

Schools

Public K-12 schools are accounted for in Envision with their own development type, similar to community parks. Approximate sizes and locations of future schools have been "painted" in the scenarios; however, the locations and types of schools identified will be further refined based on coordination with Bend-La Pine Schools, which is currently underway.

Other Lands

As part of the analysis for the 2008 EOA and HNA, the City of Bend calculated the amount of land used for "other lands" city-wide, including uses such as churches, fraternal organizations, golf courses and other uses that are neither housing nor employment (schools and parks are addressed separately as discussed above). Overall, 12.8% of the city's land area was found to be dedicated to these uses. This percentage set aside is applied to development types representing all plan designations in Envision Tomorrow.

REDEVELOPMENT

Each "development type" addresses redevelopment by applying its growth assumptions to a specific percentage of land that is already developed – called the "redevelopment rate". The model applies the appropriate density and mix assumptions to the redeveloped fraction of the land. It does not specify which land exactly is redeveloped, only how much of it is redeveloped overall. This percentage is set for each development type.

For residential land, redevelopment rates were set to zero across the board. This was based on a combination of the way that "vacant" and "developed" lands were identified for residential land,[8] and the fact that there has been virtually no history of residential redevelopment through tear-downs in Bend to date[9].

For employment land, the approach to identifying the overall amount of redevelopment that is reasonable to expect under "base case" (current policy and trend) conditions was documented in the November 11, 2014 memorandum titled "Recommended Redevelopment Rate for Employment Lands" that was provided to the Employment TAC. The redevelopment rates in the development types, which specify a percentage of land that will redevelop rather than a percentage of jobs that will be accommodated through redevelopment, were calibrated in the

[8] See February 6, 2015 memorandum titled Draft Bend UGB Buildable Lands Inventory. In short, residential land identified as "developed" would generally only be able to redevelop through removal of existing development. Land that can be built on without removal of the existing structure was generally coded as "vacant" even if there was development on the parcel.

[9] Based on an analysis of building permit data to identify instances where demolition of a residential structure was followed by construction of one or more residential structure(s) with more total units than were on the site previously.

base case to yield approximately the number of jobs that the more detailed redevelopment analysis suggested were reasonable. In the current scenario for growth inside the existing UGB, the redevelopment rates (percent of land area) in each development type remain the same, but more developed land has been identified for potential redevelopment, and some land has been "painted" with more intense development types and ones that may have a higher redevelopment rate. These changes have increased the number of jobs that can be accommodated through redevelopment, even without changing the assumed rate in each development type. Redevelopment rates for employment designations vary as follows:

- 4-6% for CC, CL, CG, ME, PF, and the industrial designations
- 8-10% for MR and MDOZ
- 15-25% for CB and the new mixed use development types

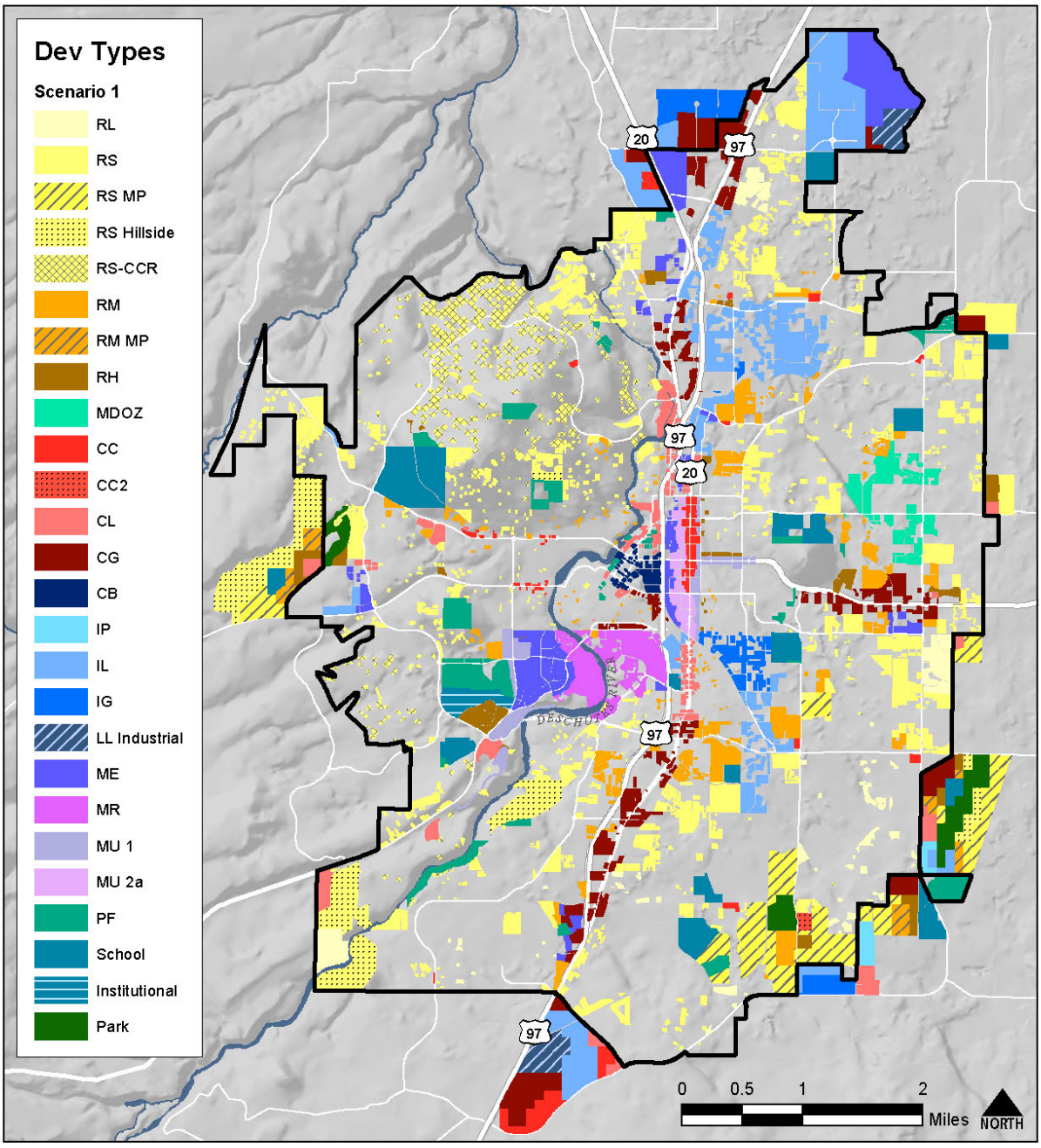
DETAILED MAPS

The following maps show how the development types described above have been applied both within the UGB and to potential expansion areas in each scenario. The "painting" inside the UGB is the same for all three scenarios; only the expansion areas differ. It is important to note that only land identified as having development potential (vacant land, residential or employment land that is partially developed but has remaining land available, and employment land that has is developed but has redevelopment potential) is "painted", and that applying a development type indicates that additional development is expected within the planning horizon. Put simply – the colored areas on the following maps indicate the areas of change through the planning horizon.

Bend UGB

Draft Expansion Scenarios

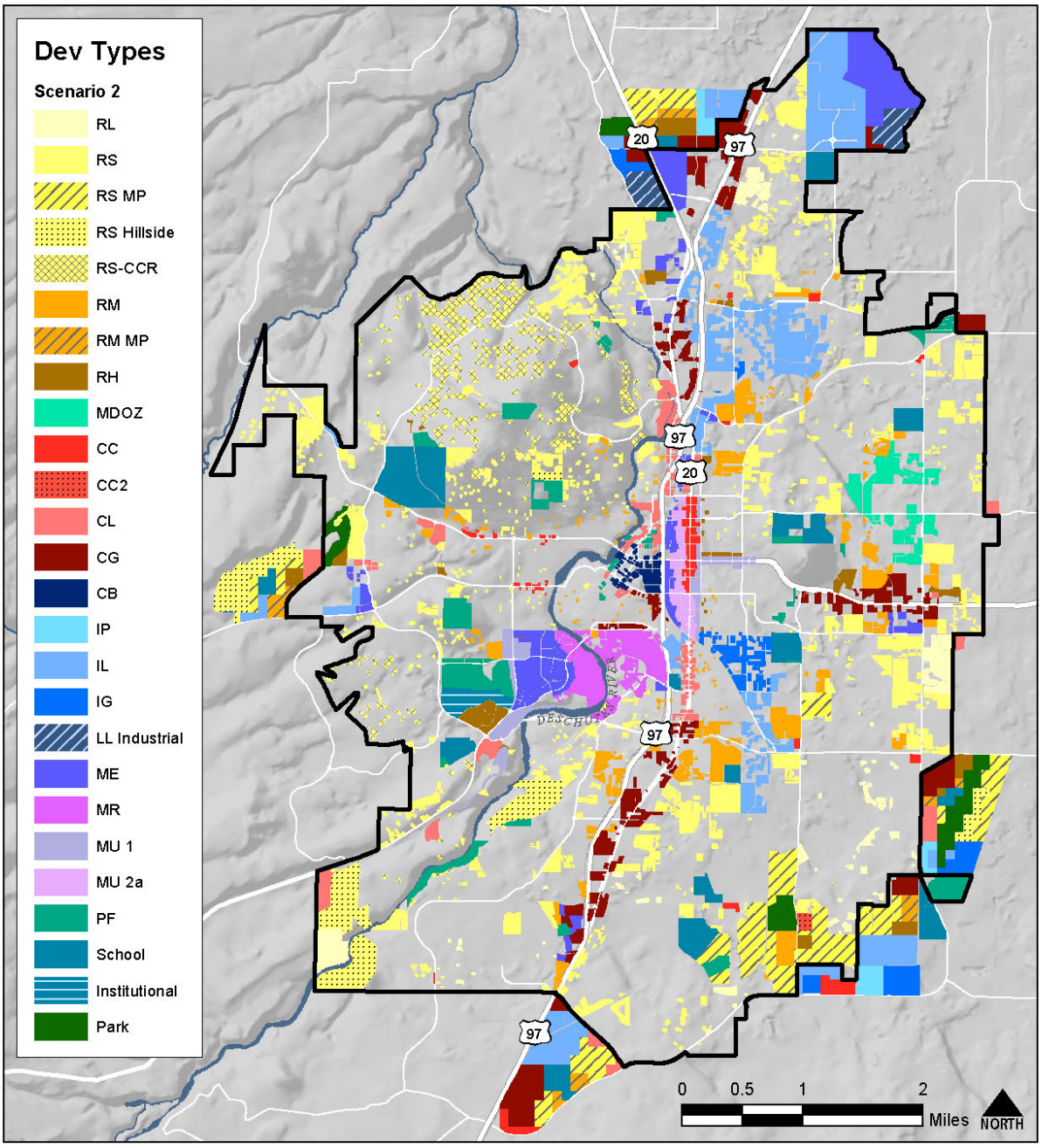
Prepared 5/29/2015



Bend UGB

Draft Expansion Scenarios

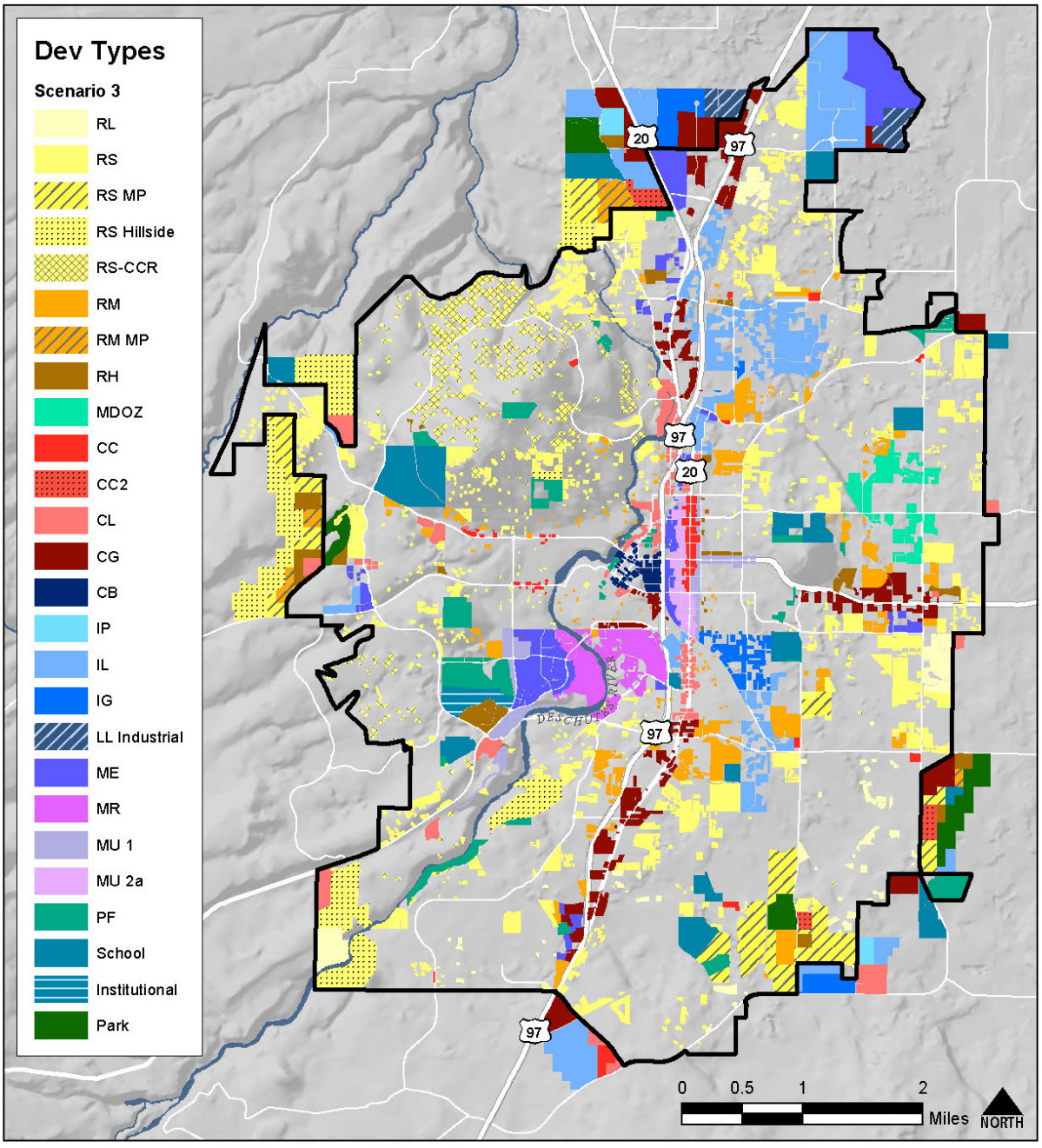
Prepared 5/29/2015



Bend UGB

Draft Expansion Scenarios

Prepared 5/29/2015



APPENDIX C:

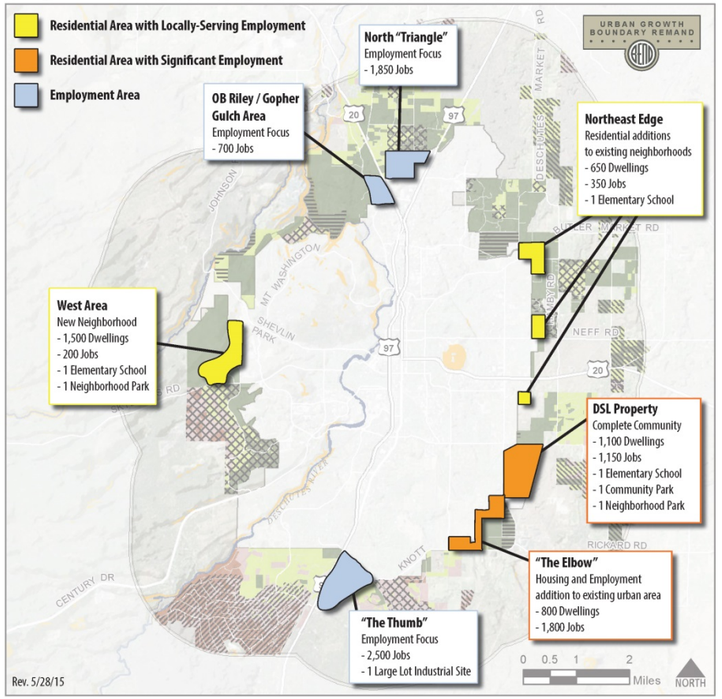
UGB Expansion Scenarios at a Glance

UGB Expansion Scenarios at a Glance

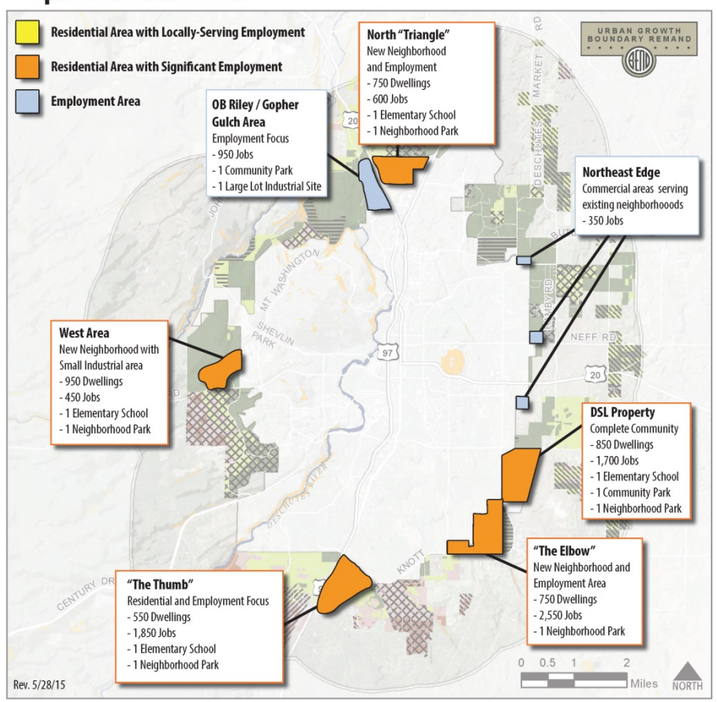
June 3, 2015

Scenario Maps

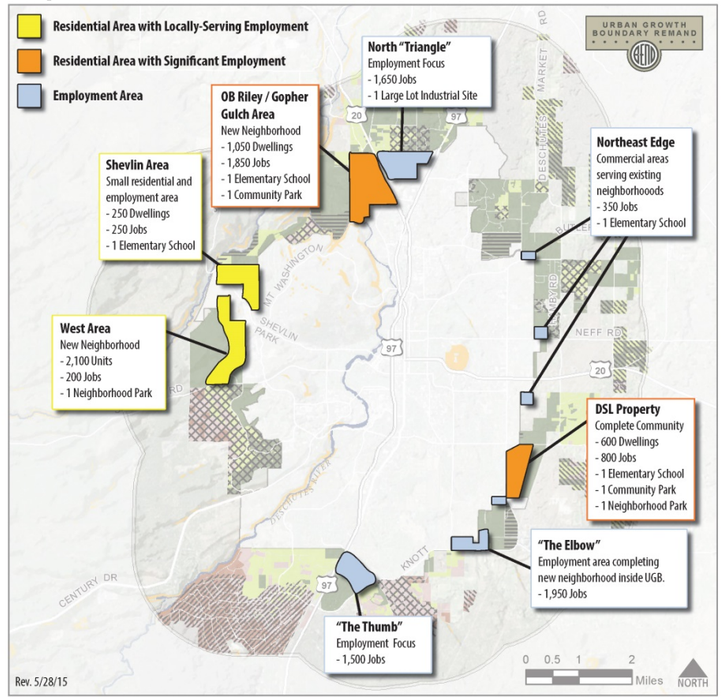
Expansion Scenario 1



Expansion Scenario 2

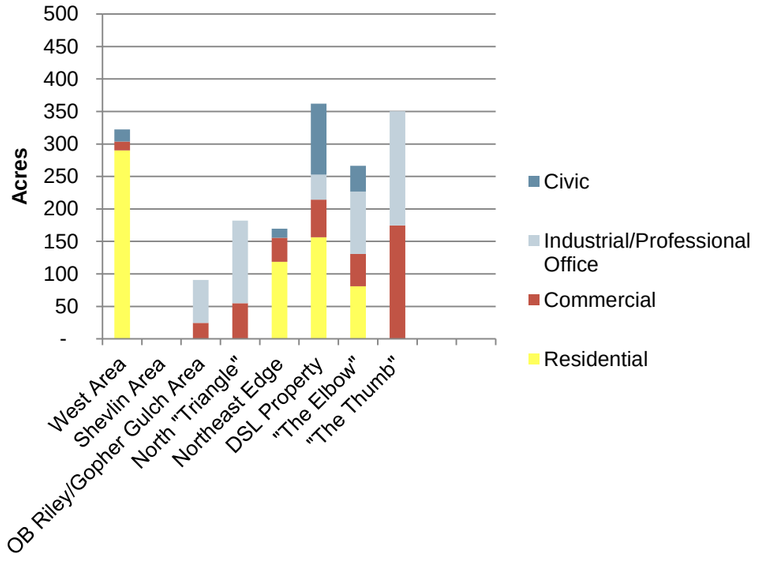


Expansion Scenario 3

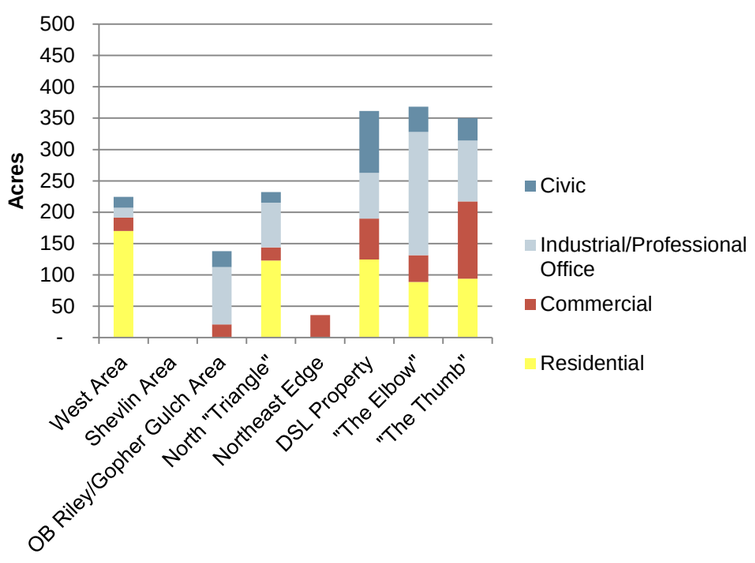


Acres by Generalized Land Use

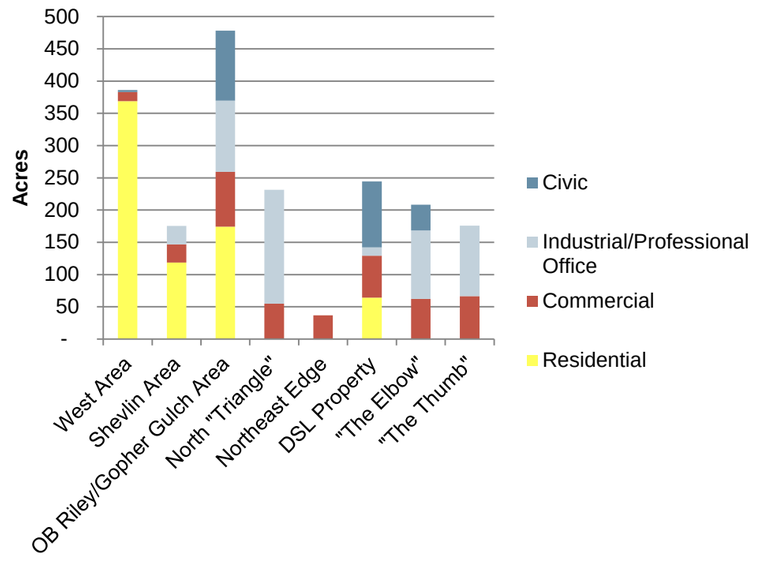
Expansion Scenario 1



Expansion Scenario 2



Expansion Scenario 3



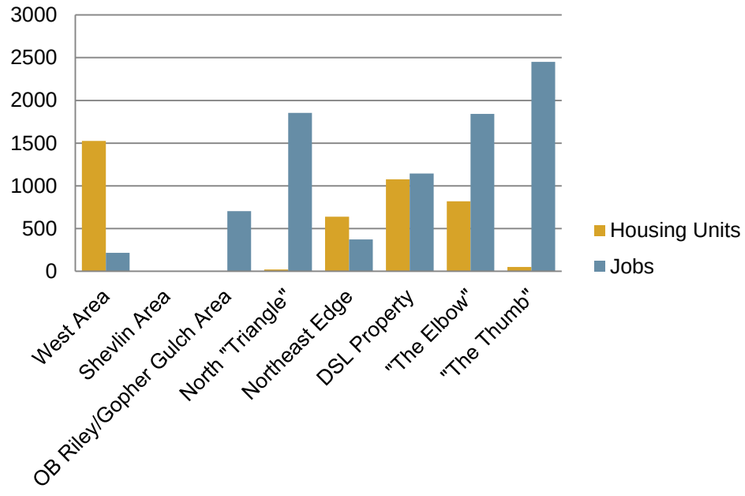
UGB Expansion Scenarios at a Glance

June 3, 2015

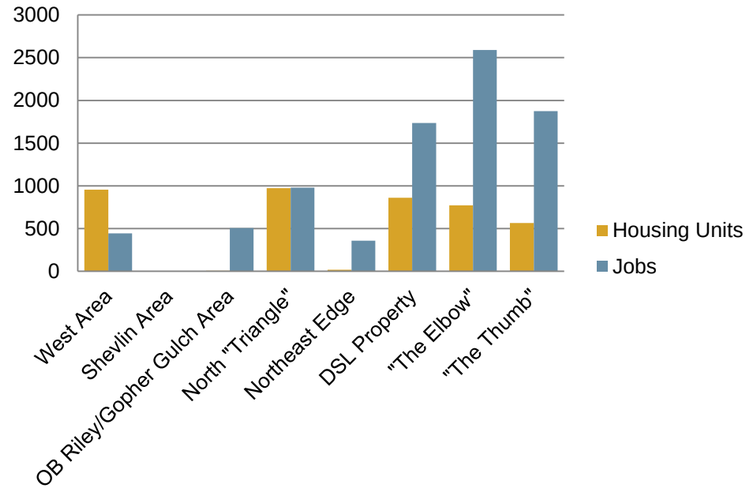
Page 2

Housing and Employment Capacity

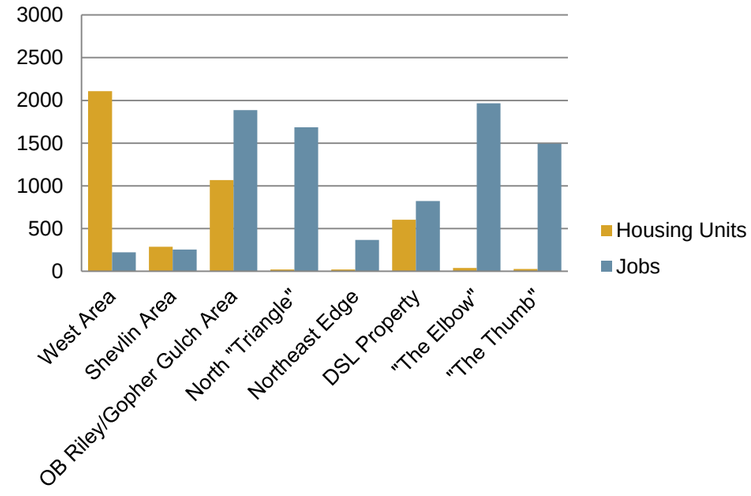
Expansion Scenario 1



Expansion Scenario 2

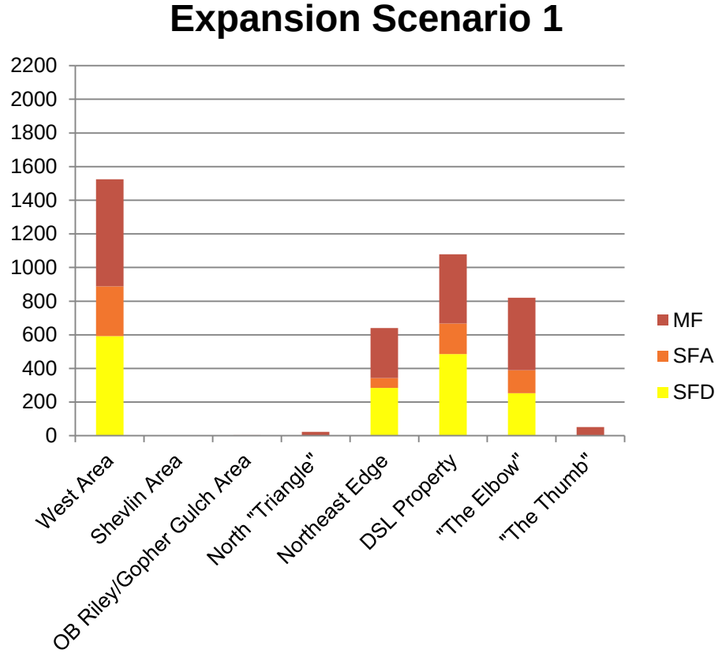


Expansion Scenario 3

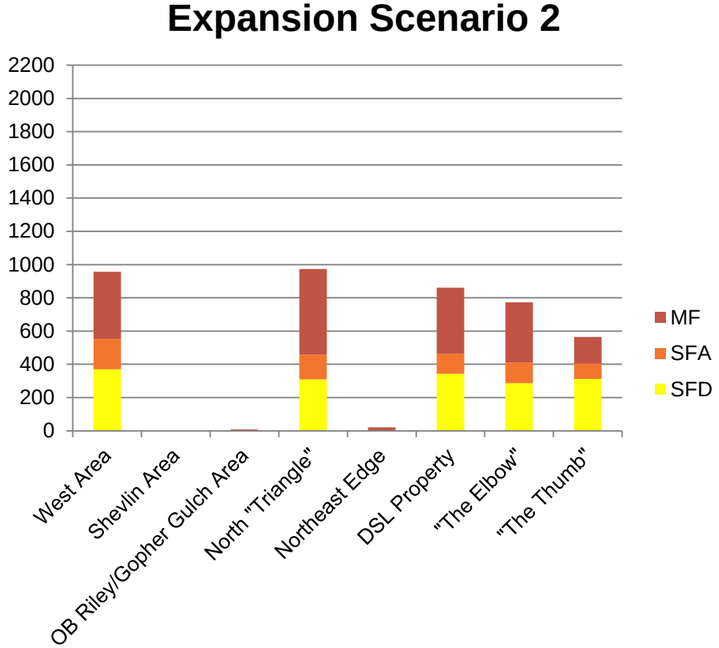


Housing Mix

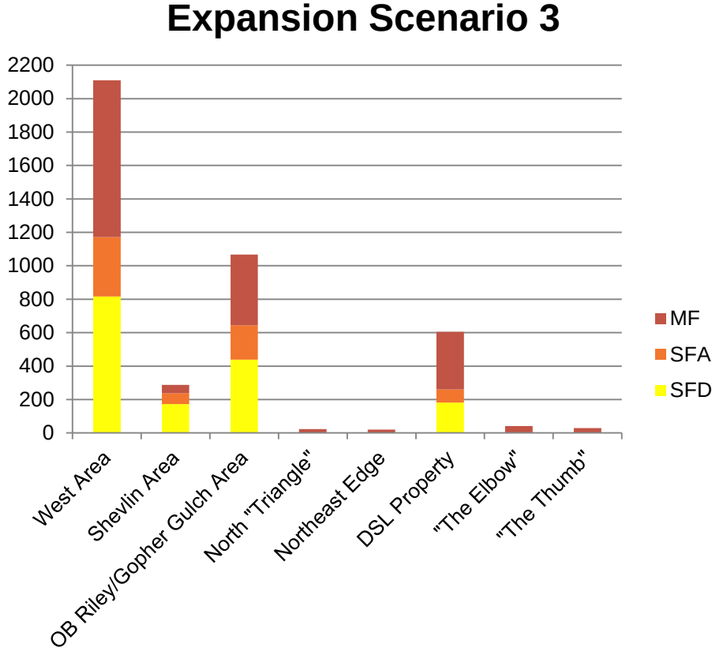
Expansion Scenario 1



Expansion Scenario 2



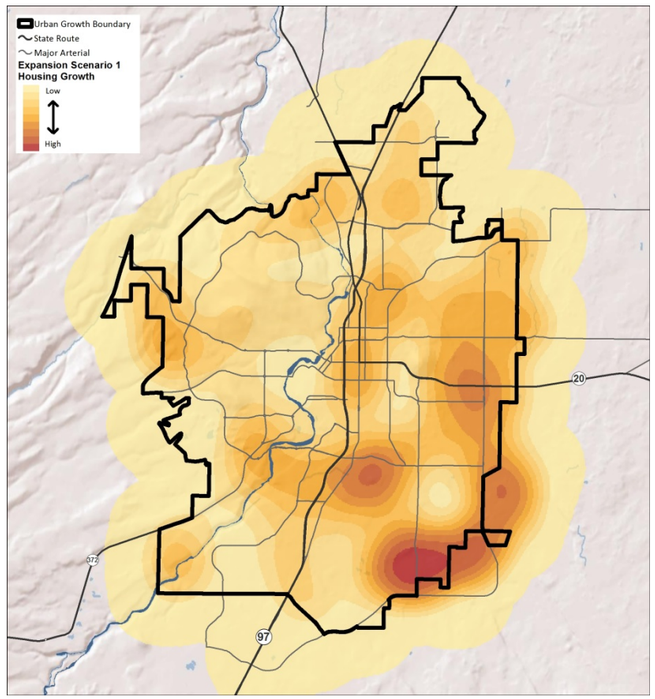
Expansion Scenario 3

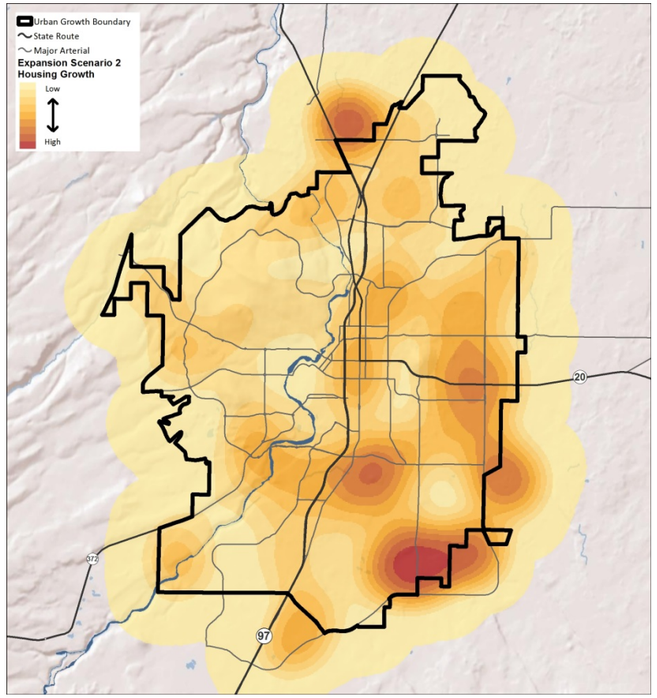


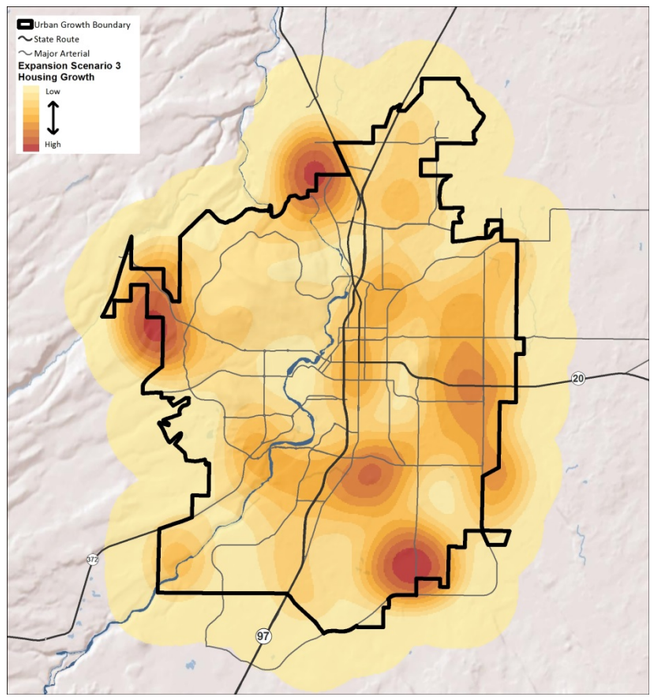
UGB Expansion Scenarios at a Glance

June 3, 2015

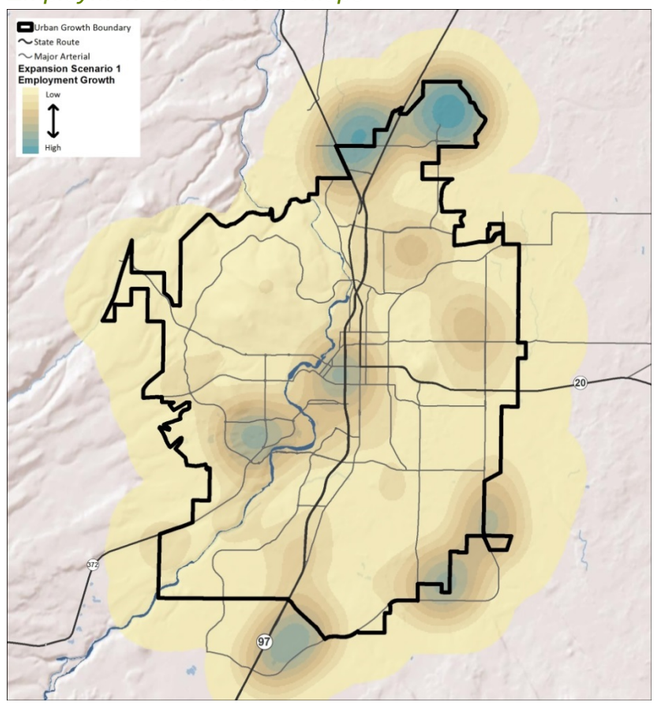
Housing Growth Heat Maps

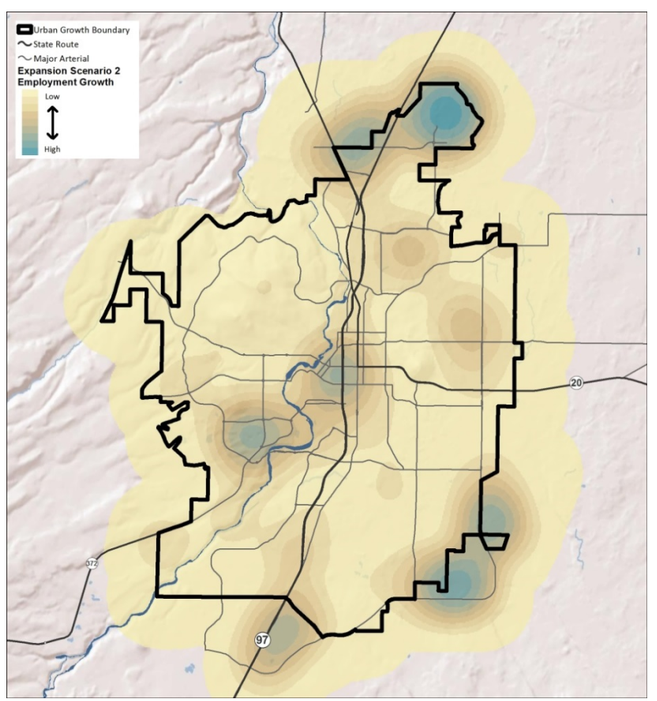


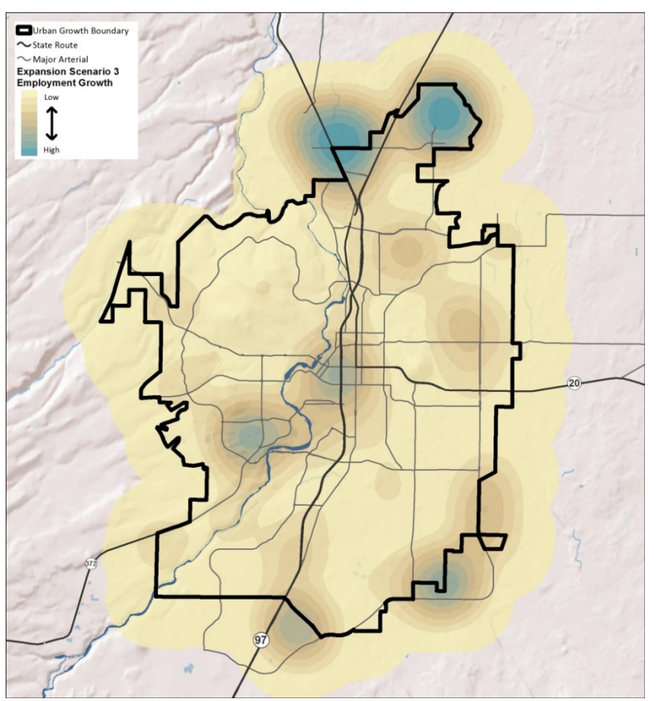




Employment Growth Heat Maps







Acres by Land Use Category by Scenario and Subarea

Subarea	Land Use Category	Expansion Scenario 1	Expansion Scenario 2	Expansion Scenario 3
West Area	Residential	290	170	369
	Commercial	14	21	14
	Industrial/Professional Office		16	
	Civic	18	17	3
	Total	322	225	386
Shevlin Area	Residential			119
	Commercial			28
	Industrial/Professional Office			29
	Civic			
	Total	0	0	176
OB Riley/Gopher Gulch Area	Residential			174
	Commercial	25	21	85
	Industrial/Professional Office	66	91	110
	Civic		25	108
	Total	91	138	478
North "Triangle"	Residential		123	
	Commercial	55	21	55
	Industrial/Professional Office	127	71	177
	Civic		17	
	Total	182	232	231
Northeast Edge	Residential	119		
	Commercial	37	36	37
	Industrial/Professional Office			
	Civic	14		
	Total	170	36	37
DSL Property	Residential	156	125	64
	Commercial	58	65	65
	Industrial/Professional Office	39	73	13
	Civic	109	99	102
	Total	362	361	244
"The Elbow"	Residential	81	89	
	Commercial	50	43	62
	Industrial/Professional Office	96	196	106
	Civic	40	41	40
	Total	267	368	208
"The Thumb"	Residential	0	94	0
	Commercial	175	123	66
	Industrial/Professional Office	176	97	109
	Civic		36	
	Total	350	350	176
All Areas	Residential	646	600	726
	Commercial	412	331	413
	Industrial/Professional Office	503	545	544
	Civic	181	234	253
	Total	**1,743**	**1,710**	**1,937**

Totals may not match exactly due to rounding. All acreage estimates are preliminary and subject to change.

Housing Units and Jobs by Subarea and Scenario

Subarea	Capacity		Expansion Scenario 1	Expansion Scenario 2	Expansion Scenario 3
West Area	Housing Units	Total	1,520	960	2,110
		SFD	*590*	*370*	*820*
		SFA	*300*	*180*	*360*
		MF	*640*	*400*	*940*
	Jobs	Total	220	450	220
Shevlin Area	Housing Units	Total	-	-	290
		SFD	-	-	*170*
		SFA	-	-	*60*
		MF	-	-	*50*
	Jobs	Total	-	-	260
OB Riley / Gopher Gulch Area	Housing Units	Total	-	10	1,070
		SFD	-	-	*440*
		SFA	-	-	*210*
		MF	-	*10*	*420*
	Jobs	Total	710	510	1,890
North "Triangle"	Housing Units	Total	20	970	20
		SFD	-	*310*	-
		SFA	-	*150*	-
		MF	*20*	*510*	*20*
	Jobs	Total	1,850	980	1,690
Northeast Edge	Housing Units	Total	640	20	20
		SFD	*280*	-	-
		SFA	*60*	-	-
		MF	*300*	*20*	*20*
	Jobs	Total	370	360	370
DSL Property	Housing Units	Total	1,080	860	600
		SFD	*490*	*340*	*180*
		SFA	*180*	*120*	*80*
		MF	*410*	*400*	*340*
	Jobs	Total	1,150	1,740	820
"The Elbow"	Housing Units	Total	820	770	40
		SFD	*250*	*290*	-
		SFA	*140*	*120*	-
		MF	*430*	*360*	*40*
	Jobs	Total	1,840	2,590	1,960
"The Thumb"	Housing Units	Total	50	560	30
		SFD	-	*310*	-
		SFA	-	*90*	-
		MF	*50*	*160*	*30*
	Jobs	Total	2,450	1,880	1,490
All Areas	Housing Units	Total	4,140	4,160	4,180
		SFD	*1,620*	*1,620*	*1,610*
		SFA	*670*	*670*	*710*
		MF	*1,850*	*1,870*	*1,870*
	Jobs	Total	8,590	8,490	8,700

Estimates are rounded to the nearest 10. Totals may not match exactly due to rounding. All capacity estimates are preliminary and subject to change.

URBAN GROWTH BOUNDARY REMAND

MAKING BEND EVEN BETTER

Expansion Scenarios

Bend UGB Remand Project

Boundary TAC Meeting #9

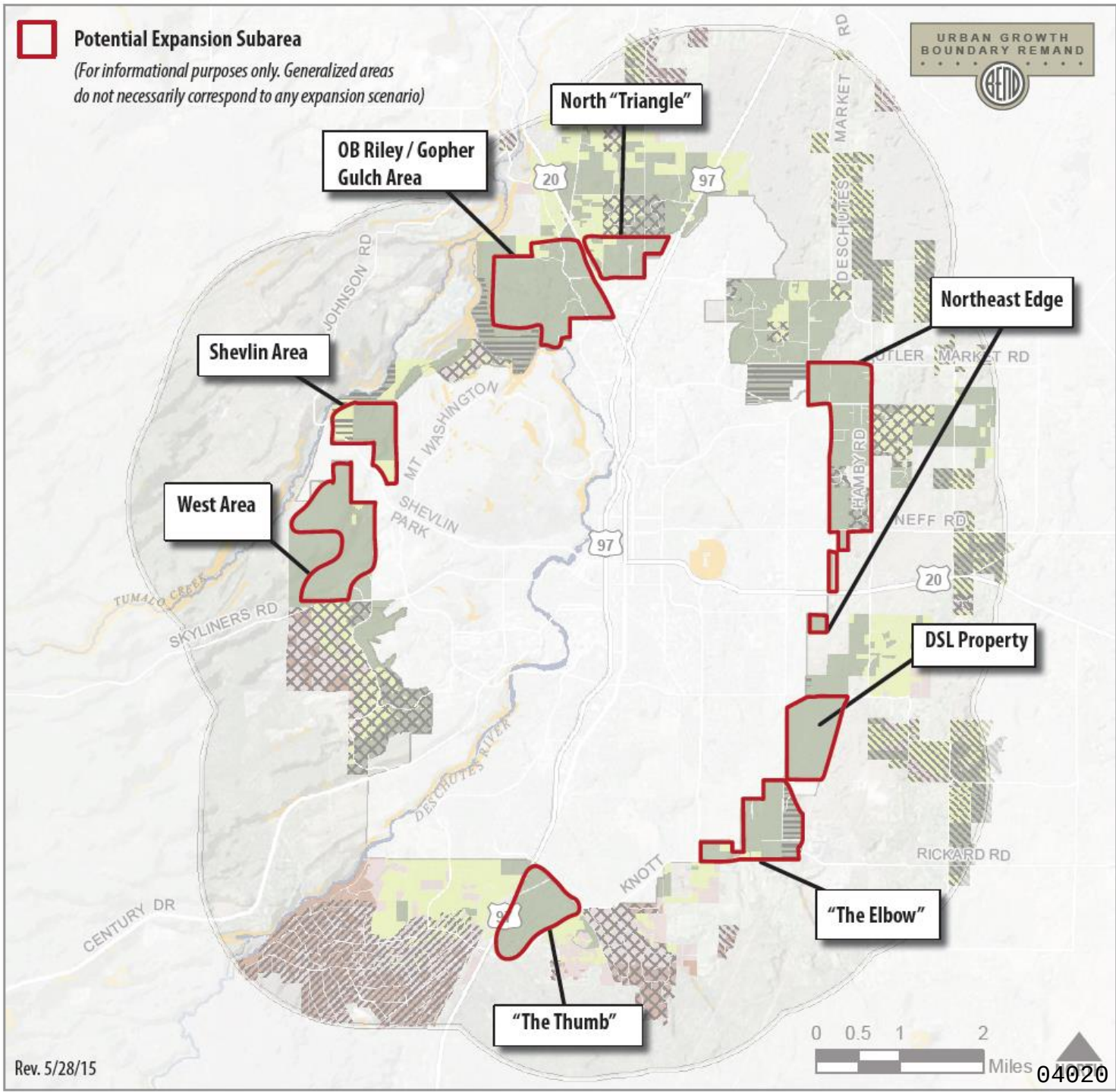
June 9, 2015

Introduction

URBAN GROWTH BOUNDARY REMAND

- Subareas
- Common Elements and Considerations
- Draft Scenarios
- Metrics

Subareas


Potential Expansion Subarea
(For informational purposes only. Generalized areas do not necessarily correspond to any expansion scenario)
URBAN GROWTH BOUNDARY REMAND
BEND
North "Triangle"
OB Riley / Gopher Gulch Area
Shevlin Area
West Area
Northeast Edge
DSL Property
"The Elbow"
"The Thumb"
JOHNSON RD
MT WASHINGTON
SHEVLIN PARK
TUMALO CREEK
SKYLINERS RD
DESCHUTES RIVER
CENTURY DR
KNOTT
RICKARD RD
NEFF RD
BUTLER MARKET RD
HAMBY RD
DESCHUTES MARKET RD
20
97
0 0.5 1 2
Miles
Rev. 5/28/15
04020

Common Elements

URBAN GROWTH BOUNDARY REMAND

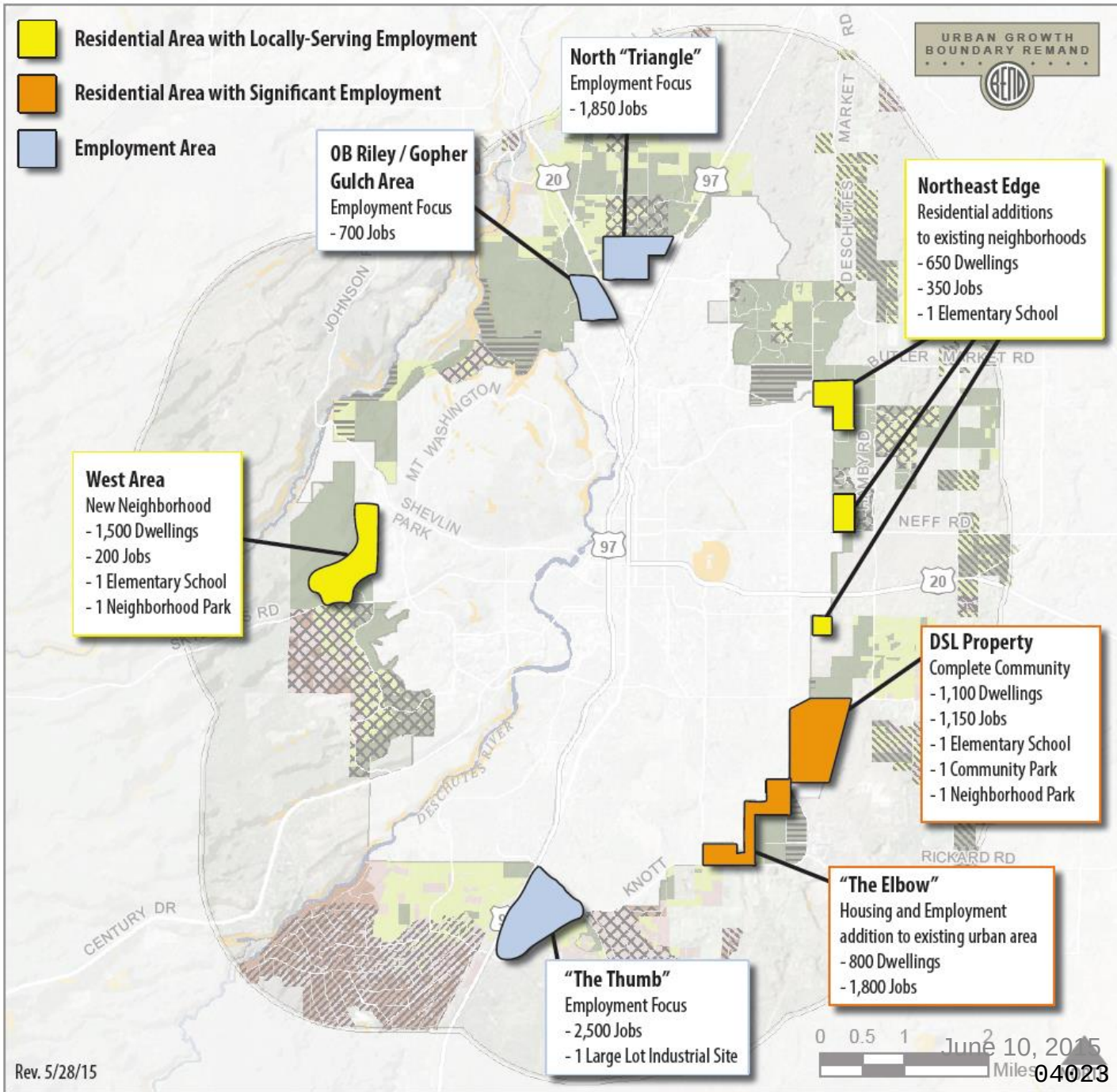
- **Lots of consensus in the workshop:**
  - **Complete Communities**
  - **Exception land**
  - **Employment in Juniper Ridge**
  - **All tables generally had some expansion in every subarea**
- **Size of Expansion**
- **Complementing land inside UGB**
- **One “Large Lot Industrial” site inside Juniper Ridge**

Considerations

URBAN GROWTH BOUNDARY REMAND

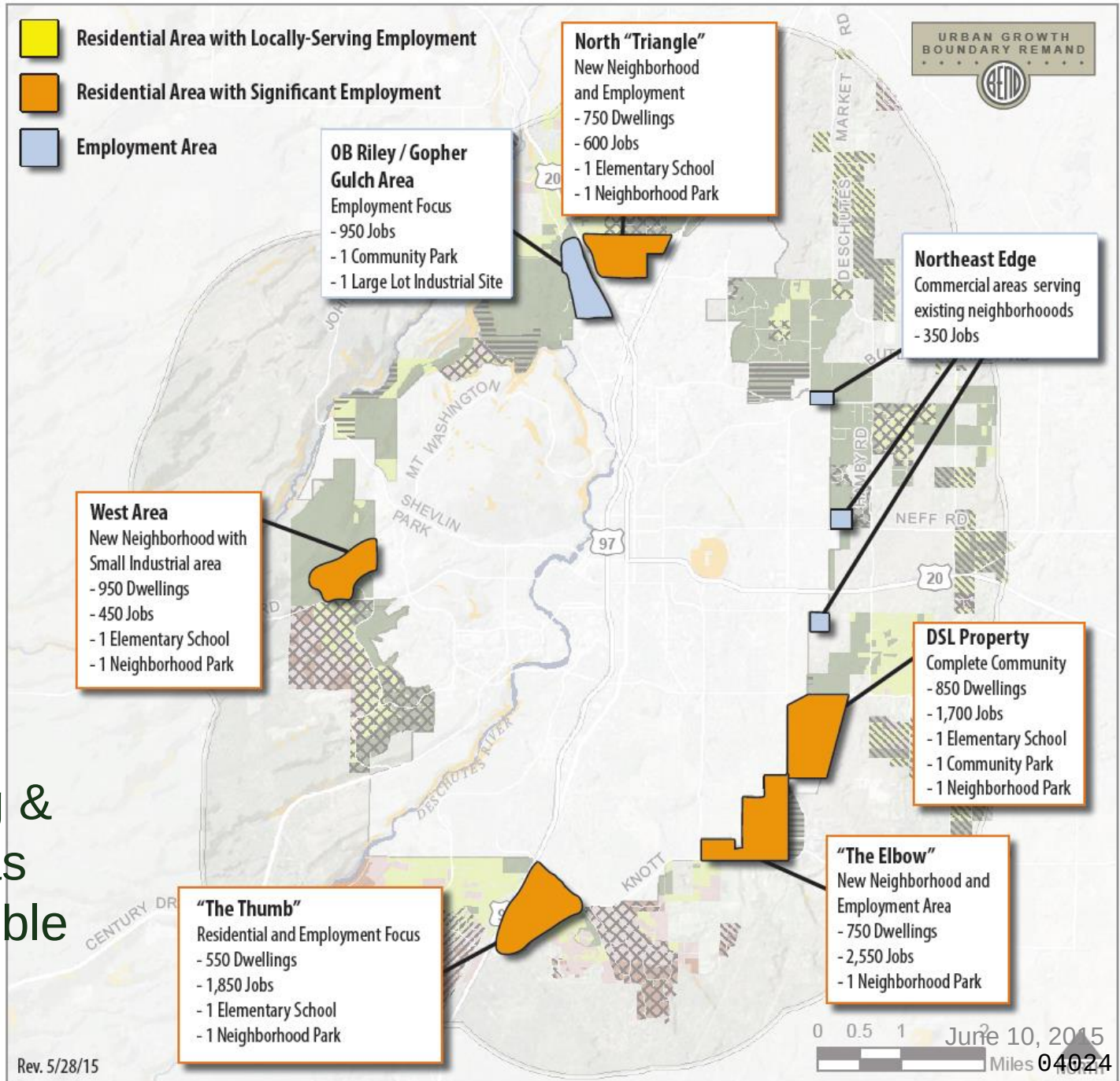
- **Residual Need**
  - **(Housing/Jobs forecast & mix – UGB Capacity)**
- **Urban form**
  - **Site suitability**
  - **Roadway access**
  - **Some thinking of urban/rural reserves**

Expansion Scenario 1



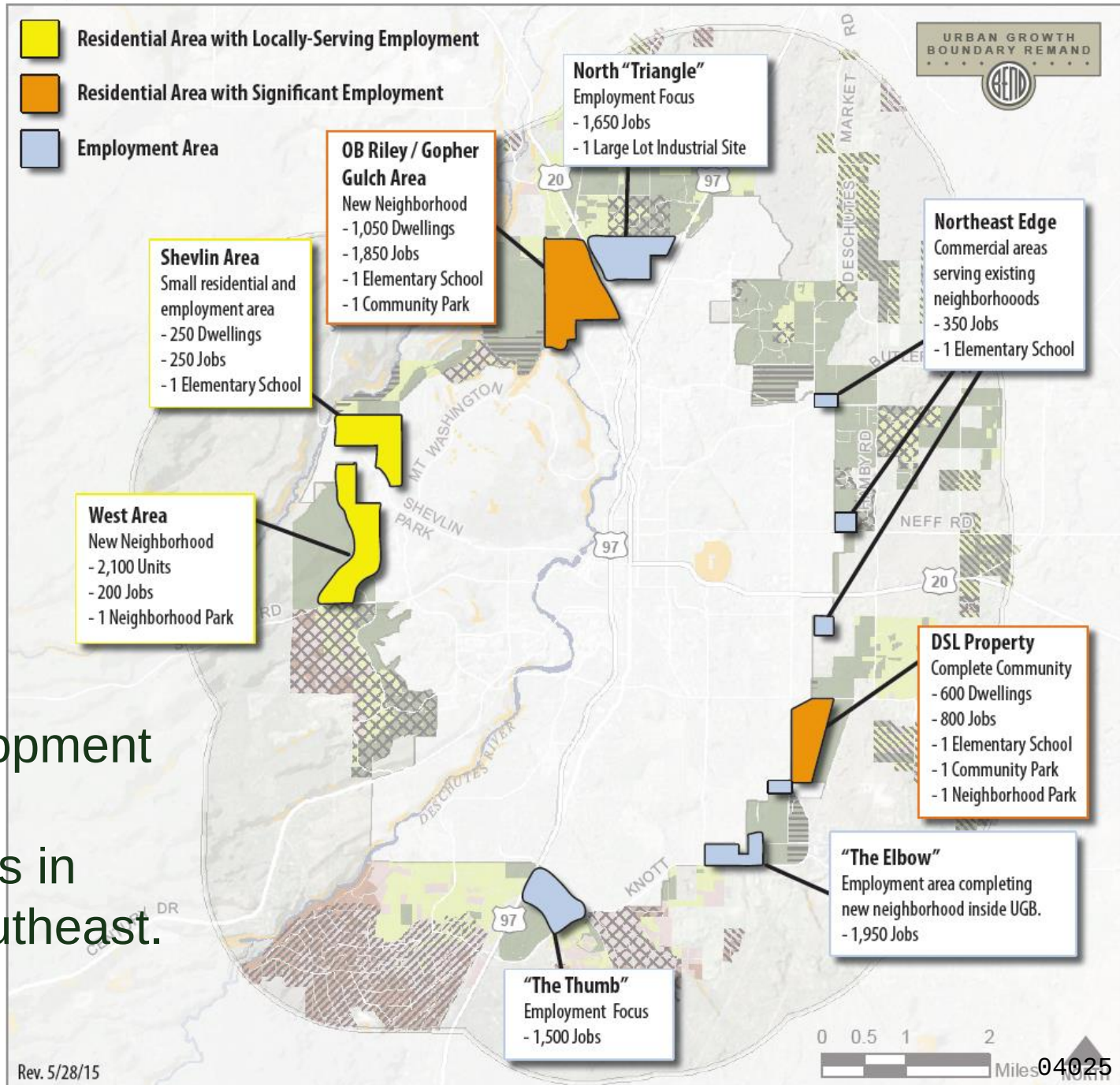
- Employment North & South
- Residential East & West

Expansion Scenario 2

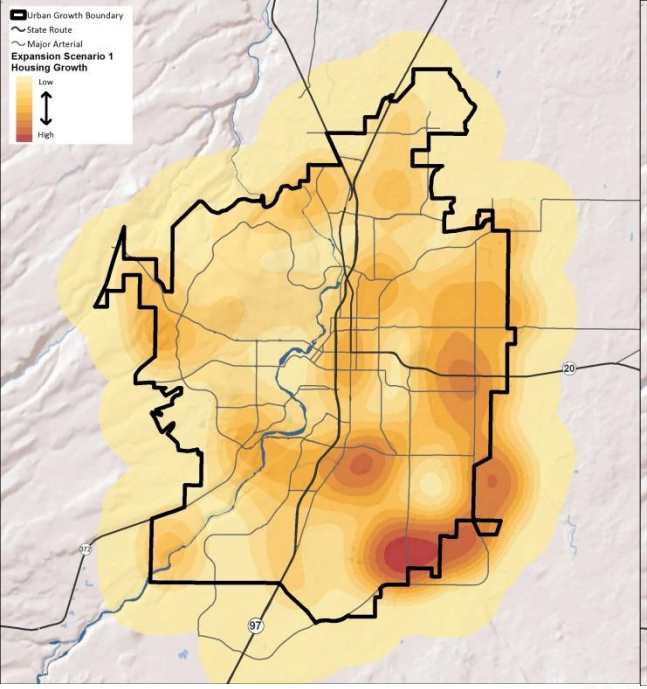


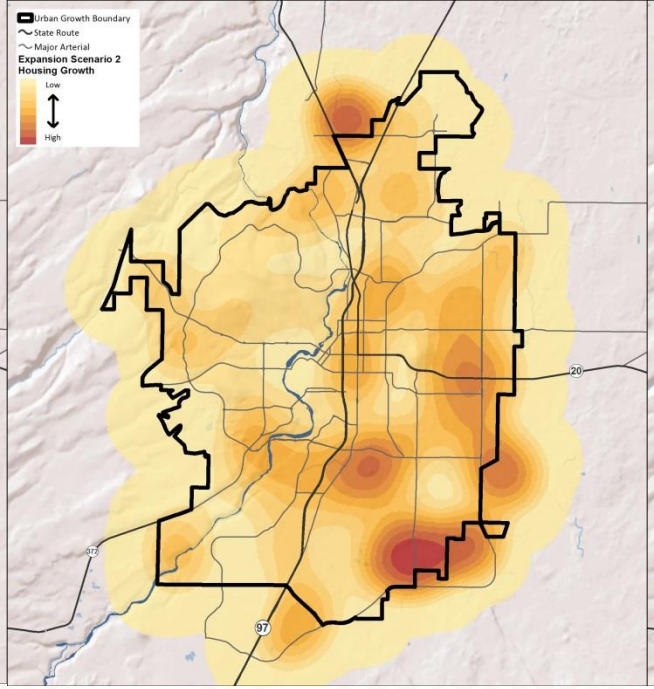
- Mixed housing & Employment as much as possible

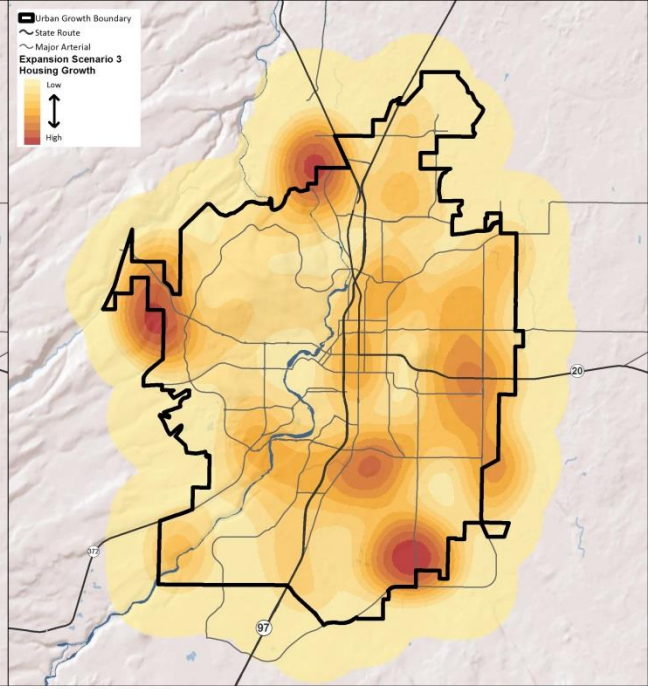
Expansion Scenario 3



- Greater development in West and Northwest, less in South and Southeast.


Urban Growth Boundary
State Route
Major Arterial
Expansion Scenario 1
Housing Growth
Low
High
20
97
172


Urban Growth Boundary
State Route
Major Arterial
Expansion Scenario 2
Housing Growth
Low
High
20
97
172


Urban Growth Boundary
State Route
Major Arterial
Expansion Scenario 3
Housing Growth
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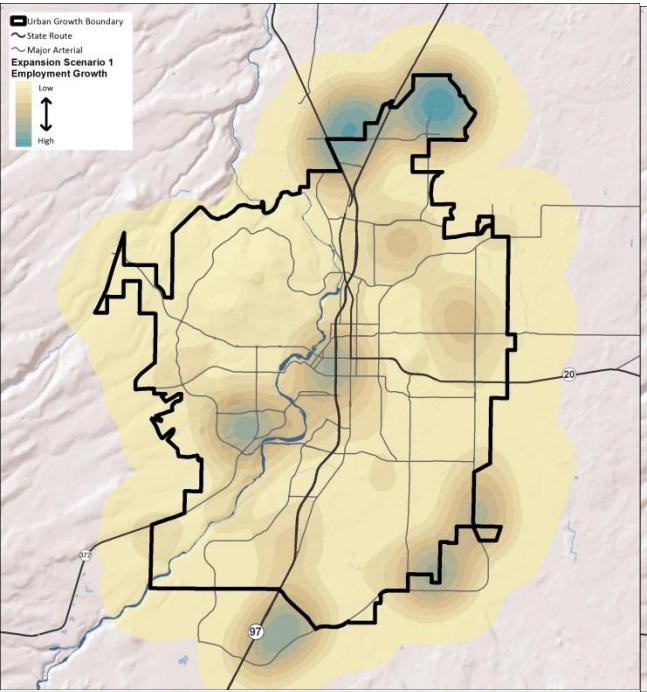
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Major Arterial
Expansion Scenario 1
Employment Growth
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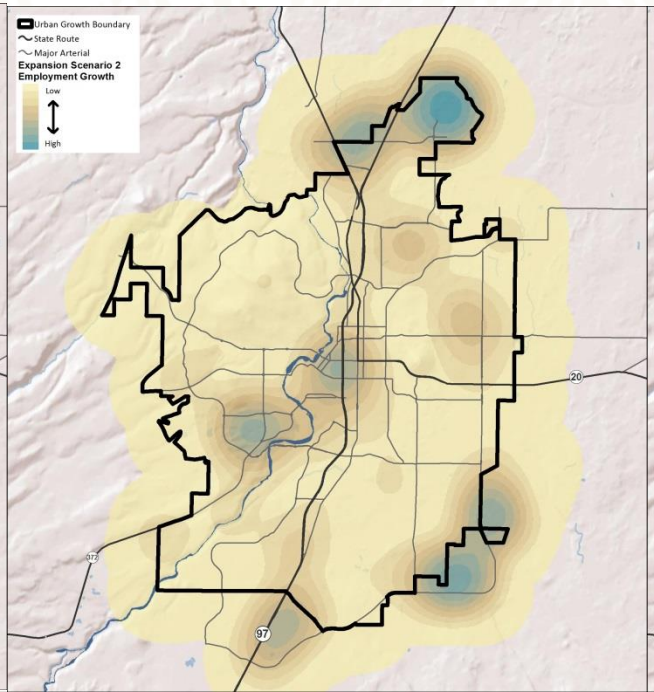
Urban Growth Boundary
State Route
Major Arterial
Expansion Scenario 2
Employment Growth
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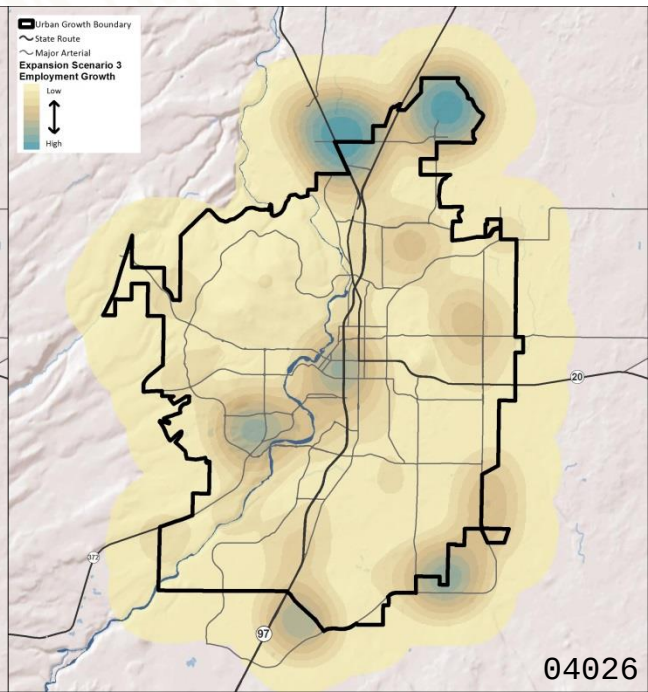
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Major Arterial
Expansion Scenario 3
Employment Growth
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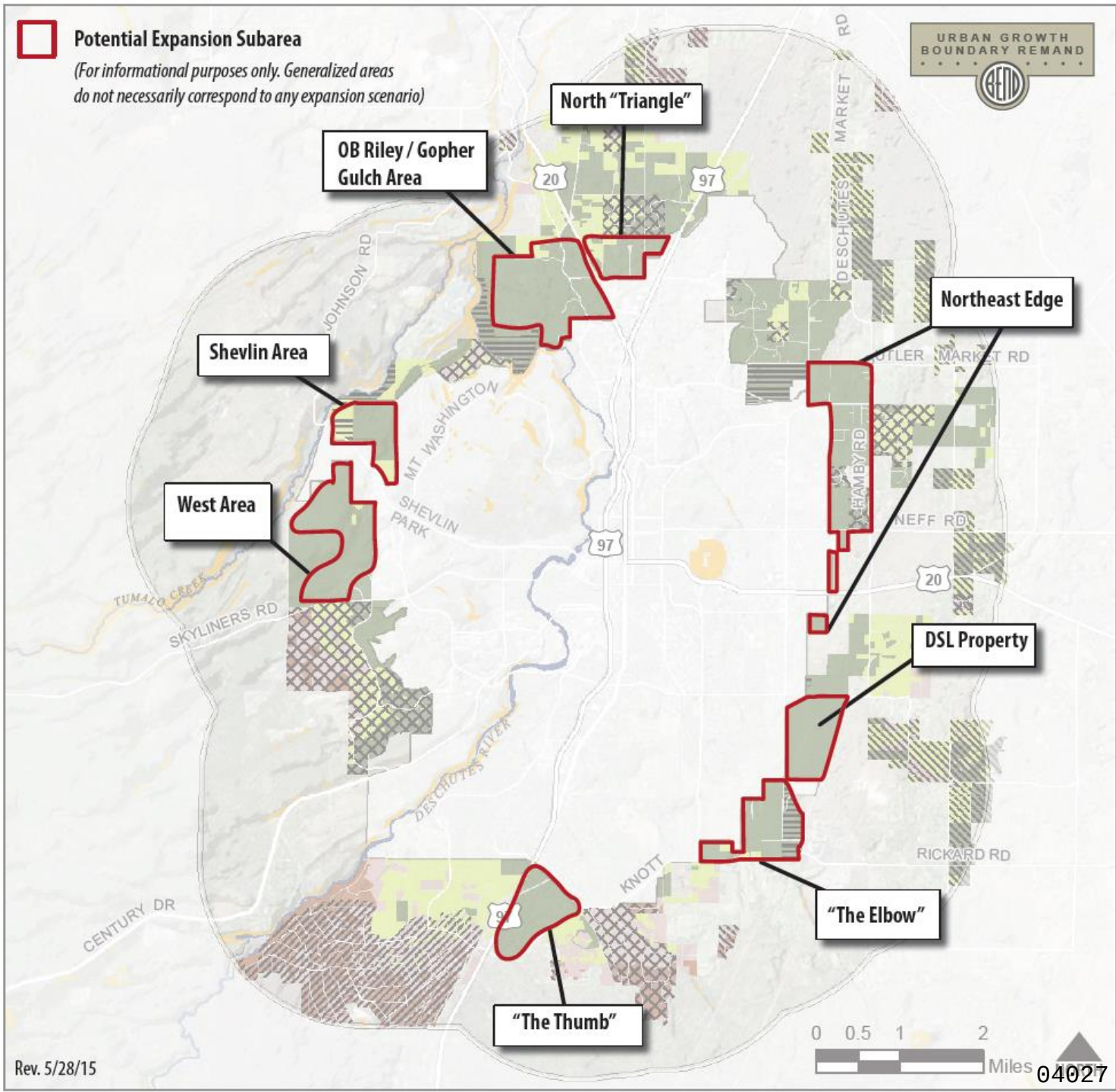
Subareas


Potential Expansion Subarea
(For informational purposes only. Generalized areas do not necessarily correspond to any expansion scenario)
URBAN GROWTH BOUNDARY REMAND
BEND
North "Triangle"
OB Riley / Gopher Gulch Area
Shevlin Area
West Area
Northeast Edge
DSL Property
"The Elbow"
"The Thumb"
JOHNSON RD
MT WASHINGTON
SHEVLIN PARK
TUMALO CREEK
SKYLINERS RD
DESCHUTES RIVER
CENTURY DR
KNOTT
RICKARD RD
NEFF RD
BUTLER MARKET RD
HAMBY RD
DESCHUTES MARKET RD
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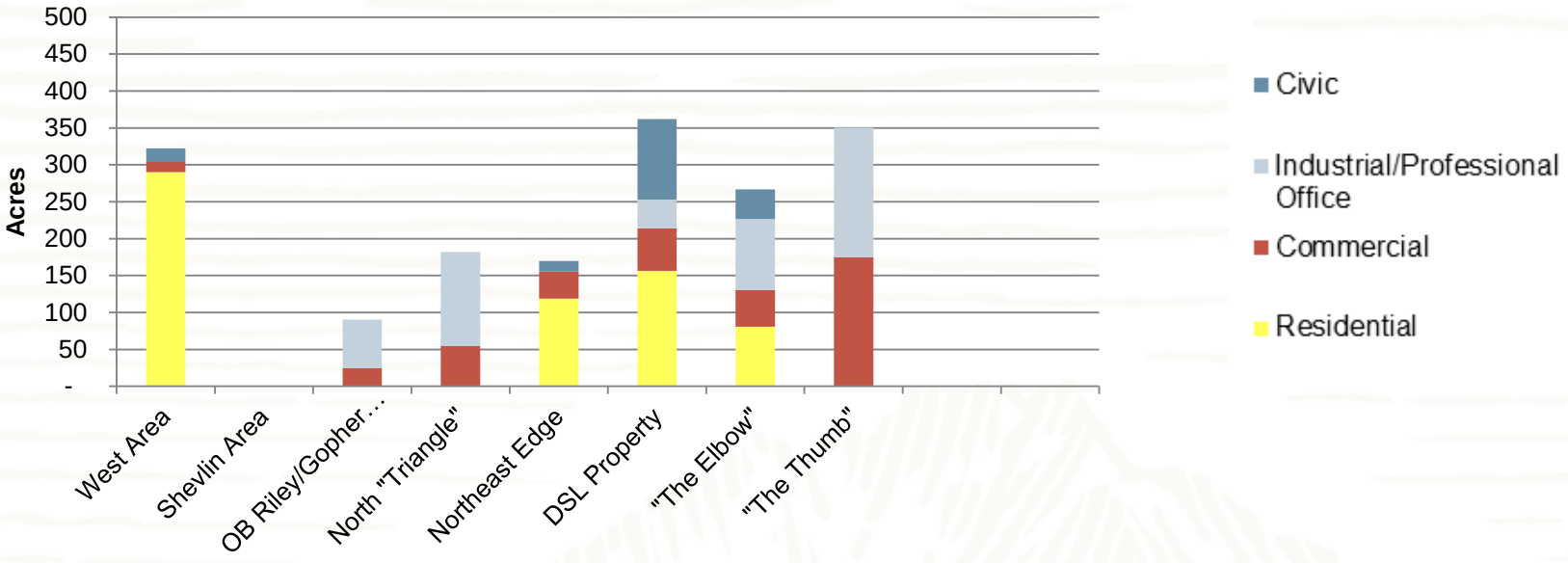
Expansion Scenario 1



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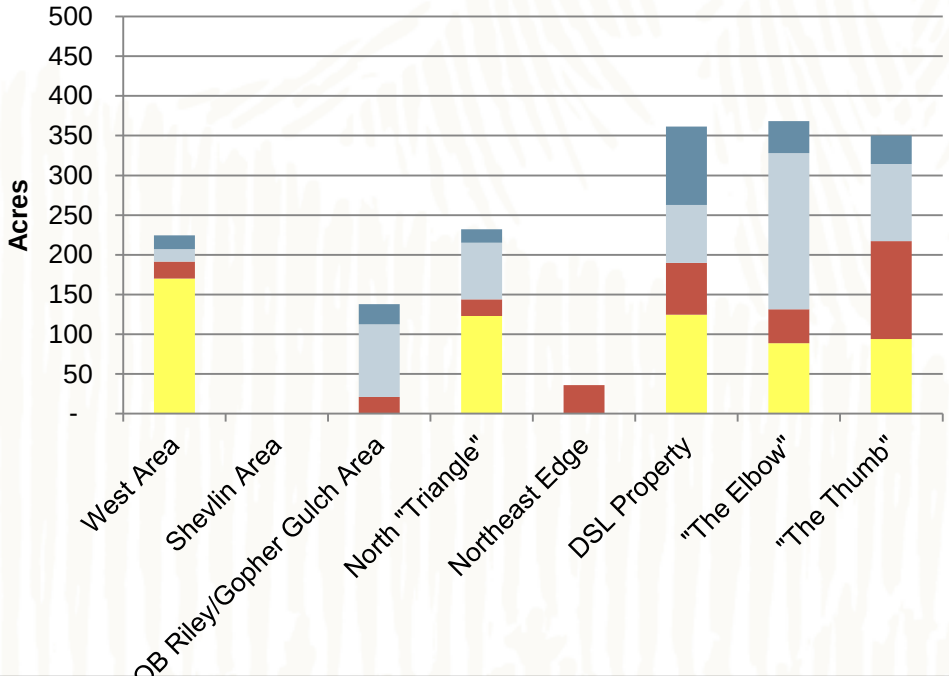

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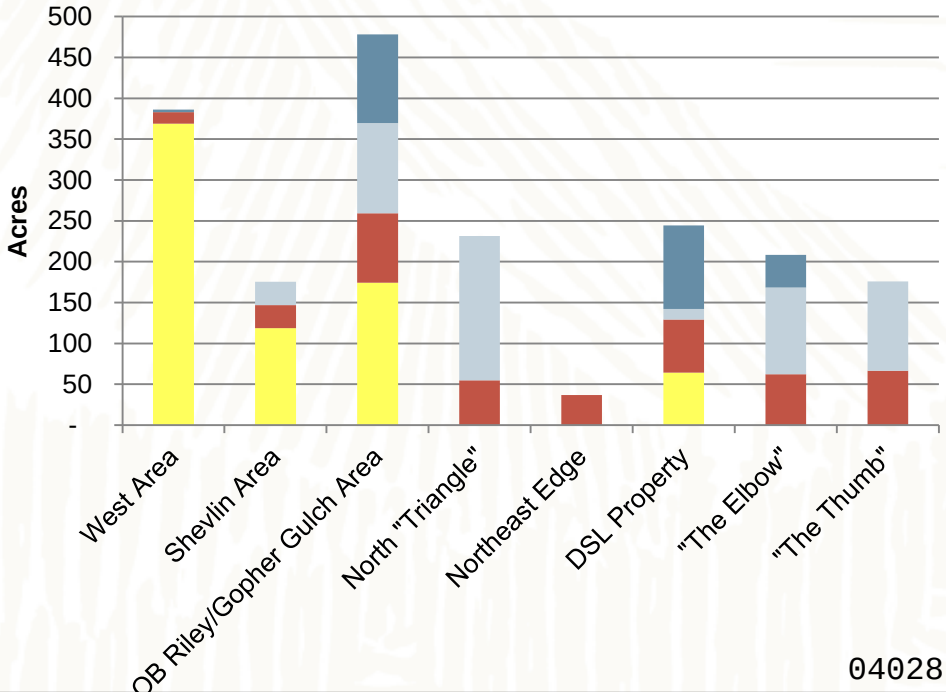

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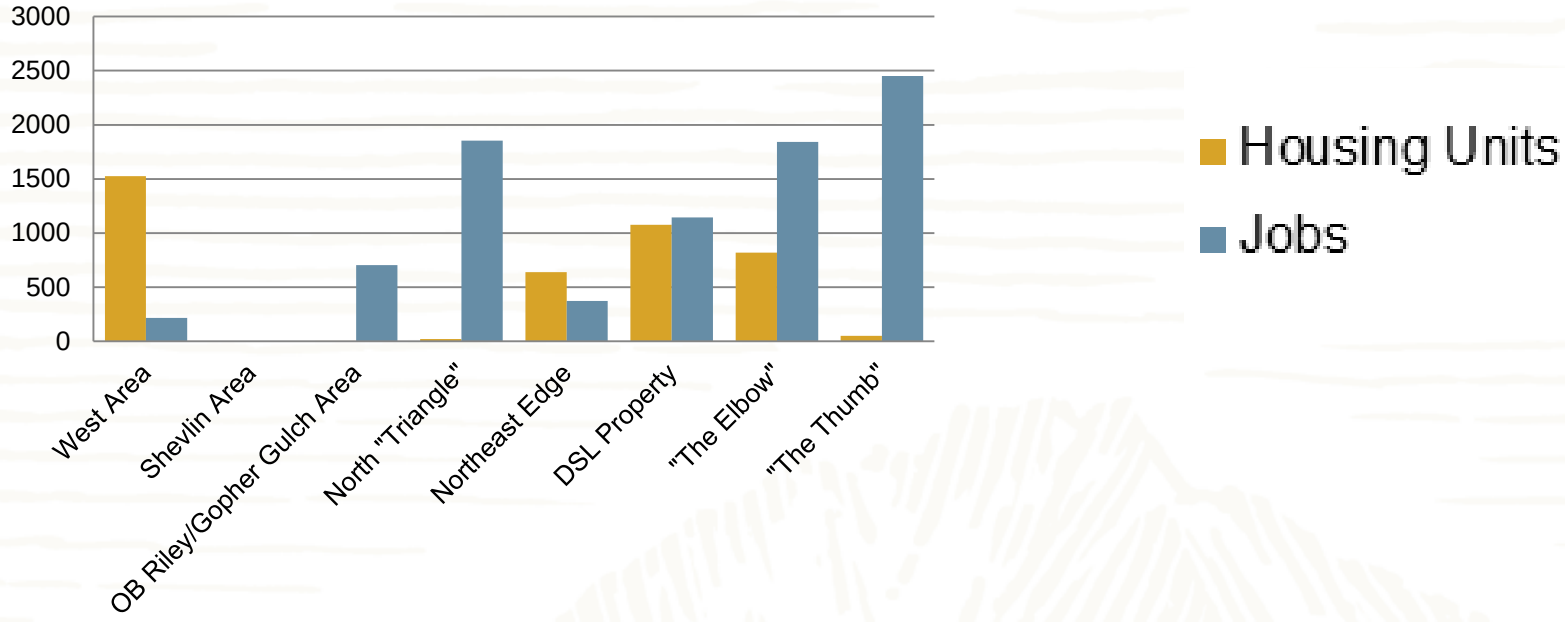

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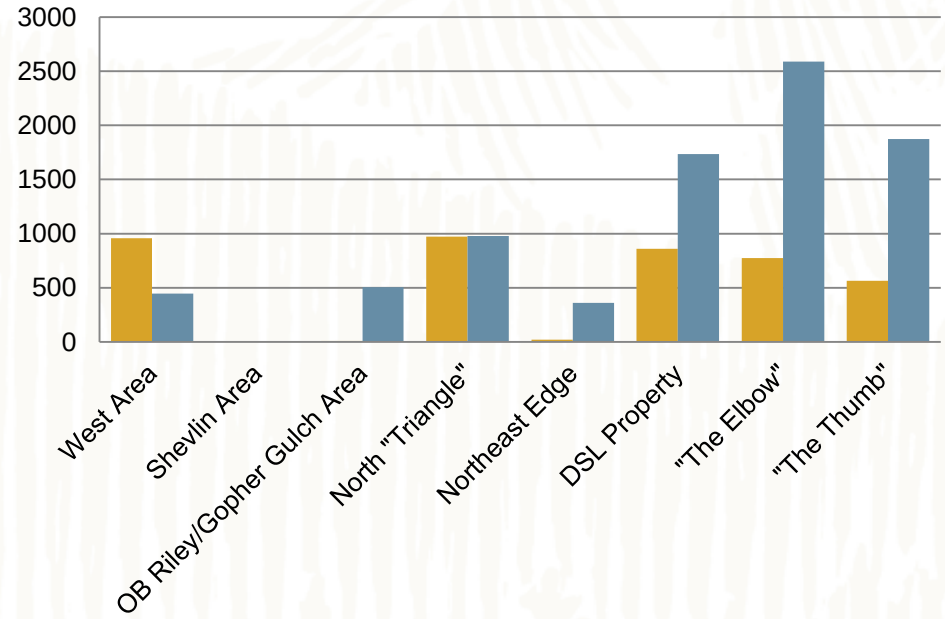

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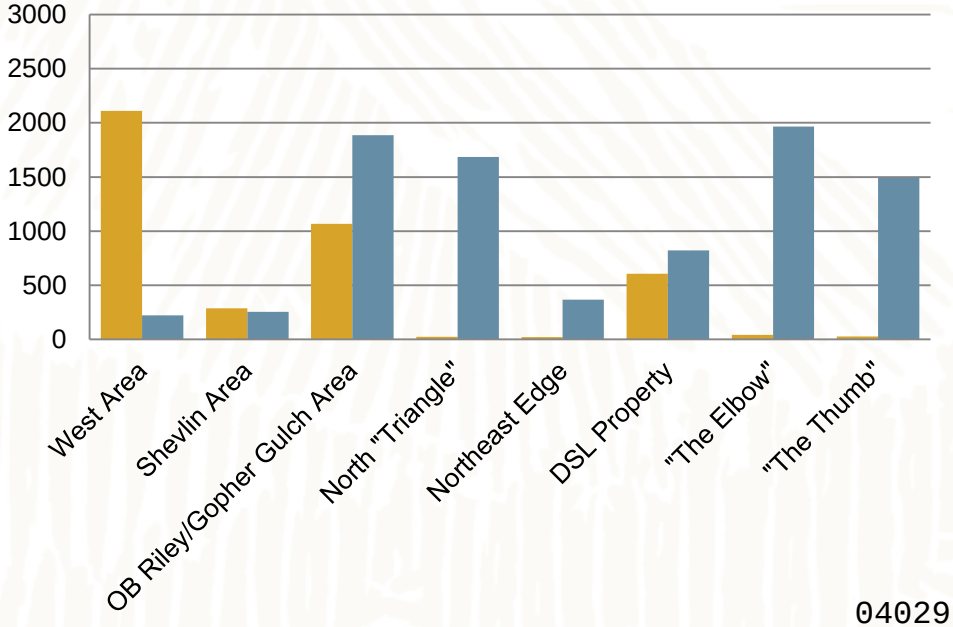
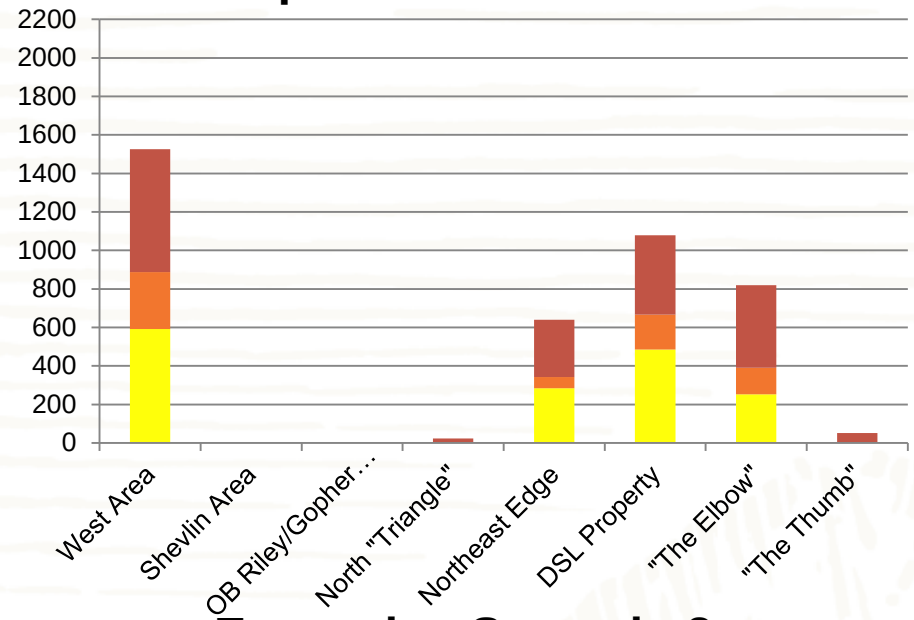


Expansion Scenario 1



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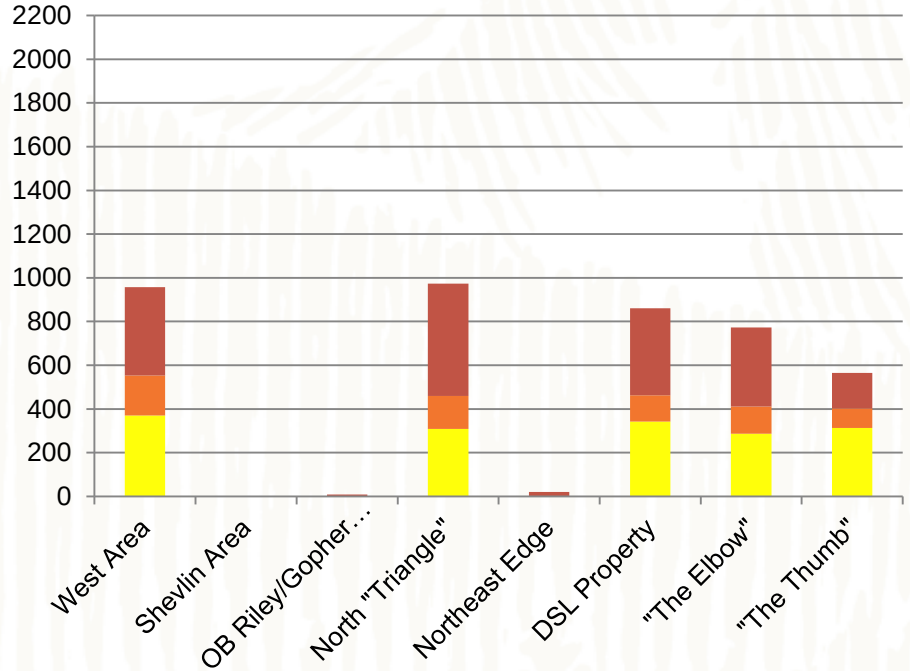

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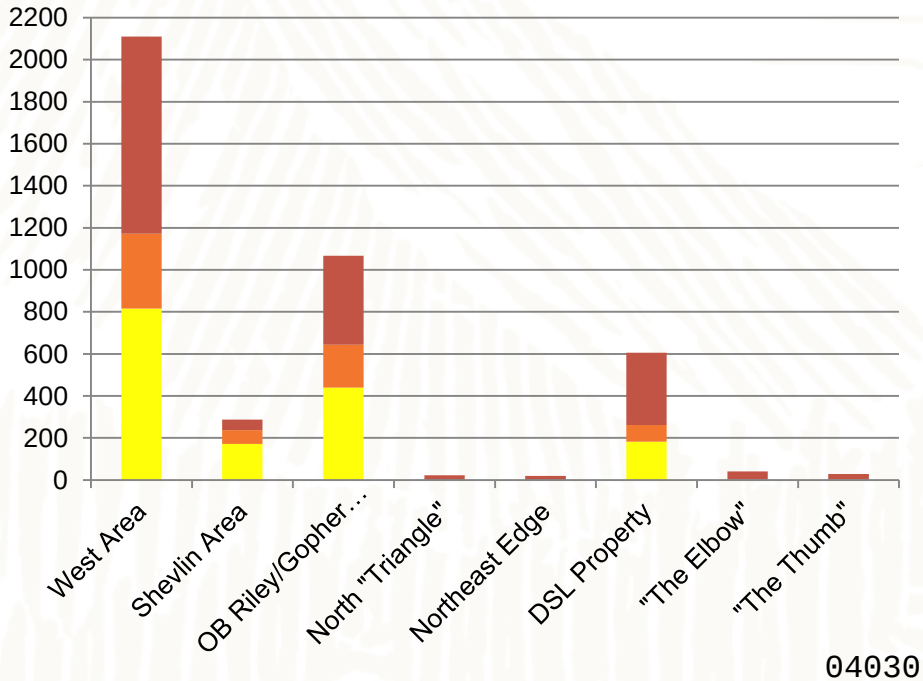
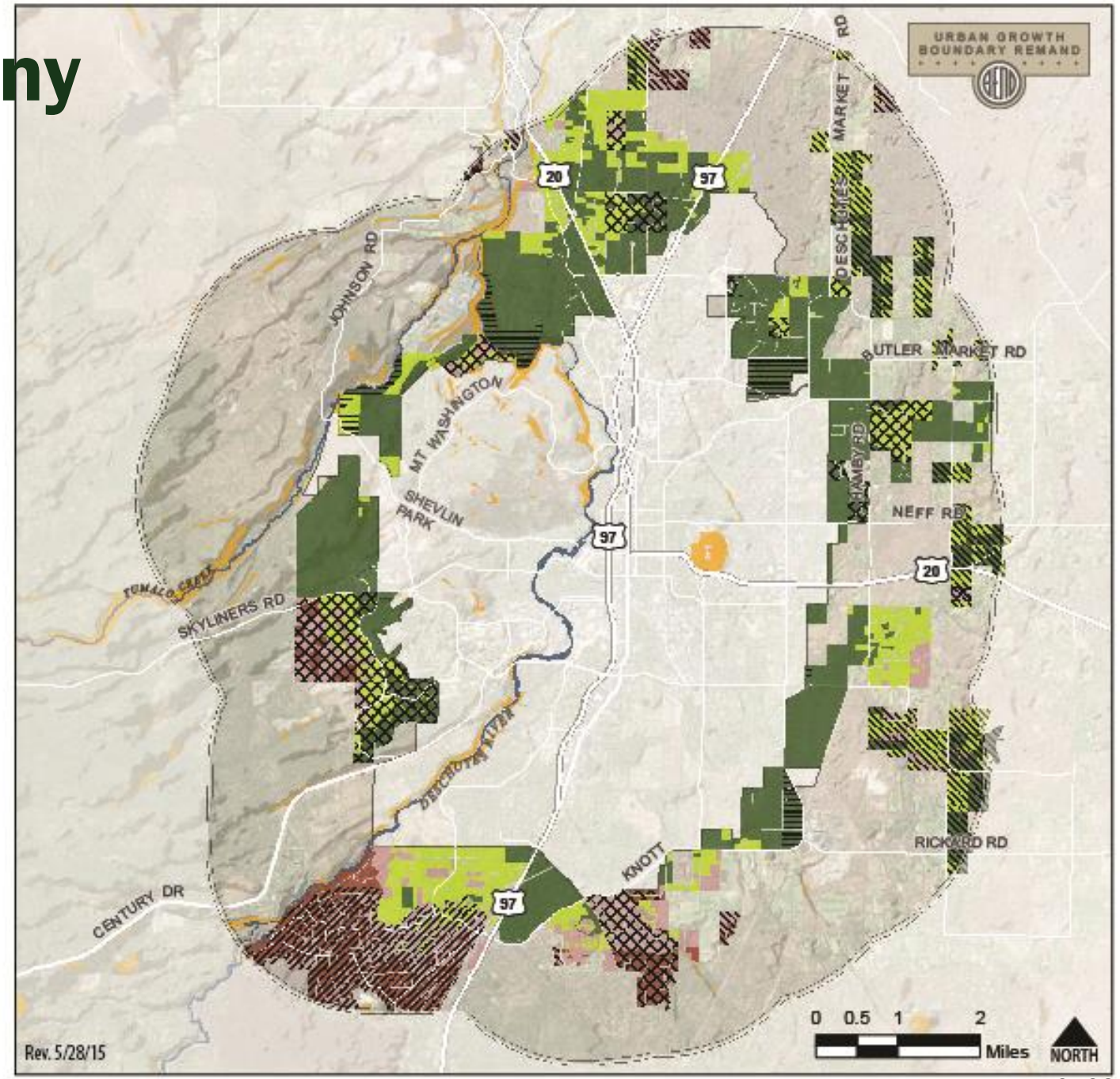


Testimony


URBAN GROWTH BOUNDARY REMAND
JOHNSON RD
MT WASHINGTON
SHEVLIN PARK
SKYLINERS RD
CENTURY DR
DESCHUTES RIVER
KNOTT
DESCHUTES MARKET RD
BUTLER MARKET RD
SHEMEY RD
NEFF RD
RICKARD RD
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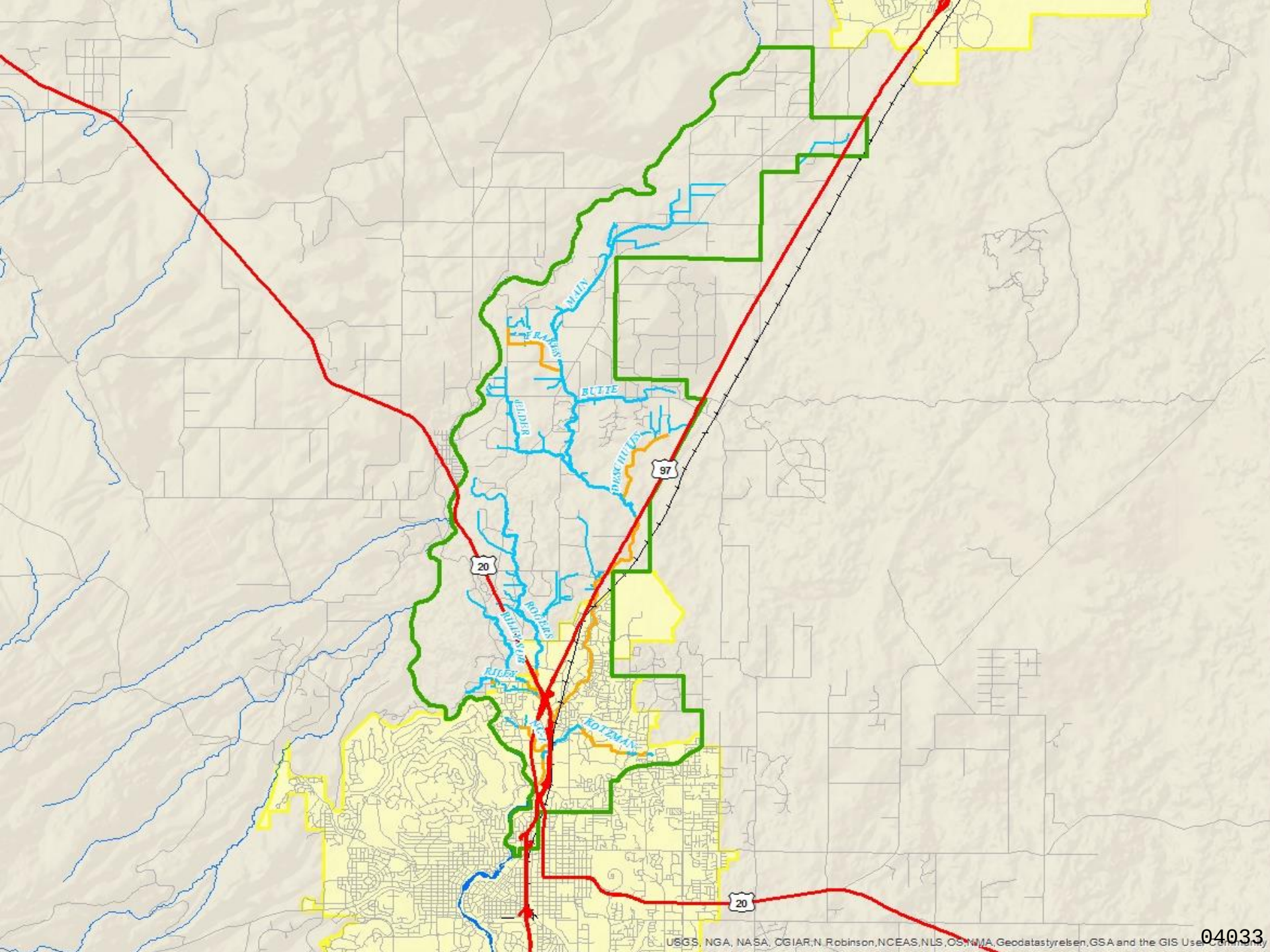
Miles
NORTH
Rev. 5/28/15

Presentation to Urban Growth Boundary Technical Advisory Committee – Meeting 9

Tuesday, June 9, 2015


MAIN
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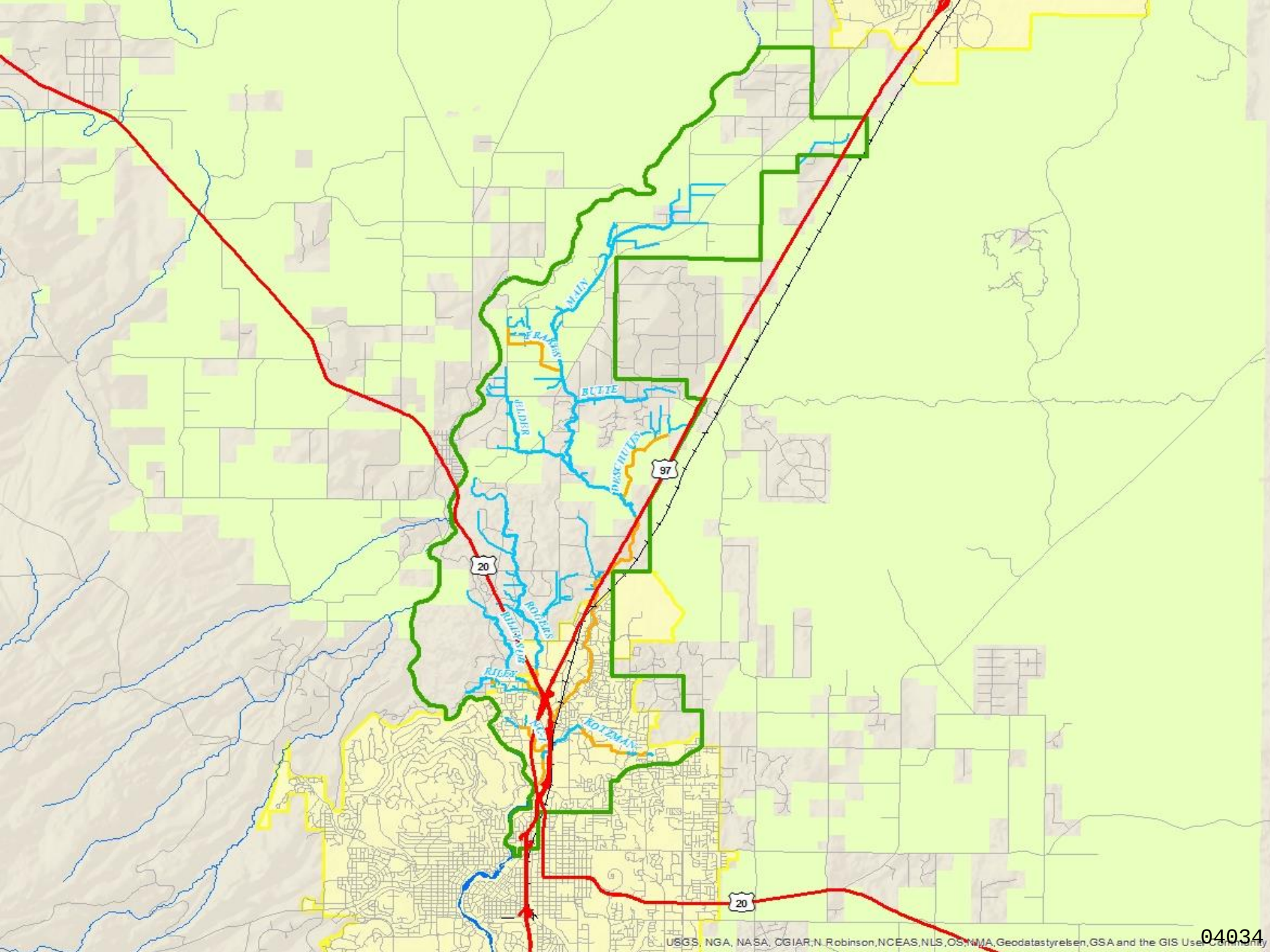
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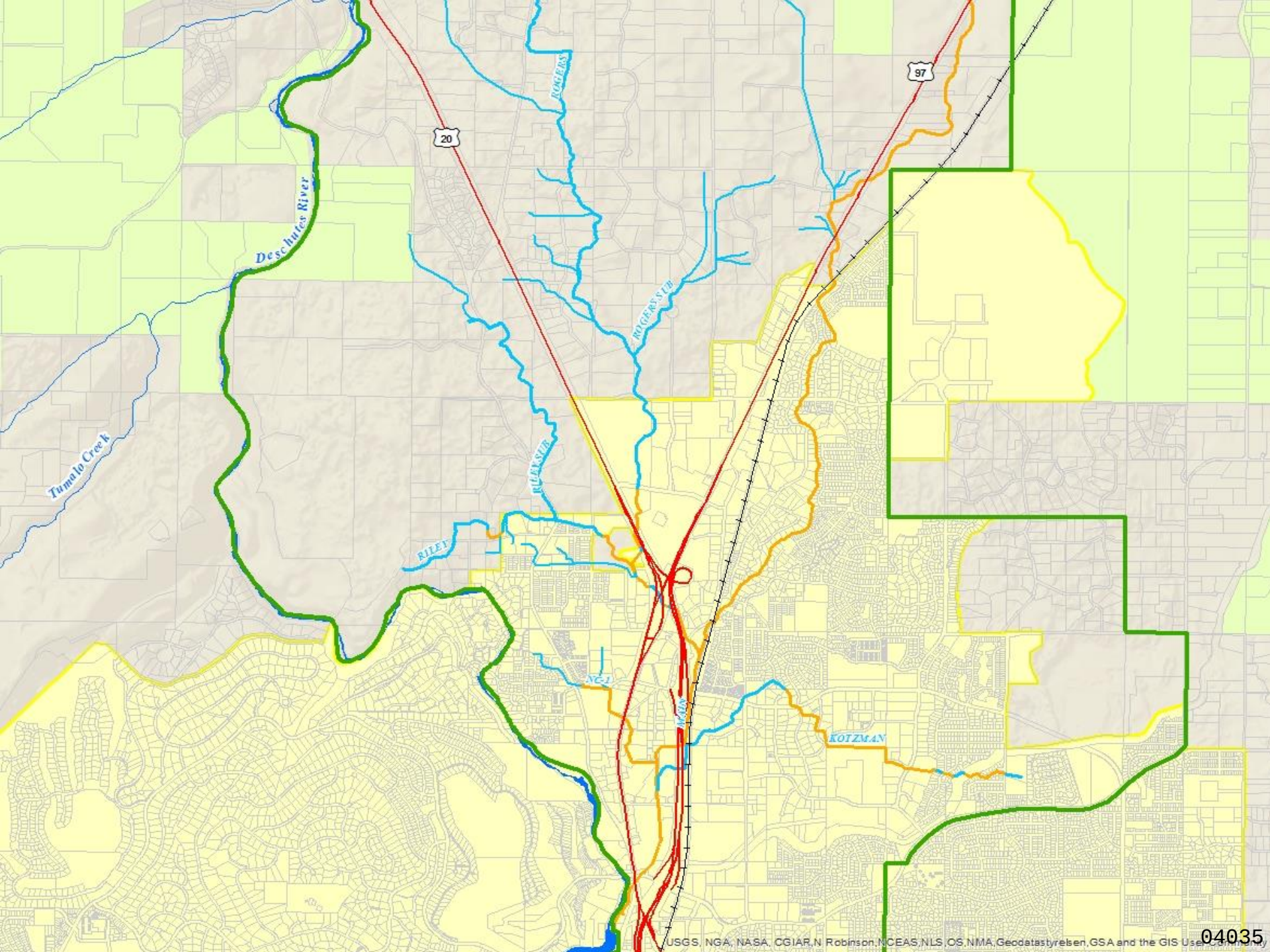
Deschutes River
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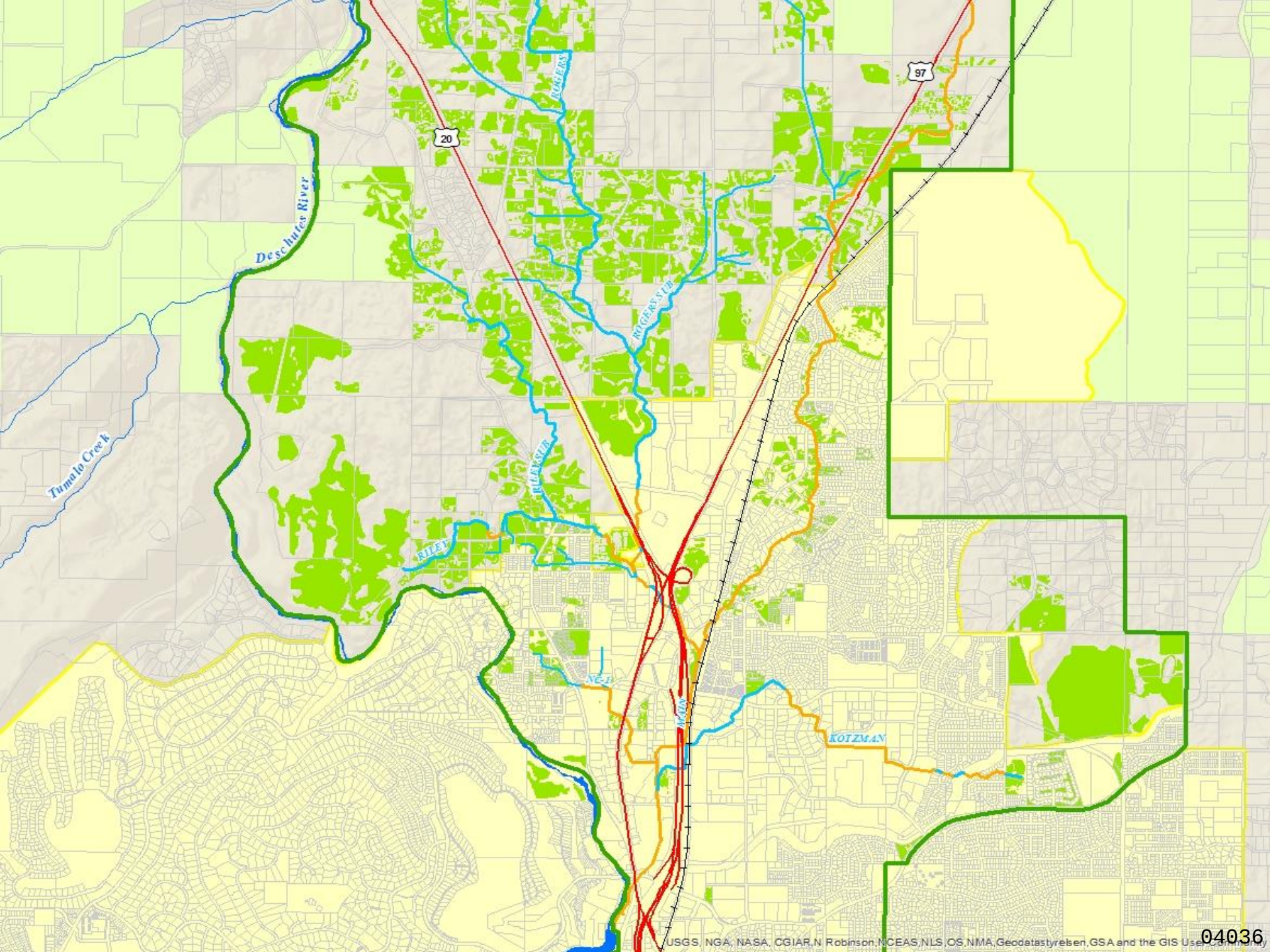
Deschutes River
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ROGERS
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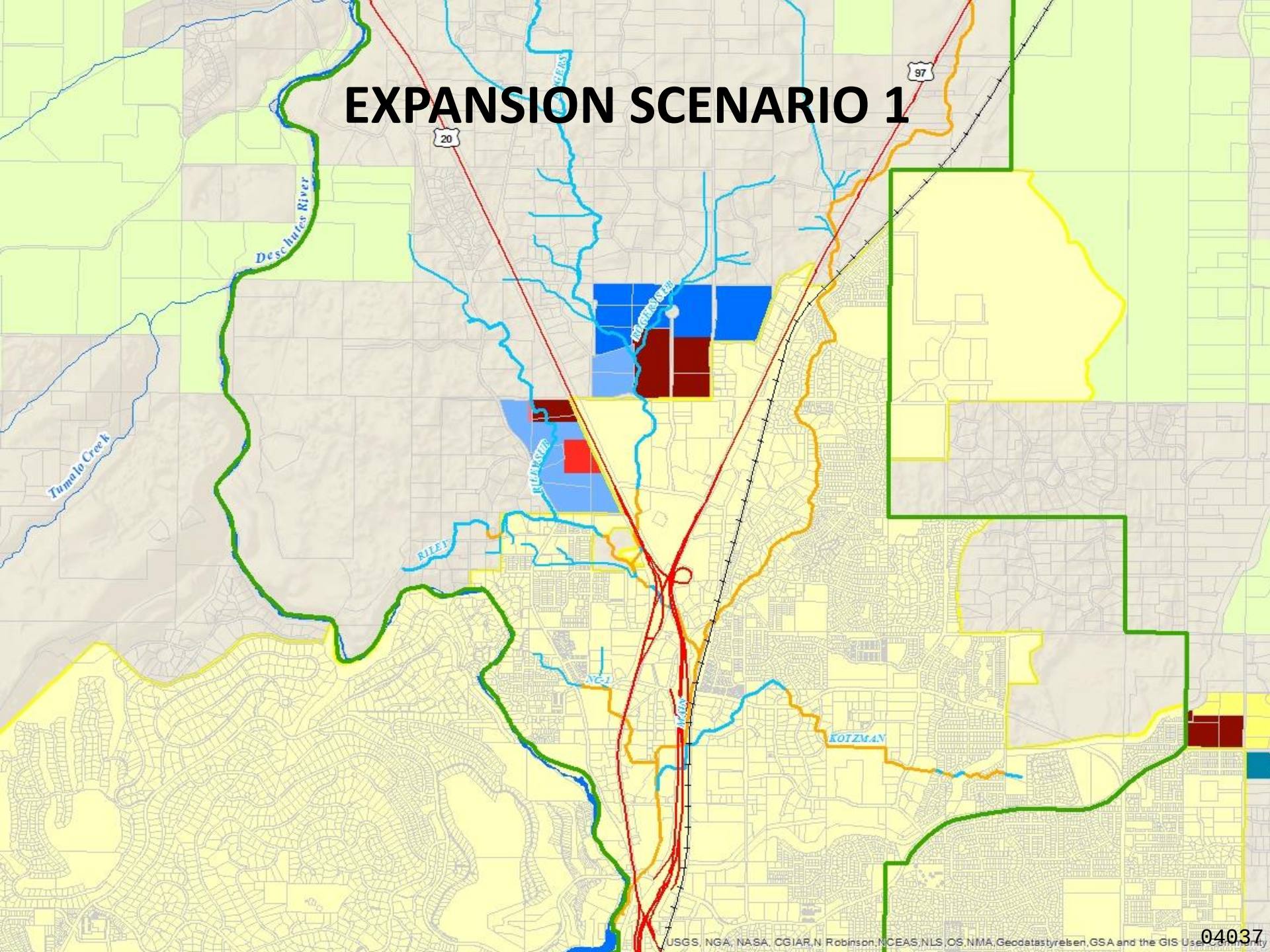
USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, GSA and the GIS User Community


EXPANSION SCENARIO 1
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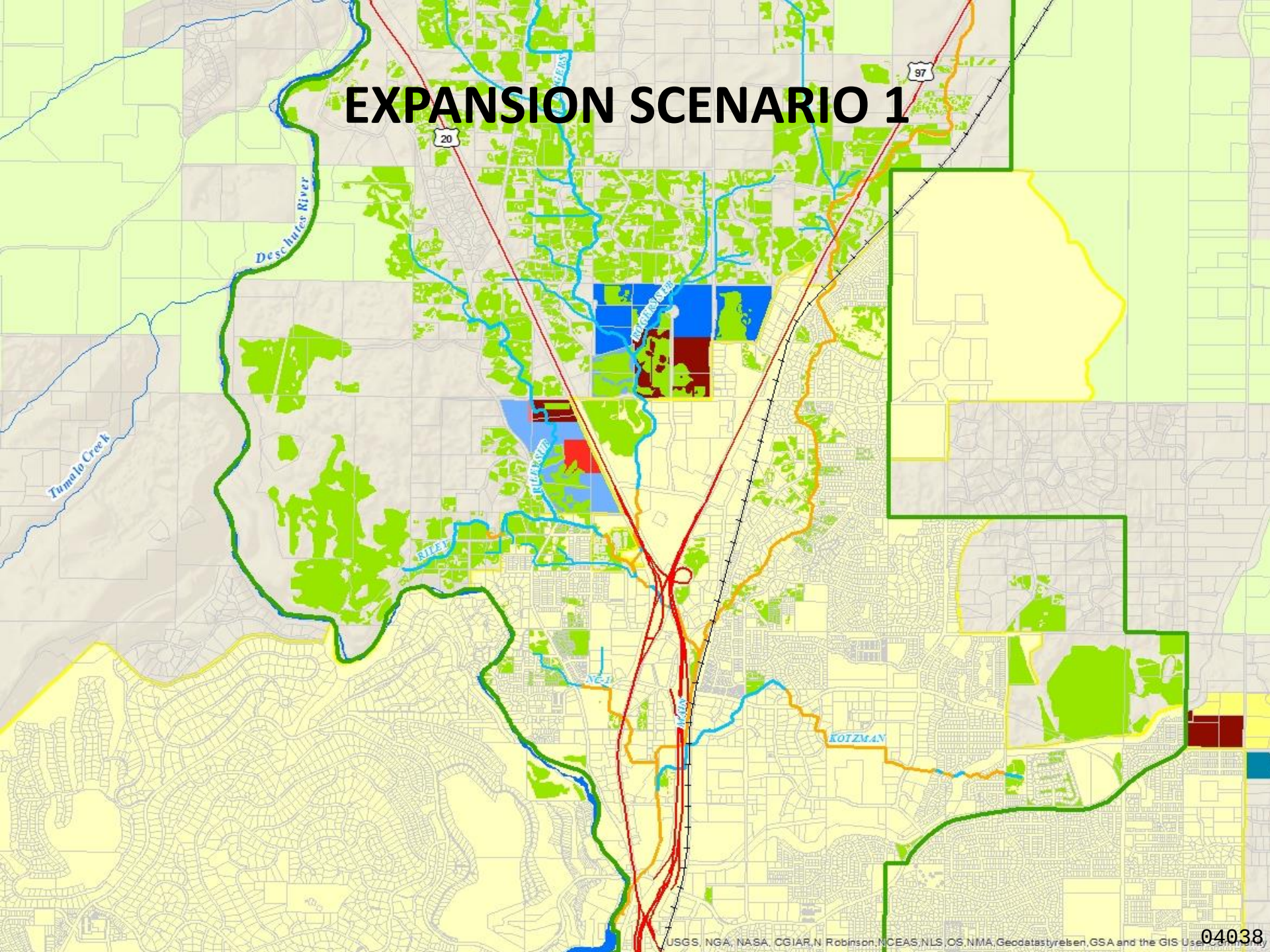
EXPANSION SCENARIO 1
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Deschutes River
Tumalo Creek
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KOTZMAN
USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, GSA and the GIS User Community

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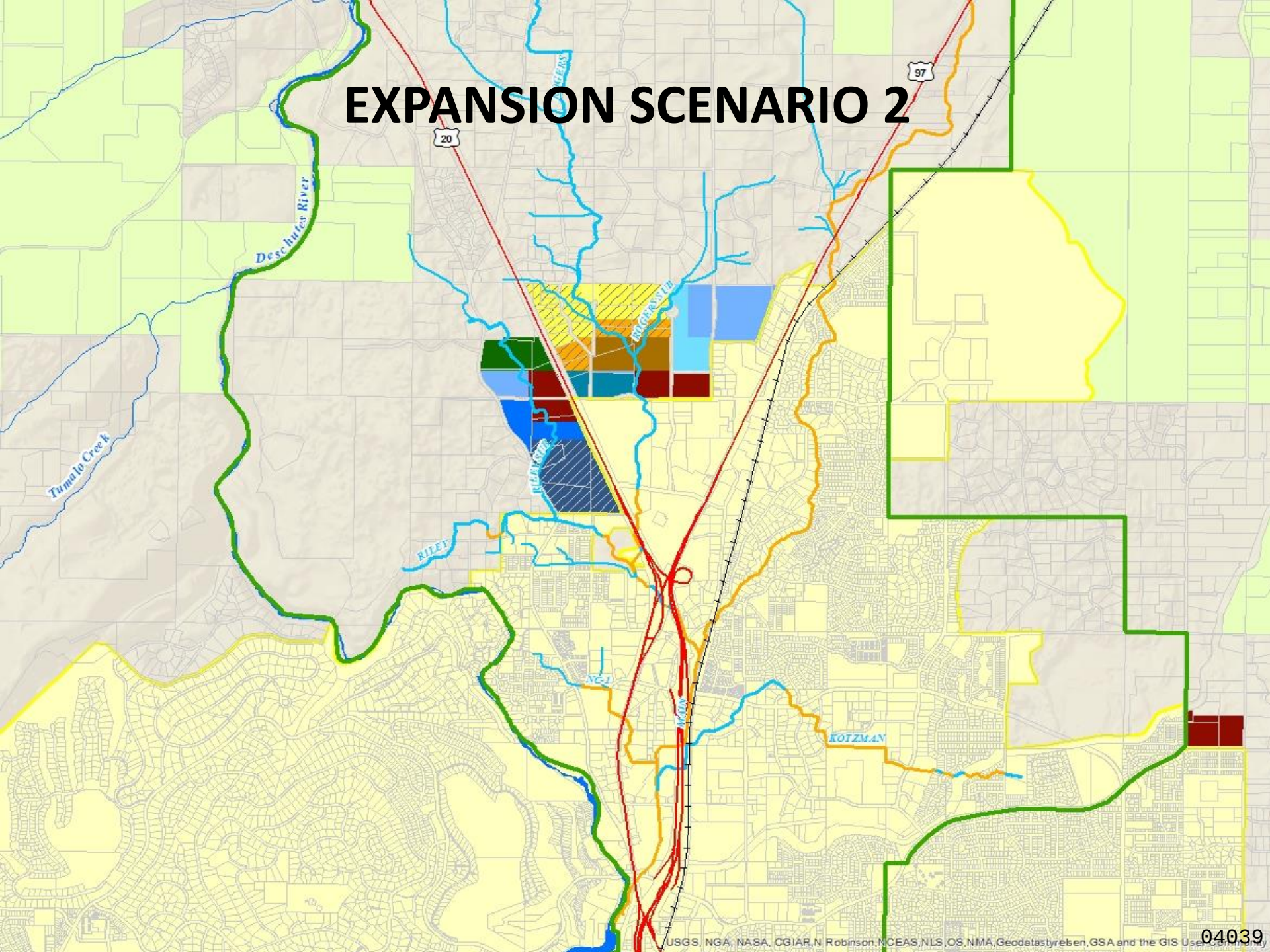

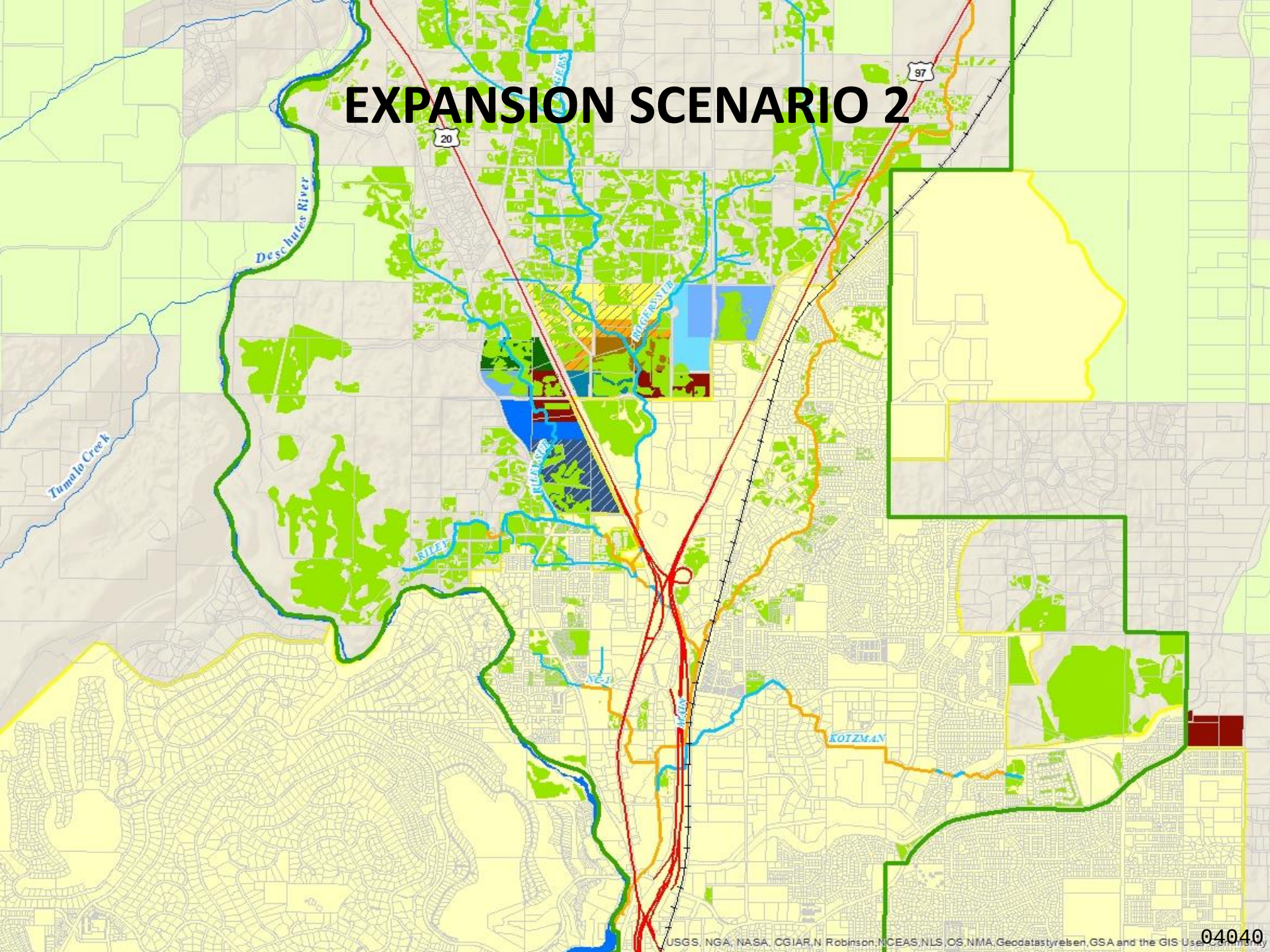
EXPANSION SCENARIO 2
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Deschutes River
Tumalo Creek
RILEY
NEAL
KOTZMAN
USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, GSA and the GIS User Community

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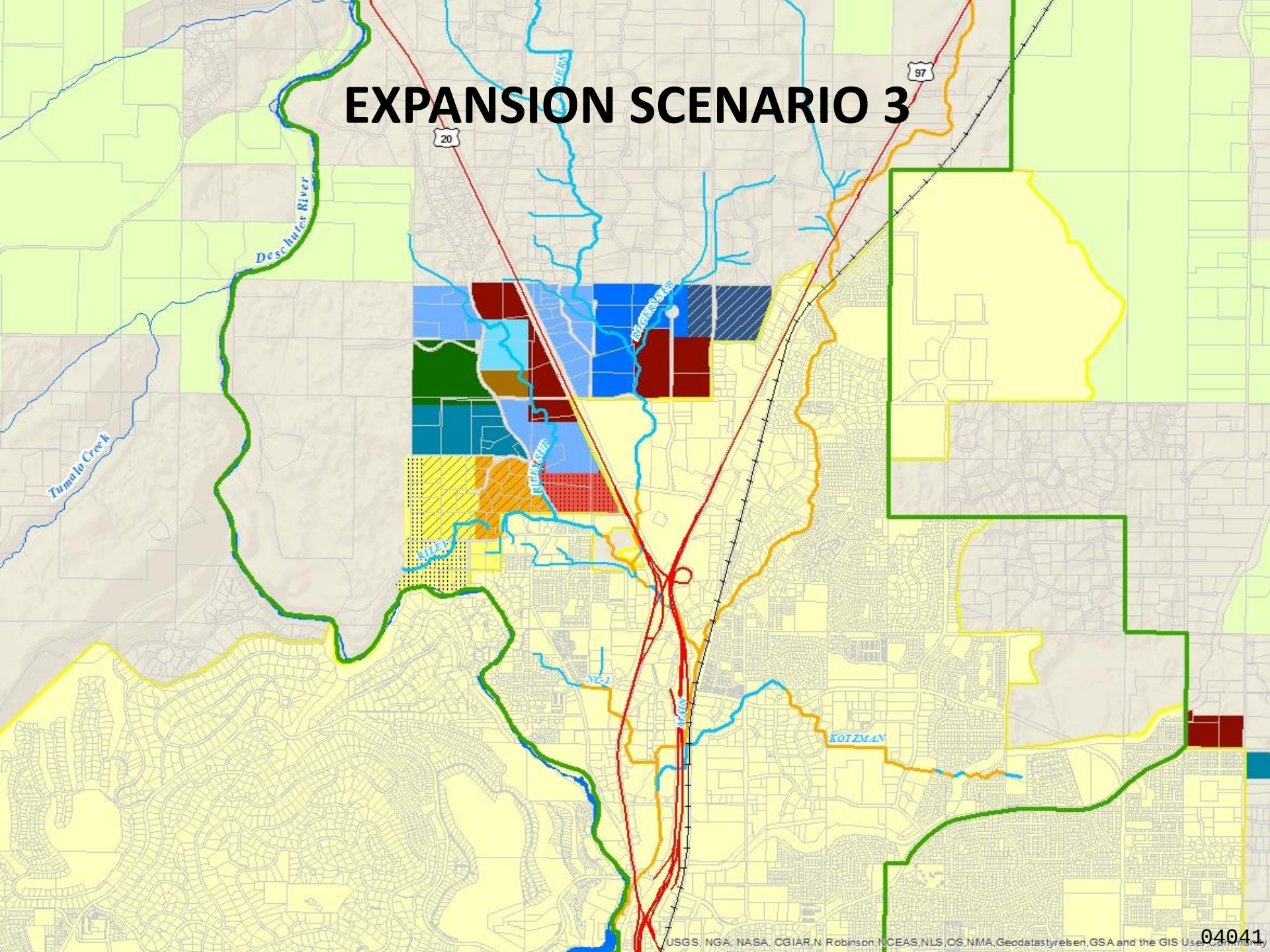
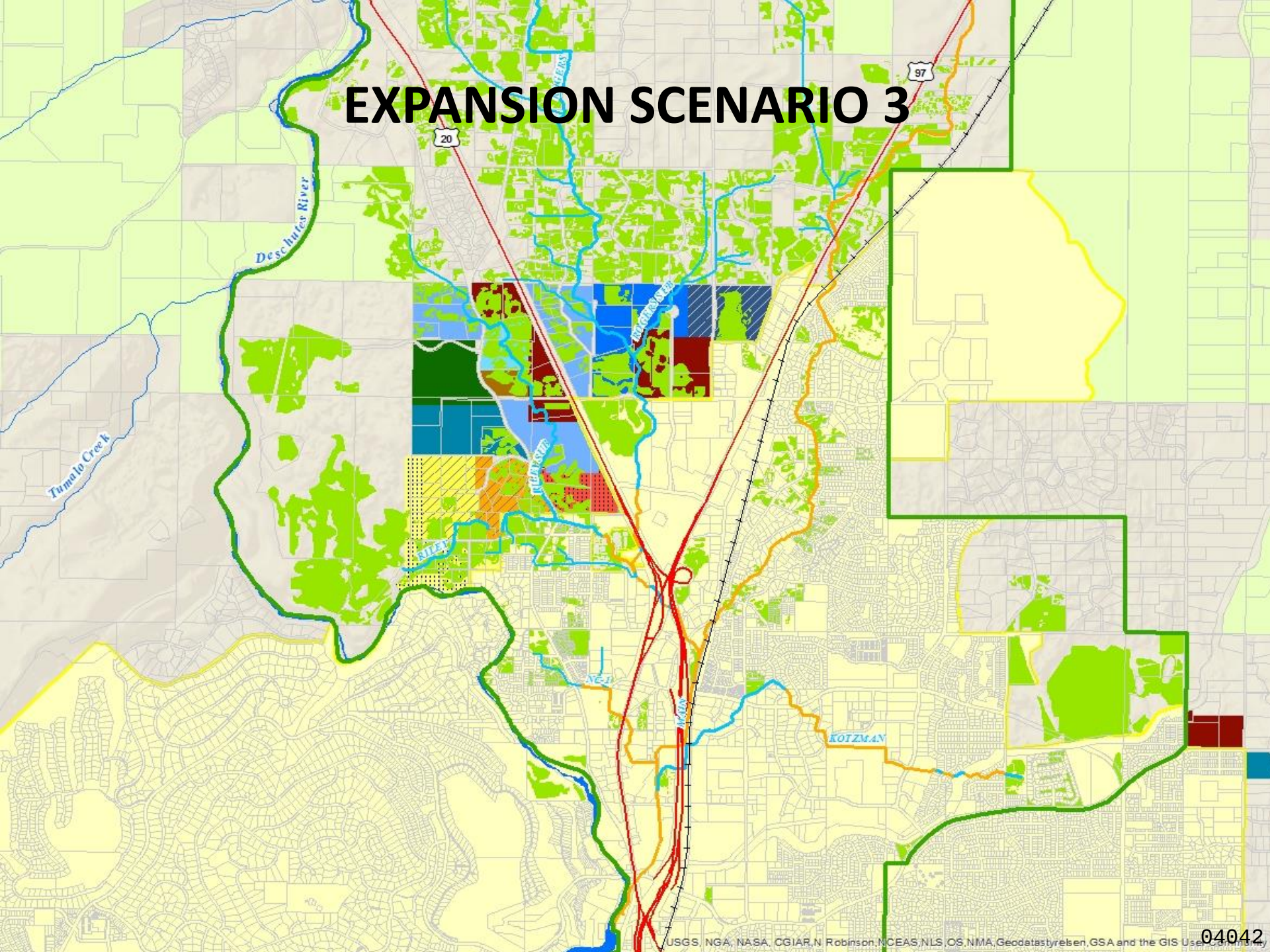


EXPANSION SCENARIO 3

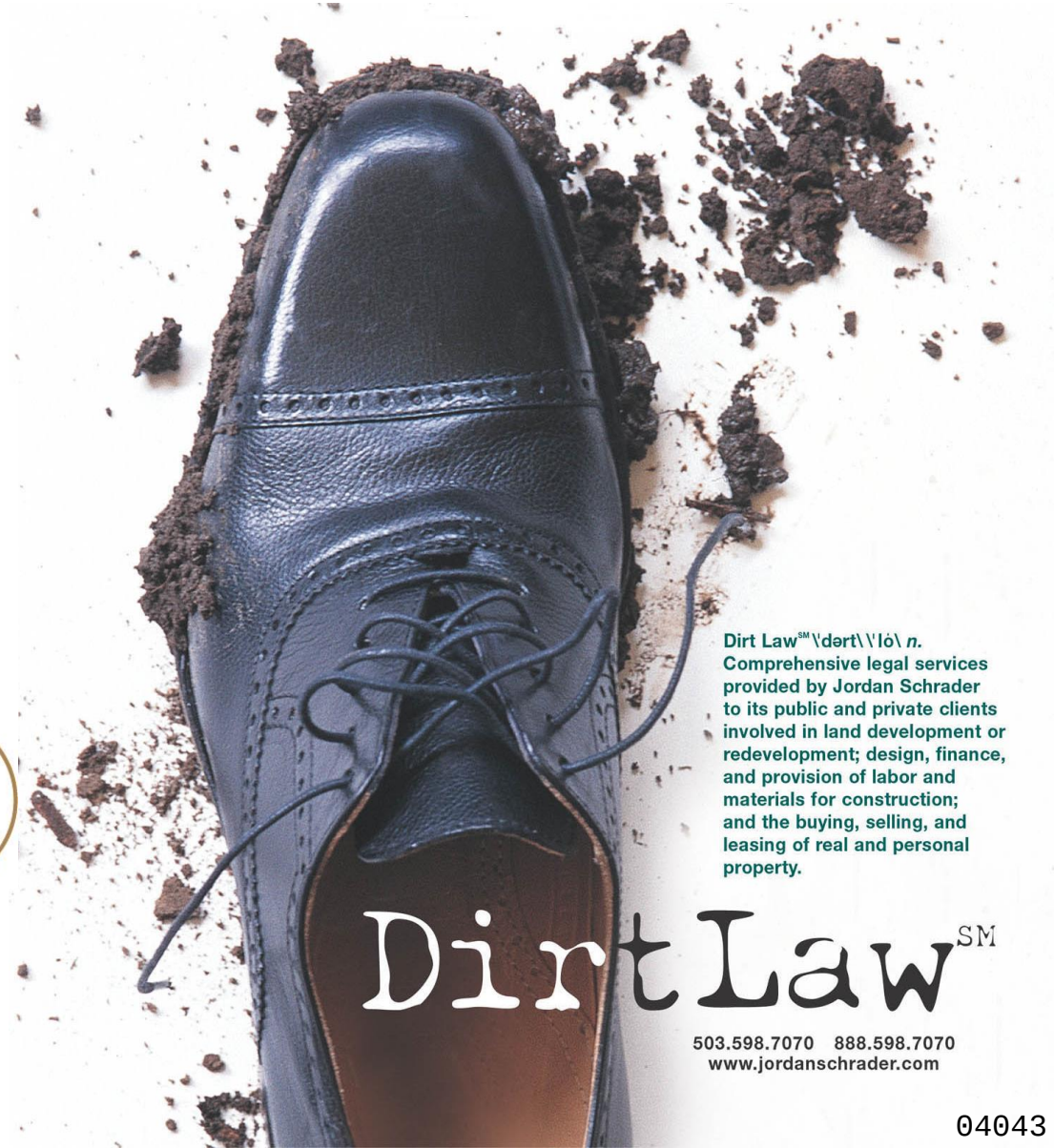


Thank You

JORDAN RAMIS PC

ATTORNEYS AT LAW

CELEBRATING 50 YEARS



Public Testimony from Suzanne Butterfield, Swalley Irrigation District

June 9, 2015 Boundary and Growth Scenarios TAC

Swalley
IRRIGATION DISTRICT

June 1, 2015

To: Brian Rankin, Principal Planner, City of Bend

From: Suzanne Butterfield , Manager, Swalley Irrigation District SB

Subject: Swalley Irrigation District Comment on UGB Scenarios 6, 7 and 8

Dear Brian,

Thank you for the opportunity to review and comment on the current UGB expansion scenarios. We met with Damian Syrnyk last week to review the maps labeled as Scenarios 6, 7 and 8. All of the current scenarios include growth in SID's boundaries. We realize that urbanization within SID is inevitable, but we urge the City to consider alternatives that will minimize the impact on SID's distribution system and assessment base.

As we indicated in our April 23, 2015 letter, our system serves lands both inside and outside the UGB study area. Due to the hub and spoke nature of our system, development impacts close to the current UGB have the potential to ripple outward through our entire system, impacting EFU lands to the north.

Conflicts with SID's system will limit development and will drive up costs for the City and developers. Each of the three proposed scenarios create a high likelihood that future development will directly interfere with irrigation service from SID's Rogers and Riley lateral systems. These two systems serve about 40% of our water users. Irrigation easements (some as large as 120 feet in width) also accompany the lateral systems, prohibiting development along their courses. Conflicts with these laterals will also drive up development costs. A 2013 study on the Rogers and Riley lateral systems suggested the cost to pipe those systems would be approximately $1.5 million. SID policy requires developers to pay for piping laterals impacted by urbanization, so this could significantly increase the per-lot development costs in this proposed UGB expansion area.

All three scenarios would include land located nearest the hub of our distribution system on the south side of the District. However, Scenario 8 includes significantly more land than the other two—pulling in a large number of smaller irrigated parcels located west of OB Riley Road. This has the potential to magnify the operational impacts on the SID system and to lead to a substantial erosion of SID's assessment base.

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SUITE ONE
BEND, OREGON 97701

www.swalley.com

The three scenarios also propose differing uses for the lands to be included. Scenario 7 and 8 both include significant residential development and a school. It has been our experience that small lot development leads to more frequent conflicts with our water delivery system. It can result in a piecemeal approach to infrastructure construction, leading to confusion, delays, and greater development costs overall. For this reason, we prefer Scenario 6 and would strongly recommend against Scenarios 7 and 8.

We are, of course, also thinking about the next round of UGB planning, and where urban reserves may be designated. If the City brings in significant acreage within SID's boundaries and designates those lands for residential and school construction, it will surely lead to significant future small lot residential development within SID. This will only compound the urbanization impacts of the current UGB expansion, and will result in greater long-term investment costs for SID, the City, and developers.

Finally, we note that none of the scenarios propose boundary expansion in Gopher Gulch Ranch. SID's letter of April 23 and the accompanying map show that urbanization of Gopher Gulch Ranch would have less impact on SID and future development costs than the current scenarios, which push development farther north into the heart of SID.

We appreciate the opportunity to provide this feedback and we look forward to continued engagement with the City on, both on the UGB process and efforts to address the impacts that the proposed urbanization will have on SID. To that end, we suggest we resume past discussions about urbanization impacts and how such changes can best be managed by both the City and SID to achieve our mutual management objectives.

Public Testimony from Robin Vora

June 9, 2015 Boundary and Growth Scenarios TAC

Damian Syrnyk

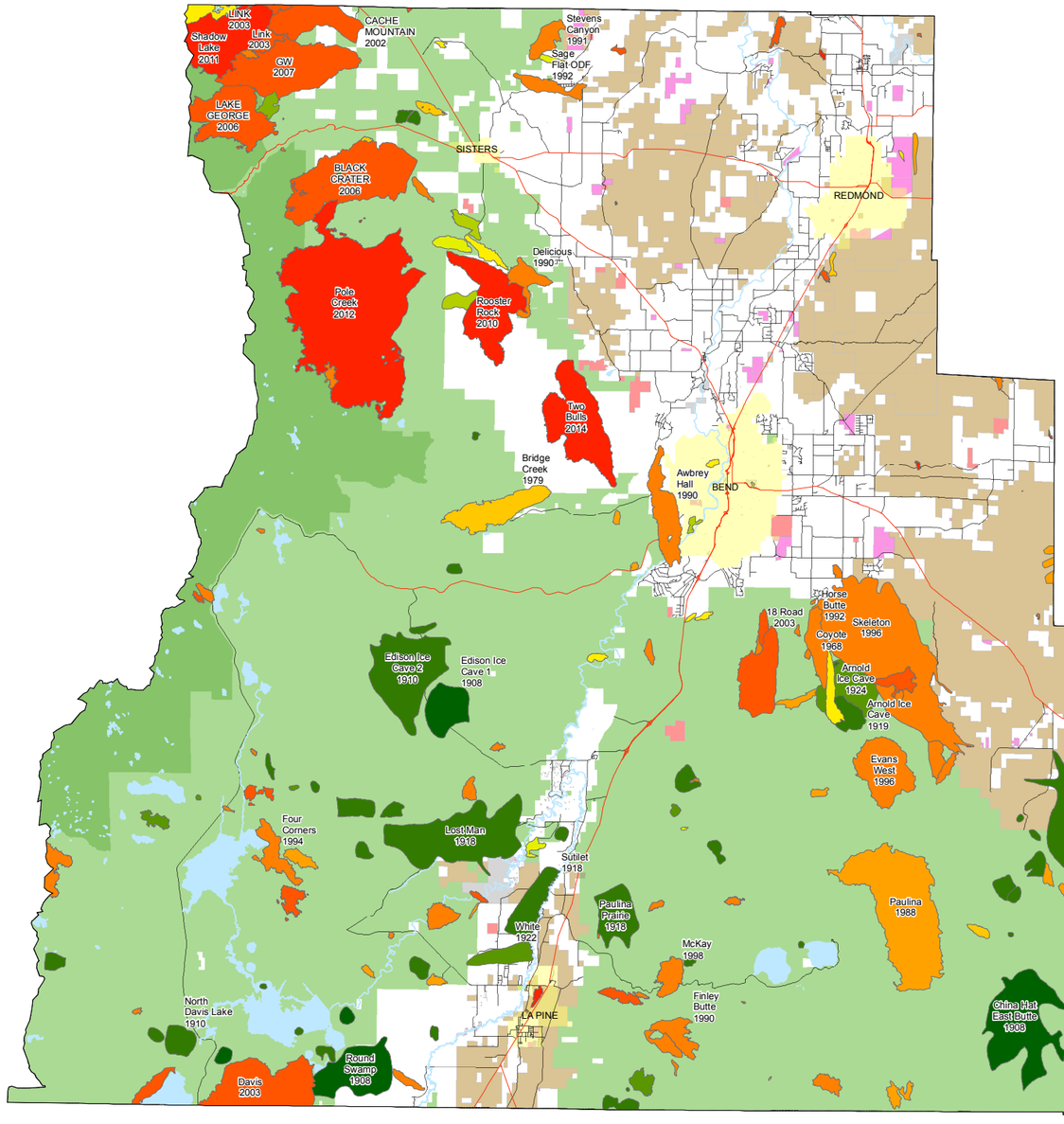
From: Robin Vora <robinvora1@gmail.com>
Sent: Sunday, May 31, 2015 8:33 PM
To: Brian Rankin; Damian Syrnyk; Joe Dills; Mike Riley; Karen Swirsky
Subject: Large fire map & Fire cost and wildland urban interface articles
Attachments: Estimating Suppression Expenditures Individual Fires_Gebert2007.pdf; Factors influencing large wildland fire_Liang2008.pdf; Homes&WildfireCost_Gude2012.pdf; Potential for Future Development&Fire_Gude2008 (1) (1).pdf; deschutes_county_fire_history_map.pdf

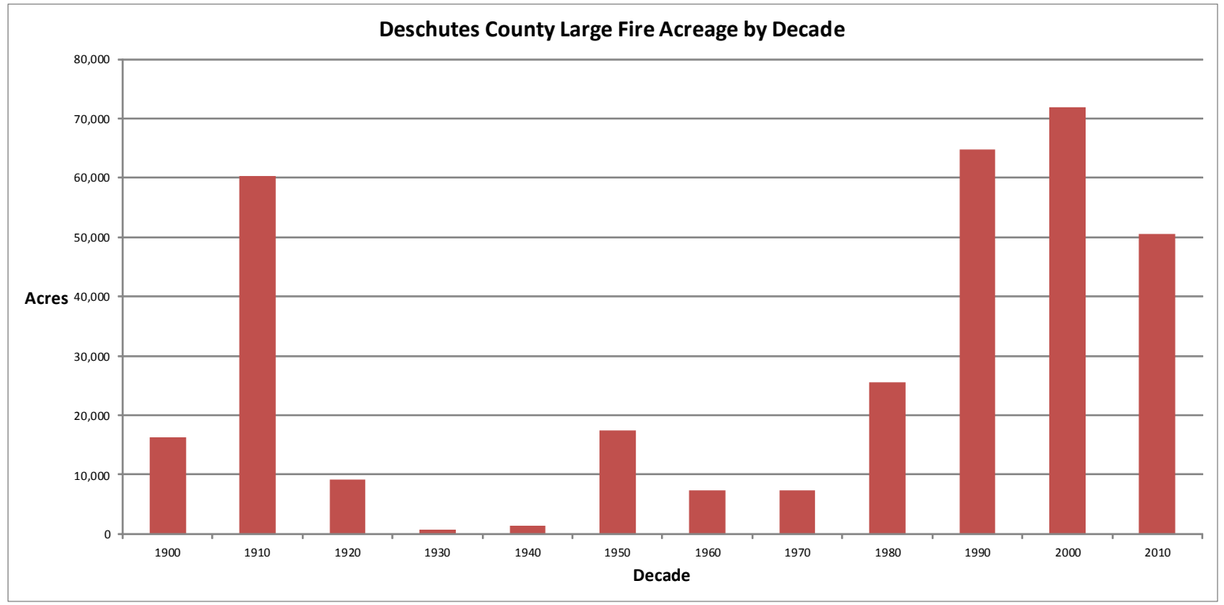
Enclosed are four articles I found on the public cost of building into the wildland urban interface WUI) where there is a higher threat of wildfire. Besides the safety, potential property losses, and smoke for new residents in the WUI, this is a national and state concern with dwindling budgets for natural resource management, fire suppression, and fuels treatments.

I have also again attached the Deschutes County large fire history map from the Deschutes Country website. It shows no large fires over the past 114 years between Rickard Road going northeast to Hwy 20 around Bend's urban growth boundary despite numerous natural and human ignitions. It does show several large fires going around the city boundary to the south and west. I think the map speaks for itself.

I would like for the map and four articles to be entered into the record for the City's UGB expansion study. I would also like it shared with UGB Boundary TAC members.
Thank you,
Robin Vora
Bend, OR 97701
541 318 4652

Deschutes County Large Fire History
1900 - 2014





Land Ownership

- USFS
- BLM
- ODSL
- OPRD
- PRIVATE
- Wilderness Area
- Deschutes County

FIRE OCCURENCE BY DECADE

1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

Map Prepared by Deschutes County
Forestry
Ed Keith
61150 SE 27th Street
Bend, OR 97702
541-322-7117

0 5 10 20 Miles

NORTH

04039

Estimating Suppression Expenditures for Individual Large Wildland Fires

Krista M. Gebert, David E. Calkin, and Jonathan Yoder

ABSTRACT

The extreme cost of fighting wildland fires has brought fire suppression expenditures to the forefront of budgetary and policy debate in the United States. Inasmuch as large fires are responsible for the bulk of fire suppression expenditures, understanding fire characteristics that influence expenditures is important for both strategic fire planning and onsite fire management decisions. These characteristics then can be used to produce estimates of suppression expenditures for large wildland fires for use in wildland fire decision support or after-fire reviews. The primary objective of this research was to develop regression models that could be used to estimate expenditures on large wildland fires based on area burned, variables representing the fire environment, values at risk, resource availability, detection time, and National Forest System region. Variables having the largest influence on cost included fire intensity level, area burned, and total housing value within 20 mi of ignition. These equations were then used to predict suppression expenditures on a set of fiscal year 2005 Forest Service fires for the purpose of detecting "extreme" cost fires—those fires falling more than 1 or 2 SDs above or below their expected value.

Keywords: Regression analysis, cost, fire characteristics

The severity of recent fire seasons in the United States has highlighted the extreme expenditures associated with wildland fire suppression. In fiscal years (FY) 2000, 2002, 2003, and 2006, fire suppression expenditures by the USDA Forest Service alone totaled about $1 billion annually. For the 10 years prior to 2000, fire suppression expenditures averaged around $350 million annually (in constant 2004 dollars). Along with the goal of diminishing the risk and consequences of severe wildland fires, the extreme expense of fighting these fires has become a driving force behind agency policy for some time. The desire to contain fire suppression expenditures motivates fuel treatments, affects suppression strategies and tactics, and helps define the relationship between the Forest Service and oversight agencies such as the Office of Management and Budget.

Large fires are responsible for the bulk of fire suppression expenditures (USDA Forest Service, USDA, and NASF 2003); therefore, understanding the characteristics of large fires is important for both strategic fire planning and onsite fire management decisions. Then, the characteristics can be used to predict suppression expenditures for individual, large fires. Currently, estimates of fire suppression expenditures for planning or decisionmaking are based on historical per acre expenditures or by selecting the firefighting resources to be used and arriving at an aggregate cost for these resources. Both have problems. Per acre expenditure estimates often are based on a small number of fires, in which their characteristics might vary dramatically from the fire in question. Aggregating the cost of selected fire suppression resources does not take into account the large overhead costs often associated with these larger fires. Developing regression models that take into account a variety of factors affecting suppression expenditures may be one way to improve these estimates (MacGregor and Haynes 2004).

Some research into developing statistical models to either predict fire expenditures or investigate causal factors of expenditures has been conducted. Donovan et al. (2004) used regression analysis to identify variables affecting suppression expenditures for 58 fires that occurred in Oregon and Washington in 2002. The only significant variables were fire size and terrain with measures of housing density, a focus of the study, not showing up as a significant predictor of costs. Steele and Stier (1998) developed a series of regression equations to estimate suppression costs for Wisconsin wildfires managed by the State Department of Natural Resources. Significant variables included final fire size and burning index. Earlier studies such as the one performed by Gonzalez-Caban (1984) attempted to estimate suppression expenditures based on the number and type of the different resources used on the fire, and it found considerable variation among fires and regions of the country.

In these analyses, it is important to differentiate between expenditures and economic costs. The actual cost of the fire has many components that are not accounted for by the suppression expenditures on the fire such as property-related losses, burned area emergency rehabilitation expenditures, long-term rehabilitation projects, water quality mitigation, business losses, and loss of recreation values. In our study, we made no attempt to account for all the costs associated with wildfires. When we use the word "cost" in this article, unless otherwise stated, we are talking about the expenditures to suppress the fire.

Using data on 1,550 fires reported by the Forest Service from FYs 1995–2004, we developed equations to predict fire suppression expenditures on a given wildfire based on fire characteristics that we hypothesized would affect expenditures and that were readily available or could be calculated with given information. Such equations could be used in prefire planning and real-time decision support

Received May 12, 2006; accepted August 31, 2006

Krista M. Gebert, USDA Forest Service, Rocky Mountain Research Station, Missoula, MT 59807, can be reached at kgebert@fs.fed.us. David E. Calkin, USDA Forest Service, Rocky Mountain Research Station, Missoula, MT 59807, can be reached at decalkin@fs.fed.us. Jonathan Yoder, Washington State University, School of Economic Sciences, Pullman, WA 99164, can be reached at yoder@wsu.edu.

systems. They also could be helpful for postfire analysis. Actual expenditures on individual fires in any given year could be compared with their "predicted" expenditures, and those fires with actual expenditures above a certain range (outliers) could be further reviewed to see why their costs were so high relative to other fires with similar characteristics. The statistical model presented in this study is designed to balance statistical performance with ease of use for prediction and analysis of fires beyond the sample used to estimate the parameters of the model.

Methods

We collected expenditure and fire characteristic data for large fires reported in the Forest Service's fire occurrence database, the National Interagency Fire Management Integrated Database (NIFMID), that could be accurately cross-identified with the Forest Service accounting system. We then developed and tested a theoretical model with suppression cost per acre as a function of the fire environment, values at risk, detection time, and resource availability for individual fires using ordinary least squares regression. Below we discuss the data collection process, the model and variables used, and the analysis methods.

Data Collection

Data were collected on fires reported in the NIFMID for FYs 1995–2004 (FY 1995 was the earliest year for which financial information was still available). Our analysis was restricted to fires that exceeded the "escaped" fire limit, defined by the Forest Service as greater than 100 ac before FY 2003 and greater than 300 ac since FY 2003. This restriction was necessary because smaller fires generally are assigned to a generic P-code for a region or forest, making it impossible to relate actual expenditures to individual fires and their characteristics (P-codes are the accounting codes the Forest Service uses to track expenditures on wildfires). Additionally, we used only fires where the Forest Service was the recorded protection agency because of the difficulty of obtaining expenditures by all agencies involved in a wildfire. We hoped that by making this restriction the Forest Service would have incurred the bulk of the expenditures on these fires, and we would lessen potential underestimation due to not accounting for the expenditures of other agencies. An earlier analysis of 216 fires, where expenditures for all agencies were obtained and the Forest Service was identified as the lead protection agency, showed that the Forest Service expended, on average, more than 90% of the money on these fires (Rocky Mountain Research Station, unpublished report, 2002). The remaining 10% was split between the Department of the Interior and state/local agencies.

Estimated suppression costs are available for most of the fires reported in the NIFMID or from the ICS-209 (the ICS-209 Incident Status Summary is used for reporting information on "incidents of significance" [USDA Forest Service 2004b]). However, through extensive use and analysis of the data, we believe that the cost estimates found in these reports are largely inaccurate and should not be used for analysis. For instance, in FYs 2000 and 2002, when the Forest Service spent more than $1 billion on suppressing wildland fires, the estimated costs in the NIFMID only totaled $655 and $629 million, respectively. The only accurate data on suppression expenditures are the actual expenditures obtained from the Forest Service accounting system, but there is difficulty matching these expenditures with specific fires. Starting in FY 2005, the P-code will be a required field in the NIFMID, making subsequent analysis of large fire expenditures much easier.

Fire complexes also cause problems when analyzing expenditures on individual fires. A fire complex is a group of fires that are administratively treated as one fire. There is no set rule for tracking expenditures on complexes, but, usually, expenditures for all fires in the complex are assigned to a single P-code. Where possible, we apportioned actual expenditures to the fires in the complex based on the estimated costs shown in the NIFMID and used these fires in our analysis. This was possible for approximately 80% of the identified fire complexes. For 17 fire complexes (comprised of 61 individual fires) this was not possible because of missing information or because we were unsure if we had accounted for all the fires in the complex. The necessary removal of these fires from the analysis is unfortunate because fire complexes often are some of the most expensive fires.

Our data collection requirements had the following effect on the number of fires available for analysis: fires reported in the NIFMID, 100,643; fires greater than 100 ac (or 300 ac depending on the year), 3,061; fires where the Forest Service was the recorded protection agency, 2,518 fires; remaining fires with useable P-codes, 1,644; final fires used in analysis, 1,550 (because of missing values for some variables). Rather than use other statistical methods for addressing the 94 observations with missing values (such as using the sample mean), we chose to eliminate these observations from the analysis. A regression relationship is conditional (conditioned) on the explanatory variables; therefore, selection of a sample from a population based on one or more explanatory variables is not a problem unless there is reason to believe that the random regression disturbance is in some way correlated with missing data. Given our knowledge of the data collection process, we see no reason why this would be the case.

The Model

The goal of fire suppression is to reduce resource damage from a natural hazard, in highly variable environments, with considerable uncertainty associated with such things as fire behavior and weather. Some fires, regardless of the amount of suppression resources used, will resist control. Others are relatively easy to suppress. We hypothesize that suppression expenditures are a function of environmental factors during the fire, the values at risk surrounding the fire, the availability of suppression resources, the initial suppression strategy, and the amount of time between ignition and discovery (delay). Therefore, a general form for a regression model to estimate the impacts of these variables can be summarized as

$$\text{suppression expenditures/area burned} = fn\ (\text{area burned, environment, values at risk, resource availability, initial suppression strategy, and delay}).$$

We use area burned, rather than fire perimeter, because perimeter information was not available for the majority of fires used in our analysis. Also, in practice, fire managers are accustomed to thinking in terms of cost per acre; therefore, cost per acre was used as the response variable rather than total cost.

Given that our observations are at the level of an individual fire, there is a potential problem with including fire size as an independent variable to explain cost per area burned. Standard fire economic theory implies that as more suppression effort is directed at a fire, area burned goes down—more money expended reduces area burned. Consequently, in principle, there may be a two-way causality: cost per acre affects area burned and area burned affects fire

Table 1. Variables used in development of regression equations [dependent variable = ln(wildland fire suppression expenditures/acre)].

Fire characteristics	Variable definition	Source
Size		
ln(Total acres burned)	Natural log of total acres within the wildfire perimeter	NIFMID
Fire environment		
Aspect	Sine and cosine of aspect at point of origin in 45° increments	NIFMID
Slope	Slope percent at point of origin	NIFMID
Elevation	Elevation at point of origin	NIFMID
Fuel type	Dummy variables representing fuel type at point of origin. Grass = NFDRS fuel models A, L, S, C, T, and N; Brush = NFDRS fuel models F and Q; slash = NFDRS fuel models J, K, and I; timber = NFDRS fuel models H, R, E, P, U, and G; brush4 (reference category) = NFDRS fuel models B and O	NIFMID
FIL	Dummy variable for FIL 1–6 (FIL 1 = reference category)	NIFMID
ERC	ERC calculated from ignition point using nearest weather station information (cumulative frequency)	Calculated
Values at risk		
ln(Distance to nearest town)	Natural log of distance from ignition to nearest census designated place	Calculated
ln(Total housing value 5)	Natural log of total housing value in 5-mi radius from point of origin (census data)/100,000	Calculated
ln(Total housing value 20)	Natural log of total housing value in 20-mi radius from point of origin (census data)/100,000	Calculated
Reserved areas	Dummy variables indicating whether fire was in a wilderness area, inventoried roadless area, or other special designated area (reference category = not in reserved area)	Calculated
ln(Distance to reserved area boundary)	If in a reserved area, natural log of distance to area boundary	Calculated
Detection time		
ln(Detection delay)	Natural log of hours from ignition time to discovery time	Calculated
(ln[Detection delay])^2	Square of ln of detection delay	Calculated
Suppression strategy		
Initial suppression strategy	Dummy variables representing initial suppression strategy (confine, contain, and control) − reference category = control	NIFMID
Resource availability		
ln(Average deviation)	Natural log of the difference between the number of fires burning in the region during the period of the specified fire compared with the average in that region during the same time of year	Calculated
Region	Dummy variables for National Forest System region (reference category for western model = region 1 and for eastern model = region 9)	NIFMID

costs. If this two-way causality exists and is not accounted for in estimation, area burned is said to be *endogenous*, and the parameter estimates of the model are likely to be biased. However, large fires by their definition resist control. These events are very heterogeneous and, therefore, area burned may be more a function of fire complexity or potential than suppression effort, thus reducing the causal relationship between area burned and cost per acre. We pursue the standard approach, which is to test for endogeneity of area burned, and if it is found to be endogenous, then the use of an instrumental variables estimation method is warranted (Cameron and Trivedi 2005).

Explanatory Variables

Fire Environment

The environment in which a fire occurs can affect the difficulty and, therefore, the costs of controlling a wildfire. Characteristics such as rough or steep terrain, heavy fuel loads, and dry fuel conditions may increase unit suppression costs. A variety of fire characteristics that may affect suppression expenditures are available in the NIFMID or can be calculated using the information available there, including slope, aspect, elevation, fire intensity level (FIL), fuel type, and energy release component (ERC). Table 1 shows the fire characteristic information we extracted from the NIFMID for the fires in our database and the fire characteristics that were collected or calculated separately.

Topographic variables (slope, elevation, and aspect) are included because of the influence they have on fire behavior (all three are generally included in models of fire behavior such as FARSITE [Finney 2004]). Steeper slopes may cause fires to spread more rapidly, elevation can affect the amount of wind and moisture in an area, and south- and west-facing aspects often have lower humidity and/or higher temperatures. We hypothesize that the sign on elevation and slope will be positive, given no collinearity issues. Aspect, which is recorded in the NIFMID according to azimuth, was transformed to two variables—the sine and cosine of the azimuth (in radians; Mardia and Jupp [2000]) as opposed to using dummy variables for each aspect class, which would use up many more degrees of freedom. We hypothesize that the sign on the cosine and sine of aspect will be negative. A negative sign on these coefficients would increase costs for southern and western aspects where fuels are dryer and decrease it on eastern and northern aspects.

Fuel type also influences fire behavior and firefighting difficulty. We used five dummy variables to account for fuel type at the ignition point of the fire: grass, shrub, two brush variables, timber, and slash. The two brush models were brush and brush4, where brush reflected the National Fire Danger Rating System (NFDRS) fuel models F and Q (brush and dormant brush), and brush4 reflected NFDRS fuel models B and O (chaparral or heavy brush). Conversations with fire personnel identified these classifications as the most useful in determining required suppression effort (Merrill Saleen, National Interagency Fire Center, personal communication, Feb. 2, 2005). The reference category for fuels was brush4. We hypothesized that grass and brush would be less expensive than brush4 and timber and slash would be more expensive.

The other fire environment variable that came directly from the NIFMID, FIL, is an estimate of the fire behavior at the fire head

during the first burning period and is based on the calculated flame length, where FIL 1 is 0–2 ft, FIL 2 is 2–4 ft, FIL 3 is 4–6 ft, FIL 4 is 6–8 ft, FIL 5 is 8–12 ft, and FIL 6 is greater than 12 ft. Because this is a categorical variable, it was transformed to five dummy variables, with FIL 1 being the reference category. We hypothesized that higher FILs would be associated with increased suppression costs because of the difficulties of fighting fire when extreme fire behavior is present.

To assess the effect of fire potential or fire danger on expenditures, in addition to FIL, we calculated an ERC index, which is a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It takes into account fuel moisture in both live and dead fuels and is a good reflection of drought conditions (National Wildfire Coordinating group 2002, California Board of Forestry 2004). ERC was calculated using Fire Family Plus (USDA Forest Service 2004a) with information from the weather station closest to the fire ignition point and based on Fuel Model G (Patricia Andrews, Rocky Mountain Research Station, personal communication, Aug. 20, 2003). Fuel model G was used because it has been found to be correlated with fire behavior in many areas of the country (Hall et al. 2005). The raw ERC value was converted to a cumulative frequency (the percentage of observations, based on local weather station information, that fall at or below the calculated ERC value) to better reflect fire conditions. We hypothesized that the sign on the coefficient for ERC would be positive: as fuel becomes drier, suppression becomes more difficult and costs increase.

Values at Risk

Areas with high values at risk such as private structures, public infrastructure, and high value timberlands are likely to command more suppression resources (USDA Forest Service 1995a, 1995b, National Academy of Public Administration 2002) and may, therefore, have higher costs than areas where fire is unlikely to cause significant resource losses. In fact, population encroachment into forested areas often is one of the factors used to explain the high costs of suppressing wildfires (Snyder 1999). Data on how much is spent to protect people and property are not readily available, so we assessed these effects indirectly using two different approaches: (1) calculating demographic characteristics within certain radii of fire ignition and (2) computing the distance to the nearest town. Using 2000 census data we calculated measures reflecting income (e.g., medium family income and per capita income), property values at risk (e.g., median housing value and total housing value), and total population for various radii around the fire ignition points: 5, 10, and 20 mi. All these variables were highly correlated with one another, and simple correlations showed total property values at different distances from the fire were most significantly correlated with suppression costs. Therefore, other demographic variables were omitted from the final model. We hypothesized that the total housing value variables would increase suppression costs and that distance from the nearest town would decrease costs.

Values at risk and the role of fire in land management may be substantially different between unreserved Forest Service lands and designated wilderness and roadless areas, resulting in fundamentally different suppression strategies. It is important to note, however, that wildland fire-use fires (naturally ignited fires that are managed to achieve resource benefits) were not contained in the dataset used for this analysis. Although 570 of the fires in our dataset began on reserved lands, these are fires in which active suppression took place. When this analysis was done, only 29% of Forest Service wilderness areas had approved fire management plans that allowed for the option of wildland fire use somewhere within their boundaries (Carol Miller, Aldo Leopold Wilderness Research Institute, personal communication, Jan. 20, 2004). Using the latitude and longitude of the fire ignition point, we calculated whether the fire started in one of these reserved areas and if it did, the distance to that area's boundary. These calculations were done for three categories of reserved lands: (1) wilderness areas, (2) inventoried roadless areas, and (3) other special designated areas such as wilderness study areas or national recreation areas. We also calculated the distance from the fire ignition to the nearest boundary of that particular area; e.g., for a fire starting in a wilderness area, the distance to the wilderness area boundary was calculated. Our hypothesis was that fires in reserved areas would be fought less aggressively and thus have reduced unit suppression costs (the sign on the dummy variables would be negative). We also hypothesized that fires further within the reserved area boundary would cost less than those closer to the boundary; fires closer to the boundary would be fought more aggressively because of increased risk of the fire traveling out of the reserved area.

Resources Available

The effect of resource availability on suppression costs is theoretically unclear. In one respect, having additional resources available may allow more rapid and efficient line construction and, therefore, reduce unit costs. However, it may be that the availability of resources may encourage excessive resource use due to a management incentive system that encourages risk-averse behavior and thus increases unit costs (Donovan and Brown 2005). Conversely, a lack of resources may dictate a revised and less-aggressive suppression strategy in some areas of the fire zone, resulting in a larger fire area, thus lowering unit costs.

We collected or calculated two variables to account for availability of resources. The first was the national preparedness level on the date of the fire ignition (National Interagency Fire Center 2004), but this variable was omitted from the final model because it was not statistically significant in preliminary regressions. The second variable, average deviation, estimates how many other fires were burning in the region at the same time as the fire in question, compared with the average number of fires that usually burn at that time of year. Our hypothesis was that if more fires were occurring than average for that time of year, firefighting resources might have been limited.

Following an analysis done by Lankoande (2005), we included delay, or response time, in the model. Delay was measured as the time from fire ignition to discovery, and it is expected (as Lankoande found) to be positive. We also included the square of delay because a scatterplot of delay and cost per acre indicated a possible quadratic relationship.

The final variable included in the model was initial suppression strategy (confine, contain, or control). According to the *FIRESTAT User's Guide* (USDA Forest Service 2003), these terms are defined as follows: (1) confine means to limit fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions, (2) contain is the completion of a control line around a fire and any associated spot fires that can reasonably be expected to check the fire's spread, and (3) control is the completion of a control line around a fire and any associated spot fires that can reasonably be expected to hold under foreseeable conditions. We hypothesized that a more aggressive initial strategy (control) would

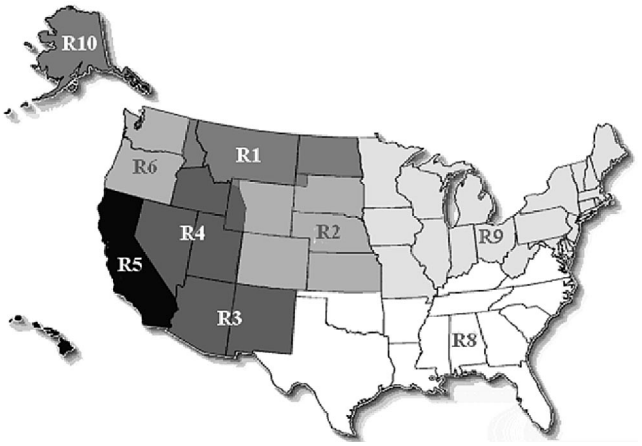


Figure 1. Map of USDA National Forest System regions.

increase cost per acre. It is important to note, however, that this is the strategy at the time the fire began. As the fire progressed, the suppression strategy may have changed.

Analysis

The results of our final analysis were two regional fixed effects models, one for the western United States (National Forest System Regions 1–6) and one for the eastern United States (National Forest System Regions 8 and 9; Figure 1). Statistical tests indicated that, at least for our dataset, it was not necessary to treat costs and acres as being simultaneously determined. A Wu-Hausman test failed to reject exogeneity of acreage for predicting cost per acre ($P > 0.23$).

All candidate independent variables were entered into the model to test significance. To develop a more parsimonious model, variables with a P value greater than 0.15 were removed one at a time, with the exception of categorical variables (such as fuel type) or other variables we felt should be treated as a group (such as housing values) with the model being reevaluated at each step. These groups of variables were handled differently. If F tests for joint significance showed that a group of related variables contributed to the model as a whole, then all variables within the group (except the reference variable in the case of categorical groups) were kept in the model regardless of their individual significance level.

Final model specification used a natural log transformation for the dependent variable (Forest Service expenditures per acre) as well as for most of the independent variables, with the exception of categorical variables. This model provided the best fit of the data and mitigated problems with heteroskedaticity among residuals. The general linearized model was

$$\ln(\$/\text{ac}) = B_0 + B_i^* \ln(X) + B_j^* Z,$$

where X are the fire characteristics to which we applied the natural log transformation (e.g., acres and distances), and Z were the variables that were not transformed, either because they were dummy or categorical variables or transformation did not appear to be indicated (such as slope and elevation). The percent impact of dummy variables is calculated following Kennedy (1981).

One final caveat about the estimated parameters follows from the fact that the sample is limited only to large fires. The consequence of this sample truncation is that the parameter estimates are not applicable to fires smaller than the lower limit of 100 ac. In addition, the parameter estimates for each variable given truncation are comprised of two parts: one represents the effect of a variable on the probability of being in the sample, and one represents the effect of the variable on the costs given that the fire size is big enough to be in the sample. Given that the primary purpose of this model is predictive, disentangling these effects on specific parameter estimates is of little importance, and we settled for the simpler linear specification rather than a truncated regression specification for the sake of pragmatic out-of-sample application of the model. Furthermore, exploratory regressions accounting for this truncation indicated that the estimated effects on the individual parameter estimates of this truncation are relatively small.

We do not feel that the differences in the lower bounds on acreage depending on year (100 ac versus 300 ac) should cause problems with the estimation process. There is no econometric/statistical problem, in principle, for having the sample based on the two different lower bounds as long as the same regression relationship holds for each subsample, which we found to be true in our preliminary investigations.

Table 2. Wildland fire suppression expenditures per fire and expenditures per acre for 1,550 large wildland fires, FY 1995–2004.

National Forest System region	Average cost per fire	Average cost per acre
	2004 dollars	
1	1,554,254	1,088
2	1,028,415	808
3	983,434	695
4	1,012,436	897
5	2,772,378	2,114
6	3,502,779	1,988
8	157,808	307
9	43,223	106

Results

The 1,550 fires analyzed in this study accounted for $2.07 billion of Forest Service suppression expenditures (in constant 2004 dollars) over the 7 years included in the sample. The average per fire cost was $1.3 million and the average cost per acre was $979 (both in constant 2004 dollars). Fires were distributed regionally as follows: Region 1, 217 fires; Region 2, 93 fires; Region 3, 222 fires; Region 4, 250 fires; Region 5, 199 fires; Region 6, 160 fires; Region 8, 309 fires; and Region 9, 100 fires. Table 2 shows average fire cost and cost per acre for each of the regions. One-factor analysis of variance indicated significant differences in both cost per acre and cost per fire among regions, with Regions 5 and 6 having significantly higher costs than Regions 1, 2, 3, and 4 and Regions 8 and 9 having significantly lower costs ($P < 0.001$ using Tukey's multiple comparison test).

Significant Variables and Their Affect on Cost

The final regression models for the West and the East are shown in Table 3, which lists the variables included, the estimated coefficients, and the P values. With the exception of elevation, all other variables (or groups of variables) were significant in at least one of the regression equations.

The size of the fire, in terms of area burned, has a negative effect on cost per acre, all else held constant. The interpretation for the coefficient on log transformed variables is that a 1% increase in the magnitude of the variable results in a B (the estimated coefficient)

Table 3. OLS regression models, western and eastern United States.

Variable	National Forest System Regions 1–6		National Forest System Regions 8–9	
	Coefficient	*P* value	Coefficient	*P* value
ln(Total acres burned)	−0.3238	0.000	−0.1941	0.006
Fire enviroment				
Aspect (cosine)	−0.1675	0.005	0.1009	0.263
Aspect (sine)	−0.1066	0.149	−0.4388	0.000
Slope	0.0057	0.003	0.0065	0.059
Elevation	Not in model		Not in model	
Grass	−0.5703	0.000	−0.5339	0.015
Brush	−0.3613	0.075	2.0391	0.026
Slash	0.2817	0.175	0.3503	0.261
Timber	0.5032	0.001	0.4981	0.038
FIL 2	0.8442	0.000	0.2206	0.265
FIL 3	1.3224	0.000	0.8458	0.000
FIL 4	1.6930	0.000	1.0424	0.000
FIL 5	1.8715	0.000	0.8160	0.010
FIL 6	1.7865	0.000	1.6956	0.000
ERC	0.0113	0.000	0.0047	0.112
Values at risk				
ln(Distance to nearest town)	Not in model		0.3029	0.014
ln(Total housing value 5)	0.0059	0.686	0.0329	0.188
ln(Total housing value 20)	0.1131	0.000	0.1703	0.098
Wilderness area	−0.2123	0.151	0.6703	0.017
IRA	0.1453	0.311	0.5806	0.213
Other SDA	0.1788	0.363	−0.6272	0.208
Wild × ln(distance to boundary)	−0.4309	0.000	0.7580	0.002
IRA × ln(distance to boundary)	0.0861	0.272	−0.1413	0.622
SDA × ln(distance to boundary)	−0.0905	0.313	−0.2781	0.187
Detection time				
Ln(Detection delay)	0.0353	0.171	−0.1859	0.000
Square of ln(detection delay)	−0.0184	0.037	0.0581	0.001
Suppression strategy				
Initial suppression strategy: confine	Not in model		0.6958	0.000
Initial suppression strategy: contain	Not in model		1.0056	0.002
Resource availability				
ln(Average deviation)	−0.0970	0.093	Not in model	
Region				
Region 2	−0.5398	0.016		
Region 3	−0.0792	0.643		
Region 4	0.1283	0.446		
Region 5	0.9631	0.000		
Region 6	0.9697	0.000		
Region 8			0.8122	0.000
Constant	4.587	0.000	0.3919	0.699

(Dependent variable = ln(wildland fire suppression expenditures/acre), R^2 (West) = 0.44, R^2 (east) = 0.49, *n* (West) = 1141, *n* (East) = 409), RMSE (West) = 1.5086 RMSE (East) = 1.1308. IRA, inventoried roadless areas; OLS, ordinary least squares; SDA, special designated areas.

percent change in the dependent variable (Gujarati 1988). Therefore, in the western model, a 1% increase in acres burned decreases cost per acre 0.32%. In the eastern model, the effect of acres is less pronounced, with a 1% increase in acres resulting in a 0.18% decrease in costs. However, it is important to remember that fire size in the East tends to be smaller and less variable than in the West. For the fires in our analysis, the average fire size in the East was 605 ac, compared with 4,700 ac in the West. There are several reasons given in the literature for the drop in cost per acre as fire size increases. Smith and Gonzalez-Caban (1987) state that most fire suppression activities are adjacent to the fire perimeter and because the ratio of the perimeter to area decreases as area increases, cost per acre should decline. Schuster et al. (1997) attribute this decline to economies of scale and more unburned areas within the perimeter of larger fires.

Looking next at those variables representing the fire environment, all except elevation were included in the final model. All other variables (or groups of variables) were statistically significant and for the most part had the expected signs. For aspect, because we used the sine and cosine of the azimuth (converted to radians) as the independent variable, the results are somewhat difficult to interpret: one must take the sine and cosine of the aspect (in radians), multiply the results by the respective coefficients, and add together. However, negative signs on both coefficients would support our hypothesis, with southern and western aspects having higher costs. For the western model, the coefficient on the cosine of aspect was indeed negative and statistically significant ($P = 0.005$). The coefficient of the sine of aspect also was negative, although not statistically significant ($P = 0.149$). However, for the eastern model, the coefficient on the cosine of aspect was positive but statistically insignificant ($P = 0.263$) and much smaller in magnitude than the coefficient on the sine of aspect. Because of this, by the time the two parts were added together, the effects in the East were, for the most part, consistent with those in the West, with fires with a southeastern, southern, southwestern, and western aspect having higher costs and fires with an eastern, northeastern, northwestern, or northern aspect having lower cost per acre.

Slope has a positive effect (as expected) on cost per acre in the West with a 1-unit change in the slope percent increasing costs by 0.57% in the West. For instance, a fire with a slope of 35% compared with one with a slope of 10% would cost approximately 15%

more, all else held constant. Slope was not statistically significant in the eastern model.

Fuel type had a very similar effect on cost for the West and the East. In the West, fires starting in timber cost 61% more than the reference category (brush4, heavy brush). In the East, the results were very similar, with timber fires being 62% more expensive than the reference category. Grass fires were the least expensive in both models, being 45% less expensive than the reference category in the West and 44% less expensive in the East. In both models, the coefficients on slash were statistically insignificant but comparable in magnitude. However, for the brush fuel model, the results were very different. This is because in the East, there was only one fire that started in brush (low or moderate brush), and it was a very expensive fire. Therefore, the coefficient on brush for the East showed that this fire was 465% more expensive than the reference category (heavy brush or chaparral). In the West, brush fires were 33% less expensive than the reference category.

FIL was a highly significant variable in both the western and the eastern models. All FILs were significantly more expensive than the reference category, FIL 1. As the FIL categories increase, cost per acre tends to increase. For the western model, the increase in cost per acre ranged from 127% for FIL 2 (compared with FIL 1) to a 539% increase in cost per acre for FIL 5 (FIL 6 was slightly lower at 486%). In the East, the magnitudes for FILs 2–4 were much smaller, ranging from a 33% increase in cost per acre for fires with FIL 2 (compared with FIL 1) up to a 204% increase for FIL 4. For FIL 6 the effect was similar to the West, increasing costs by 467% compared with the base case. However, in the East, fires with FIL 5 were less expensive than either FIL 4 or FIL 6 fires, increasing cost per acre 123% compared with the base case.

The last fire environment variable that was included in the model was ERC. Holding all else constant, an increase in the ERC increases costs 1.13% for every 1-unit increase in ERC (calculated as a cumulative frequency) in the West and 0.41% in the East. So, e.g., a western fire with an ERC in the 95th percentile, compared with the 80th, would have a cost per acre that was approximately 17% higher.

The next set of variables dealt with values at risk. The only surprising finding was that in the eastern model, as the distance to the nearest town increases, so do costs, with a 1% increase in the distance increasing costs by 0.31%. We expected this sign to be negative, indicative of fewer values at risk the farther you are from a populated place. Collinearity diagnostics did not indicate any problems with collinearity in the model. Therefore, it may be that in the East, with its more dense population, the farther from a town that the fire starts, the farther from firefighting resources and the more expensive the fire.

The total housing values within 5 and 20 mi of fire ignition were included in the models as a set, because statistical tests indicated that their predictive power was higher than if only one was used. Both variables suggest that as housing values increase, so do costs; however, only the housing value within 20 mi of fire ignition was statistically significant. Because of the magnitude of the numbers, we calculated total housing value in units of $100,000. In the West, for every 1% increase in total housing value (in units of $100,000) within 20 mi of fire ignition, cost per acre increases 0.11%. This seems like a small number, but given the magnitude of the housing values, it can add up quickly. The average total housing value within 20 mi of ignition for Regions 1–6 is over $3 billion. The maximum is $129 billion, and the minimum is around $450,000.

The variables representing whether or not the fire occurred in one of three reserved areas and the distance to the area boundary were all entered as a group and were retained, regardless of significance level. The only variables in the group that were statistically significant were whether or not the fire was in a wilderness area and the distance to the wilderness area boundary. In the western model, distance to the wilderness boundary had a statistically significant negative effect on cost. This conformed to our hypothesis that wilderness fires would be less expensive, especially the farther away the fire was from the wilderness boundary. In the eastern model, however, the opposite was true. If a fire started in a wilderness area, it was 86% more expensive than a fire not starting in the wilderness (all else constant) and the cost increased 0.72% for every percent increase in the distance to the wilderness boundary. This is comparable with the result for distance to the nearest town that we found in the eastern model, another indicator that in the more populated East, fires in more remote areas are more expensive to control.

The time between fire ignition and discovery time increased costs in the West and decreased costs in the East (although the coefficient for the western model was not statistically significant). The quadratic terms, however, were statistically significant in both models, although of different signs. The combined effect of the two terms showed that in the western model, costs increase as delay increases until delay is more than approximately 6.3 hours, and then cost per acre starts to decrease (average delay was 25.2 hours). In the eastern model, delay decreases cost per acre until the delay in hours is more than approximately 22.6 hours, at which time cost per acre starts to increase (average delay was 10.5 hours).

Initial suppression strategy (which is defined as confine, contain, or control) was not statistically significant in the western model. However, in the East, an initial strategy of confine increased costs 100%, relative to a strategy of control (the base case). A strategy of contain (as opposed to control) increased cost per acre by 173%. This is not the expected effect; control (the base case) is the most aggressive strategy, and we would expect it to cost more.

Resource availability, as measured by the variable average deviation, was not statistically significant in the eastern model, and in the western model, it was statistically significant only at the $P = 0.10$ level. The negative coefficient indicates that as the number of fires burning in the region increases by 1%, relative to the average for that time of year, cost per acre decreases by 0.097%. This would be consistent with a hypothesis that more fires mean fewer resources available to put on each fire (lower cost) and potentially a larger area burned, resulting in a lower cost per acre.

Estimating Suppression Expenditures

The main objective of this study was to produce regression equations that could be useful for predicting suppression expenditures on individual large fires. We developed a model using fire characteristics that were hypothesized to influence suppression expenditures such as fire behavior, difficulty of the firefighting environment, proximity to values at risk, and resource availability, while also controlling for size. The variables used, for the most part, conformed to our understanding of how they might affect expenditures, and we feel, therefore, that the relationships we found can be useful in explaining expenditures on large wildland fires.

We used these equations to make out-of-sample predictions for large FY 2005 fires. The R^2 between the observed and predicted values in sample (FY 1995–2004) was 0.45 for the western model and 0.46 for the eastern model. For the out-of-sample predictions, it

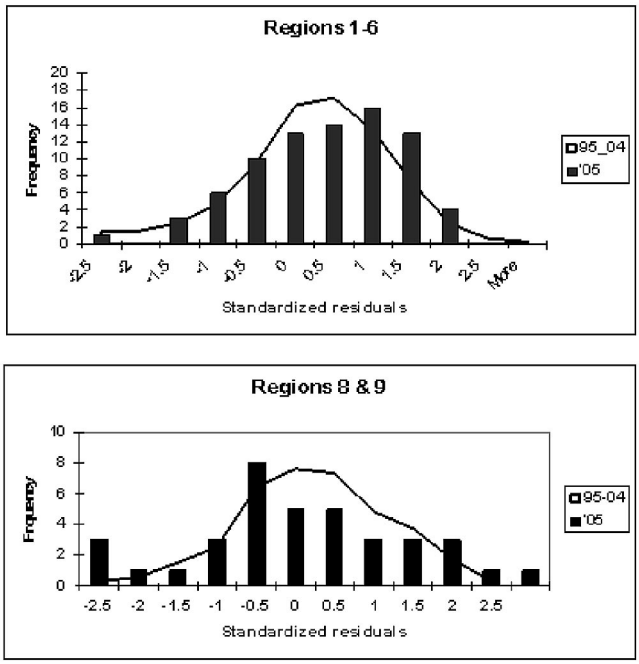


Figure 2. Standardized residuals from wildland fire suppression expenditure regressions, historical (1995–2004) versus FY 2005.

was 0.33 for the western model, but only 0.18 for the eastern model. Why the substantially poorer performance of the eastern model for FY 2005? Figure 2 shows the standardized residuals from both the in-sample and out-of-sample predictions. For the western model, the two distributions are very similar and chi-square tests showed no statistical difference between the two distributions ($P = 0.51$). For the West, the relationships between fire characteristics and costs found in the historical data seemed to follow through into FY 2005. However, for the East, we do see a noticeable difference in the distributions for FY 2005 compared with the historical data. There are more fires at each end of the distribution in FY 2005 compared with the historical distribution and a lot fewer fires in the middle section of the distribution, especially on the right side. The chi-square tests confirmed that the two distributions are significantly different ($P = 0.001$), with the biggest difference occurring in the very low cost fires. This may represent a change in how fires are being fought in the East or perhaps just a fire season that was very dissimilar to those occurring from FYs 1995–2004.

The estimated equations can be useful for identifying fires within or outside the original model estimation sample in which their costs fall outside a "normal range," given a specific set of fire characteristics. To do so, we identified FY 2005 fires where the actual cost per acre fell 1 or 2 SDs above or below the predicted cost (both in terms of the natural log of cost per acre), given the fires explanatory characteristics. For FY 2005, we identified 12 fires that fell outside the 2 SD range; six with higher than expected expenditures and six with lower than expected expenditures (out of 117 total fires).

These fires can then be reviewed further to see why they cost so much more (or less) than other fires with similar characteristics. For some of these "outlier" fires, the extreme difference between expected and actual costs may be due to the fact that the equations are built using information available at the start of the fire—nonspatial information based on characteristics at the ignition point of the fire. For instance, a fire may have started out in grass but burned predominantly in timber. The model would, therefore, underpredict the cost of this fire. However, on review of the fire, the cause of the extreme cost would be easily discernible. This was the case for a particular fire that we looked at in more detail because of a fire review that was being done. The predicted cost per acre was based on the fuel type at the ignition point, which was grass. However, if the fuel type was changed to timber (which we found out was the predominant fuel type), the predicted value would have increased by nearly 200% and the predicted cost would have been almost identical to the fire's actual cost. Therefore, this fire was designated as an outlier simply because of the nature of the fire occurrence data. However, for other fires the cause may not be related to the nonspatial nature of the data, but rather to policy issues that are not readily captured by the variables available for this study. The decision to fight fires aggressively because of political or jurisdictional issues is not captured in any of the fire databases. However, by further reviewing "outlier" fires, such expenditure patterns may become apparent. Additionally, analysis of the "low cost" fires could lead to the discovery of firefighting strategies or cost-saving techniques that could be applied to other fires.

For the process of identifying outliers as discussed previously in this article, we used the results from the original log-linear model, which provides linear predictions of the *natural log* of cost per acre, *not* cost per acre itself. To get predictions for cost per acre in dollar values, it is tempting to simply exponentiate the predicted values from the log-linear regression. However, this provides a biased and inconsistent estimate of cost per acre. There are a number of methods to adjust for this bias. The smearing estimator (Duan 1983) is derived by multiplying the retransformed predicted values, $\exp(\hat{y})$, by a *smearing correction factor*, which is the average of the retransformed residuals, $\exp(\hat{e})$. Another estimator (often called the "naive" estimator) assumes normally distributed errors and is calculated as $\exp(\hat{y} + \hat{\sigma}/2)$, where $\hat{\sigma}$ is the estimated standard error of the regression residuals. The calculated smearing correction factors for the western and eastern models were 2.476 and 1.83, respectively. The naive correction factor (the estimated error variance divided by two) was 1.137 for the western model and 0.639 for the eastern model.

Predicted costs using the two correction methods and with no bias correction were generated and compared using the (out-of-sample) 2005 data. For both models, summary measures such as root mean square error (RMSE) indicated that the results with no bias correction produced better estimates, with the smearing estimator coming in second, and the naive correction coming in third. The RMSE for the uncorrected predictions was \$54, for the smearing estimator it was \$69, and for the naive estimator it was \$86. For the eastern model, the RMSE for the uncorrected predictions was \$35, for the smearing estimator it was \$59, and for the naive estimator it was \$61. These results indicate that, in practice, for the models developed in this study, the uncorrected predictions produce better predictions for the 2005 data. However, this result will not necessarily be true for other samples, and the theoretical bias and inconsistency of the uncorrected predictions still holds.

Another issue to recognize when using these models for predicting suppression expenditures is the large confidence intervals for the predictions that follow primarily from the large residual variation in costs. For instance, for the FY 2005 fires, the mean predicted value was \$317/ac with a ± 1 SD (68%) range of \$88–1,132. This large range in predicted costs must be recognized when using these models for wildland fire decision support.

Discussion

In this study we found statistical evidence that factors often used to explain high and rising costs of fire suppression do indeed seem to be an important determinant of fire expenditures. Variables related to fire risk or potential such as FIL and ERC were positively related to fire expenditures, and in the case of FIL, had a large effect on cost per acre. Wildland-urban interface issues also were found significantly related to fire expenditures in the West. As the total housing value within 20 mi of the fire ignition point increases, cost per acre increases. Characteristics such as housing value, however, are not really under the control of land managers. It would be useful to start collecting data on other factors that may be alterable to see their effect on suppression expenditures. Examples might include condition class: primary objectives of fire suppression (why is the fire being suppressed) that could include categories such as protecting lives, protecting property, preventing spread onto another agencies land, protecting threatened and endangered species habitat, and so on, ranked by importance; location of past fuel treatments; amount of effort expended on structure protection; road access; resources used—not just type and number, but hours; and information on the incident management team type assigned to the fire.

Additionally, improvements in the data would likely improve the estimates and add to our understanding of the factors influencing suppression expenditures. Such improvements might include developing a truly interagency fire occurrence data system with links to the financial system and more spatially explicit data that includes fire perimeter information and fire characteristics over a broader landscape than just at the fire ignition point.

Equations such as those developed in this study could be used to flag outliers or fires with extremely high or low costs compared with what would be expected, as we did for the FY 2005 fires. By further reviewing these fires, more information may be obtained on the issues associated with suppression expenditures on large wildland fires. This could lead to the identification of other data that could be easily collected on wildfires and lead to improvements in estimates of wildland fire expenditures. However, it also is possible that the review of such fires could lead to the identification of policy or political issues that need to be dealt with before large gains in containing suppression expenditures can be realized.

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Corrigendum

Factors influencing large wildland fire suppression expenditures

Jingjing Liang, Dave E. Calkin, Krista M. Gebert, Tyron J. Venn and Robin P. Silverstein

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The authors wish to alert readers of the following technical errors.

The final paragraph in the right column of p. 655 should read as follows (changed values underlined):

From the sensitivity analysis of the final model (Fig. 6), with the average fire size (925 ha), suppression expenditures dramatically increased as the proportion of private land within the burned area increased from 0 to 20%. Suppression expenditures peaked at approximately US$3 million with 20% of private land. As this percentage continued to increase, suppression expenditures started to slowly decline and stabilised in the neighbourhood of US$1 million. With the average percentage of private land within burned area (10%), suppression expenditures increased monotonically from approximately US$280 000 to US$28 million, as fire expanded in size from 148 to 22 000 ha. The independent variables explained 58% of the variance of the dependent variable.

Table 2 should read as follows (changed values underlined):

Table 2. Summary of regression models to predict fire suppression expenditures
See Table 1 for definition of variables. F, F-value for statistical significance of the regression equation; *, $P < 0.05$; **, $P < 0.01$; Significance level (P) of the overall fit; R^2, coefficient of determination adjusted for the number of parameters

Model	Estimated right hand side of equations	F	P	R^2	DW
1	$6.10^{**} + 1.01^{**} \times A$	50.03	0.00	0.33	1.16
2	$9.53^{**} + 0.66^{*} \times A - 0.43 \times PR$	26.88	0.00	0.34	1.14
3	$\underline{5.41}^{**} + \underline{0.96}^{**} \times A + 0.06^{**} \times P + 0.04 \times V + \underline{0.11} WUI$	23.86	0.00	0.48	1.41
4	$5.58^{**} + 0.99^{**} \times A + 0.07^{**} \times P$	46.74	0.00	0.48	1.48
5	$1.11 + 0.85^{**} \times A + 0.06^{**} \times P + 0.03 \times S + 0.01 \times PP + 0.42 \times SA + 159.47 \times PA + 0.07 \times MS + 0.01 \times RS - 2.21 \times FL + 0.13 \times FF - 1.86 \times SL^{*} + 0.26 \times AS - 0.36 \times EL + 80.90 \times R$	8.08	0.00	0.50	1.55
6	$5.48^{**} + 0.92^{**} \times A + 0.36^{**} \times P - 0.01^{**} \times P2 + \underline{0.0001}^{**} \times P3$	34.54	0.00	0.58	1.72

Fig. 6 should be as follows (note change of scale on *y*-axes):

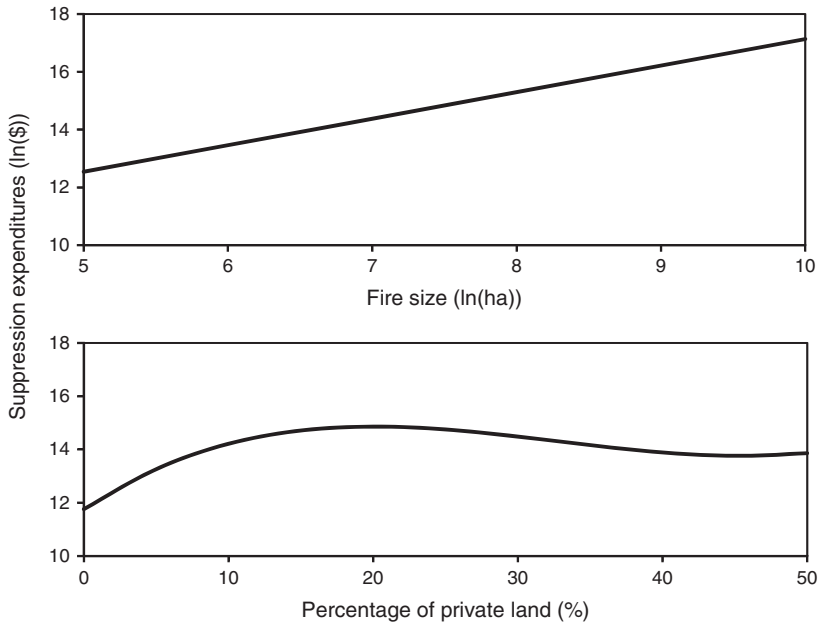

Fig. 6. Controlled effect of fire size (natural logarithm of hectares), and percentage of private land within fire perimeter (%) on total fire suppression expenditures (natural logarithm in 2005 US dollars) of the final model (see Table 2). An explanatory variable varied between its smallest and largest observed values while the other variable was held constant at its sample mean.

We thank Joe Fargione for helping us to discover these errors.

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Factors influencing large wildland fire suppression expenditures

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Abstract. There is an urgent and immediate need to address the excessive cost of large fires. Here, we studied large wildland fire suppression expenditures by the US Department of Agriculture Forest Service. Among 16 potential non-managerial factors, which represented fire size and shape, private properties, public land attributes, forest and fuel conditions, and geographic settings, we found only fire size and private land had a strong effect on suppression expenditures. When both were accounted for, all the other variables had no significant effect. A parsimonious model to predict suppression expenditures was suggested, in which fire size and private land explained 58% of variation in expenditures. Other things being equal, suppression expenditures monotonically increased with fire size. For the average fire size, expenditures first increased with the percentage of private land within burned area, but as the percentage exceeded 20%, expenditures slowly declined until they stabilised when private land reached 50% of burned area. The results suggested that efforts to contain federal suppression expenditures need to focus on the highly complex, politically sensitive topic of wildfires on private land.

Additional keywords: cost containment, fire economics, geostatistics, hierarchical partitioning, hypothesis test.

Introduction

There is an urgent and immediate need to address the excessive cost of large fires. The United States' federal expenditures on wildfire suppression have dramatically increased in recent years. Since the new millennium, the federal government has spent on average over US$1 billion per year on suppression, while its annual expenditures from 1970 to 2000 averaged below US$400 million (all expenditures in 2005 US dollars). As suppression expenditures come to represent a higher portion of federal land management agencies' flat budgets, less money will be available for other management responsibilities. The recent extreme fire seasons and associated high costs have brought about intense public concern for reform of federal firefighting strategies and policy (Calkin *et al*. 2005).

Despite the urgent need to address the factors influencing suppression expenditures, previous studies were limited. Gonzalez-Caban (1984) pioneered fire suppression expenditures study by addressing costs of mopping up wildfires with data collected from a questionnaire. Donovan *et al*. (2004) attempted to identify factors that influenced suppression expenditures in Oregon and Washington. Their regression analysis of 58 fires from 2002 ranging in size from 10 to 20 000 ha showed that only fire size and extreme terrain conditions are significant. Gebert *et al*. (2007) compiled a much larger dataset of US Department of Agriculture (USDA) Forest Service fires in the western United States (Forest Service Regions 1 through 6). They estimated a predictive suppression expenditures model and discovered, among other things, that higher home value within 32 km of a fire ignition increases total fire cost. However, the absence of fire perimeter records made their results susceptible to spatial errors.

It is appropriate for a study of federal fire suppression to focus on Forest Service expenditures on large fires. According to the Office of Inspector General (OIG) of USDA, the Forest Service is 'a major partner in the Federal wildland fire management community', and 'currently controls nearly two-thirds of all Federal fire management resources' (USDA OIG 2006, p. 1). Fires larger than 121 ha (300 acres), although representing only 1.4% of all wildland fires, are responsible for 93.8% of the suppression expenditures in the USA from 1980 to 2002 (USDA Forest Service *et al*. 2003).

It has been widely agreed that fire size is an obvious spatial factor in increasing suppression expenditures (Gonzalez-Caban 1984; Steele and Stier 1998; Donovan *et al*. 2004; Gebert *et al*. 2007). As fire spreads, a higher level emergency-response team is typically organised, involving more labour and resources (USDA OIG 2006), and hence increasing suppression expenditures.

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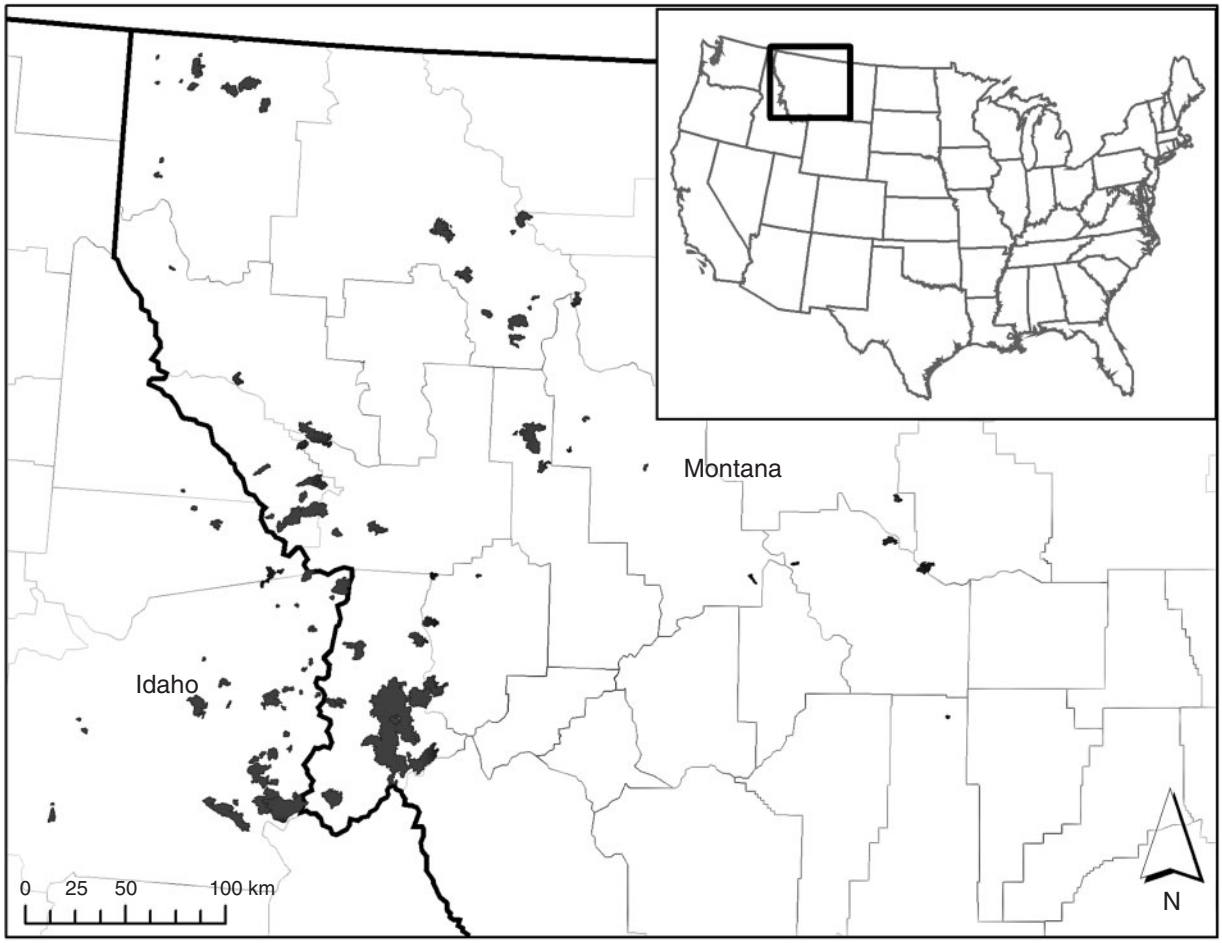

Fig. 1. Burned areas of the 100 large wildfires shown in dark shaded units and their relative location within the United States (inset), with county and state borders. Courtesy of E. B. Butler, Forestry Sciences Lab, USDA Rocky Mountain Research Station.

Private properties might also influence suppression expenditures. The OIG report states that '50 to 95% of the cost for many large wildfire suppression operations derived directly from protecting private property' (USDA OIG 2006, p. ii), and requests congressional clarification regarding the Forest Service's role in protecting private properties. In this highly politicised environment, understanding how private properties at risk affect suppression expenditures is critical for federal agencies to address cost containment issues. Land ownership, structure value, and wildland–urban interface could all represent private properties. However, which one has the greatest influence on suppression expenditures is not yet known.

The objective of the present study was to test the effects of private properties and other non-managerial factors on suppression expenditures. Non-managerial factors were spatial explicit elements of a fire representing its size and shape, geographic settings, forest and fuel conditions, and jurisdiction of the burned area. Non-managerial factors, as opposed to managerial factors, were not subject to the attitude and experience of fire management teams. Unless otherwise stated, suppression expenditures in the current paper refer to total Forest Service suppression cost for a wildland fire.

Data

We investigated 100 wildfires suppressed by the Forest Service from 1996 to 2005 within the Northern Rocky Mountains. All the fires were larger than 121 ha. The high proportion of federal land and sparse population in the Northern Rockies allowed evaluation of both interface fires and more remote wilderness fires (Fig. 1). Wildland Fire Use (WFU) fires, those managed for resource benefit, were not included in this analysis.

For each of these fires, we obtained total Forest Service suppression expenditures (C), which were costs of resources outlaid by the Forest Service in order to suppress wildland fires. The expenditures data were collected from the Forest Service accounting systems based on methods described in Gebert *et al*. (2007). The natural logarithm of suppression expenditures was studied to mitigate the influence of extremely large numbers and heteroskedasticity, as recommended by Wooldridge (2000).

We defined 17 spatially explicit variables that were most likely to influence these suppression expenditures. The variables were classified into the following groups: fire size and shape, private properties, public land attributes, forest and fuel conditions, and geographic settings (Table 1). Fire size (A) represented

Table 1. Definition, mean, and standard deviation (s.d.) of all variables
Unless otherwise stated, all independent variables were obtained within the fire perimeter. UTM, Universal Transverse Mercator coordinates

Variable	Description	Unit	Mean	s.d. ($n = 100$)
C	Suppression expenditures in 2005 US dollars	ln($)	13.00	2.38
Fire size and shape				
A	Total area	ln(ha)	6.83	1.37
PR	Perimeter to area ratio	10^{-3} m^{-1}	2.35	1.37
Private properties				
P	Percentage of private land	%	10.07	14.17
V	Total structure value (2005 US$) within an 8-km buffer surrounding the fire perimeter	ln($)	11.51	6.28
WUI	Percentage of the wildland–urban interface area within an 8-km buffer surrounding the fire perimeter	%	5.84	8.21
Public land attributes				
S	Percentage of state land	%	0.94	2.11
PP	Percentage of public priority areas	%	0.23	0.37
Forest and fuel conditions				
SA	Surface-area-to-volume	10^3 m^{-1}	4.84	0.37
PA	Packing ratio		1.53	0.40
MS	Moisture content	%	22.97	1.46
RS	Rate of spread	m h^{-1}	241.00	73.13
FL	Flame length	m	1.28	0.15
FF	Fine fuel load	t ha^{-1}	7.99	2.77
Geographic settings				
SL	Percentage of burned area that is less than 35% slope	%	52.43	25.29
AS	Percentage of burned area with a northern aspect (±45° from north)	%	22.75	14.64
EL	Average elevation of burn area	10^3 m	1.69	3.39
R	Percentage of burned area with road access[A]	%	0.002	0.003
Fire central point				
x	Easting of UTM coordinates	10^6 m	0.56	0.15
y	Northing of UTM coordinates	10^6 m	5.19	0.11

[A]Any point within 12.5 m from a road was considered with road access.

the burned area within the fire perimeter. The data were obtained directly from fire history polygons in Smail (2007). For the same reason as the suppression expenditures, the natural logarithm of burned area was used. Fire shape, represented by perimeter to area ratio (*PR*), was also obtained directly from Smail (2007). In addition, we located fire central points in these polygons, and converted their graticule coordinates to Universal Transverse Mercator (UTM) coordinates (Snyder 1987), in order to detect distance-related spatial effect (Gooevaerts 1997) of suppression expenditures.

Land jurisdiction represented the percentage of land within the fire perimeter under various ownerships. Jurisdiction maps were taken from the official state websites of Montana[A] and Idaho[B]. The jurisdiction of each fire polygon was classified into three categories: private, state, and federal, all in percentage of land, and added up to 100%. Private jurisdiction (*P*) covered private, city, tribal, and non-profits land, whereas state and federal jurisdiction represented state- and federal-owned land, respectively.

Total structure value (*V*) and wildland–urban interface area (*WUI*) were measures of private development and high-valued resources. Total structure value came from the average tract-level home value multiplied by the number of structures. The average tract-level home value was taken from the official website of the US Census Bureau[C], and the number of structures was obtained from cadastral data[D], which represented the real property of Montana and Idaho, including the presence of residential structures. Percentage of wildland–urban interface area was obtained directly from the National wildland–urban interface (WUI) layers of 2000 (Radeloff *et al*. 2005). Total structure value and percentage of the wildland–urban interface area were taken within the perimeter and an 8-km buffer surrounding the final perimeter for the following reasons. First, high-valued resources threatened by a fire, but not contained within the final fire perimeter, might influence suppression effort and therefore total suppression expenditures. Second, successful fire containment lines might often be built adjacent to the location of high-valued resources.

[A]See http://nris.mt.gov (accessed 22 May 2006).
[B]See http://www.idwr.idaho.gov (accessed 22 May 2006).
[C]See http://www.census.gov/ (accessed 29 June 2006).
[D]Available at http://nris.state.mt.us/nsdi/cadastral/ for Montana and http://gis.idl.state.id.us/website/idl for Idaho (accessed 15 August 2006).

Spatially explicit Forest Service Region One Restoration and Protection Priority Areas (*PP*; Forest Service Region One Management Team, unpubl. data), were used to identify the public resource lands of high priority including sensitive wildlife habitat, old-growth forest structure, sensitive watershed, and public land interface (Forest Service Region One Geospatial Service Group, unpubl. data).

Surface-area-to-volume (*SA*), packing ratio (*PA*), moisture content (*MS*), rate of spread (*RS*), flame length (*FL*), and fine fuel load (*FF*) represented forest and fuel conditions within fire perimeter. They were obtained from the National LANDFIRE map (Rollins and Frame 2006), and the corresponding fire behaviour models (Scott and Burgan 2005). For simplicity, forest and fuel conditions were based on normal local weather conditions.

Data for slope (*SL*), aspect (*AS*), elevation (*EL*), and road access (*R*) came from the US Geological Survey (USGS) website[E]. *SL* represented percentage of burned area with less than 35% of slope. Most forest machines and suppression resources have difficulty operating on slopes steeper than 35%, and hence suppression may be more difficult when slope is over 35%. Extreme terrain was identified by Donovan *et al*. (2004) and Gebert *et al*. (2007) as increasing suppression cost.

Methods

We recognised that fire size was a significant factor contributing to suppression expenditures. To identify the other important factors influencing suppression expenditures, the hierarchical partitioning (HP) method (Chevan and Sutherland 1991) was used to detect the relative importance of all the explanatory variables in terms of the contribution to the goodness-of-fit of suppression expenditures. The HP was conducted with the *hier.part* package (Mac Nally and Walsh 2004) in the R system (R Development Core Team 2006). Variables with the highest contribution were selected, and their uncontrolled effect was analysed in separate univariate regressions. Because contribution to the goodness-of-fit did not imply causality, we needed to study the effect of each factor for statistical significance and policy implications when all the other factors were controlled for.

The controlled effect of all the variables was examined with a series of tests, following three principles that assured rigour and efficiency: (1) variables selected by the HP method had testing priority, because they were most capable of explaining the variation of suppression expenditures; (2) the overall significance of a category were tested before testing the significance of single variables; and (3) if a category was not significant, all its underlying variables were discharged; otherwise, variables within a category were tested in order of increasing significance and removed one at a time, until all remaining variables were significant at the $\alpha = 0.05$ level. A Student's *t*-test (Gosset 1908) was used to test the significance level of a single variable, and an *F*-test (Fisher 1925) was used to test the combined significance level of more than one variable.

Having identified the variables with significant controlled effect, we explored their cubic polynomials to allow for nonlinearity. A parsimonious final model was obtained by removing all the insignificant terms. To check if the final model met the assumptions of Ordinary Least Squares (OLS), the normality and independence of residuals were examined.

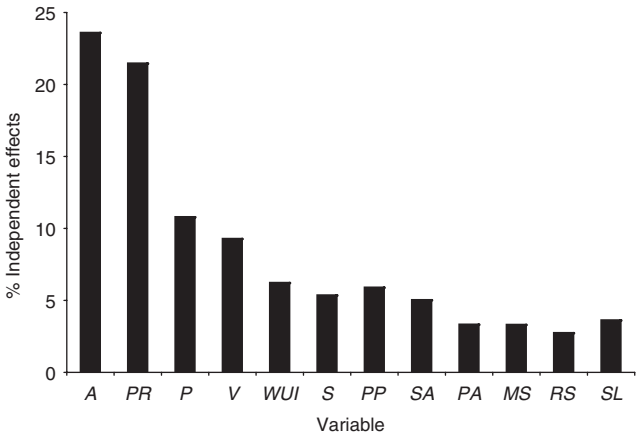

Fig. 2. Contribution of explanatory variables to the goodness-of-fit of suppression expenditures. The goodness-of-fit was measured with the coefficient of determination, R^2. See Table 1 for definition of variables.

To test for spatial autocorrelation effects across fires, as well as for large-scale spatial patterns, likely caused by weather and unaccounted fuel factors, we re-estimated the final model by the Generalised Least-Squares (GLS) method with *geoR* (Ribeiro and Diggle 2004), an open-source package for geostatistical analysis to be used as an add-on to the R system. The spatial autocorrelation of residuals, if any, was assumed to be isotropic and spherical (Cressie 1993). If the semivariogram (Cressie 1993) of the residuals was not associated with distance between fires, the residuals were not spatially autocorrelated and thus our final model could be estimated by OLS. After a thorough examination of the final model, we performed a sensitivity analysis for each variable in the model to find out how suppression expenditures responded to the change in each explanatory variable, while all other variables were kept constant at their sample means.

Results

With the HP method, we estimated fire suppression expenditures with all possible combinations of the explanatory variables, i.e. with all candidate models, and obtained the contribution of each explanatory variable to the goodness-of-fit of suppression expenditures. Compared with all the other variables, fire size (*A*), perimeter to area ratio (*PR*), percentage of private land (*P*), and total structure value (*V*) had substantially higher independent effects. These four variables contributed 65% of the goodness-of-fit, whereas the remaining 12 variables contributed only 35% in total (Fig. 2).

When analysed in separate univariate regressions, the same four variables had exclusively a strong effect on suppression expenditures ($P < 0.01$). Expenditures were positively correlated with fire size (*A*) (Fig. 3*a*), which was consistent with previous studies. In addition, expenditures were negatively associated with perimeter to area ratio (*PR*) (Fig. 3*b*), and positively correlated with percentage of private land (*P*) and total structure value (*V*) (Fig. 3*c*, *d*).

[E] See http://seamless.usgs.gov (accessed 6 June 2006).

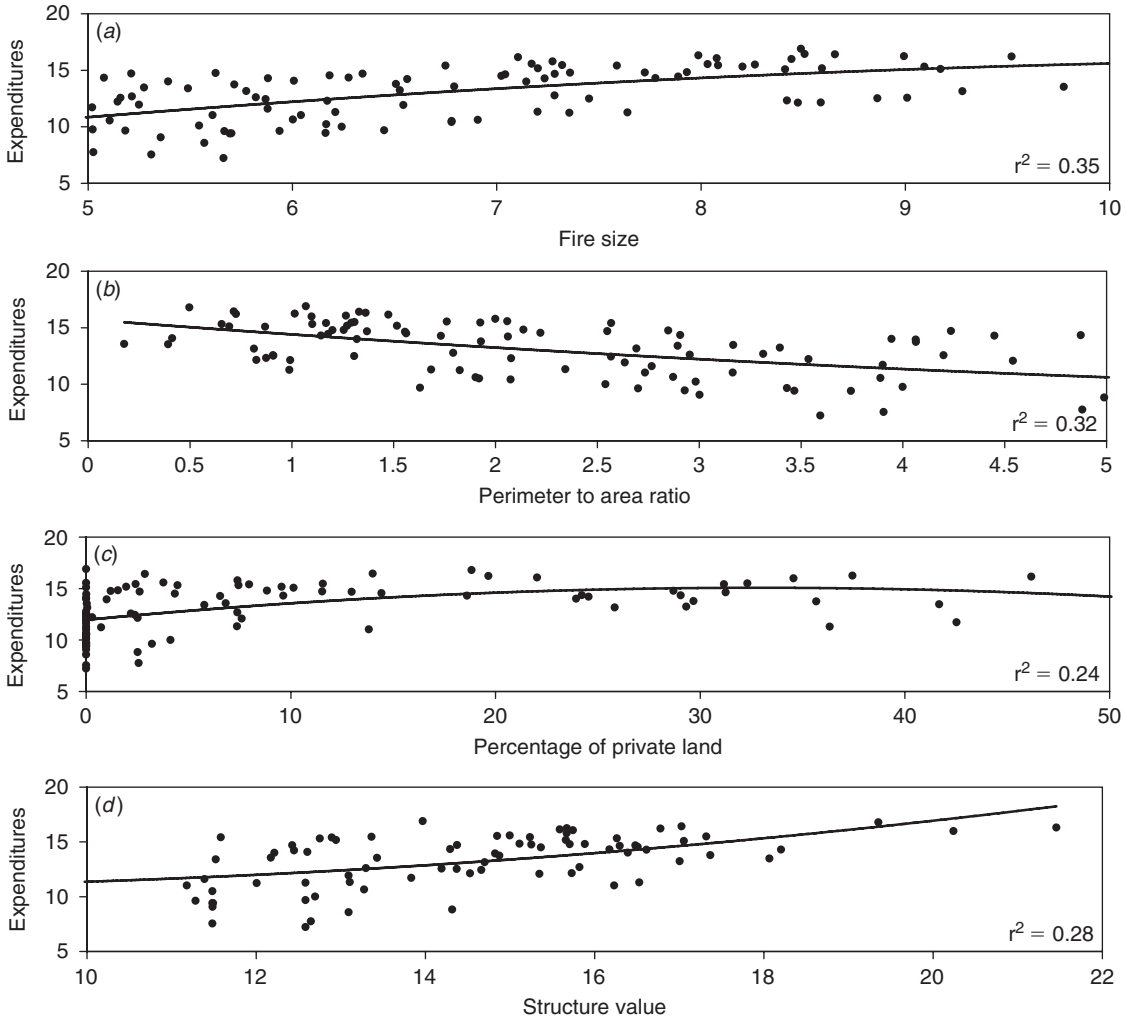

Fig. 3. Dependence of total fire suppression expenditures (natural logarithm in 2005 US dollars) of large fires in Forest Service Region One between years 1996 and 2005 on fire size (natural logarithm of hectares) (*a*); fire perimeter to area ratio (10^{-3} m^{-1}) (*b*); percentage of private land within fire perimeter (%) (*c*); and total structure value within 8 km of the fire perimeter (*d*). Curves shown were simple asymptotic functions fitted to the data (see Model 1). More complex curves did not provide significantly better fits. All curves were highly significant ($P < 0.001$).

In the basic model, we recognised fire size (A) as a significant spatial factor of suppression expenditures:

$$C = \alpha_0 + \alpha_1 A + e \quad (1)$$

where α values were estimated by OLS, and e were normally distributed residuals.

The controlled effects of various spatial factors were then tested in the following hypotheses:

Hypothesis 1

The effect of perimeter to area ratio (PR), given fire size (A) was in the model, was insignificant [H_0^1: $\beta_2 = 0|\beta_1$]:

$$C = \beta_0 + \beta_1 A + \beta_2 PR + e \quad (2)$$

where β values were estimated by OLS, and e were normally distributed residuals.

The estimated parameters of Model 2 are summarised in Table 2. As perimeter to area ratio (PR) was not significant at the 5% level, there was no evidence to reject H_0^1. Therefore, suppression expenditures were not decided by the fire shape, given fire size was considered.

Hypothesis 2

Private properties had no effect on suppression expenditures, given fire size was in the model [H_0^2: $\gamma_2 = \gamma_3 = \gamma_4 = 0|\gamma_1$]:

$$C = \gamma_0 + \gamma_1 A + \gamma_2 P + \gamma_3 V + \gamma_4 WUI + e \quad (3)$$

where γ values were estimated by OLS, and e were normally distributed residuals.

This hypothesis was tested with an F-test in which the residual sum of squares from Model 3 was compared with Model 1 (Table 2). H_0^2 was rejected by strong evidence ($P < 0.01$) from

Table 2. Summary of regression models to predict fire suppression expenditures
See Table 1 for definition of variables. *F*, *F*-value for statistical significance of the regression equation *, $P < 0.05$; **, $P < 0.01$, Significance level (*P*) of the overall fit; R^2, coefficient of determination adjusted for the number of parameters

Model	Estimated right hand side of equations	*F*	*P*	R^2
1	$6.10^{**} + 1.01^{**} \times A$	50.03	0.00	0.33
2	$9.53^{**} + 0.66^{*} \times A - 0.43 \times PR$	26.88	0.00	0.34
3	$5.47^{**} + 0.94^{**} \times A + 0.06^{**} \times P + 0.04 \times V + 0.01WUI$	23.86	0.00	0.48
4	$5.58^{**} + 0.99^{**} \times A + 0.07^{**} \times P$	46.74	0.00	0.48
5	$1.11 + 0.85^{**} \times A + 0.06^{**} \times P + 0.03 \times S + 0.01 \times PP + 0.42 \times SA + 159.47 \times PA + 0.07 \times MS + 0.01 \times RS - 2.21 \times FL + 0.13 \times FF - 1.86 \times SL^{*} + 0.26 \times AS - 0.36 \times EL + 80.90 \times R$	8.08	0.00	0.50
6	$5.48^{**} + 0.92^{**} \times A + 0.36^{**} \times P - 0.01^{**} \times P^2 + 0.001^{**} \times P^3$	34.54	0.00	0.58

the *F*-test. At least one private property variable had significant effect on suppression expenditures. As percentage of private land (*P*) was highly significant in Model 3, while total structure value (*V*) and percentage of the wildland–urban interface area (*WUI*) were not, we hypothesised that the only private properties variable that mattered was percentage of private land. The hypothesis was tested as follows.

Hypothesis 3

Total structure value (*V*) and percentage of the wildland–urban interface area (*WUI*) had no effect on suppression expenditures, given fire size (*A*) and percentage of private land (*P*) were in the model $[H_0^3: \gamma_3 = \gamma_4 = 0 | \gamma_1, \gamma_2]$.

This hypothesis was tested with the *F*-test in which the residual sum of squares from Model 3 was compared with Model 4:

$$C = \zeta_0 + \zeta_1 A + \zeta_2 P + e \tag{4}$$

Because H_0^3 could not be rejected ($P = 0.38$), total structure value and percentage of the wildland-urban interface area did not matter, given fire size and percentage of private land were already in the model.

Hypothesis 4

Public land attributes, forest and fuel conditions, and geographic settings had no effect, given fire size (*A*) and percentage of private land (*P*) were in the model $[H_0^4: \delta_3 = \delta_4 = \cdots = \delta_{14} = 0 | \delta_1, \delta_2]$:

$$\begin{aligned} C = {} & \delta_0 + \delta_1 A + \delta_2 P + \delta_3 S + \delta_4 PP + \delta_5 SA + \delta_6 PA \\ & + \delta_7 MS + \delta_8 RS + \delta_9 FL + \delta_{10} FF + \delta_{11} SL \\ & + \delta_{12} AS + \delta_{13} EL + \delta_{14} R + e \end{aligned} \tag{5}$$

where the δ values were coefficients estimated by OLS, and *e* were normally distributed residuals.

This over-sweeping hypothesis was tested with the *F*-test in which the residual sum of squares from Model 4 was compared with the one from Model 5. There was no evidence to reject H_0^4 ($P = 0.29$), meaning that when fire size and percentage of private land were considered, no other variables had significant effect on suppression expenditures. Slope (*SL*), although barely significant ($P = 0.05$) in Model 5, was not considered an influential factor of suppression expenditures, owing to its trivial contribution to the overall goodness-of-fit (Fig. 2). In summary, among all the variables considered here, only fire size and percentage of private land had significant influence on suppression expenditures.

The cubic polynomials of fire size (*A*) and percentage of private land (*P*) were tested, and the final model contained the first, second, and third order of percentage of private land, and the first order of fire size. No effect of interaction terms was found in the final model:

$$C = \eta_0 + \eta_1 A + \eta_2 P + \eta_3 P^2 + \eta_4 P^3 + e \tag{6}$$

where the η values were coefficients estimated by OLS, and *e* were normally distributed residuals. The model was subject to little influence from multicollinearity, as fire size (*A*) and percentage of private land (*P*) were not significantly correlated (Table 3).

As the semivariogram of the final model followed a flat line (Fig. 4), the variance of the residuals was not correlated with the distance between fires. There was no evidence for the spatial autocorrelation in the residuals of the final model. The residuals had an average of 0.00 and standard deviation of 1.52 (Fig. 5*a*). The Anderson–Darling normality test (Stephens 1974) shows that the residuals were normally distributed ($A^2 = 0.24$, $P = 0.76$). The residual plot (Fig. 5*b*) illustrates no obvious patterns. Although we detected no effect of distance in our data, caution is advised for studies of larger scale, because the last data point in Fig. 4 shows a significant increase in semivariogram when the distance between fires approached 420 km.

From the sensitivity analysis of the final model (Fig. 6), with the average fire size (925 ha), suppression expenditures dramatically increased as the proportion of private land within the burned area increased from 0 to 20%. Suppression expenditures peaked at approximately US$410 000 with 20% of private land. As this percentage continued to increase, suppression expenditures started to slowly decline and stabilised in the neighbourhood of US$120 000. With the average percentage of private land within burned area (10%), suppression expenditures increased monotonically from US$70 000 to US$1 700 000, as fire expanded in size from 121 to 22 000 ha. The independent variables explained 58% of the variance of the dependent variable.

Table 3. Correlation between suppression expenditures, fire size, percentage of private land, and other variables

See Table 1 for definition of variables. *, $P < 0.05$; **, $P < 0.01$ for test of significant difference of correlation from 0

	Pearson correlation and its level of significance		
	C	*A*	*P*
A	0.58**		
P	0.41**	0.03	
PR	−0.56**	−0.83**	−0.06
V	0.38**	0.23*	0.40**
WUI	0.27**	0.11	0.50**
S	0.24*	0.03	0.52**
PP	0.26*	0.10	0.16
SA	0.23*	0.07	0.41**
PA	0.11	0.14	−0.14
MS	0.04	0.08	−0.16
RS	−0.02	−0.04	0.12
FL	0.01	0.08	−0.23*
FF	−0.04	0.04	−0.31**
SL	−0.15	−0.02	0.08
AS	0.23*	0.21*	0.17
EL	−0.04	0.04	−0.15
R	0.44**	0.32**	0.24*

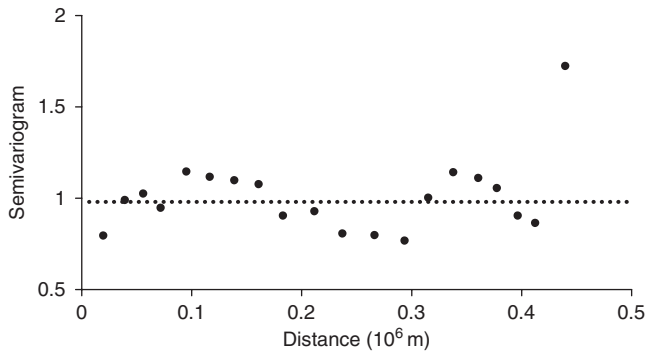

Fig. 4. Estimated semivariograms (dotted line) of the standardised residuals from the final model.

Discussion and concluding comments

The present study represented a thorough analysis of potential factors influencing Forest Service suppression expenditures. All the data were obtained within the fire perimeter, except that structure value and percentage of the wildland–urban interface area were obtained within the fire perimeter, and within an 8-km buffer surrounding the fire perimeter, representing adjacent but unaffected resource values. A model to predict suppression expenditures was suggested. Suppression expenditures were a function of the first, second, and third order of percentage of private land, and the first order of fire size, with no interaction terms. The residuals were normally distributed, and had no spatial autocorrelation.

The causal effects of private land and fire size in the present study were based on the notion of *ceteris paribus*, which means 'other factors being equal' (Wooldridge 2000, p. 13). Evaluated factors included fire size and shape, private properties, public land attributes, forest and fuel conditions, and geographic characteristics. As our data stretched over a vast area in the states of Montana and Idaho, we also controlled for the possible large-scale spatial autocorrelation. By holding other factors fixed, the effects of private land and fire size on suppression expenditures were independent from the effects of all other factors that we studied.

The positive effect of private land on suppression expenditures, although less than 20% of burned area was private (Fig. 6), indicated that private properties adjacent to public lands greatly increased fire suppression expenditures, and 'preserving life and property from the threat of fire' (36 CFR 211.5, Code of Federal Regulations) is carried out by the Forest Service in fire suppression. As private land exceeded 20% of burned area, the increase of suppression expenditures slowed down to zero, slightly declined afterwards, and finally levelled off at ∼50% of private land holdings. The reason for the decline was presumably the cost-share agreements between the Forest Service and the responsible state and local governments (USDA OIG 2006). As more private land was threatened by wildland fires, expenditures shared by the respective state and local governments (not considered in the model) likely represented a higher percentage of total suppression expenditures. According to our data, most fires with more than 20% of burned area as private land were close to towns. Although there was no established standard for identifying financial responsibilities through the cost-share agreements, as fires approached towns, local governments might have shouldered more responsibility in providing firefighting resources or in reimbursing the Forest Service for suppression expenditures. Unfortunately, further investigation of the cost-share agreement was very difficult. According to P. Garbutt[F] (pers. comm., June 2007), the cost-share agreements had been evaluated on a fire by fire basis and are linked to various predefined protection responsibilities.

How much predicative power did fire size and percentage of private land have on suppression expenditures? We measured the predicative power of one factor, when other factors were controlled, with generalised R^2 (Pedhazur 1997). The generalised R^2 was 0.40 for fire size, and 0.37 for percentage of private land. Both fire size and percentage of private land had similar predicative power on fire suppression expenditures. Because fire size is difficult to control after a fire has escaped initial attack, efforts to contain suppression expenditures may need to focus on the wildfires that threaten private land.

We found no evidence that the effect of fire size dominated in controlling suppression expenditures. In some previous studies (e.g. Gebert *et al*. 2007), average suppression expenditures per unit area were considered instead of total fire expenditures to avoid the overwhelming effect of fire size. Here, fire size contributed to only 25% of goodness-of-fit provided by all the explanatory variables (Fig. 2). Hence, fire size did not overwhelmingly control suppression expenditures, and there was no

[F] P. Garbutt is the USDA Forest Service Region One Assistant Director of Fire management.

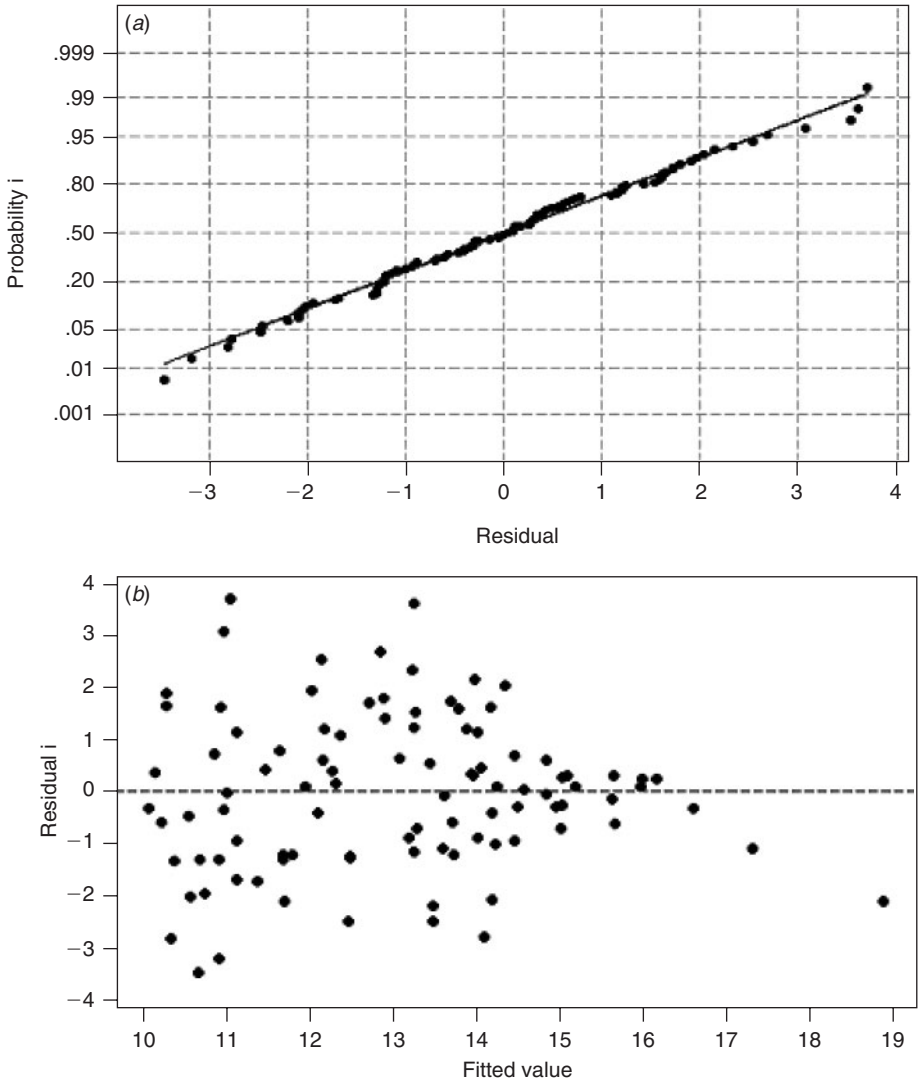

Fig. 5. Normal plot of residuals (*a*), and plot of residuals against fitted values (*b*) of the final model estimated from the 100 large fires in Forest Service Region One.

reason to study average expenditures per unit area instead of total expenditures. The lack of significant higher-order terms of fire size in the final model suggested that reduced average cost per unit area resulting from increasing fire size, as identified in Schuster *et al*. (1997) and Gebert *et al*. (2007), was not present in this sample.

Although the causal reasons of the effects of fire size and private land were obvious, why other explanatory variables had no effect on suppression expenditures was admittedly difficult to explain. Although we found no effect of forest and fuel conditions and geographic settings on wildland fire suppression expenditures, given that fire size and percentage of private land were accounted for, forest and fuel conditions and geographic settings could indirectly affect suppression expenditures through fire size, because fire size is determined by forest and fuel conditions and geographic settings (Finney 2004). Similarly, total structure value and percentage of the wildland–urban interface area could be indirect factors, as they also reflected private development, and were highly correlated with percentage of private land (Table 3). As percentage of private land was much more significant than total structure value and percentage of the wildland–urban interface area, it may imply that presence of private land, rather than value of structures, was of primary concern to the Forest Service. Current national WUI layers were less effective in representing private development in wildland fire studies, presumably owing to the low-resolution of national WUI layers, especially in rural areas. There was no evidence whatsoever that public land attributes affect suppression expenditures directly or indirectly.

The year 2006 saw intensified concern about the Forest Service paying a disproportionate share of fire expenditures to protect privately owned properties (USDA OIG 2006). The OIG report recommends congressional clarification of the role of the Forest Service in protecting private properties, and suggests

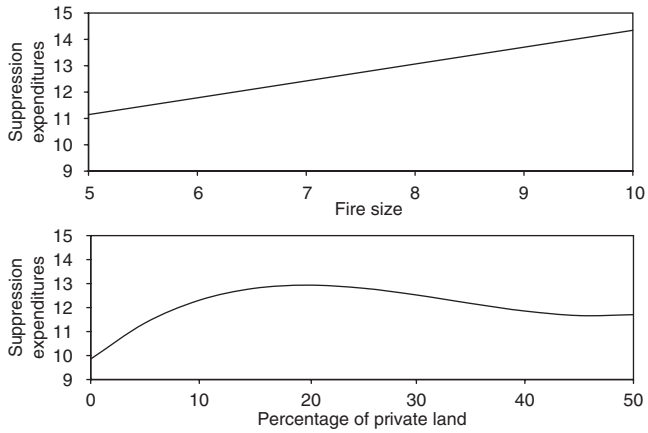

Fig. 6. Controlled effect of fire size (natural logarithm of hectares), and percentage of private land within fire perimeter (%) on total fire suppression expenditures (natural logarithm in 2005 US dollars) of the final model (see Table 2). An explanatory variable varied between its smallest and largest observed values while the other variable was held constant at its sample mean.

renegotiation between the Forest Service and non-Federal partners to ensure the suppression expenditures in private and WUI areas are appropriately shared. These recommendations could help shift expenditures from federal to state and local entities. However, they may have no effect on reducing total suppression expenditures. To this end, county zoning and development standards prohibiting further development in areas of high fire threat[G] may be most effective. In addition, activities promoted within Community Wildfire Protection Plans (CWPP, see USDA Forest Service *et al*. 2004), such as fire-wise building codes and localised fuel treatments, may allow suppression resources to be more cost-effectively employed in the interface area to protect development, thus reducing total suppression expenditures.

The present study was subject to the usual caveats due to the use of non-experimental data. On the positive side, the final model satisfied the OLS assumptions, and had no spatial autocorrelation. However, selecting the right model was a pervasive problem. To avoid compromised type-I error rates and severe artefacts commonly associated with model selection procedures (Mac Nally 2000), we selected a variable by its overall explanatory power and statistical significance.

The issue of fire suppression was undoubtedly complicated. Nonetheless, we found 58% of variation in suppression expenditures could be explained by spatial factors. Management factors, such as incident team type and fire experience of the responsible land managers, were not available for the present study, but may help in understanding the unexplained variation.

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How much do homes contribute to wildfire suppression costs?
Evidence from Oregon and California

January, 2012

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Abstract

This paper estimates the relationship between housing and fire suppression costs using wildfires in Oregon and California. Specifically, we investigated whether the presence of homes was associated with increased costs of firefighting after controlling for the effects of potential confounding variables including fire size, weather, terrain, and human factors such as road access. Our goals were to determine the robustness and generalizability of the effect of homes on wildfire suppression costs, and calculate an improved estimate of the homes effect by replicating methods used in a previous study with a smaller sample of fires. A total of 533 days of firefighting that occurred in 60 wildfires were analyzed. Linear mixed models with serial autocorrelation and error heterogeneity covariance structures were used to estimate the effects of homes on daily costs while incorporating within-fire variation in the response and predictor variables. Our models were based on data from I-Suite Cost Reports, Geographic Information System fire perimeters, and ICS-209 forms. We conclude that the expected increase in daily log cost with each unit increase in log homes count within 6 miles of an active fire is 0.05 ($p = 0.02$). Because this relationship describes log-transformed variables we state that the expected change in firefighting costs with each 1% change in the count of homes within 6 miles is 0.05%. The study adds to mounting evidence that increases in housing lead to increases in fire suppression costs, and demonstrates that policy makers can achieve future fire suppression cost savings by focusing attention on development patterns.

Introduction

The cost of fighting wildfires has become a major issue in the United States. Federal appropriations for all wildfire management activities have more than doubled in recent years, from an average of $1.2 billion annually during fiscal years 1996 through 2000 to more than $2.9 billion annually during fiscal years 2001 through 2007 (General Accounting Office [GAO] 2009). Spending related specifically to wildfire suppression has similarly doubled. The average annual USDA Forest Service emergency suppression spending was $1.1 billion in the 2000s, compared with $0.5 billion during the 1990s (Prestemon et al. 2010). This extraordinary investment of funds during the past decade was accompanied by more than 200 wildfire caused fatalities and the destruction of more than 10,000 structures (National Wildfire Coordinating Group Safety and Health Working Team 2011, National Interagency Fire Center [NIFC] 2011). Why have wildfires become so expensive and dangerous? Commonly suggested reasons include:

1. A build-up of fuels resulting in part from past fire suppression policies (Covington and Moore 1994, Caprio and Swetnam 1995, Moore et al. 1999),

2. Warming temperatures and drought conditions (Calkin et al. 2005, Westerling et al. 2006, Collins et al. 2006), and

3. The expansion of home development into fire prone landscapes (Snyder 1999, Canton-Thompson et al. 2006, GAO 2006).

However few quantitative studies have investigated the degree to which these factors affect wildfire suppression costs (Donovan et al. 2011). Without this information, existing policy remedies to address wildfire suppression costs are focused almost entirely on fuels treatments, ignoring the human dimension of wildfire costs (Stephens and Ruth 2005, Gude et al. 2008, Donovan et al. 2011). Although fuels management can reduce wildfire damages (Mercer et al. 2007), its effectiveness for reducing suppression costs has been questioned (Donovan and Brown 2007, Gude et al. in review). Better information on the factors affecting suppression costs is needed to guide future policies because the three major factors listed above as contributing to more expensive and dangerous wildfire seasons are unlikely to stop.

Gude et al. (2008) point out that, home construction in the western U.S. may increase future fire suppression costs dramatically since only 14 percent of the available wildland interface is currently developed. Climate change will likely exacerbate this effect. Nearly all climate models project warmer spring and summer temperatures across the West (Intergovernmental Panel on Climate Change 2001), leading to larger wildfires and longer fire seasons (Westerling et al. 2006; Running 2006). The combination of continued fuel build up, longer fire seasons, and increased development in fire prone areas may lead to future fire suppression costs substantially higher than what we have experienced in the past decade.

The escalating cost of wildfire management is germane not only because of taxpayer's pocketbooks, but also because a wide array of natural resource issues are affected as wildfires consume the majority of the managing agencies' budgets. In a 2008 memo, the Chief of the Forest Service stated that because the agency must fund the cost of wildfire suppression out of its total available funds, all other Forest Service activities have experienced a steady decline in funding (GAO 2009). In addition, the Forest Service and Interior agencies responsible for wildfire management have borrowed billions of dollars since 2000 from other programs to help pay for fire suppression (GAO 2009). Some of the

affected programs include construction and maintenance, the national forest system, state and private forestry programs, and land acquisition programs.

Wildfire problems related to homes have received national attention as more acres and homes are burned by wildfire (NIFC 2011). Homes have the potential to affect suppression costs in a variety of ways: by directly influencing the quantity of flame retardant and other resources required for home protection, and by influencing management decisions, such as whether the fire should be suppressed at all. When fire managers were asked what portion of the firefighting costs was attributable to the defense of private property, some estimated it ranged between 50 to 95 percent. However, only a handful of studies have empirically investigated the relationship between homes and suppression costs. This paper adds to the small body of literature, using wildfires in Oregon and California as case studies to estimate the relationship between housing and fire suppression costs. Oregon and California rank highest both in the area of undeveloped, forested private land bordering fire-prone public lands, and in the amount of forested land where homes have already been built next to public lands (Gude et al. 2008). These two states have experienced many historically significant fires in which hundreds of structures were destroyed per event (NIFC 2011). They offer ample opportunity to investigate the effect of homes on fire suppression costs. Specifically, this research investigates whether the presence of homes increases the cost of firefighting after controlling for the effects of potential confounding variables, such as fire size and terrain.

Literature Review

The wildland– urban interface (WUI), generally defined as areas where structures and other human development meet or intermingle with undeveloped wildland (Office of Inspector General [OIG] 2006), has experienced rapid growth in housing (Radeloff et al. 2005; Theobald and Romme 2007). The development of the WUI has been driven, in large part, by the phenomenon of people moving to areas of high natural amenities, sometimes called amenity migration (Moss 2006). Access to environmental amenities and public lands can be a primary determinant in choice of home location (Rudzitis 1999, 1996; Rasker 2006; Gude et al. 2006). Housing is becoming increasingly dispersed, particularly in areas rich in natural amenities, resulting in extensive land conversion adjacent to lakes, national parks, wilderness areas, seashores, and forests (Bartlett et al. 2000; Rasker and Hansen 2000; Radeloff et al. 2001; Schnaiberg et al. 2002; Radeloff et al. 2005; Gude et al. 2006; Gude et al. 2007). This trend is widespread in the United States (Johnson and Beale 1994; Johnson 1999), and is occurring in many other parts of the world as well, including the European Alps (Perlik, 2006, 2008), Norway (Flognfeldt 2006), Philippines (Glorioso 2006), Czech Republic (Bartos 2008), New Zealand (Hall 2006) and Argentina (Otero et al. 2006). WUI homes are often difficult to protect because of remoteness, steep slopes, narrow roads and the dispersed pattern of development. These characteristics can create dangerous situations for firefighters.

Five empirical studies have investigated the relationship between fire suppression costs and housing. One study failed to find an effect of housing on cost, and four studies found that housing was a significant predictor of costs. Donovan et al. (2008) studied a sample of 58 wildfires that occurred in Oregon and Washington in 2002, and failed to find a relationship between housing and fire suppression cost. The study estimated total costs from the 209 forms submitted daily by fire crews, which are known to be highly inaccurate (Gebert et al. 2007, personal communication Jaelith Hall-Rivera, Deputy Area Budget Coordinator, State and Private Forestry, U.S. Forest Service). Donovan et al. (2008) also acknowledged that the sample may not have contained fires that did not threaten homes, which may have made it difficult to detect an effect of homes on fire suppression costs.

Liang et al. (2008) studied U.S. Forest Service (USFS) wildfire suppression costs for 100 large wildfires occurring in the Northern Region (R1) of the USFS, and found that fire size, perimeter to area ratio, percentage of private land, and total structure value had substantially higher independent effects than all other measured variables. They found expenditures to be positively correlated with percentage of private land and total structure value. Gebert et al. (2007) studied a large sample of USFS wildfires in the western U.S., and found that variables having the largest influence on cost included fire intensity level, area burned, and total housing value within 20 mi of ignition. Gude et al. (in review) investigated 303 firefighting days for 27 USFS wildfires in northern California and the Sierra Nevada area and found that wildfire suppression costs were strongly related to the number and location of homes. The study concluded that, after controlling for the effects of potential confounding variables including fire size, terrain, and road access, a 0.07% change in firefighting costs is expected with each 1% change in the count of homes within 6 miles from the wildfire perimeter.

The goal of the analysis described in this paper was to:

1. Determine the robustness and generalizability of our previous estimate of the effect of homes on wildfire suppression costs by replicating the California study within Oregon, and

2. Calculate an improved estimate of the homes effect by repeating the analyses on the combined California and Oregon data.

Methods

Our data collection and model-building methodology followed the same protocol used in the California study (Gude et al. in review). This consisted of collecting data on daily wildfire costs, daily home counts, and a suite of potential confounding variables, and then building linear mixed models to estimate the effect of homes on costs while adjusting for the confounders and accounting for the multilevel structure of the data.

Response and Explanatory Data

Daily cost data were compiled from I-Suite Cost Reports. Wildfires for which the cumulative costs reported in I-Suite were ten percent less than those reported by the US Forest Service's financial system were eliminated from the sample. Data describing other daily fire characteristics were generated using Geographic Information System (GIS) perimeters available from the U.S. Geological Survey's Rocky Mountain Geographic Science Center website or were compiled from ICS-209 forms (Table 1).

All explanatory variables except "Percent Forest" were time-varying within fires. The explanatory variable used to represent the temporal progression of fires, "Percent Complete", was calculated by dividing the day of the observed data by the total number of days the fire was actively fought, and multiplying by 100. We chose to represent this variable as a percent so that it would be standardized between fires. Calculations of daily fire acres, road counts, and homes within 6 mi. (9.7 km) of wildfires involved the use of GIS daily perimeter files. The "Road Count" variable was set equal to the number of road segments that intersected each daily fire perimeter. The homes variable was calculated by summing the number of homes within a 6 mi. (9.7 km) radius around each daily fire perimeter. The locations of homes were determined from county tax assessor records joined to tax lot boundaries. Generation of the "Percent Forest" variable for each of the daily observations was too costly; therefore we used the most representative perimeter file per fire to calculate this variable. The other explanatory variables, including daily weather measurements and categorical variables representing growth potential and terrain difficulty, were used as reported in ICS-209 forms.

Table 1. Data collected for each day of firefighting for each of the 33 OR wildfires and 27 CA studied.

Data	Source
Total Daily Cost	I-SUITE
Percent Complete	I-SUITE
Fire Acres	GIS Perimeter Files
Percent Contained	209 Forms
Wind Speed	209 Forms
Temperature	209 Forms
Relative Humidity	209 Forms
Fire Growth Potential	209 Forms
Terrain Difficulty	209 Forms
Percent Forest	NASA MODIS Land Cover
Road Count	ESRI
Homes within 6 mi. (9.7 km) of wildfire*	Tax Assessor Records

*We originally hypothesized that homes within 1 mi. (1.6 km) of a fire would better explain firefighting costs. However, we found the zero-inflated distribution of this variable resulted in violation of distributional assumptions on model errors. Distributional assumptions were met by using the count of homes with 6 mi (9.7 km) of wildfires. This distance was also found to be influencial in a study of suppression costs in California (Gude et al. in review).

With the exception of grassland fires, the entire population of Oregon wildfires for which accurate data were available was included in the analyses. Just as in the Gude et al. (in review) California study, grassland fires were not included because we expected that firefighting strategies, and therefore the relationship between cost and homes, would differ substantially between grassland and forest fires.

The final Oregon dataset consisted of information on daily suppression costs and wildfire characteristics for 230 days of firefighting on 33 individual Oregon wildfires (Figure 1). In comparison, the final California dataset consisted of 303 days of information for 27 wildfires (Figure 2). Due to data availability, sample fires included only those in which the U.S. Forest Service was the primary agencies involved, with the exception of two Bureau of Land Management fires in Oregon. For both the Oregon and California datasets, the final sample included some wildfires that burned in areas where few or no homes were threatened, and some that burned through developed areas. This sample of fires allowed for a comparison between fires that threatened homes to varying extents.

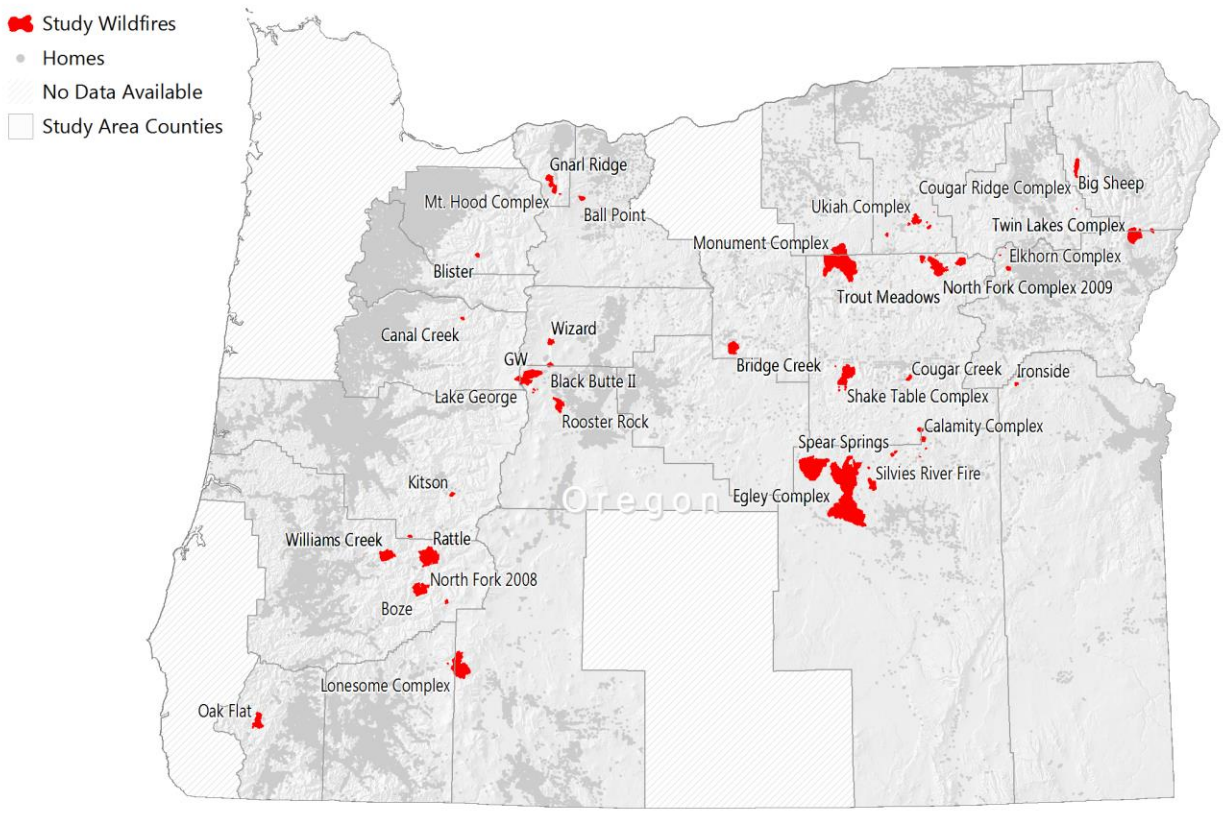

Figure 1. The locations of 33 Oregon wildfires included in this study are shown.

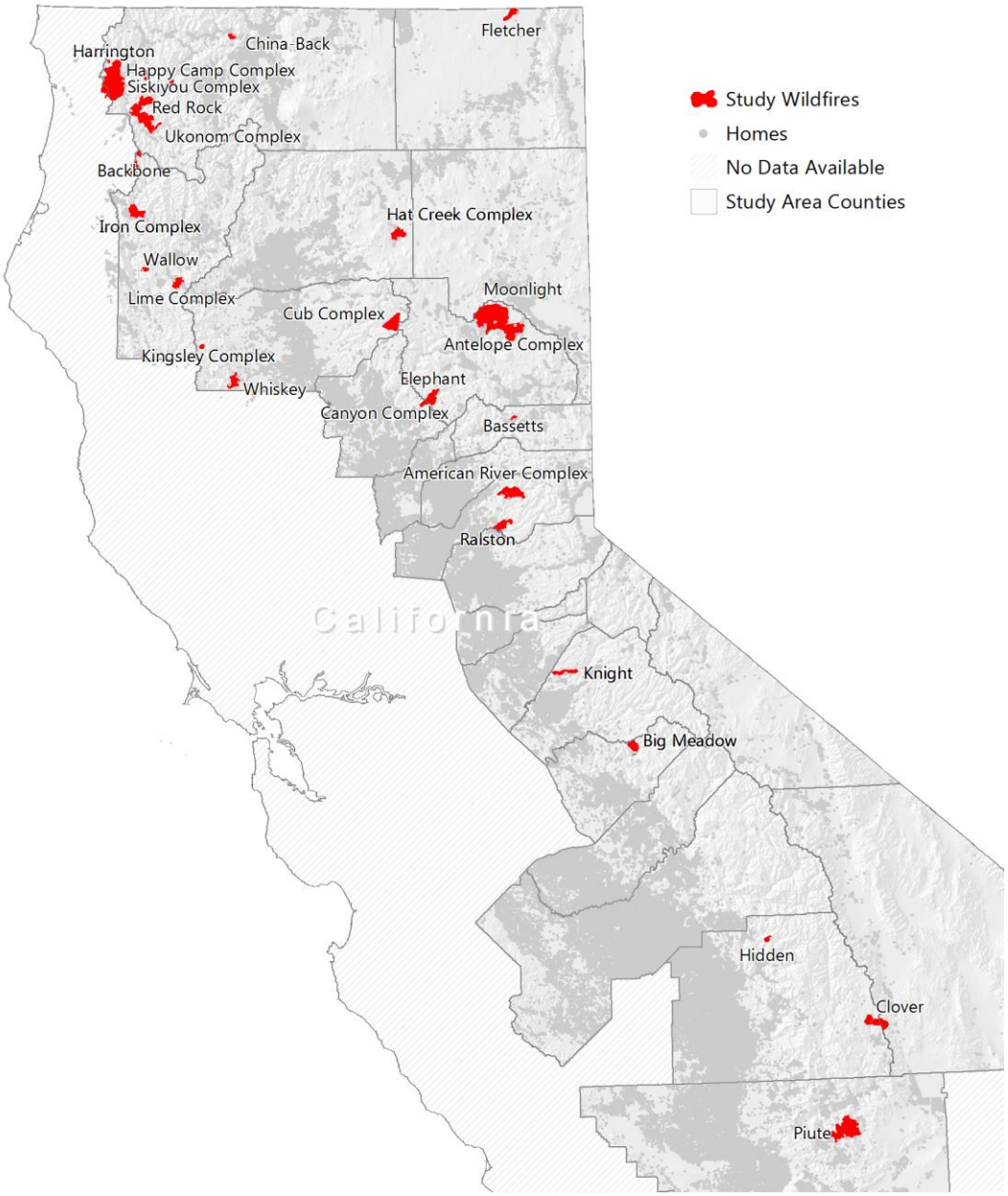

Figure 2. The locations of 27 California wildfires included in this study are shown.

Mixed Models

To accommodate the multilevel data structure (daily observations nested within fires) we chose linear mixed models (LMMs) to estimate paramaters of interest (Littell et al. 2006; Pinheiro and Bates 2000). Using matrix notation, LMMs are of the form

$$\begin{aligned}
&\boldsymbol{Y} = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{Z}\boldsymbol{u} + \boldsymbol{e} \\
&\boldsymbol{u} \sim N(\boldsymbol{0}, \boldsymbol{G}) \\
&\boldsymbol{e} \sim N(\boldsymbol{0}, \boldsymbol{R}) \\
&Cov[\boldsymbol{u}, \boldsymbol{e}] = \boldsymbol{0}
\end{aligned}$$

where Y is a vector of response values, X is a fixed-effects design matrix, ß is a vector of fixed effects, Z is a random-effects design matrix, u is a vector of random effects, and e is the vector of within-group errors. Because the only constraint on the G and R matrices is symmetric positive-definiteness, there is a great deal of flexibility in modeling the covariance structure of the response variable (Var[Y] = ZGZ' + R in contrast to OLS regression where Var[Y] is proportional to an identity matrix).

We first constructed a set of LMMs based on the Oregon data alone, and then another set based on the combined Oregon and California data. All models were built with the goal of drawing valid inferences on the element of ß associated with the effect of homes on firefighting costs. This required controlling for confounders, fitting the grouping and temporal correlation structures, and adding other terms needed to meet model assumptions. We used the gls and lme functions within the nlme packgage in the R statistical environment for all model fitting (Pinheiro et al. 2011, R Core Team 2011). Model parameters were estimated using maximum likelihood.

Model Building

We built all models following the protocol developed for the California analyses. We began by examining scatterplots of the response versus continuous predictors and chose transformations and higher-order terms to linearize relationships. We proceeded by adding fixed-effects terms for the potential confounding variables, the mean temporal structure, and the homes variable; these variables and a column of 1s for an intercept comprised the X matrix described above. Because daily observations were nested within fires, we added random intercepts for each fire into the Z matrix. We also examined lattice plots (Sarkar 2008) of costs over time within each fire to assess the need for random linear and quadratic slopes in time. As we added random terms, improvements to model fit were assesed by examining residual autocorrelation using ACF plots of the empirical autocorrelations across days within fires. We judged significance of autocorrelations based on plotted two-sided critical bounds (Pinheiro and Bates 2000 p. 241). We also used BIC (Schwartz 1978) and examination of within-fire residual diagnostic plots to determine if structuring the error covariance (R) with estimated variance heterogeneity and temporal correlation parameters improved model performance. Based on residual diagnostic plots and BIC values we chose appropriate variance and correlation structures from among those listed in Pinheiro and Bates' (2000) tables 5.1 and 5.3.

To assess statistical significance of fixed effects (**ß**) we used t-tests conditioned on the estimated random effects (Pinheiro and Bates 2000, p. 90). We set contrasts such that the two categorical

predictors (Terrain Difficulty and Growth Potential) were dummy-coded with coefficients representing differences from a baseline level. Terrain Difficulty had three levels and the two associated model coefficients represented the expected change from the Medium level to the High and Extreme levels. The Growth Potential variable had 4 levels and the associated coefficients represented expected changes from the Low level to the Medium, High, and Extreme levels.

In addition to drawing inferences based on the full models, we created models which were reduced based on two criteria. First, terms that were clearly confounders or were needed due to the data structure were not considered for removal -- these included variables measuring the fire size, the within-fire temporal component, and all covariance structures. The second criteria was that the p-value associated with the t-statistic for a predictor was greater than 0.2. We set the p-value cutoff at a high level because all variables were carefully chosen based on the belief that they had potential for confounding the effect of interest, and because we aimed to avoid biases induced by intensive data-driven model selection and an overly simplistic model structure (Hastie et al. 2009, Harrell 2001, Schabenberger and Gotway 2005, Vittinghoff 2005, Wolfinger 1993).

Results

In the Oregon sample of wildfires, the cumulative suppression cost per fire ranged from $1,073,010 to $21,057,784, with a mean of $7,580,465 (Table 2). The number of days the sample fires were actively fought ranged from 6 to 59, with an average of 20 days. The fires ranged in size from 1 to 294 square kilometers, with an average of 27 square kilometers. The average duration and size within our sample fires are representative of fires fought by federal agencies in Oregon.

The scatterplots of the response versus each of the predictors suggested natural log transformations of the Cost, Homes, Fire Acres, and Road Count variables adequately linearized relationships. The Homes and Road Count variables contained zero values and we added one to them prior to log transforming. Figures 3 and 4 provide detailed views of the marginal bivariate relationships between the log transformed costs and the log transformed homes count for the Oregon and combined datasets, respectively. The bivariate scatterplots and lattice plots of the response over time indicated a convex relationship, and we therefore added the square of Percent Complete to the fixed effects. All transformations were the same as those required in the California analyses.

Table 2. Summary data per fire for each of the 33 Oregon wildfires studied.

Fire	Cumulative Cost	Year	Agency	Firefighting Days	Days in Sample	Avg Size of Fire (sq.km.)	Avg Num. Roads Intersecting Fire	Avg Homes within 1 mi (1.6 km)	Avg Homes within 6 mi (9.7 km)
Ball Point	$3,075,788	2007	USFS	17	3	5	3	0	427
Big Sheep Ridge	$1,217,673	2009	USFS	10	3	13	17	1	141
Black Butte II	$3,080,983	2009	USFS	7	3	3	13	0	937
Blister	$5,726,503	2006	USFS	22	6	2	2	0	1
Boze	$7,019,985	2009	USFS	22	9	23	45	0	0
Bridge Creek	$4,410,206	2008	USFS	11	7	19	17	3	131
Calamity Complex	$3,652,755	2007	USFS	14	3	8	39	1	22
Canal Creek	$4,735,060	2009	USFS	11	7	1	2	0	0
Cougar Creek	$2,544,887	2009	USFS	10	4	3	0	2	593
Cougar Ridge	$1,657,848	2009	USFS	20	2	1	0	0	1
Egley Complex	$16,296,760	2007	USFS	19	10	294	695	4	64
Elkhorn Complex	$3,985,253	2006	USFS	15	4	4	2	11	404
Gnarl Ridge	$15,047,477	2008	USFS	28	7	11	7	3	130
GW Fire	$7,917,759	2007	USFS	23	4	26	45	0	700
Ironside	$1,667,362	2007	BLM	9	2	1	0	0	25
Kitson	$4,302,039	2008	USFS	13	4	3	7	0	44
Lake George	$12,367,001	2006	USFS	34	3	13	0	0	16
Lonesome Complex	$18,411,841	2008	USFS	55	26	41	15	0	3
Monument Complex	$11,634,250	2007	USFS	22	9	167	120	10	144
Mt. Hood Complex	$8,514,319	2006	USFS	25	9	5	3	0	14
North Fork Complex 08	$9,274,059	2008	USFS	24	8	2	1	0	9
North Fork Complex 09	$5,250,859	2009	USFS	59	5	14	3	0	8
Oak Flat	$18,738,968	2010	USFS	27	16	17	15	0	17
Rattle	$21,057,784	2008	USFS	37	20	50	39	5	18
Rooster Rock	$5,609,299	2010	USFS	9	5	19	95	4	2249
Shake Table Complex	$15,264,142	2006	USFS	24	7	42	19	5	65
Silvies River	$2,531,835	2008	BLM	8	4	13	4	1	13
Spear Spring	$1,073,010	2007	USFS	6	2	2	8	1	7
Trout Meadows	$6,569,023	2007	USFS	23	6	14	4	0	1
Twin Lakes Complex	$4,538,513	2006	USFS	17	10	35	38	22	206
Ukiah Complex	$4,356,664	2007	USFS	11	2	14	43	4	126
Williams Creek Fire	$14,630,640	2009	USFS	21	14	21	46	4	60
Wizard	$3,994,788	2008	USFS	12	6	5	32	0	232

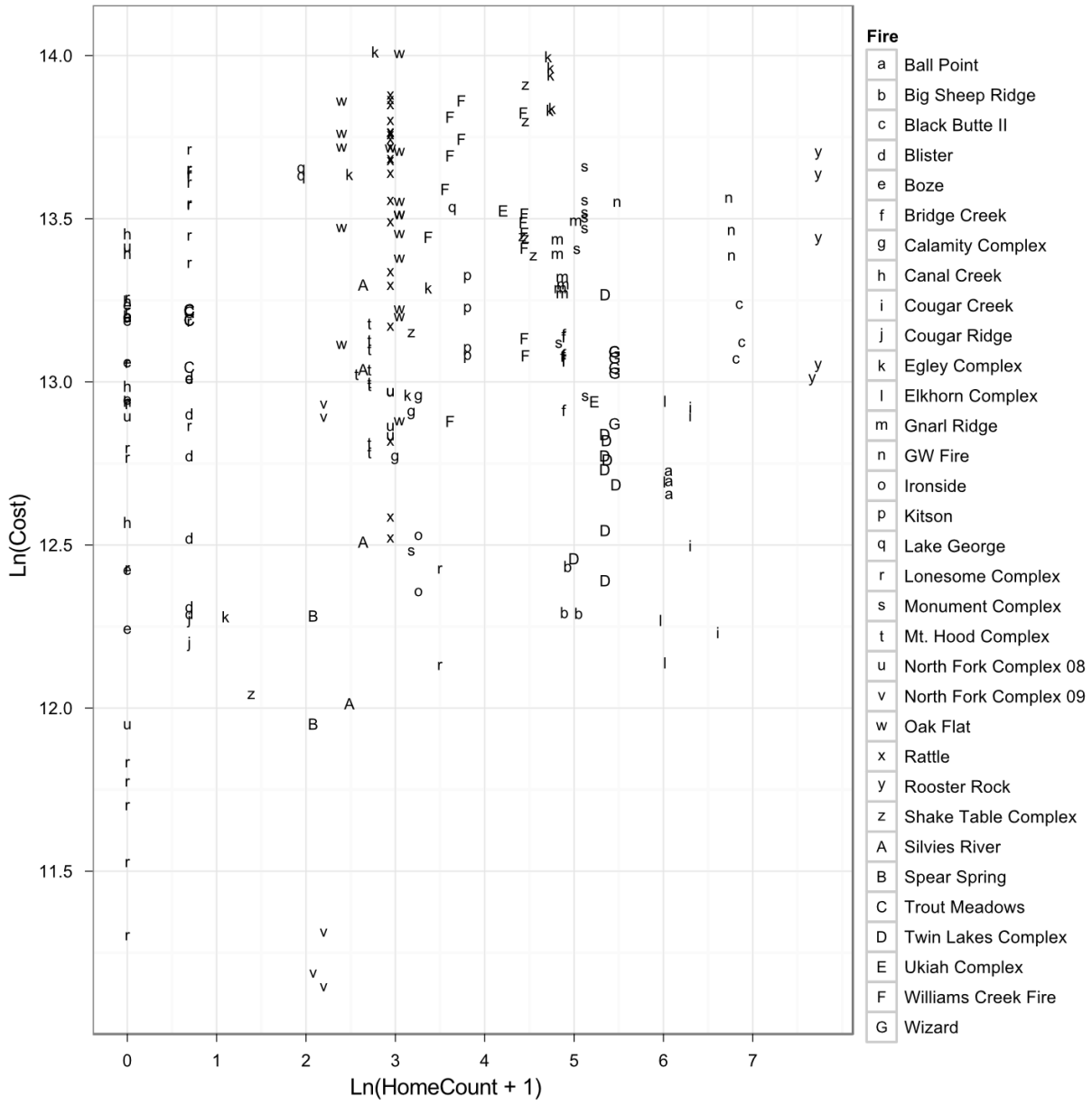

Figure 3. The log count of homes is plotted against the log daily costs in dollars for each day of firefighting within each of the 33 Oregon fires.

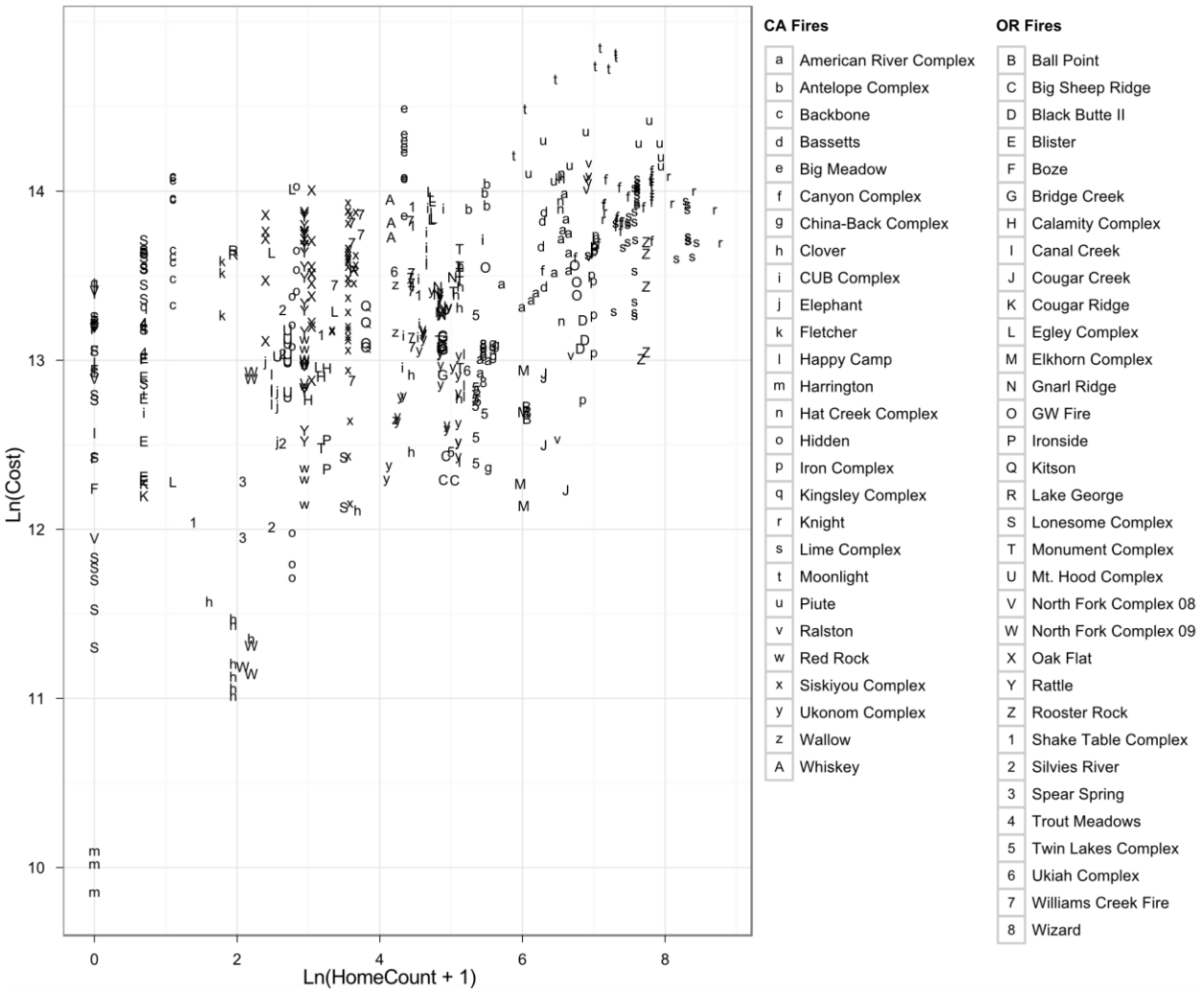

Figure 4. The log count of homes is plotted against the log daily costs in dollars for each day of firefighting within each of the 60 Oregon and California fires in the combined dataset.

Mixed Models

ACF plots of residuals from the models containing only fixed effects indicated high levels of within-fire autocorrelation, and we therefore structured the G and R matrices to account for the lack of independence. For the Oregon data, the BIC-selected method was to add random intercepts, random slopes for Percent Complete, and an AR1 within-fire error correlation structure[1]. For the combined Oregon and California data, the BIC-selected method was the addition of random intercepts, random slopes for Percent Complete, and an exponential within-fire error correlation structure[2]. For the Oregon data, the addition of these terms resulted in a BIC decrease of 387 points from the fixed-effects-only model, while for the combined data BIC decreased by 1076 (note that likelihoods and BIC values are not comparable between datasets).

After the addition of these terms there was no visible autocorrelation within the ACF plots for any of the models. However, for the model based on the combined data there was indication of decreasing variance with increasing fitted values, and we fit a power-of-the-mean variance structure[3] which lowered BIC another 41 points. We refer to the models completed at this stage as the "full models". The "reduced models" were created through the backward elimination process. For the Oregon data, this resulted in the elimination of the Wind Speed, Percent Forest, and Growth Potential terms. For the combined data, the Temperature, Wind Speed, and Percent Forest variables were removed.

Table 3 provides a summary of model estimates and inferences for the full and reduced models for the Oregon and combined datasets. The estimates of interest are highlighted, showing that the point estimates of the Homes effect range from 0.0454 for the reduced model on the combined data, to 0.0591 for the reduced model on the Oregon data. All estimates of the effect are statistically significant at the 0.05 level. Table 3 also indicates that within both datasets model reduction through backward elimination had little impact on the estimated effect size.

We draw concluding inferences based on the reduced model using the combined data. Because the response and predictor were each log transformed, the effect of interest is an elasticity. Therefore the expected change in firefighting costs with each 1% change in the count of homes within 6 miles is 0.045%. Using the reported standard error and a critical value from a t-distribution with 481 degrees of freedom, we conclude with 95% confidence that the true change in firefighting costs with each 1% change in the count of homes is between 0.009% and 0.081%.

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[1] Letting h denote the lag distance, the correlation between two model errors h days apart within a given fire is ρ^h, where ρ is the lag-1 correlation and takes values between -1 and 1 (Pinheiro and Bates 2000).

[2] Letting h denote the lag distance, the correlation between two model errors h PctComplete-units apart within a given fire is $\exp(-h/\varphi)$, where φ is the range of the correlation function (Pinheiro and Bates 2000).

[3] Letting v denote the model-fitted values, the error variances are modeled as $\sigma^2|v|^{2\delta}$, where δ is the parameter mediating the relationship between error variance and the fitted values (Pinheiro and Bates 2000).

Table 3. Inference statistics for fixed effects in the full and reduced mixed models predicting logged daily wildfire suppression costs.

	OR Full	OR Reduced	OR+CA Full	OR+CA Reduced
Intercept	12.0753***	12.2392***	12.3268***	12.1362***
	(0.4899)	(0.3856)	(0.3516)	(0.2603)
PctComplete	−0.0013	−0.0015	0.0024	0.0023
	(0.0027)	(0.0026)	(0.0021)	(0.0020)
PctComplete2	−0.0003***	−0.0003***	−0.0003***	−0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
LnFireAcres	0.0049	0.0034	0.0838*	0.0839*
	(0.0510)	(0.0486)	(0.0376)	(0.0370)
GrowthPotMedium	−0.0604		0.0319	0.0360
	(0.0622)		(0.0500)	(0.0497)
GrowthPotHigh	−0.0474		0.1767**	0.1696**
	(0.0709)		(0.0542)	(0.0529)
GrowthPotExtreme	−0.0076		0.1121	0.1135
	(0.1126)		(0.0656)	(0.0637)
TerrainMedium			−0.2173	−0.1880
			(0.1673)	(0.1655)
TerrainHigh	0.1720	0.1690		
	(0.1430)	(0.1379)		
TerrainExtreme	0.7290***	0.7387***	0.1163*	0.1005
	(0.1665)	(0.1573)	(0.0584)	(0.0557)
PctContain	−0.0027	−0.0024	−0.0013	−0.0013
	(0.0015)	(0.0014)	(0.0009)	(0.0009)
LnRoadCount	0.2567***	0.2563***	0.0943*	0.0978**
	(0.0560)	(0.0546)	(0.0370)	(0.0367)
PctForest	0.0024		−0.0024	
	(0.0032)		(0.0023)	
Wind	−0.0005		−0.0011	
	(0.0033)		(0.0015)	
Humidity	−0.0020	−0.0021	−0.0013	−0.0012
	(0.0014)	(0.0013)	(0.0010)	(0.0007)
Temperature	−0.0022	−0.0024	−0.0001	
	(0.0018)	(0.0018)	(0.0012)	
LnHomesCount	0.0571*	0.0591*	0.0492**	0.0454*
	(0.0265)	(0.0262)	(0.0187)	(0.0186)
σ_ϵ	0.4318	0.4258	$2.75\times10^{8\dagger}$	$1.92\times10^{9\dagger}$
σ_i	0.1999	0.2195	0.2213	0.2538
σ_{s1}	0.0066	0.0069		
ρ	0.8899	0.8866		
ϕ			35.4765	31.6535
δ			−7.8321	−8.6029
Log-likelihood	7.67	6.78	72.60	76.48
BIC	93.43	68.02	−19.63	−46.23
No. Fires	33	33	60	60
No. Fire-days	230	230	533	533

Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. σ_ϵ = error StdDev; σ_i = intercept StdDev; σ_{s1} = PctComplete slope StdDev; ρ = AR1 correlation parameter; ϕ = exponential correlation parameter; δ = power-of-the-mean variance parameter.

†Due to the variance structure this estimate does not represent the usual definition of σ_ϵ (see footnote 3).

Discussion

This research provides further evidence that wildfire suppression costs are positively associated with the number and location of homes. Interpretation of the combined Oregon and California model suggests that after accounting for confounders, including fire size and growth potential, a 1% change in the number of homes within six miles of a wildfire is associated with a 0.05% increase in fire suppression costs. Similarly, after controlling for confounders, a doubling of homes (100% increase) is associated with a 5% increase in fire suppression costs. The similarity between the estimated effect of homes on suppression costs in Oregon (6% increase with a 100% increase in homes) and California (7% increase with a 100% increase in homes) (Gude et al, in review) indicate that these results are likely generalizable to federally fought wildfires in other western U.S. states as well.

The quantified relationship between homes and suppression costs suggests that introducing new housing units in an otherwise undeveloped area has the greatest potential to increase firefighting costs. In other words, the expansion of housing into new areas has a greater potential to increase future suppression costs than in-fill of previously developed areas. The size of the effect per home is smaller in highly developed areas threatened by wildfire. This is likely because when large numbers of homes are threatened, fire managers are already investing the maximum amount of available resources to stop the fire. For example, using the average daily cost within our sample ($700,911), the combined Oregon and California model predicts an increase in suppression costs of $31,545 if two homes instead of one were within 6 miles of the wildfire. By comparison, the model predicts an increase of only $319 if 100 homes instead of 99 were within 6 miles of the wildfire.

Our findings agree with four of the five empirical studies that investigate the relationship between fire suppression costs and housing. Importantly, this paper and the Gude et al. California study (in review) investigate wildfires in a way that the other published studies did not. Daily suppression costs were analyzed rather than cumulative costs per fire. Analyzing costs at the daily level allowed us to retain information that would have been lost had we aggregated response and predictor values across fires. Our estimates of the effects of log homes count on log daily costs, for example, incorporated associated variation in both costs and homes within fires. In addition, our study and Gude et al. (in review) used counts of threatened homes as reported by county tax assessor offices. In the other studies, housing value averaged over census tracts or blocks were used to estimate threats to development. This representation is not ideal for several reasons. Census tracts are extremely large in rural areas. Sometimes they are the same as county boundaries, sometimes there are only 2 or 3 tracts per county. Also, fire managers may or may not spend more resources protecting expensive versus moderately priced versus inexpensive housing.

Policy Review and Implications

Existing federal and state wildfire policies have focused more on improving fuels management than on patterns of home development (Stephens and Ruth 2005; Gude et al. 2007). With few exceptions, state policies addressing the wildland urban interface have not been regulatory. Those states that have gone beyond incentive driven and voluntary measures, have focused almost entirely on fuels reduction projects. For example, California state law requires that homeowners in the WUI clear and maintain vegetation specific distances around structures (e.g., defensible space); Utah sets minimum standards for ordinance requirements based on the 2003 International Urban Wildland Interface Code; and, Oregon sets standards for defensible space, fuel breaks, building materials, and open burning on the property (Gude et al. 2007).

Importantly, thinning, prescribed fire, and the existing laws that address defensible space, ingress, egress, and water supply can provide a safer environment for firefighters and enable more structures to be saved. However, the extent to which these measures impact wildfire suppression costs is unknown. These measures are sometimes prohibitively expensive. For example, markets for the products of thinning activities are currently limited. An empirical analysis that evaluates whether investments in fuels treatments reduce firefighting costs would be an important contribution. In some cases, policies that address fuels may create a safe enough environment to allow some homeowners to "shelter-in-place", a strategy promoted in Australian communities in which a homeowner remains to protect his or her property (Cova 2005). However, the net effect of sheltering-in-place on suppression costs is unknown, since fire managers assume the additional burden of protecting not only structures, but lives.

In light of mounting evidence that home construction leads to higher fire suppression costs, policies meant to address rising suppression costs should attempt to:

1. Influence future home construction patterns in a way that reduces suppression costs, and

2. Generate funds to cover the additional suppression costs related to new housing.

To ignore homes in future wildfire policies is to ignore one of the few determinants of wildfire suppression cost that can be controlled. For example, governments have limited ability to control factors such as weather and the terrain in which wildfires burn.

The most obvious means of reducing additional suppression costs due to future home development would be to limit future home development in wildfire prone areas. Based on our findings, future savings may be achieved by a combination of policies that encourage open space conservation and discourage development outside existing urban growth boundaries and subdivisions. Often, regulatory approaches that would accomplish these goals are challenging for policy makers to enact. Policy tools such as zoning are highly controversial in much of the rural United States due to the perception of regulatory takings, where the government effectively takes private property when zoning laws limit how it can be used. To date, instead of attempting to regulate development in fire prone lands, the majority of western states have enacted legislation that encourages counties to prepare plans that would reduce wildfire problems and, in some cases, clarifies that counties can legally deny subdivisions that do not mitigate or avoid threats to public health and safety from wildfire. While these types of policies may be helpful, they will likely not result in significant future savings because local governments, due to a lack of resources and a lack of cost accountability, have little incentive to act.

Future policies will likely need to focus on covering the additional suppression costs related to new housing for several reasons. First, federal and state agencies are experiencing difficulty budgeting for fire suppression, and these challenges will worsen when there are more homes to protect. Second, the public may become dissatisfied with the existing arrangement in which the general taxpayer covers the costs of protecting at-risk homes. Establishing fees to encourage undeveloped parcels to remain undeveloped while aligning the cost burden with the presence of structures and expansion into new construction areas would have the most logical connection to controlling costs. Finding a more equitable means of covering fire suppression costs may also change behavior in a way that leads to lower future costs. For example, development rates in high wildfire risk areas may slow if suppression costs were borne, in part, by those who build at-risk homes, or by local governments who permit them, rather than by the federal and state taxpayer.

This study quantifies the effect of homes on firefighting costs for one part of the US West, and demonstrates that policy makers can achieve future fire suppression cost savings by focusing attention on development patterns. Since it is the initial development that has the greatest affect on firefighting costs, pursuing strategies that keep land undeveloped could lead to significant fire suppression cost savings. In the future, effective management of suppression costs will likely require a combination of policies that regulate land use, provide incentives for limiting the "footprint" of future development, and reform how suppression costs are paid.

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Potential for Future Development on Fire-Prone Lands

Patricia Gude, Ray Rasker, and Jeff van den Noort

ABSTRACT

Most studies of wildland fire and residential development have focused on the cost of firefighting and solutions such as fuel reduction and fire-safe home building. Although some studies quantify the number of homes being built near forests, little research has indicated the potential magnitude of the problem in the future. This article presents data illustrating this emerging problem for western communities. Our analysis takes a long view, looking at the potential for more home construction next to public forests and implications for future wildfire fighting costs. In a study of 11 western states, we found that only 14% of the available "wildland interface" in the West is currently developed, leaving great potential for new home construction in the remaining 86%. If just one-half of the wildland interface is developed in the future, annual firefighting costs could escalate to $4.3 billion. By comparison, the Forest Service's annual budget is about $4.5 billion.

Keywords: wildfire, forest fire, wildland–urban interface, residential development

Large areas of land are being converted to housing in the western United States. The current preference for rural landscapes (Johnson and Beale 1994, Johnson 1999), the increasing popularity of large lots (Theobald et al. 1997, Hammer et al. 2004), and the powerful draw of natural amenities (Rasker and Hansen 2000, Schnaiberg et al. 2002, Radeloff et al. 2005, Gude et al. 2006) have all contributed to this trend. Widespread population gains in nonmetropolitan counties have taken place since roughly 1970 (Brown et al. 2005), and housing has become increasingly dispersed, particularly in rural areas where land is more affordable. The popularity of low-density development has lead to large areas of land being converted to housing, because each home is consuming more land (Theobald et al. 1997, Hammer et al. 2004). Adjacency to lakes, seashores, forests, national parks and other protected areas are strongly related to the locations of recently built rural homes (Bartlett et al. 2000, Rasker and Hansen 2000, Radeloff et al. 2001, Schnaiberg et al. 2002, Radeloff et al. 2005, Gude et al. 2006, Gude et al. 2007).

The wildland interface is an area rich in natural amenities, where population growth and new housing is on the rise (Radeloff et al. 2005, Theobald and Romme 2007). In 2000, 4% of western homes were located within the wildland–urban interface (WUI), generally defined as areas where structures and other human development meet or intermingle with undeveloped wildland (Office of Inspector General [OIG] 2006). According to Theobald and Romme (2007), the states with the greatest proportion of residential land conversion in the wildland interface from 1970 to 2000 were mostly in the West. In addition, in many western states more than 50% of new housing areas fall within areas classified as severe-fire zones, which are prone to catastrophic fires (Theobald and Romme 2007).

Recent increases in the area burned annually by wildfire (National Interagency Fire Center [NIFC] 2007) and the number of homes burned by these fires have put the WUI in the national spotlight. Many studies communicated in the scientific literature, government documents, and the popular press have described the cost of firefighting, the risk to firefighter lives, and the damage to private property. A recent government audit identified the WUI as the primary factor escalating federal firefighting costs in excess of $1 billion in 3 of the past 6 years (Office of Inspector General [OIG] 2006). In 87% of large wildfires reviewed in the audit, the protection of private property was described as a major reason for firefighting efforts (OIG 2006). In addition to the financial costs, homes in the wildland interface are often difficult to protect and create dangerous situations for firefighters because of remoteness, steep slopes, and narrow roads. In the

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5-year period from 2002 to 2006, $6.3 billion in federal funds were spent fighting wildfires (NIFC 2007) and 92 people were killed during wildland fire operations (National Wildfire Coordinating Group Safety and Health Working Team 2007); but despite the firefighting efforts, 10,159 homes were lost to wildfires during this period (NIFC 2007).

Most discussions of possible solutions and existing federal wildfire policies have focused on improving wildland fuels management (Stephens and Ruth 2005). Most studies agree that a combination of thinning and prescribed burning is effective in reducing wildfire effects in specific habitats characterized by short fire-return intervals (Price and Rind 1994, Pollet and Omi 2002, Fried et al. 2004, Martinson and Omi 2006). However, many recent studies also conclude that wildfire damage and costs may continue to rise despite fuels management because of extreme weather conditions, such as the droughts, high winds, and increased lightning forecasted to occur in a warming climate (Price and Rind 1994, Pollet and Omi 2002, Fried et al. 2004, Pierce et al. 2004, Westerling et al. 2006). The forecasted growth in catastrophic wildfires implies that climatic change could cause an increase in both fire suppression costs and economic losses due to wildfires (Torn et al. 1998). The West is already experiencing fires, driven by drought and strong winds, that burn open forests, conventionally viewed as relatively fire resistant, and closed forests alike (Whitlock 2004).

While both the effectiveness and the public approval of thinning and prescribed burns are being investigated (Beebe and Omi 1993, Shindler and Toman 2003, Youngblood et al. 2007), recent studies have pointed out that the likelihood of a house burning has more to do with home ignitability and landscaping than backcountry wildland fuels management (Cohen 2000). Guidelines for the amount of defensible space necessary to protect homes range from 40 to 500 m around the home, in which vegetation should be thinned sufficiently to break up any flame front and lower radiant heat (Butler and Cohen 1998, Cohen 2000, Nowicki 2002). However, because burning embers can travel great distances in high winds, protecting homes requires the use of fire-resistant building materials and regular maintenance, including clearing roofs and gutters of debris (Nowicki 2000, Firewise Communities Program 2007). Although the federal government is charged with protecting WUI homes, currently, there is no legislation in place that allows the federal government to regulate the construction or landscaping of WUI homes in ways that reduce wildfire risks (OIG 2006). In addition, reliance on the federal government to suppress wildfires may actually remove incentives for homeowners to construct and landscape WUI homes in ways that reduce wildfire risks (OIG 2006).

Clearly, the guarantee of wildfire occurrence in the WUI is a locally relevant problem, in which planning decisions must play a role. Furthermore, given the costs of firefighting by federal land-management agencies, there are also nationwide policy implications. This study aims to provide objective and relevant data that can help inform the decisions of planners, communities, landowners, and elected officials across the West and the nation. The objectives include

1. Describing the current status of residential development in the wildland interface.
2. Identifying counties with high existing risk and those with high potential future risk.
3. Discussing alternative planning policies, tailored for the type of risk a community is faced with.

Methods

In this article, we focus on housing that borders public forestlands in the West. Roughly, 70% of western forests are publicly owned. Because wildfire is a natural disturbance in many of these forests, this creates a potential risk to adjacent private lands. Private land owners expect federal agencies to protect private property from wildfire that spreads from the surrounding public lands, and the cost to US taxpayers of protecting privately owned properties adjacent to public lands has been estimated by Forest Service managers to be as high as $1 billion each year (OIG 2006). Additionally, the wildfire management options on public forestlands are severely constrained by nearby development, sometimes to the detriment of forest health (Kauffman 2004). Because fire risk is extremely difficult to quantify (Jaelith Hall-Rivera, pers. comm., The Wilderness Society, Sept. 20, 2007), most western forests burn at some point, and residential areas are rarely abandoned, all forested public lands were considered susceptible to wildfire.

A buffer of 500 m surrounding forested public lands, including federal, state, and locally managed forests, was mapped, and residential areas that fell within this buffer were identified. The Protected Areas Database (DellaSala et al. 2001) was used to map public lands in California, Colorado, Idaho, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming, and state data sources were used to map public land boundaries in Montana (Montana Natural Heritage Program [MNHP] 2007) and Arizona (Arizona Land Resources Information System [ALRIS] 1998). The forested public lands were identified based on the following classes from the National Land Cover Dataset (Vogelmann et al. 2001): evergreen needleleaf forest, evergreen broadleaf forest, deciduous needleleaf forest, deciduous broadleaf forest, mixed forests, and closed shrublands. Although open shrublands and grasslands are also prone to wildfire, defending homes in these habitats tends to be less dangerous and less expensive from a firefighting perspective (Marcel Potvin, US Forest Service, pers. comm., June 11, 2007). Because guidelines for the amount of defensible space necessary to protect homes range from 40 to 500 m around the home (Butler and Cohen 1998, Cohen 2000, Nowicki 2002), the threshold of 500 m was used to identify where residential development has occurred adjacent to fire-prone public lands. This is a conservative estimate of the WUI and the associated risk of fire, because it is unknown how many home owners within this zone have followed defensible space guidelines.

To identify where housing has occurred adjacent to forested wildlands in the West, maps of housing density were created at the scale of 2000 Census blocks. Forested areas where residential development (census blocks with mean lot sizes less than 40 ac) occurred within 500 m (0.31 mi) of public lands were identified. The threshold of 40-ac lot sizes was used to identify residential development because at this home density, areas are generally considered to be more populated than working agricultural lands (Gude et al. 2006), although some high-value agricultural operations, including orchards, can be profitable at this lot size (Theobald 2005).

The maps of housing density were prepared similarly to those described by Theobald (2005). Geographic information system (GIS) layers describing the Census block boundaries in 2000 were extracted from the TIGER/Line databases (US Census Bureau 2001a) for Arizona, California,

Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming. Tabular data describing the population and number of housing units in each block were extracted from Census Summary File 1 tables (US Census Bureau 2001b) and joined to the GIS layers. To calculate the mean lot size per Census block, the number of housing units was divided by the area of private land. Water, as identified in the National Hydrography Database (US Geological Survey 2001), and public lands, as identified in the Protected Areas Database (DellaSala 2001), were excluded from the area calculations. In Montana and Arizona, the Protected Areas Database was found to have substantial errors in the locations of public land boundaries, and other data sources (ALRIS 1998, MNHP 2007) were used instead.

For each western state and for the West as a whole, the area of forested wildland interface containing homes, i.e., the WUI, was compared with the area of undeveloped forested wildland interface. Per state, the number of homes in the wildland interface was calculated, as well as the percent of these homes that are second homes. The number of second homes within the WUI was calculated by adding the number of "seasonally occupied" homes, as specified in by the Census SF1 H005005 field, to the number of "other vacant" homes, as specified in the Census SF1 H005007 field. These counts do not include homes that are vacant because they are for rent or sale (US Census Bureau 2001b).

In addition to state metrics, two measures were used to identify counties with high existing and high potential risk of wildland fire to homes. Counties with extreme risk are listed in this table because many land policies with the potential to impact development in the WUI are implemented by county governments. Existing risk was measured in terms of the total area of WUI per county, and potential risk was represented by the area of undeveloped forested wildland interface, where homes construction could occur in the future. Importantly, these metrics show the total area at risk rather than the proportion of each county that is at risk. Had we expressed risk as a percent of each county's land area, a small county with a small amount area of WUI may have ranked as having relatively high existing risk.

Future annual firefighting costs were projected for a scenario where 50% (rather than the current 14%) of the wildland interface is developed. The projected costs were based on information provided in an OIG audit regarding the component of the Forest Service's suppression expenditures dedicated to WUI protection. The audit states that Forest Service managers and staff estimated between 50 and 95% of suppression costs are directly related to protecting private property and homes in the WUI (OIG 2006). Assuming the same is true for the Bureau of Land Management, the average annual firefighting costs in the WUI, from 2000 to 2005, ranged from $630 million to $1.2 billion for these two agencies alone. We chose to use the average annual costs of fire suppression over a 6-year period rather than the cost of fire suppression during a single year because fire frequency and behavior is variable from year to year and because 2000 was an above average year for fire suppression costs.

The range of 50–95% is quite wide, and we wanted our projections to take this uncertainty into account. We estimated the ratio of the average annual cost of fire suppression from 2000 to 2005 to the percent of the interface with development in 2000. Assuming that 50% of suppression costs ($630 million) are due to WUI protection when 14% of the interface is developed yields the ratio 630,371,513/14. Assuming that 90% of suppression costs ($1.2 billion) are due to WUI protection when 14% of the interface is developed yields the ratio 1,197,705,874/14. We assumed that cost was a linear function of the area of the interface with development and multiplied the two ratios by 50 to calculate a range in estimated costs of fire suppression if 50% (rather than the current 14%) of the interface was developed.

Results

By 2000, 9% of the private lands in the West were developed at residential densities (lot sizes less than 40 ac). Of the residential areas, 17% were developed at urban densities (lot sizes less than 1 ac), 30% were developed at suburban densities (lot sizes between 1 and 10 ac), and 53% were developed at exurban densities (lot sizes between 10 and 40 ac). Housing patterns in the WUI tended to be more skewed toward lower density developments than housing patterns in other western private lands (Figure 1). In the WUI, 2% of the land was developed at urban densities, 25% was developed at suburban densities, and 73% was developed at exurban densities. Consequently, per capita land consumption was much greater in the WUI. On average, each person in the West consumed 0.47 ac for housing, compared with the 3.21 ac/person consumed in the WUI. However, per capita land consumption, both in and out of the WUI, is highly variable among western states and tends to be highest in the northern Rockies (Figure 1).

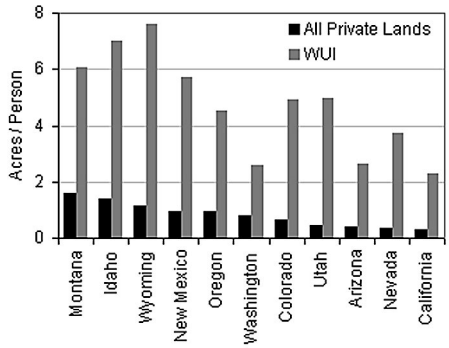

Figure 1. Per capita land consumption for residential development is extremely high in the wildland–urban interface (WUI) compared with other private lands and is highest in the northern Rocky Mountain states.

By 2000, 4% of western homes (91,541 homes) had been built on 3,290 mi^2 of private forestland adjacent to public forests. These homes occur on 14% of the forested wildland interface in the West, leaving 86% (20,350 mi^2) of the interface still undeveloped. Oregon had the largest area of total forested wildland interface (5,960 mi^2) of which 10% contains homes (Table 1, Figure 2). California has the second largest area of total forested wildland interface (5,129 mi^2), of which 17% contains homes. Oregon and California together contain nearly one-half (47%) of the West's total wildland interface and nearly one-half (45%) of the West's WUI. Over one-third of the homes built in the wildland interface occur within California. Oregon, California, Montana, Washington, Idaho, and Colorado each contain more than 1,000 mi^2 of total forested wildland interface, and New Mexico, Utah, Arizona, Wyoming, and Nevada each contain less than 700 mi^2 (Figure 2).

One in five homes in the western WUI is a seasonal home or cabin. In comparison, 1 in 25 homes is a seasonal home or cabin in other western private lands. The percent of WUI homes that are seasonally occupied ranges from 8% in Washington to 44% in Wyoming (Figure 3). The more urban, Pacific states (California, Oregon, and Washington) have fewer seasonal homes in the

Table 1. Percent of the wildland interface that is developed within each of the 11 western states.

State	Area of interface (mi^2)	Percent developed	No. of homes	Percent seasonal	Mean lot size (ac)
Arizona	482	17	54,634	34	2.6
California	5,129	17	341,175	19	2.3
Colorado	1,978	21	94,739	38	4.9
Idaho	2,148	10	30,026	31	7.0
Montana	3,025	9	31,394	24	6.1
New Mexico	245	17	24,899	34	5.7
Nevada	666	10	13,184	20	3.7
Oregon	5,960	10	110,563	15	4.5
Utah	604	5	11,734	36	5.0
Washington	2,969	21	198,119	8	2.6
Wyoming	434	4	4,604	44	7.6

The table also shows the number of homes within the interface, the percent that are seasonally occupied, and the average lot size.

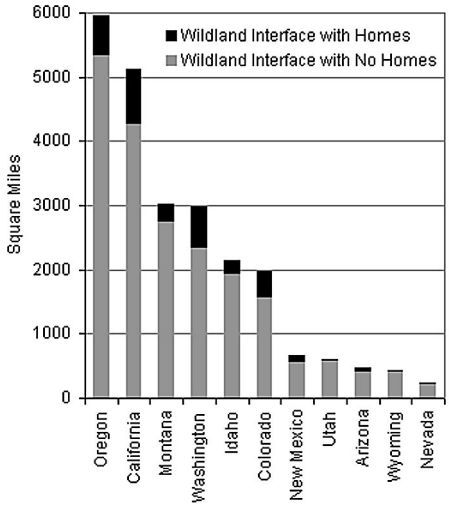

Figure 2. In every western state there is a strong likelihood that wildland–urban interface/fire problems will intensify as the interface continues to become developed.

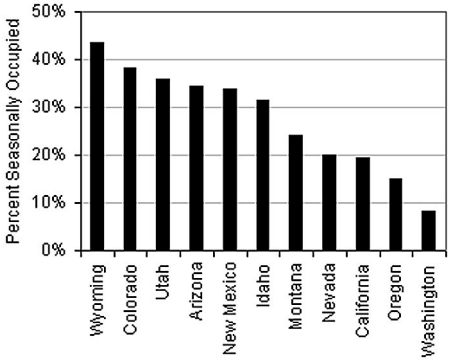

Figure 3. A large percent of homes in the wildland–urban interface are seasonal homes and cabins.

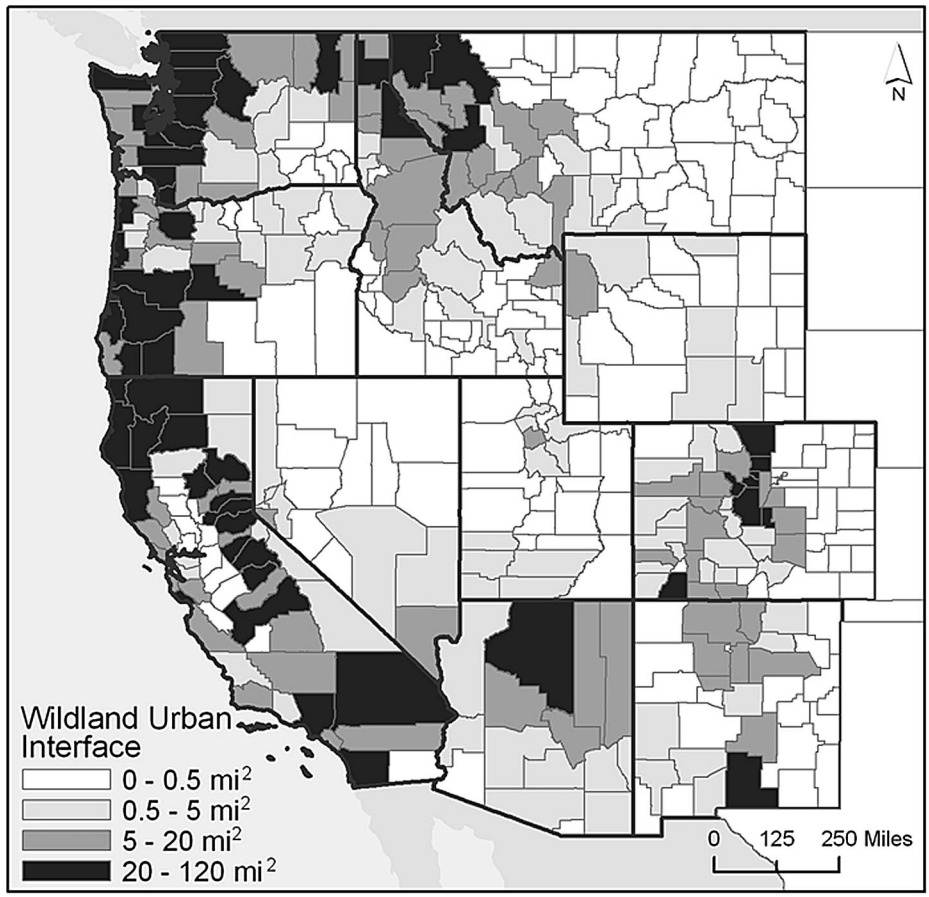

Figure 4. Counties with large areas of forested wildland–urban interface (WUI) are shaded darkly in this map. These counties have extensive areas of housing at risk from forest fire.

WUI (15%), compared with the interior mountain states (Arizona, New Mexico, Nevada, Utah, Colorado, Wyoming, Idaho, and Montana), where 33% of homes in the WUI are seasonal homes or cabins.

Each western state, with the exception of Wyoming, Utah, and Nevada, has at least one county with more than 20 mi^2 of WUI and more than five counties with more than 5 mi^2 of WUI (Figure 4). The largest areas of WUI are concentrated in northwest Montana; northern Idaho; throughout the Cascades and Sierra Nevada ranges of Washington, Oregon, and California; northern Arizona; and along the Rockies in central New Mexico and Colorado. The most severely at-risk counties among western states in terms of number of square miles of WUI are located in the northwestern states, California, and Colorado (Table 2).

Because most of the wildland interface, the forested areas where public and private lands meet, is currently undeveloped, there remains a large potential for continued expansion of the WUI (Figure 5). Montana, Idaho, Washington, Oregon, California,

Table 2. Top 10 western counties ranked by the number of square miles of developed land in the wildland–urban interface (WUI).

County	Population center	Area (mi^2)		WUI homes	Seasonal homes (%)
		WUI	Undeveloped interface		
Josephine, OR	Grants Pass	119	186	12,451	5
Jackson, OR	Medford	83	464	7647	5
Lane, OR	Eugene	79	627	13,704	7
Bonner, ID	Sandpoint	77	231	8,020	31
Clallam, WA	Port Angeles	72	167	13,271	6
El Dorado, CA	Lake Tahoe	70	164	20,233	24
Trinity, CA	Douglas City	64	311	5,331	25
Flathead, MT	Kalispell	61	223	7,846	24
Snohomish, WA	Everett	60	75	17,740	4
Boulder, CO	Boulder	57	38	5,409	25

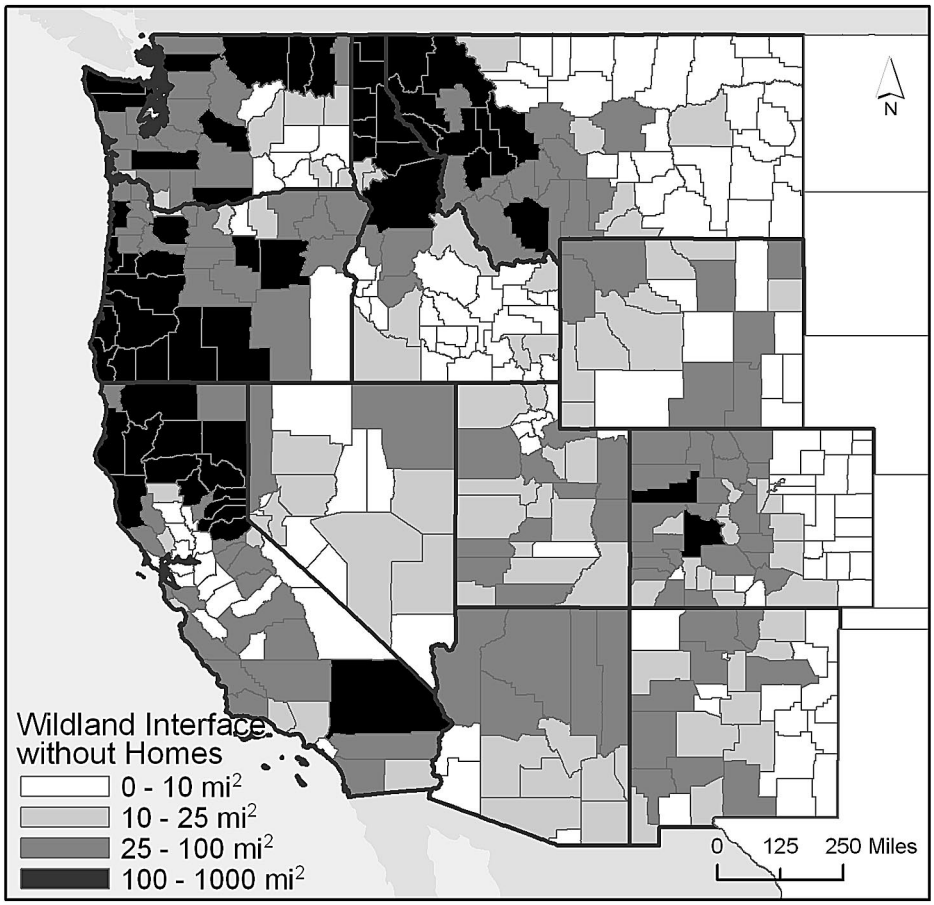

Figure 5. Counties with large areas of undeveloped forested wildland interface, in which future housing could be built, are shaded darkly in this map. These counties have high potential future risk of new homes being developed in fire prone lands.

and Colorado each have counties that contain more than 100 mi^2 of undeveloped interface, where future homes could be built. All 11 western states have multiple counties with more than 25 mi^2 of undeveloped interface. The counties that rank highest in the West in terms of potential future risk (number of square miles of wildland interface that remains undeveloped) are concentrated in southwestern Oregon, northern California, northeastern Washington, northwestern Montana, and northern Idaho (Table 3).

In our estimates of current and future costs of firefighting due to development in the wildland interface, we found that, currently, fighting fires to protect private structures in the interface costs between $630 and $1.2 billion/year, with only 14% of the interface developed (Table 4). Another 86% of the interface that could potentially be built on still has not been developed. Not all interface properties are likely to be developed, but if 50% of the interface is developed, the average annual cost of fighting fires to protect private structures could range from $2.3 to 4.3 billion (Table 4).

Discussion

The dynamics of land-use change have serious implications for our quality of life, our environment, and our safety. Understanding these dynamics will improve our ability to craft policies that are in the best interest of people and sustain our natural environment. In this study, we examined residential development trends in the western wildland interface, the forested areas where public and private lands meet. We quantified the extent to which the interface has been developed and measured several characteristics of the WUI, the part of the interface containing homes. We also ranked western counties by existing and potential future risk of wildland fires to homes. Our hope is that this study will provide clarity regarding the potential future magnitude of the wildfire/housing issue and help national, state, and local decisionmakers identify policies that are appropriate for communities in need of planning in the wildland interface.

We found that development in the wildland interface occurs at substantially lower densities than development on other western private lands. Because homes adjacent to forested wildlands tend to be built on larger lots, the area of WUI will likely grow quickly. Firefighters will likely have to protect dispersed housing over an extremely large area of fire-prone forest. In many cases, ingress and egress to remote homes spread over large areas can be challenging because of lack of infrastructure. The popularity of low-density development on forested private lands adjacent to public wildlands also im-

Table 3. Top 10 western counties ranked by the number of square miles of undeveloped land in the wildland–urban interface (WUI).

County	Population center	Area (mi^2)		WUI homes	Seasonal homes (%)
		WUI	Undeveloped interface		
Douglas, OR	Roseburg	40	964	4,735	8
Lane, OR	Eugene	79	627	13,704	7
Siskiyou, CA	Yreka	35	528	3,613	16
Jackson, OR	Medford	83	464	7,647	5
Shasta, CA	Redding	32	413	6,289	10
Missoula, MT	Missoula	34	351	3,936	13
Lincoln, MT	Libby	54	348	5,109	15
Klamath, OR	Klamath Falls	15	339	2,421	23
Clearwater, ID	Orofino	9	325	1,242	12
Stevens, WA	Colville	26	315	3,272	10

Table 4. If 50% of the interface becomes developed, the average annual cost of fighting fires to protect private structures could range from $2.3 to 4.3 billion.

Percent of interface with homes	Projected annual fire suppression costs assuming:	
	50% of costs due to WUI	95% of costs due to WUI
14 (current level)	630,371,513	1,197,705,874
50	2,251,326,831	4,277,520,978

WUI, wildland–urban interface.

plies that unless homeowners assume the responsibility for protecting their homes from wildfire, extensive areas of public forestlands will have to be managed to protect homes rather than to meet natural resource, wildlife management, or recreation needs.

We also found that the proportion of homes that are only seasonally occupied is substantially higher in the WUI (1 in 5 homes, compared with 1 in 25 homes in other western private lands). It is easy to understand why people want to live or own second homes in beautiful forested areas. However, our analyses indicate that if current building trends continue, the losers will be US taxpayers, public land–management agencies, and the communities that can potentially benefit from more sustainable growth.

Most importantly, we found that the current level of financial burden, property damage, and disruption caused by wildfires is occurring in a wildland interface that is only 14% developed, leaving high potential for new home construction in the remaining 86%. If the incidence of catastrophic wildfires increases, as is predicted to occur in a warming climate (Price and Rind 1994, Torn et al. 1998, Pollet and Omi 2002, Fried et al. 2004, Westerling et al. 2006), and the area of WUI increases, as is forecasted to occur by growth models (Theobald and Romme 2007), we will likely see skyrocketing firefighting costs for taxpayers and more difficult and dangerous fire seasons for firefighters.

With only 14% of the wildland interface developed, the average annual cost to the Forest Service and Bureau of Land Management of protecting private property from wildfire from 2000 to 2005 ranged from $630 million to $1.2 billion. With the current level of expenditure on fire suppression, these agencies are already facing difficulties in funding other management objectives such as trail maintenance and habitat improvement. If 50% of the wildland interface was developed, the cost could range from $2.3 to 4.3 billion. By comparison, the Forest Service's annual budget is about $4.5 billion. In this scenario, firefighting costs could consume close to 100% of the Forest Service's annual budget. Without improved land-use planning in the wildland interface, the future costs of fire suppression, both monetary and social, will likely become politically unacceptable.

Policy Review and Implications. To date, existing federal wildfire policies have mainly focused on improving fuels management (Stephens and Ruth 2005). Since 2000, the major wildland fire policies and initiatives have been the National Fire Policy established in 2001, designed to be a long-term, multibillion dollar effort at hazardous fuels reduction (General Accounting Office [GAO] 2003), and the Healthy Forests Initiative and Healthy Forests Restoration Act, introduced in 2002 and 2003, respectively, aimed at shortening administrative and public review by limiting appeals processes. Critics point out that national policies promote treatments that are assumed to be effective, but the appropriateness of treatments across forest types and fire regimes are not adequately considered (Kauffman 2004, Schoennagel et al. 2004, Stephens and Ruth 2005).

The majority of western states have also enacted legislation in recent years that addresses wildfire, and in particular the WUI. The extent to which these laws are regulatory, incentive driven, or a mix, varies widely. Within Arizona, New Mexico, Idaho, and Colorado, the language in the states' legislation addressing the WUI is rather adaptable: recommending building standards or encouraging counties to prepare plans that would reduce wildfire problems. In Oregon, California, Utah, and Montana, state laws clarify that counties can legally deny subdivisions that do not mitigate or avoid threats to public health and safety from wildland fire. The state laws within Oregon, California, and Utah go beyond this to set minimum standards for development in high wildfire hazard areas. For example, California state law requires that homeowners in the WUI clear and maintain vegetation-specific distances around structures; Utah sets minimum standards for ordinance requirements based on the 2003 International Urban Wildland Interface Code; and Oregon sets standards for defensible space, fuel breaks, building materials, ingress and egress, and open burning on the property.

Even in the western states with more progressive laws, it is unlikely that existing policies addressing the wildland interface will slow the growing cost of fighting wildfires. Importantly, the state laws that do address defensible space, ingress, egress, and water supply for protecting homes from wildfire can provide a safer environment for firefighters and enable more structures to be saved. These policies may also create a safe enough environment to allow some homeowners to "shelter-in-place," a strategy being promoted in Australian communities in which a homeowner remains to protect his or her property (Cova 2005). However, given enough time, evacuation is generally the best option for protecting life (Cova 2005), and sheltering-in-place may be prob-

lematic in the United States, where individuals are fond of litigation and homeowners expect protection from wildfires. Ultimately, many of the resources dedicated to fire suppression, including fire engines, bulldozers, helicopters, and personnel, will likely be the same whether or not the homes are constructed from fire-safe building materials and have adequate defensible space.

Another potential problem with existing state laws is that in cases where counties are required to identify wildfire hazard areas (Oregon, California, and Montana), the hazard areas are designated by local jurisdictions or county committees. It is likely that this will result in omission of some high-risk areas and misidentification of others, because accurate identification of fire hazard areas is data intensive and scientifically challenging. This is a key issue, because the misidentification of wildfire hazard areas could risk human life and property as well as contribute to the increasing financial burden on taxpayers. One possible solution would be for a federal agency to take on the responsibility of identifying wildfire hazard areas, as is done for Special Flood Hazard Areas for managing floodplains.

Currently, no state laws require zoning the wildland interface, which would allow counties to regulate housing densities in high-risk areas or require current and future structures to be compliant with standards that help protect them from wildfire. This is not surprising because in much of the rural West, zoning is controversial due to its perception as a regulatory taking, where the government effectively takes private property when zoning laws limit how it can be used. Despite this viewpoint, statewide "zoning" already exists in many forms, including statewide building codes and subdivisions regulations. For local ordinances, most western county commissions ultimately control whether or not policies pass. Even in cases where state laws allow for citizen initiated zoning, the county commissions vote whether or not to pass each resolution. However, national and state mandated land-use policies are not subject to commission approval, making them a key instrument in addressing wildfire problems, particularly in the rural West.

To effectively reduce the risk of wildfire, policies should be implemented at more than one level of government. The wildland interface could be treated more similarly to floodplains, where national and state policies mandate that communities adopt and enforce ordinances that meet or exceed the minimum criteria for wildfire hazard areas identified by a federal agency such as the US Forest Service. In addition, local policies aimed at reducing sprawl, such as urban growth boundaries and transfer of development rights, should have a positive impact on reducing development in the wildland interface. Incentives also play a significant role. Currently, the cost of the firefighting efforts by the Forest Service, Bureau of Land Management, and other agencies are borne mostly by the US taxpayers in general and not by those who build at-risk homes or by local governments who permit them.

Most importantly, national, state, and local policies that address wildland fuels management need to be coupled with policies that address existing and future development in fire-prone private lands. Clearly, existing homes built on the 14% of the WUI that has already been developed should be defended from forest fires. The policy challenge is whether the remaining 86% of land should be allowed to be developed without regard to the fiscal, safety, and ecological realities of forest fires. With this study, we hope to refocus the attention of policy makers and western communities on the ramifications of current growth trends and set the stage for discussion about the need for a course correction to keep homes and firefighters safe and firefighting costs in check. By incorporating wildfire risk into land-use planning, national, state, and local government can play an important leadership role in guiding new construction away from fire-prone areas.

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URBAN GROWTH BOUNDARY REMAND

Sign in Sheet

Meeting: BOUNDARY TAC
Date: JUNE 9, 2015
Location: BEND MUNI COURT

Steve Jorgensen — Bend Park & Rec — steve@bendparksandrec.org

Name	Organization	Email Address
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Eric COATS	Sherlin Sand + Gravel	—
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URBAN GROWTH BOUNDARY REMAND

Sign in Sheet

Meeting: Boundary TAC
Date: June 9 2015
Location: Bend Muni Court

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URBAN GROWTH BOUNDARY REMAND

BEND

Sign in Sheet

Meeting: June 9th

Date:

Location:

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Ron Ross		
John DOTSON		
Scott Edelman	DLCD	
Nick Lelack		
John Russell	DSL	
Mike DiTullio	Deschutes Co. Title	
[illegible]		
Jacob Schumacher	Schwabe Court	—
Brook Havens	Cascade Sotheby's	
JAMES DOROFF	OFDW	
Ruth Williamson	BEND 2030	
Rockland Dunn	PLANNING COMMISSION	
Bill Kuhn	UGB STAC - Emp	
Wes Price	UGB/Emp TAC	
Jim BRYANT	ODOT	
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Andy High COBA

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Damian Syrnyk

From: JOHN SHORT <jfshort@bendbroadband.com>
Sent: Tuesday, June 09, 2015 4:43 PM
To: Damian Syrnyk
Cc: drankin@bendoregon.gov
Subject: UBG

Follow Up Flag: Follow up
Flag Status: Flagged

To: Damian Syrnyk and Brian Rankin:

Please know that as property owners with the UBG sign at our mailbox property corner at 21504 Butler Market Rd., we would urge the UBG committee to include our 7 acres in the expansion plans. We support the rationale that Rick Lane included in his recent letter to you. We have always been in full support of Rick's efforts to see that we and our neighbors in the 240 acre block, are included in the next expansion.
Please feel free to contact us with any questions you and the committee might have concerning this property. Also know that for the last almost 40 years, our family has been convinced that our parcels' best use would be for housing, instead of struggling to keep our thin soiled fields green enough for pasture.
Feel free to share this letter with the committee.

Thank you!
John and Beth Short
21504 Butler Mkt. Rd.
Bend, OR 97701
541-389-1720

MILLER TREE FARM, LLC
110 NE Greenwood Avenue
Bend, OR 97701

June 19, 2015

Boundary Alternatives TAC
c/o Brian Rankin, UGB Project Manager
City of Bend

RE: Development plans for Miller property in UGB "West Area"

At the June 9 Boundary TAC meeting, Joe Dills invited owners of the various large parcels under consideration for inclusion in the UGB to share their thoughts and plans for their property. I would like to take this opportunity to describe our plans and intent for the entire Miller property, which includes two distinct areas:

1. **The Tree Farm**. The Tree Farm is a planned rural density cluster development on approximately 530 acres consisting of fifty 2-acre lots and over 420 acres of open space featuring a network of public trails connecting to Shevlin Park. Land use approval is currently pending before the Deschutes County Board of Commissioners. The easternmost 140 acres of The Tree Farm is zoned UAR-10, with the eastern boundary primary following a topographic line on a ridge that traverses the property and forms a physical edge to potential urbanization. The western extent of the property, which abuts Shevlin Park along the park's southeastern boundary, is zoned RR-10, but with an additional Wildlife Area overlay. The eastern boundary of The Tree Farm adjoins the Miller Urban property discussed below.

Our intent behind this development plan is to create a permanent "feathered" edge on the western side of the city of Bend, since it is highly unlikely that any future urbanization will occur beyond Shevlin Park and Tumalo Creek to the west. One of the primary purposes behind this development plan is to create a carefully managed fire-adapted community designed to provide a buffer both for the city's Outback water facility and city itself, including future urbanization on the Miller Urban property. Creation of this community will be accomplished through a highly-detailed Wildfire Protection Management Plan (WPMP) that outlines precise fire fuel reduction and construction standards as contained in National Fire Protection Agency (NFPA)1144, to be implemented through participation in the Firewise Community program, and detailed and highly restrictive CCRs, Design Guidelines, and county oversight. This WPMP include specific provisions requiring: 1) prescriptive 3-zone vegetation management buffer around all structures; 2) building footprints that hold structures back from vegetated slopes; 3) fire-resistant construction materials and methods, and : 4) fire sprinklers in all homes. In addition, streets and other infrastructure within The Tree Farm will be designed and constructed to comply with the applicable residential development standards of NFPA 1141, including extending City of Bend water to and through the project to provide high-volume fire hydrants for combating potential fires.

The low-density clustered development pattern of The Tree Farm combined with the wildland fire mitigation measures called for in the WPMP will create precisely the type of wildland fire buffer

between forest lands to the west and present and future urbanization identified by the City's Wildland Fire Focus Group as a preferred development alternative.

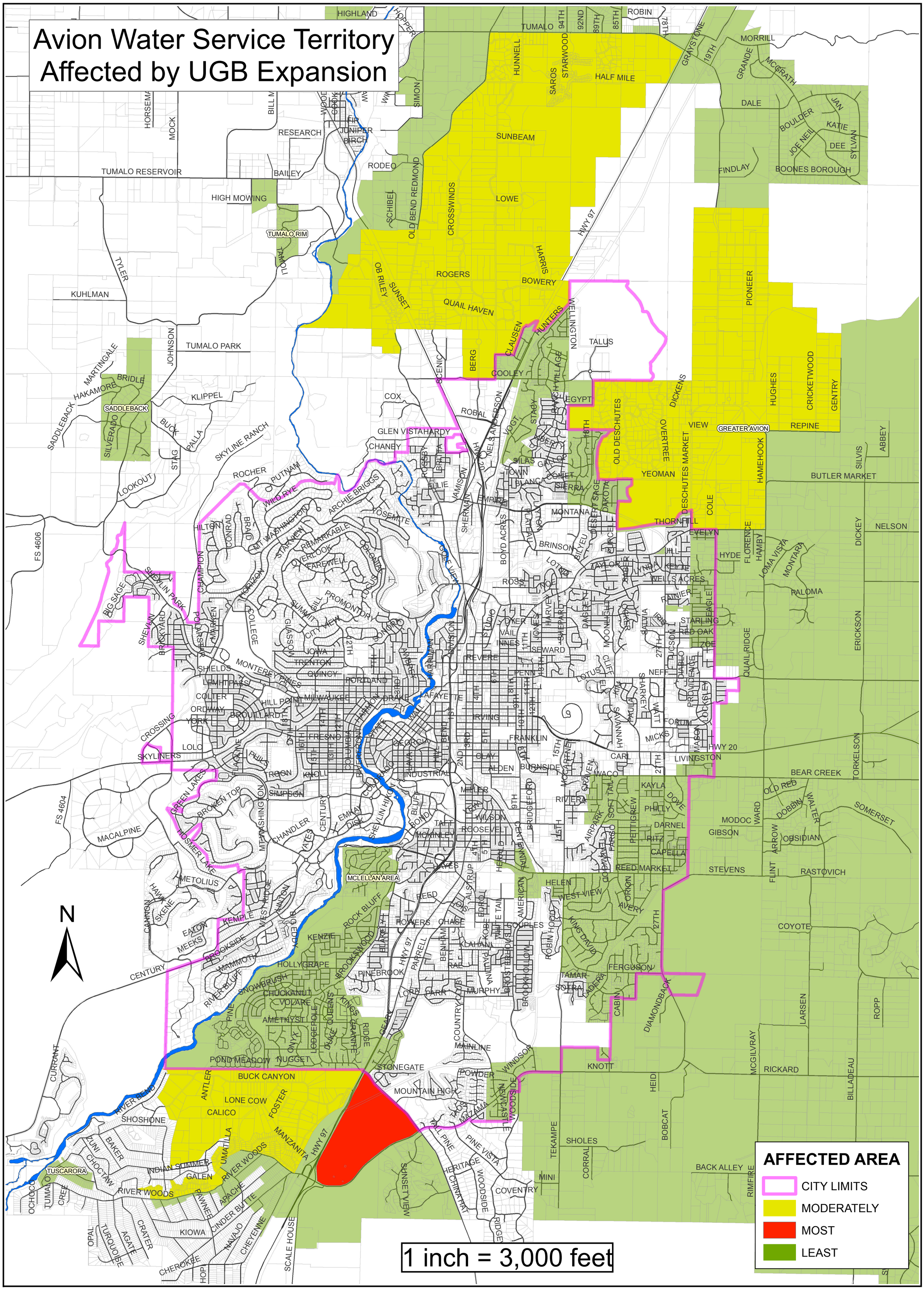
2. **Miller Urban** property. The remaining 250 acres of Miller property wraps around William Miller Elementary School and Pacific Crest Middle School (both of which are on land previously part of the Miller property). Our intent is that this property would be brought into the UGB and urbanized. We are working with the development team behind the adjoining NorthWest Crossing master-planned community to design a continuation of the mixed-use development pattern that has been so successful there. Our preliminary design concepts include a mix of residential uses and parks surrounding the two schools, as well as an extension of the existing trail network in the recently opened Discovery Park in NorthWest Crossing to connect through The Tree Farm and on to Shevlin Park and the Phil's Trail network. Given the adjoining employments and commercial lands, there is little anticipated need for such lands in any expansion in this area.

Thank you for the opportunity to discuss our plans for the property. Attached is a map of The Tree Farm that highlights the Fire Prevention Zones called for in the WPMP for the project and a description of the fire fuels reduction treatment prescribed for each zone. The entire property is currently managed to a Zone 3 standard.

Sincerely,

Charley Miller
Co-Managing Member
Miller Tree Farm, LLC

Avion Water Service Territory Affected by UGB Expansion



04096

PETITION FOR CONSIDERATION OF NORTH STEVENS RD. PROPERTIES FOR INCLUSION INTO THE UGB EXPANSION

June 22, 2015

City of Bend
UGB Steering Committee
710 NW Wall St.
Bend, OR 97701

Dear Members of the UGB Steering Committee,

On behalf of the North Stevens Rd. Property Owners, I am petitioning for consideration of the properties on the North side of Stevens Rd. in & around the SE ¼ of the SW ¼ of Section 02 of Township 18 S, Range 12 E, for inclusion into the City's Urban Growth Boundary. We understand the process for selection is to make the most of the city's available infrastructure without harming agricultural areas. Agricultural practices in these lots are minimal, and a 20 inch Avion water main exists through the center, providing a portion of the infrastructure needed for modeling.

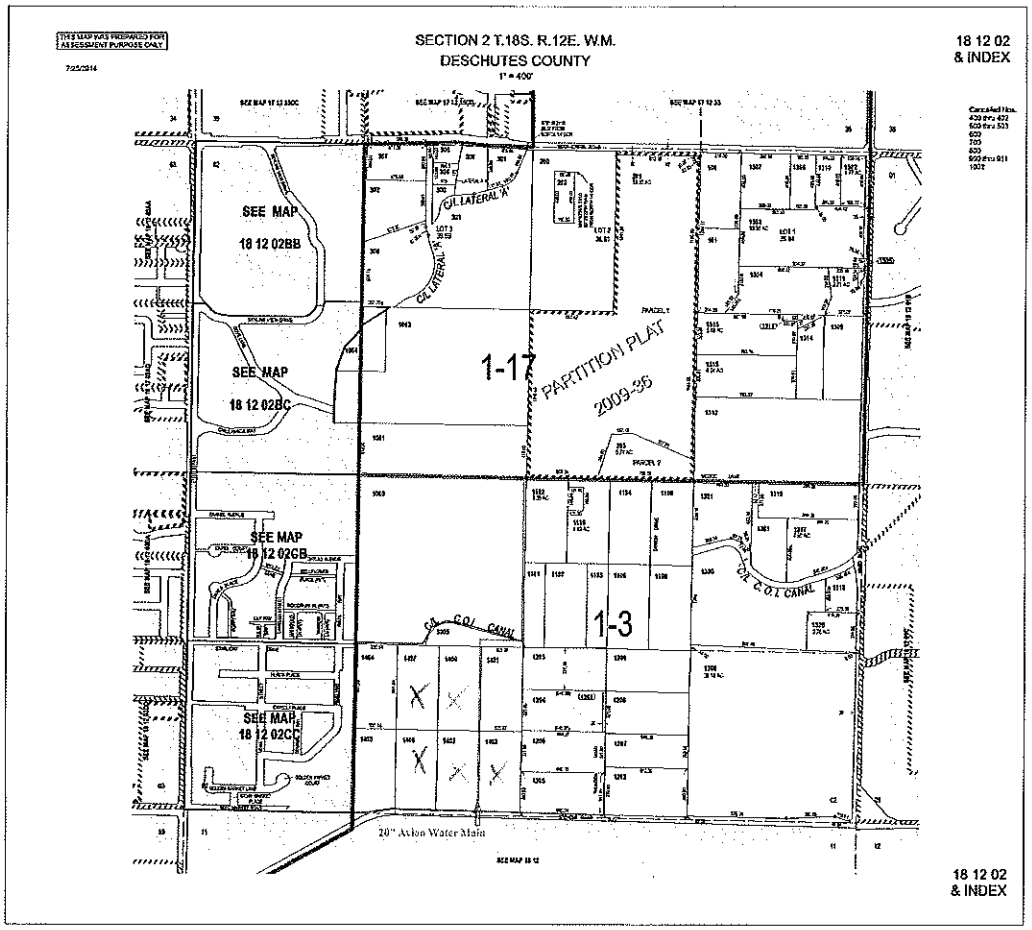
Sincerely,

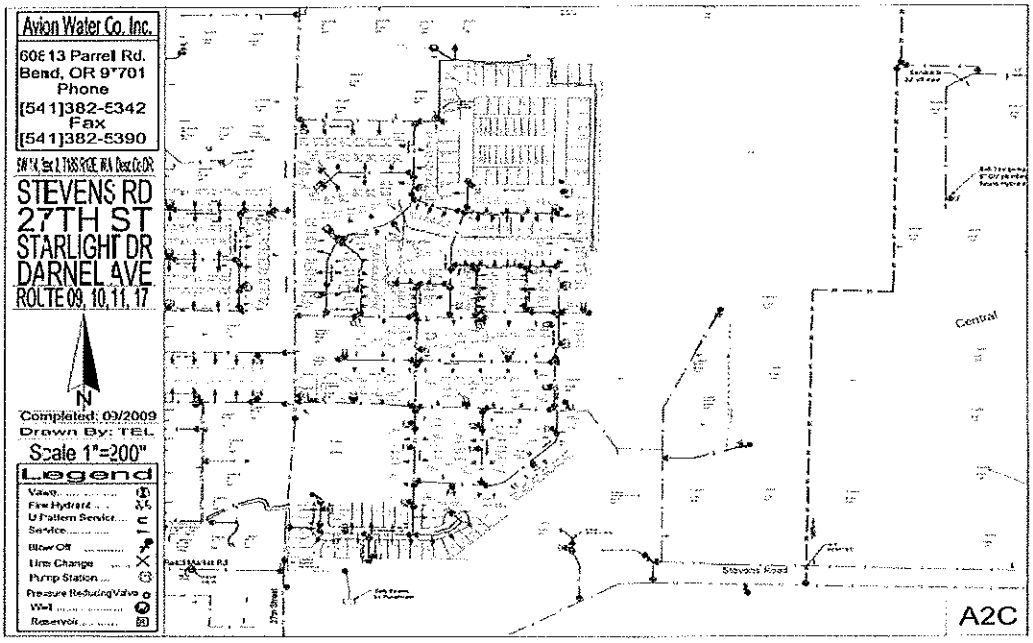
North Stevens Road Property Owners:
Represented by: **Rob Peters, 541-420-2420** - 21360 STEVENS RD. BEND, OR 97702

Property owner:	Tax lot:	Signature:
Bend Metro Parks & Rec District	1812020001404	SEE ATTACHE E-MAIL 6-24-15
Tom Pieratt	1812020001407	Tom Pieratt
Rob Peters	1812020001400	
James Lake	1812020001401	James S. Lake
Michael Larson	1812020001405	SEE ATTACHED COPY
Cracker Creek Investors, LLC Tom Pieratt	181220001406	
Brian Paslay	1812020001403	
Jerry Lucas	1812020001402	
Michael Quick	1812020001005	VERBIAL OK NOT AVAILABLE FOR SIGNATURE
Bailey Schaeffer John Schaeffer	1812020001203	
James Lake	1812020001204	
Gary Reams	1812020001205	
Nevill Naslund	1812020001206	NOT AVAILABLE FOR SIGNATURE

(18 12 02 & Avion Water Map Attached),

→ Patti Bailey Patti Bailey


THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY
7/25/2014
SECTION 2 T.18S. R.12E. W.M.
DESCHUTES COUNTY
1" = 400'
18 12 02
& INDEX
SEE MAP
18 12 02BB
SEE MAP
18 12 02BC
SEE MAP
18 12 02CB
SEE MAP
18 12 02CC
1-17
PARTITION PLAT
2009-35
1-3
CAL LATERAL A
CAL LATERAL B
CAL C.O.I. CANAL
CAL COI CANAL
20" Avion Water Main
18 12 02
& INDEX


Avion Water Co. Inc.
60813 Parrell Rd.
Bend, OR 97701
Phone
(541)382-5342
Fax
(541)382-5390
SW 1/4 Sec 2 T18S R12E WM Deschutes County OR
STEVENS RD
27TH ST
STARLIGHT DR
DARNEL AVE
ROUTE 09, 10, 11, 17
N
Completed: 03/2009
Drawn By: TEL
Scale 1"=200'
Legend
Valve
Fire Hydrant
U Pattern Service
Service
Blow Off
Line Change
Pump Station
Pressure Reducing Valve
Well
Reservoir
Central
Stevens Road
A2C

Rob Peters

From: Don Horton <Don@bendparksandrec.org>
Sent: Wednesday, June 24, 2015 5:26 PM
To: Rob Peters
Subject: RE: Property tax lot #1812020001404

Hi Rob

In the District's testimony at the last Boundary TAC meeting, we requested that the CAC consider adding any of Park District property into the UGB that abuts the current UGB or proposed expansion areas. The Hansen Park parcel would be one of those areas if the City expands in that area. I don't know that we need to formally be in this petition, but it would be ok for your petition to acknowledge that the Park and Recreation District has already requested that Hansen Park be included.

That being said, from a land use perspective, I don't see the City adding these properties as identified in the petition. It would not make sense to bring in ½ of Thunder Rd. so you have different zoning on opposite sides of a short private road. I'd bring in the 4 parcels on the east side of the road as well.

Thanks for thinking of us.

Don

PETITION FOR CONSIDERATION OF NORTH STEVENS RD. PROPERTIES FOR INCLUSION INTO THE UGB EXPANSION

June 22, 2015

City of Bend
UGB Steering Committee
710 NW Wall St.
Bend, OR 97701

Dear Members of the UGB Steering Committee,

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Sincerely,

North Stevens Road Property Owners:
Represented by: **Rob Peters, 541-420-2420**

Property owner:	Tax lot:	Signature:
Bend Metro Parks & Rec District	1812020001404	
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Michael Larsen	1812020001405	
Cracker Creek Investors, LLC	181220001406	
Brian Paslay	1812020001403	
Jerry Lucas	1812020001402	
Michael Quick	1812020001005	
Bailey Schaeffer	1812020001203	
James Lake	1812020001204	
Gary Reams	1812020001205	
Nevill Naslund	1812020001206	

(18 12 02 & Avion Water Map Attached),

Damian Syrnyk

From: Susan <susanebrody@gmail.com>
Sent: Tuesday, June 23, 2015 10:37 AM
To: Damian Syrnyk
Subject: Comments for Boundary TAC meeting on 6/24/15

Follow Up Flag: Follow up
Flag Status: Flagged

I am on vacation & unable to participate by phone in the TAC meeting tomorrow. I have reviewed the packet & have noted my comments below.

1. The additional documentation regarding the "lands to be screened from further consideration" is very helpful & provides good clarification. I also support the staff recommendation to screen the lands as described starting on page 5 & shown on Figure 2: phase 2 narrowing of exception lands.

2. I am comfortable with keeping the 3 draft scenarios, with the various refinements proposed in the staff recommendation. I think there is enough variation among the scenarios to provide for a robust analysis. I think the additions to land in the Northeast are good & I think all scenarios should include some Westside development, just at various scales.

3. I support the approach described for the creation of the "supplemental analysis map" including the description of how the analysis of adjacent lands will be conducted.

4. I am especially interested in seeing the analysis of the expansion options in relationship to the analysis of the areas already inside the UGB, including the efficiency measures recommended previously by the other TACs. I think it very important that we keep in mind that we are looking at the entire City and how it functions with various possible additions.

5. I have a question about how the residential & employment TACs will be involved in the scenarios analysis. For example, will the Residential Lands TAC have an opportunity to weigh in on the ESEE analysis regarding housing affordability under Factor 3? And, will the Employment TAC look at the evaluation of commercial & industrial uses under Factor 1? I think this would be very helpful.

Thanks for considering this input. I'm sorry I can't be at the meeting.
-- Susan Brody

Sent from my iPad

Damian Syrnyk

From: RUSSELL John <john.russell@state.or.us>
Sent: Tuesday, June 23, 2015 3:22 PM
To: Brian Rankin; Damian Syrnyk
Subject: Comments for tomorrow's meeting

Brian and Damian: Please distribute for tomorrow's Boundary Scenarios TAC meeting.

Boundary Scenarios Planning Team:

Having read the packet for the June 24 meeting of the Boundary Scenarios TAC, I offer the following comments related to the DSL site.

1. The DSL site has long been identified as a complete community development site. A formal conceptual master plan, adopted by the State Land Board in 2007, documented this concept. The plan has been available to the consultant team as well as committee members. While it is a conceptual plan, and nothing is guaranteed through the UGB process, all three of the original scenarios that were a result of the April 30 TAC/USC workshop included the DSL site as a complete community, consistent with the adopted master plan. Furthermore, all tables at the workshop showed the site as a complete community. Thus it was surprising to see only one of the three new expansion scenarios indicating a complete community for the DSL site. Scenario 1.1 includes 120 acres employment land (including a large lot), 50 acres residential and 50 acres "Civic" in an odd configuration. Scenario 3.1 includes 40 acres residential, 60 acres employment and 80 acres "Civic". Neither of these come close to being a complete community. "Civic" was not defined. If "Civic" relates to park land it seems odd to have the predominant uses adjacent to it as employment, rather than residential/mixed use.

2. One of the expansion scenarios (1.1) includes a 50 acre industrial site on the DSL property. The ideal configuration for a large industrial site is square, or close to it. A square of 50 acres is approximately 1,480 feet on each side**. Due to site constraints related to bat caves that are linked to the property and must be protected, it will be very difficult if not impossible to configure a 50 acre site that is attractive to large lot industrial users.** The master plan, which addresses the entire 640 acre section (about 380 are being discussed in this process as the remainder is resource land), shows a linear community open space that bisects the site. That community open space, serving 640 acres, consists of approximately 80 acres. While the actual area of the caves that must be protected is much smaller than 80 acres, the caves (and associated lava tubes) are approximately linear. They are fully incorporated within to the open space shown in the plan. Should Scenario 1.1 that contains the large lot industrial site be implemented, the 50 acre site would be fairly long and narrow due to these site constraints; a far from ideal situation for a large industrial user.

3. The DSL property is, by definition, public property. However, due to its Oregon Constitutional mandate, it is treated very differently than other public property. The Land Board, and DSL as its administrative arm, is mandated to obtain market value for its Constitutional lands to support and grow the Common School Fund. There have been comments in the Bend Bulletin, and in other conversations, suggesting that since DSL is public, lot industrial should be on the DSL site rather than private property. DSL should never receive any special consideration for its property, good or bad. However, sites should be evaluated on their physical and economic characteristics and impact on the overall plan, not their ownership.

John Russell
June 23, 2015

Please note I cannot currently receive calls on my office phone. We are remodeling and do not have landline service. Please contact me on my cell # below or by email. Thanks.

John R. Russell, AICP
Principal Real Property Planner
Oregon Department of State Lands
775 Summer St. NE, Suite 100
Salem, Oregon 97301
Office: 503-986-5281
Cell: 503-580-6008

Robin Vora edits
SUBMITTED 6/24/15

City of Bend
Boundary & Growth Scenarios Technical Advisory Committee
Meeting Notes
Date June 9, 2015

The Boundary & Growth Scenarios TAC held its regular meeting at 9:00 am on Tuesday, June 9, 2015 in the Bend Municipal Court Hearing Room located at 555 NE 15th Street.

Roll Call (TAC members present)

☐ Susan Brody	☐ Steve Hultberg	☐ Ron Ross
☐ Jim Bryant	Tom Kemper	☐ John Russell
☐ Paul Dewey	Nick Lelack	☐ Sharon Smith
☐ John Dotson	☐ Brian Meece	☐ Gary Timm
☐ Rockland Dunn	☐ Charlie Miller	☐ Rod Tomcho
☐ Scott Edelman	☐ Wes Price	☐ Dale Van Valkenburg
☐ Ellen Grover	Mike Riley	☐ Robin Vora
	☐	☐ Ruth Williamson

1. Welcome and Introductory Items

a. Convene and Welcome. Sharon called the meeting to order at 9:05 am.

b. Approval of Minutes 5/7/2015. Sharon asked if there were any changes to the Boundary TAC minutes of the 5/7/2015 meeting. Robin Vora recommended several changes that are identified below:

i. Mary Winters sent out a note on minority opinion. He requested this be added to the minutes. He also requested more detail in the meeting minutes.

ii. Regarding the text of the meeting minutes, on page 3 of the minutes (See page 6 of 84 of the 6/9/15 meeting packet), Robin requested that the minutes reflect why those who opposed a motion did so. He mentioned that he voted against the motion identified on the top of page 6 of 84 because wildfire should be an important consideration in UGB expansion. In addition, Ellen and Gary concurred. Several TAC members, including John, Rod, and Sharon noted that they supported the motion because they agreed wildfire was an important consideration but disagreed with those opposed on the methodology used to address it.

iii. Regarding the text of the meeting minutes, on page 3 (See Page 6 of 84), Robin also noted that on the second vote related to "1. Staying with an Unweighted Approach," he voted no because he thought ~~other packages~~ some factors were more important than others in the UGB analysis.

iv. Regarding the text of the meeting minutes on page 3 (See Page 6 of 84), Robin noted that he voted no on "2. Use the Annotated Land Suitability Composite (Figure 6) as the basis for narrowing the pool of lands to be considered for UGB expansion," he voted No

See back

averaging evenly
on this motion because ~~voting for~~ all scores masked scores he considered more important than others.

Joe asked whether the TAC approved of these changes, and noted that there was a nod of heads. Susan moved approval of the 5/7/15 meeting minutes as amended; Ellen seconded the motion. The motion passed without any no votes; Paul abstained because he did not attend this meeting.

c. Where are we in the process – a brief look back and look forward.

Joe then gave a brief report on where we are in the process. The next meeting of the UGB Steering Committee (USC) is coming up on 6/25/2015.

Steve Hultberg asked a question regarding the properties that rated dark green (high) but were not included in any of the scenarios. The question he raised was how the City could eliminate properties from further consideration based on Goal 14 considerations. On what basis do we eliminate properties based on Goal 14, and make those findings. Joe responded by stating we're using Goal 14 and the Project Goals to evaluate properties. During the narrowing process, no findings have been prepared yet to explain why properties were not included in any of the boundaries. He also point out that there are only so many acres to go around with the land need.

Mary Dorman referred to the Stage 2 mapping and explained that we can make findings why resource lands are not included. The lands mapped "green" include about 6,000 acres, working from the inside out we need to identify 2,000 acres of land to meet the need. The criteria used so far include complete neighborhoods.

The committee then began a deeper discussion of how to go about separating the lands within the scenarios from the highest rated lands that were not included in the scenarios. Steve cited to the relevant administrative rules – OAR 660-024-0060(5). The discussion touched on the following topics:

- Using Goal 14 to conduct a cost analysis of the scenarios
- For those areas included on one of the scenario maps, look at topography, proximity, document things going forward and how the decision making process was done
- Applying Goal 14 to the various scenarios, selecting some number of scenarios to which you can then apply the Goal 14 factors
- Setting up the evaluation process to recognize that if an area is too expensive that there are other lands to which the City can turn for including in the boundary
- Considering whether a property owner is advocating to be brought in the boundary or be left out of the boundary
- Don't minimize what happened at the workshop- three TACs participated in the workshop; note in the findings. Connect the dots.

- Take into account what the Forest Service is already doing through the Deschutes Collaborative Project – fire suppression efforts.
- Public agencies are not devoting adequate resources to thinning; only a small percentage of what needs to be thinned is being thinned.
- Disagreement with position that urbanization can help with mitigation.
- Firewise standards should apply to all construction in Bend.

Following the TAC discussion two people signed up to provide public comments on this topic:

1. Joe Emerson. Joe commented that the principle of high fire risk around the UGB is not a good one. He cited the Two Bulls fire as an example of a fire that is very different from a grass fire. He mentioned mitigation efforts along Highway 97, that grasses and mixed reeds have a lower risk of catastrophic wildfire and that the intensity of the heat is different based on the type of wildfire. He suggested that any on ground assessments represent recommendations for setting the boundary or input on setting a boundary.

After Joe Emerson gave his comments Craig Letz followed up with a few comments: the on-ground assessments will represent information to guide the decision on the boundary. He confirmed for the discussion that the fire risk in the future is not based on fire risk in the past.

2. Robin Vora. Robin referred the TAC to the fire history map developed by County Forester Ed Keith. He briefly summarized the fire history map, and pointed out that there were not large fires in the area east of Bend north of Rickard Road and Highway 20 ~~east~~. He commented that this area did not include enough fuels to carry a fire east of town. Areas between Powell Butte, Bend, and Redmond have a lower fire risk. There is also a cost element of these fires; there are not fire SDC's (system development charges) paid for more fire support. He mentioned that ~~there~~ is an added cost which ~~represents a~~ socialized risk and privatized profit. The articles he provided in his written materials to the TAC show that expanding ~~perimeter~~ is one of the biggest factors of paying the costs of wildfire. National fire-fighting budgets are limited.

Before turning to the recommendations in the wildfire memo, Ellen posed a question of whether there is a special use or need for less dense development on the west side for a buffer? Nick commented that he appreciated the city bringing forward wildfire mitigation codification. The UGB process is now the start of an urban reserve; we can get the framework into codes now in this process.

Joe then turned to the recommendations in the packet (See pages 14 and 15 and cited above).

Recvd 6/24/15

Land Priority Rules and UGB Amendment Cases

Christe C. White
Law Offices of Christe White

Christe C. White

Christe C. White is an attorney with the Law Offices of Christe White. She represents a variety of institutions, commercial and residential developers as well as local jurisdictions in a multitude of land use forums. Previously she was a land use attorney and partner at Ball Janik LLP from 1995-2008 where she was Chairwoman of the Land Use Practice Group. In 2008, she took a one year professional sabbatical acting as Vice President of Development for Williams and Dame Development, Inc. Following that sabbatical, she opened her own law office to continue her development and land use practice.

Ms. White is frequently asked to speak to client groups, other lawyers and consultants on a wide array of topics, including successful permitting strategies, density transfers, constitutional limitations on exactions and UGB amendments. She is the author of *Leaky Underground Fuel Tanks: An Anatomy of Regulatory Failure*, published in the *UCLA Journal of Environmental Law and Policy.*

Ms. White graduated from the University of California at Berkeley (Boalt Hall School of Law) with high honors, *Order of the Coif.*

UPDATE ON THE LAND PRIORITY RULES and METROPOLITAN AREA PLANNING REQUIREMENTS IN A UGB AMENDMENT

14th Annual Oregon Land Use Law Seminar
December 10, 2010

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1. UGB Land Priority Rules

ORS 197.298:

(1) In addition to any requirements established by rule addressing urbanization, land may not be included within an urban growth boundary except under the following priorities:

(a) First priority is land that is designated urban reserve land under ORS 195.145, rule or metropolitan service district action plan.

(b) If land under paragraph (a) of this subsection is inadequate to accommodate the amount of land needed, second priority is land adjacent to an urban growth boundary that is identified in an acknowledged comprehensive plan as an exception area or nonresource land. Second priority may include resource land that is completely surrounded by exception areas unless such resource land is high-value farmland as described in ORS 215.710.

(c) If land under paragraphs (a) and (b) of this subsection is inadequate to accommodate the amount of land needed, third priority is land designated as marginal land pursuant to ORS 197.247 (1991 Edition).

(d) If land under paragraphs (a) to (c) of this subsection is inadequate to accommodate the amount of land needed, fourth priority is land designated in an acknowledged comprehensive plan for agriculture or forestry, or both.

(2) Higher priority shall be given to land of lower capability as measured by the capability classification system or by cubic foot site class, whichever is appropriate for the current use.

(3) Land of lower priority under subsection (1) of this section may be included in an urban growth boundary if land of higher priority is found to be inadequate to

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christe.white@christewhite.com

accommodate the amount of land estimated in subsection (1) of this section for one or more of the following reasons:

(a) Specific types of identified land needs cannot be reasonably accommodated on higher priority lands;
(b) Future urban services could not reasonably be provided to the higher priority lands due to topographical or other physical constraints; or

(c) Maximum efficiency of land uses within a proposed urban growth boundary requires inclusion of lower priority lands in order to include or to provide services to higher priority lands. [1995 c.547 §5; 1999 c.59 §56]

OAR 660-024-0060 introduces the land priority exception in ORS 197.198(3) in the following manner:

"*Notwithstanding* subsection (a) through (c) of this section, a local government may consider land of lower priority as specified in ORS 197.298(3)." (Emphasis added)

2. *Hildenbrand* Untested This Time Last Year

Last year we discussed the expected import of *Hildenbrand v. City of Adair* Village, 217 Or App 623, 177 P3d 40 (2008). In *Hildenbrand*, the City approved a 142-acre expansion on agricultural land south of the City. The opponents contended that ORS 197.298 foreclosed including agricultural land within the new UGB boundary because suitable nonagricultural land was available as an alternative. *Id.* at 633. Further, opponents argued that the City and LUBA erred in allowing the addition of lower priority land without proof that the quantity of all types of higher priority lands was inadequate. *Id.* at 634.

The Court of Appeals rejected these arguments. Citing *City of West Linn v. LCDC*, the Court again held that the statutory reference to "inadequate" land addresses suitability not just quantity of higher priority land. *Id.* at 634-35. Thus, the Court concluded that:

"The ranking of land under ORS 197.298(1) is a function of its prior classification as urban reserve land, exception land, marginal land, or resource land, *as well as* the application of the qualitative factors under Goal 14 and ORS 197.298(3)." (Emphasis added). *Id.* at 635.

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In this holding the Court seemed to conclude that land priority and the qualitative factors are viewed together to determine appropriate inclusions in the UGB. In addressing the City's arguments to exclude higher priority land, the Court found that it was too costly to extend urban services across a highway to reach higher priority land and that development of higher priority land was contrary to acknowledged plan policies interpreted by the City. *Id.* at 634.

The Goal 14 factors allow comparison of needed public facility improvements in the alternative expansion areas as a part of the consideration of the orderly and economic provision of public facilities. *Id.* 632-34. It is likewise proper to consider the effects of an expansion on compact growth and community form in assessing the comparative social consequences. *Id.* at 636.

Last year we discussed the fact that *Hildenbrand* seemed to leave little doubt on the import of ORS 197.298(3) when it held "ORS 197.298(3) relaxes the prioritization requirements in certain circumstances." *Id.* at 633. Those circumstances occur when a city can demonstrate that higher priority land is inadequate as compared to lower priority land under the factors articulated in ORS 197.298(3).

According to the Oregon Court of Appeals, OAR 660-024-0060 recognizes the *coincident* application of the Goal 14 locational factors and ORS 197.298(1) in evaluating urban growth boundary changes. *Hildenbrand v. City of Adair Village*, 217 Or App 623, 636, 177 P3d 40 (2008) (fn.3). This is achieved through application of the flexibility provided by ORS 197.298(3) to elevate lower priority land where the Goal 14 location factors call for a boundary that does not match the location of the highest priority lands. *Id.* at 635-36.

3. *Hildenbrand* Now

In the Bend UGB proceedings, the City approved a UGB expansion that included lower priority lands over higher priority lands. The City relied in part on *Hildenbrand* to include lower priority lands. LCDC conditionally approved the inclusion of lower priority land and provided its own read on the impact of *Hildenbrand.*

"The Court's basic point in *Hildenbrand* was that the "exceptions" of ORS 197.298(3) and the Goal 14 location factors, together with the "priorities" of ORS 197.298(1), *have roles to play* in determining whether there is adequate land to serve an identified need for

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urbanizable land." (LCDC Remand and Partial Acknowledgement of City of Bend UGB-001795 at page 126).

The Commission did not further define the "roles to play" and did not cite any of the *Hildenbrand* language regarding "relaxation of the priorities in certain circumstances" or the coincident application of the exceptions of ORS 197.298(3) with the priority rule.

4. The Commission's Bend Order on Land Priority

According to the LCDC Order, in evaluating lands for its UGB expansion on remand, a local government must work through the following steps in the following order:

a. *Establish suitability criteria* for general housing, employment, and related land needs. These criteria must be consistent with (in the sense of implementing, or being in harmony with) the definitions in OAR 660-008-0005(2) (for lands planned for future general residential uses), and 660-009-0005(9) and (12) and 660-009-0025(1) and (2) (for lands planned for future general employment uses) as well as other provisions of law applicable in determining whether the land will meet the city's general land needs.

b. *Document the criteria* used to locate lands required to meet any "specific identified needs" as allowed by ORS 197.298(3)(a). Document that these sites cannot be accommodated inside the UGB.

Notes: The Commission finds that one of the exception criteria, ORS 197.298(3)(a) can apply in the first step of the land priority analysis.

c. *Apply the suitability criteria* for general housing, employment and related land needs to exception lands (first priority lands in Bend) within the expansion study area. In this step, the City must identify exception lands (including lands designated by the City as urban area reserve) that will not accommodate any of its general land needs during the planning period. These lands may be "screened out" from further analysis.

d. As part of this first tier screening: "The City may use other suitability criteria based on the Goal 14 locational factors, but in order to exclude lands for generalized housing or employment land needs the City must show, with an adequate factual base, that the lands will not accommodate any of its general land needs during the planning period. **Such a showing also may be based on ORS 197.298(3)(b) – e.g.,that "[f]uture urban services could not reasonably be provided to the higher priority lands due to topographical or other physical constraints.**"

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Notes: A local government is permitted to use the ORS 197.298(3)(b) exception in the first screen to remove higher priority lands from UGB expansion based on the cost of services.

e. For its remaining (general) future land needs over the planning period, the City must compare the remaining (after the screening described above for suitability) exception lands using the Goal 14 locational factors to determine which of those lands are best to include in its UGB expansion area. In this step, the City may rely on ORS 197.298(3)(c) (maximum efficiency of land uses *** requires inclusion of [resource lands] *** to include or to provide services to [the exception lands]") to *include* resource lands, particularly resource lands interspersed with exception lands, within its UGB expansion area. Resource lands included under ORS 197.298(3)(c) need not be evaluated for soil capability, as called for under ORS 197.298(2).

Notes: A local government is allowed in this step to apply the exception for maximum efficiency of land uses to include land of lower priority over land of higher priority. The question is why would a City be required to wait to apply the maximum efficiency test until this step in the process when the topographical/physical constraints exception was allowed to be applied in the first step in the process? There does not appear to be any statutory or rule language that suggests the exceptions be treated differently or applied at different stages in the process.

The answer may be based in part on *City of West Linn v. LCDC*, 201 Or App 419, 119 P3d 285 (2005). There, the Court of Appeals agreed with LCDC's contention that ORS 197.298(1) provides that "progressively lower priority lands may be included within a UGB if higher priority land is inadequate to accommodate the amount of land needed." *Id.* at 440.

"As LCDC correctly noted, ORS 197.298(1) expressly provides that the priorities that it describes apply in addition to any requirements established by rule addressing urbanization such as the locational factors described in Goal 14. As a result, that other higher priority land may exist somewhere adjacent to the UGB does not necessarily mean that the land will be adequate to accommodate the amount of land needed if using it for an identified need would violate the locational considerations of Goal 14. In other words the statutory reference to "inadequate" land addresses suitability, not just quantity, of higher priority land." *Id.* at 440 (Emphasis added).

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In its Respondent's Brief in *City of West Linn*, LCDC argued that designated farmland in Study Areas 85 and 87 within Washington County should be included in the UGB expansion because in part "urbanization of these farmlands was necessary to efficiently urbanize and to provide services to Study Areas 84 and 86." *Id.* at 443-44. In that case Study Areas 84 and 86 were exception areas that were separated and bordered by Areas 85 and 87. *Id.* There LCDC found that there was substantial evidence in the record establishing greater efficiencies and greater opportunities to design a whole community by including the resource lands under ORS 197.298(3)(c).

The Court of Appeals agreed. "We . . .understand that Metro's justification rests . . .on a combination of factors, including, as noted, the area's proximity to the existing Bethany Town Center and to Portland Community College facilities, the fact that the Bethany area inside the UGB is already developed, the availability of transportation resources, the area's relative closeness to downtown Portland . . . the conclusion that Areas 84 and 86 cannot efficiently be provided with services without also including Study Areas 85 and 87 in the UGB..." *Id.* at 444.

In the Bend hearings this last finding from the *City of West Linn*, became referred to as the "checkerboard." The Bend Commission Order uses the word "interspersed." When the application of maximum efficiency of land uses creates a checkerboard of lower and higher priority land ORS 197.298(3)(c) allows a City to include the lower priority land. Perhaps this is the rationale behind limiting the (3)(c) exception to the third step in the land priority analysis. A City would not know if it has a checkerboard until it gets to the third step.

If LCDC limits the application of *City of West Linn* to the checkerboard analysis, its application seems unreasonably narrow. The language of the *West Linn* case does not limit its application to "checkerboard" scenarios. Rather, the Court expressly relied on a combination of factors. Based on *West Linn* and *Hildenbrand,* there does not seem to be a universal rationale for allowing a (3)(a) exception in the initial screening and restricting a (3)(c) exception to a later screening.

Another possible rationale is that the ORS 197.298(3)(b) exception *excludes lands* based on physical or topographical constraints while the ORS 197.298(3)(c) exception *includes lands* based on the maximum efficiency of land uses. This rationale seems to be weakened by the use of the (3)(a) exception, *inclusion of lands* for a specified land need,

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in the second step in the process and the fact that all of the exceptions have the effect of both including and excluding land.

The rationale could also be that the Commission applied ORS 197.298(3)(b) before any comparative analysis was conducted on the suitable exception lands. Thus, the Commission concludes that land excluded at this pre-comparison stage must meet a "high bar." But the (3)(b) exception is founded on the cost of urban services. The question is whether that analysis and screening priority is legally distinct from an analysis under ORS 197.298(3)(c) which addresses the maximum efficiency of land uses. Inherent in the maximum efficiency discussion is the cost of providing services to comparative parcels of land. Inherent in the (3)(b) discussion is whether urban services can "reasonably be provided." Both exceptions seem to require some level of comparison.

LCDC cited both the Bethany example from *City of West Linn* and the Brookings example as cases where lower priority land was included and upheld by the Court of Appeals under an ORS 197.298(3)(c) exception.

f. If the City is unable to accommodate its need for additional lands during the planning period after undertaking the preceding steps, it may then evaluate lands in the next priority category under ORS 197.298(1) (e.g., resource lands) for its general land needs. If the City does so, it must consider resource lands with lower soil capability first, as specified in ORS 197.298(2). To the extent that resource lands are needed to meet remaining (general) future land needs over the planning period, the City must apply the general suitability criteria used in Step 1 (above) and then compare suitable resource lands using the Goal 14 location factors to determine which of those lands are the best to include in its UGB expansion area.

5. <u>The Metropolitan Area Planning Requirements In the Context of a UGB Amendment</u>

In its Remand and Partial Acknowledgement Order for Bend, LCDC found that the metropolitan area planning requirements of OAR 660-012-0035 must be met before a City may complete its UGB expansion.

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The Goal 12 rules require that the City prepare an integrated land use and transportation plan prior to approval of its UGB. The plan must show, amongst other things, a decline of 5% or more per capita in VMT.

Bend had not yet completed an integrated land use and transportation plan under this rule and was concerned that such an exercise would delay its UGB amendment process by a number of years, significantly impacting its economic growth opportunities and its ability to update needed facility plans.

In response to these and other arguments, LCDC struck a compromise consistent with Goal 12. If the City demonstrates that its revised UGB expansion, along with proposed land use and transportation measures, results in an estimated change in VMT per capita:

(a) Of a decline of 5% or more per capita, the City is in compliance;

(b) Of a decline of between 0% and 4.99% per capita, then the City may proceed by preparing for DLCD/LCDC review and approval *concurrently with the revised UGB*, a work plan/program to achieve a reduction of 5% or more over the planning period; or

(c) Of an increase in VMT per capita, then the City must prepare and submit and obtain LCDC approval of an integrated land use and transportation plan *prior to approval of a revised UGB.*

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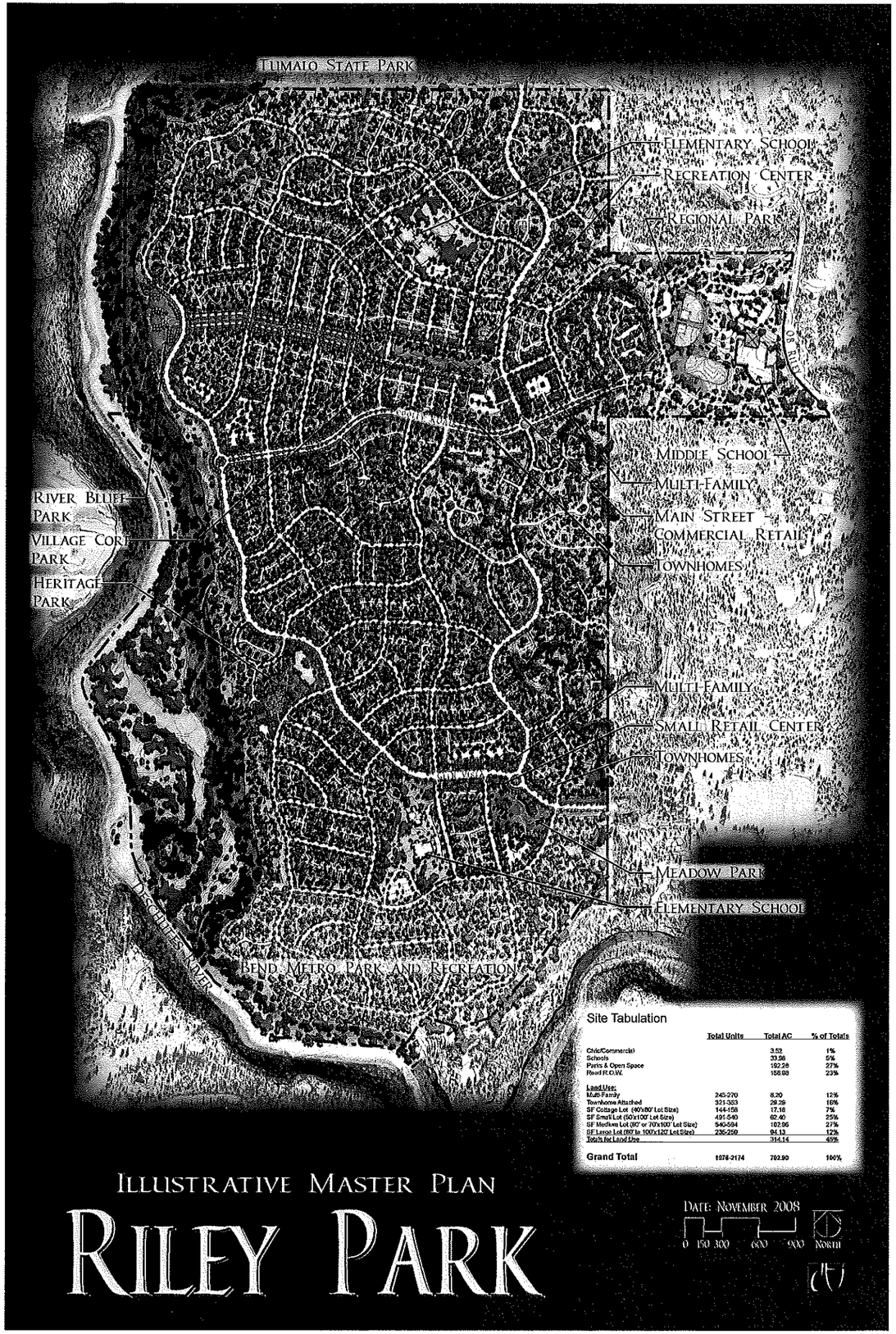

TUMALO STATE PARK
ELEMENTARY SCHOOL
RECREATION CENTER
REGIONAL PARK
MIDDLE SCHOOL
MULTI-FAMILY
MAIN STREET
COMMERCIAL RETAIL
TOWNHOMES
RIVER BLUFF PARK
VILLAGE CORE PARK
HERITAGE PARK
MULTI-FAMILY
SMALL RETAIL CENTER
TOWNHOMES
MEADOW PARK
ELEMENTARY SCHOOL
DESCHUTES RIVER
BEND METRO PARK AND RECREATION
Site Tabulation
Total Units
Total AC
% of Total
Civic/Commercial
3.52
1%
Schools
33.98
5%
Parks & Open Space
192.98
27%
Road R.O.W.
168.66
23%
Land Use:
Multi-Family
245-270
8.20
12%
Townhome Attached
321-353
29.26
16%
SF Cottage Lot (40'x80' Lot Size)
144-158
17.18
7%
SF Small Lot (50'x100' Lot Size)
491-540
62.40
25%
SF Medium Lot (60' or 70'x100' Lot Size)
540-594
192.06
27%
SF Large Lot (80' to 100'x120' Lot Size)
235-259
94.13
12%
Totals for Land Use
314.14
45%
Grand Total
1078-2174
702.90
100%
ILLUSTRATIVE MASTER PLAN
RILEY PARK
DATE: NOVEMBER 2008
0 150 300 600 900
North

new WEST village

Riley Park

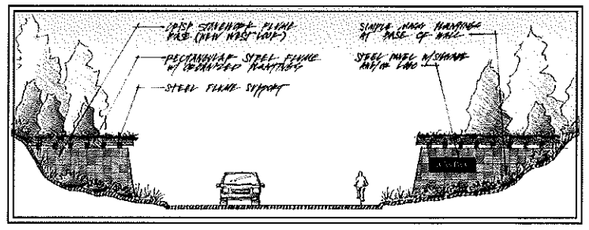
parks

The New West Village in Riley Park embodies a distinctive spirit of design, unique to the desert plains of central Oregon. The philosophy of the New West design embraces contemporary expressions of form, color, details, and materials that celebrate the environment and are instilled in the overall character of the New West Village. Defined by several small ridges and the river canyon, the New West Village core is a mixed-use center which includes retail, civic, school sites & mixed residential.

village core

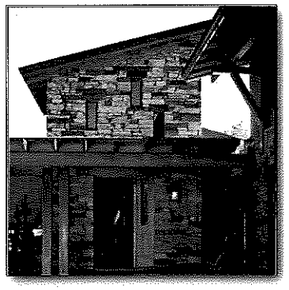
The northwest orientation of the village core is driven by the strong views of the Middle Sister peak. The style of architecture is predominantly New West character, but will also include styles such as Craftsman, Shingle, Farmhouse, and Prairie Style.

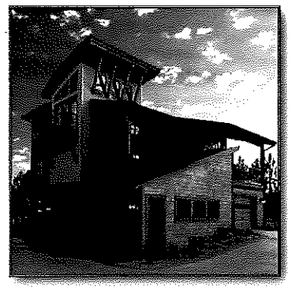
cont.

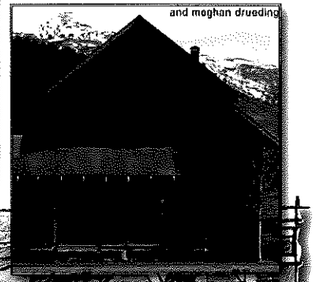


The parks & open space throughout the New West Village can be described as more urban in character, including more manicured turf and less native landscape. Organized forms in the materials such as metal, stone and dimensional wood will be used in park structures and plazas. The Village Core Park is designed to be the central gathering place for Riley Park and capable of hosting large community events.

street elevation







and meghan drueding

mixed-use

New West Village

Site Characteristics

Land Form
- Semi flat with more dramatic grade change/rock outcroppings at eastern edge, district formed by small ridges to the north and south and dramatic ridge or rim along Deschutes River to the west

Vegetation
- Areas of tree coverage with distinct rooms or meadow areas

View Opportunity
- Strong westerly views at grade change on eastern edge, at rim edge, and within open non-vegetated rooms.

Product Mix and Density
- Highest density Area of community
- Most compact area of community with increased building height (3-4 stories) and smaller setbacks
- High mix of uses within village core, including neighborhood retail, civic, school sites and mixed residential
- Highest concentration of multi-family housing
- Rim edge provides a mix of housing types

Architectural Character
- Civic, School and Mixed-Use Buildings are New West character
- Over 50% of residential units are New West character
- Other architectural character includes Craftsman, Shingle, Farmhouse and Prairie Style
- All product is alley-loaded or garage back

Parks and Open Space Character
- More urban character of parks (more manicured with less native landscape
- Community elements represent a New West character
- Formal open space areas, alee parks, urban plaza space, rim park
- Goal of trail pedestrian connectivity is to focus people to the rim

Street Pattern
- "Grand" network of streets leading from rim edge to core
- Formal street patterns with major focus on view orientation and rim access to the west
- Two parallel main east-west connections occur within this district
  - One formal alee extending from village center
  - One more organic meandering boulevard following the natural rock outcroppings
- Community boulevard entry from OB Riley to rim edge

Meadow Neighborhood

Site Characteristics

Land Form
- Combination of small rolling ridgelines and open meadows defined by rock outcrops and tree stands
- Less distinct rock outcroppings

Vegetation
- Smaller clusters of tree stands defining more intimate spaces/meadow grass areas

View Opportunity
- Strong western views when tree cover opens up, Awbrey-Mountain to the south is close prominent land form

Product Mix and Density
- Overall character is medium density…feels most like NorthWest Crossing
- Medium density area of community with building heights (2-3 stories) and typical setbacks
- Secondary neighborhood core with small retail use, higher density housing and elementary school
- Mix of residential housing with lower concentration of multi-family

Architectural Character
- Civic buildings have a more historic character with an "infusion" of New West elements
- Residential character is 25%-35% New West with other character styles including Craftsman, Prairie, Farmhouse and Shingle.
- Mostly alley loaded or garage back solutions in response to certain terrain constraints

Open Space
- Community elements relate to a historical character with a New West "infusion"
- Natural open space areas defined by rock outcroppings, meadows or tree stands, demonstrating a contrast of native and natural
- Parks spaces are multi-use areas with lots of green and minimum hardscape elements
- Goal is to connect residents to historic farmstead and then to rim edge

Street Pattern
- Modified grid with smaller enclaves separated by open space, radiating from secondary village and school site
- Street and trail system directs people to the rim and prime view orientation
- Goal is to experience many different conditions as possible, rocks, views, rim, water, trails, ledge bank, meadows, etc in smaller more relaxed settings

Woodland Enclave

Site Characteristics

Land Form
- Defined by numerous natural rock outcroppings and grade changes, several depressions or low points found toward the center

Vegetation
- Dense tree coverage and woodland meadows

View Opportunity
- View and open space oriented home sites
- West side- close proximity to rim and views down to river as well as distant views to mountain range

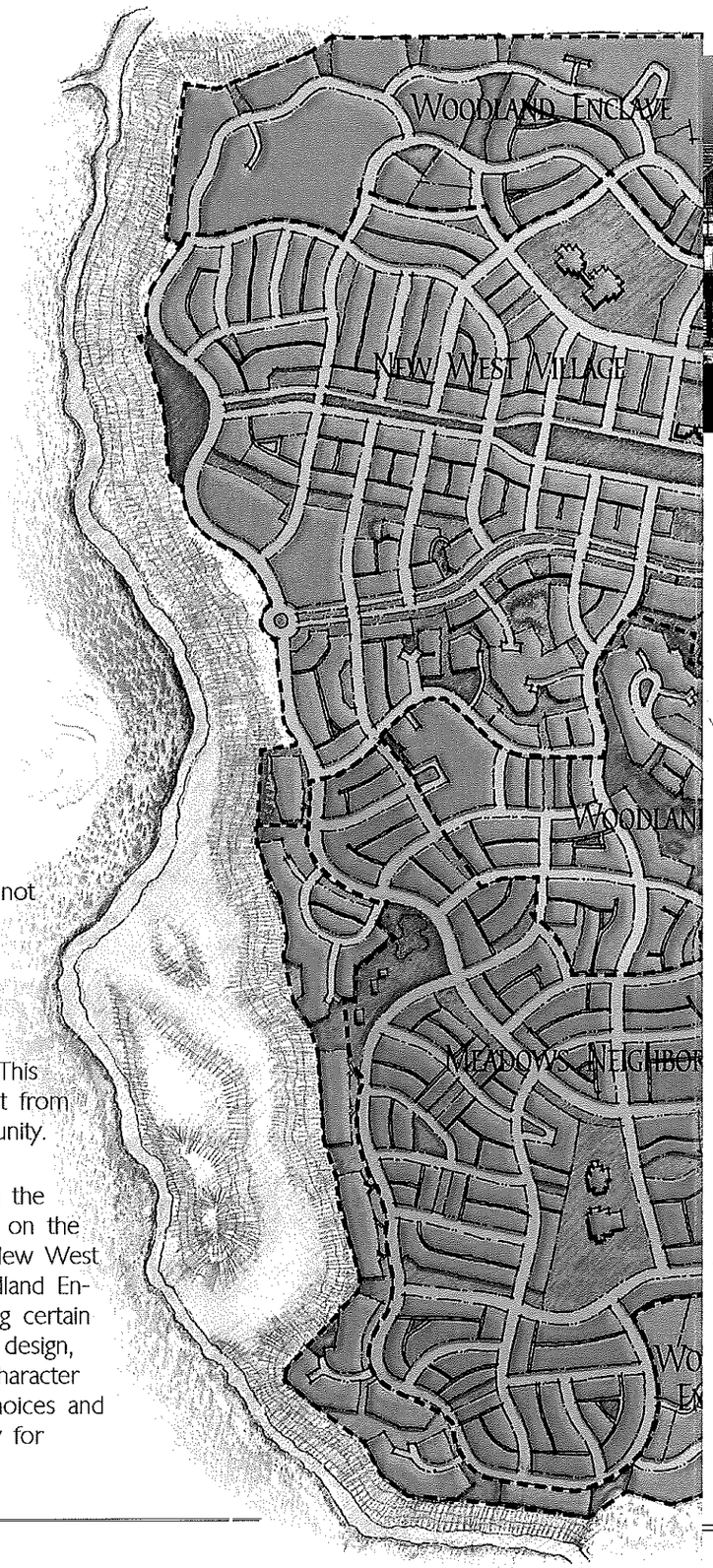
Product Mix and Density
- Low to medium density supports the natural site character with pockets of higher density to provide texture and mass at key locations

Architectural Character
- 10%-20% of homes should be New West Character with the majority as Woodland, High Desert and Craftsman no Farmhouse or Shingle
- Higher percent of front-loaded product tucked into setting
- Product designed to live to the rear of the home on open space, trees and rock outcrops

Open Space Character
- Community elements are less refined and more rustic and historic in character
- Naturalized open space areas that take advantage of special features such as rim edge, rock outcroppings, tree clusters and view opportunities
- Larger consideration for trails instead of sidewalks
- Open space may be located in rear of lots versus in front of homes

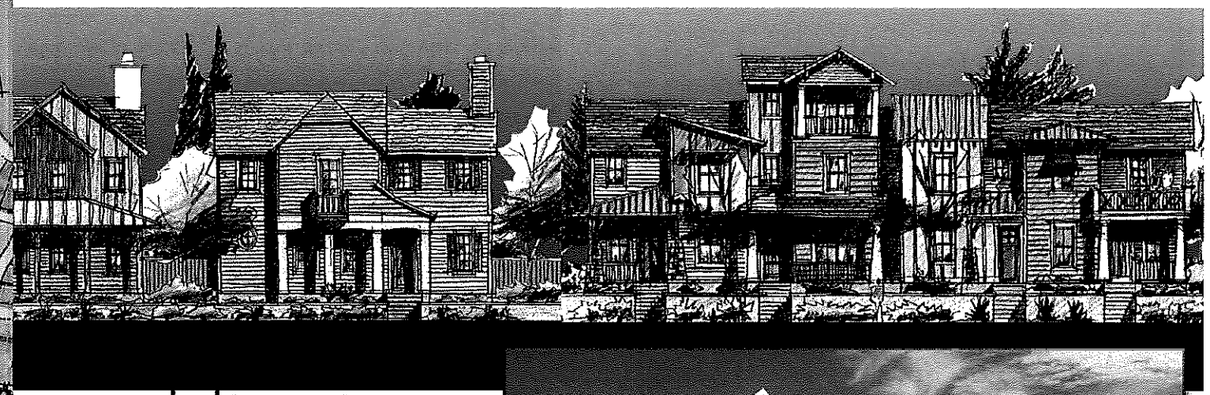
Street Pattern
- Street pattern to follow a more flowing organic pattern based on natural terrain and transition to Natural Sate Park to the north
- Rural street section with ribbon curb
- Secondary street connections to the north and east should occur in a circuitous manor to preserve vegetation and landforms

Variety: The Spice of Life

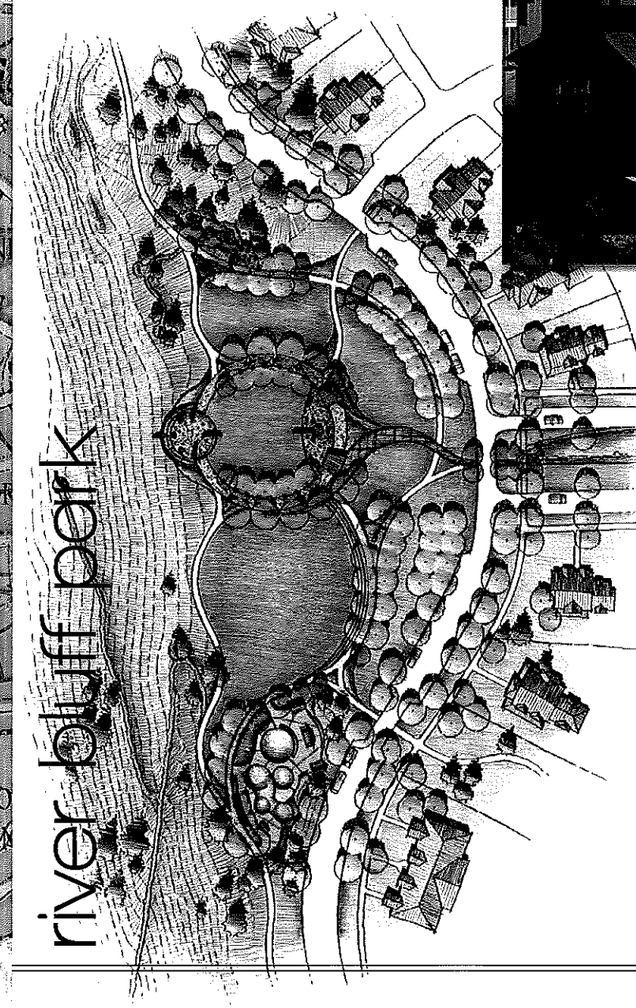


The uniqueness of Riley Park is ingrained not only in its beautiful setting but also in the opportunity to provide a variety of memorable experiences. Too large for a single architectural characteristic or a certain type of density, Riley Park requires variety to be instilled as a part of its overall character. This variety is what allows Riley Park to standout from the competition as an extraordinary community.

Part of Riley Park's uniqueness comes from the three districts within the community. Based on the characteristics of the land, these districts, New West Village, Meadows Neighborhood, and Woodland Enclave, were given further identity by applying certain architectural styles, amenity offerings, street design, and density. These neighborhoods fit the character of the land, offer the buyer a variety of choices and experiences, and create a memorable story for Riley Park.

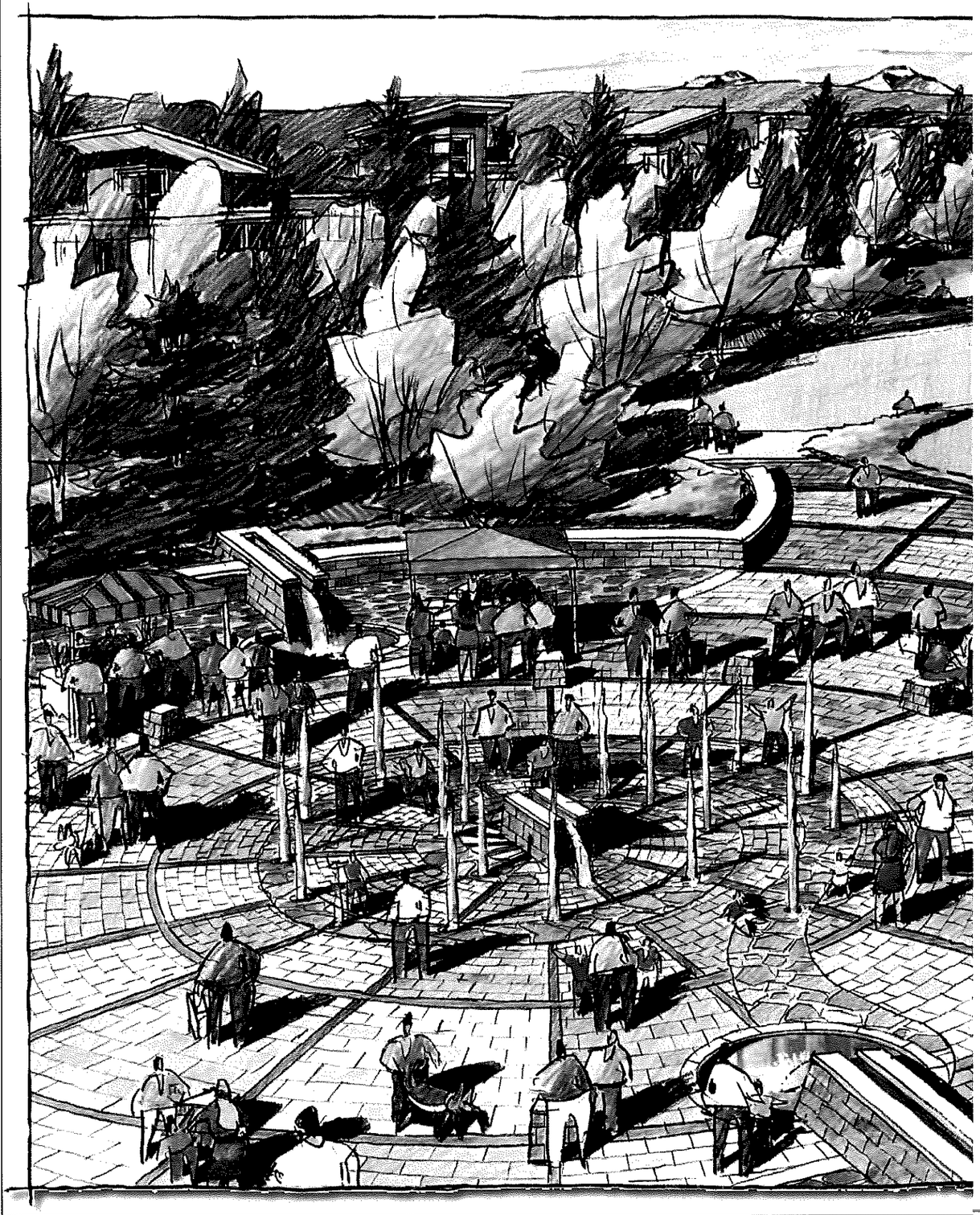


architecture

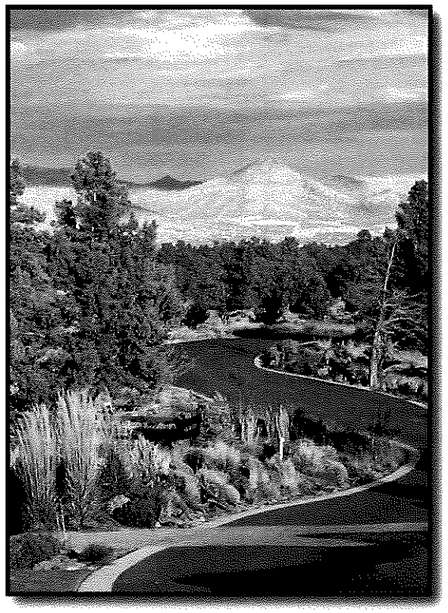


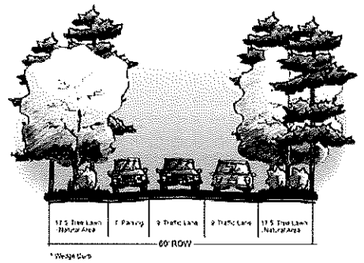
It has a plaza with a splash fountain, open lawn for recreation, an amphitheater created from an existing rock formation, an ice rink in the winter, and an overlook tower. From the Village Core Park is the Village Pronenade that maintains an open space connection to the River Bluff Park. Here, the River Bluff Park acts as a terminus to the Promenade with a flume-themed water feature. Located along the river canyon rim, this park offers a variety of uses, such as a formal event lawn, skate park, picnic areas, trail connections, a boulder play space, and several overlooks capturing views to the west.

new WEST village
Riley Park

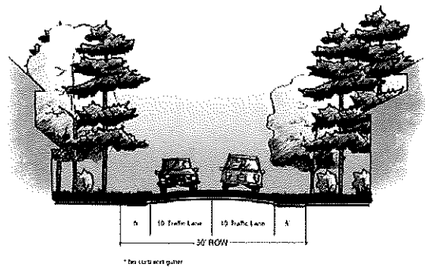


Street Sections

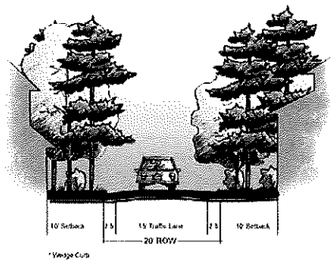




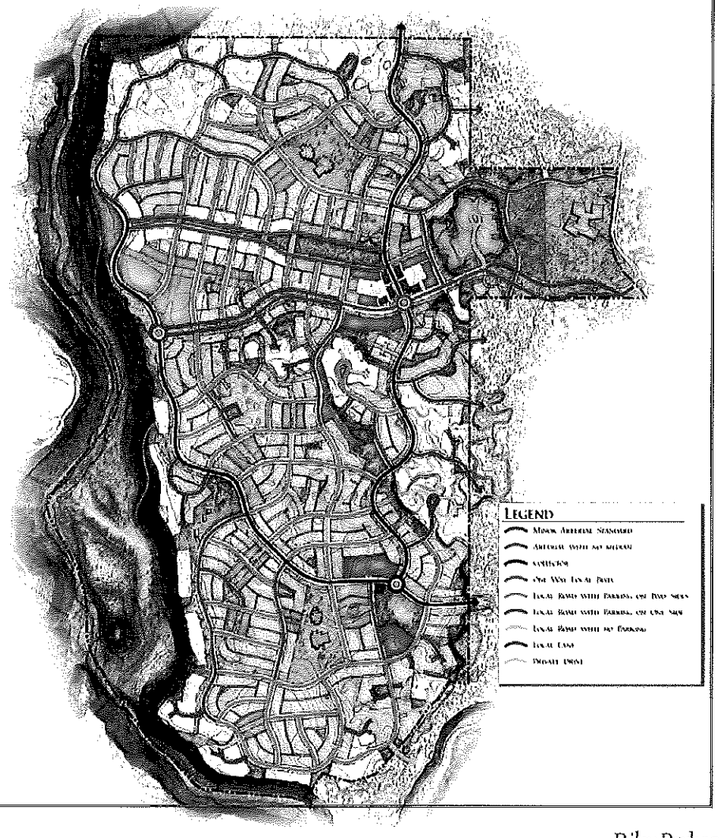
Local Lane

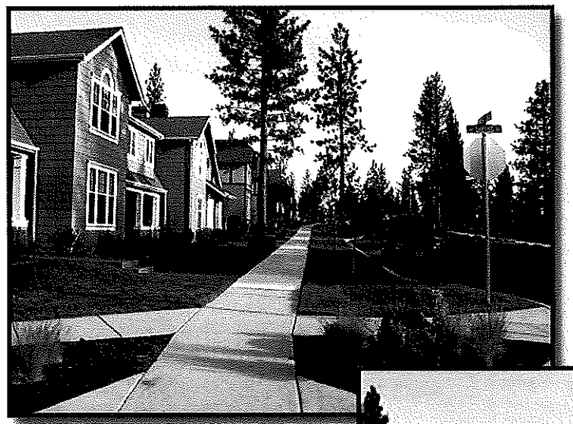


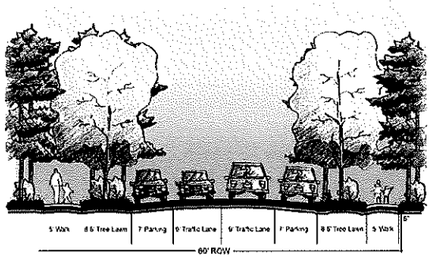
Private Drive



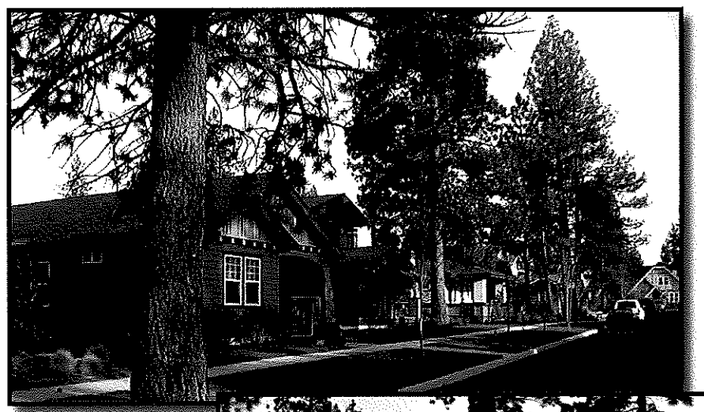
Typical Alley

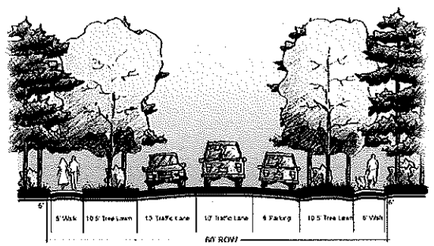




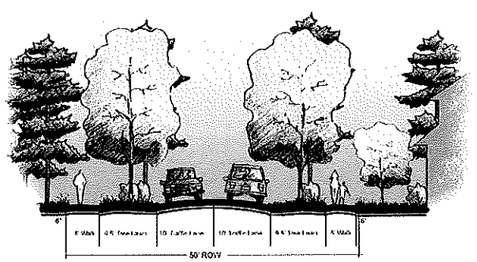


Local Road with
Parking on Two Sides



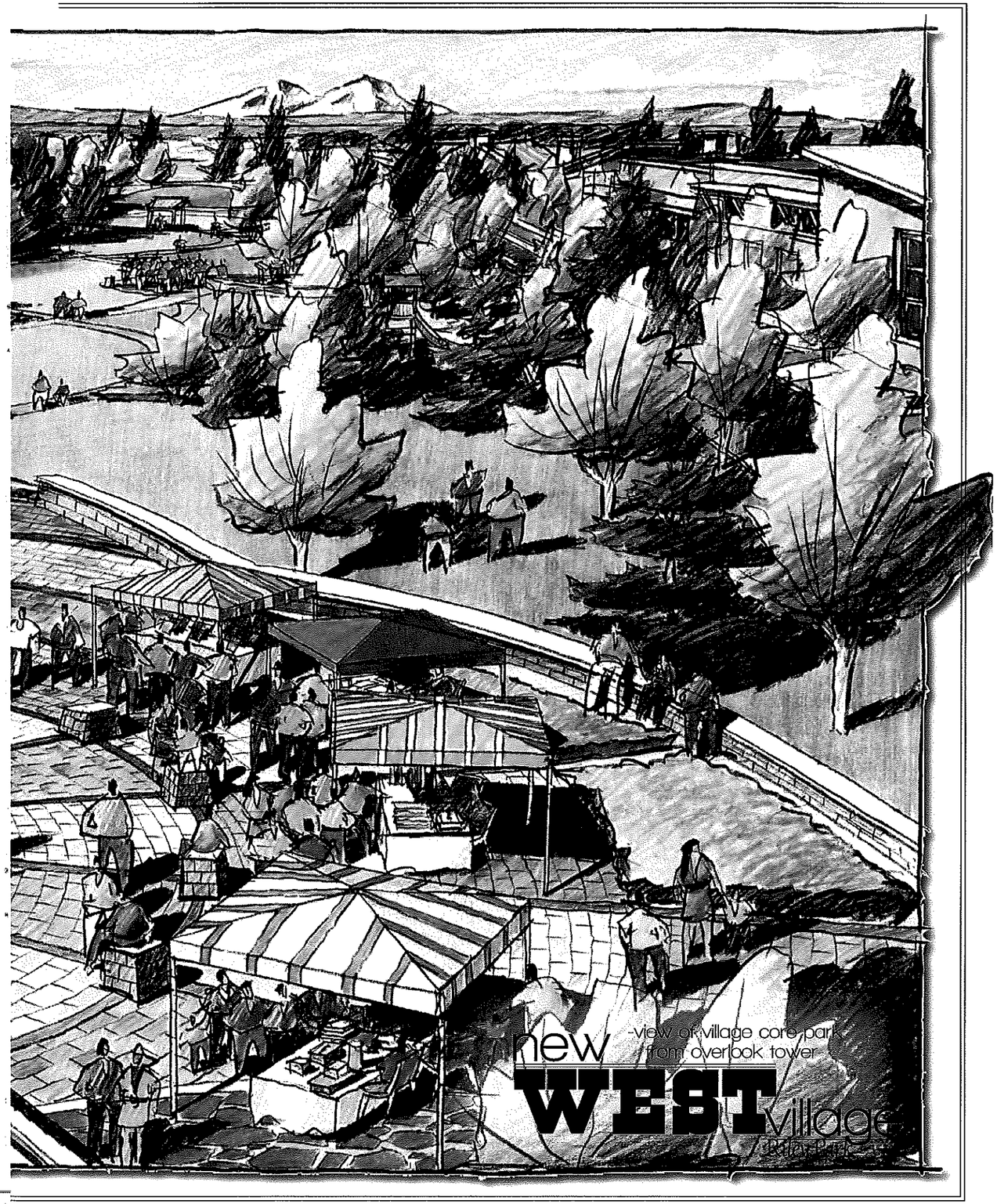


Local Road with
Parking on One Side



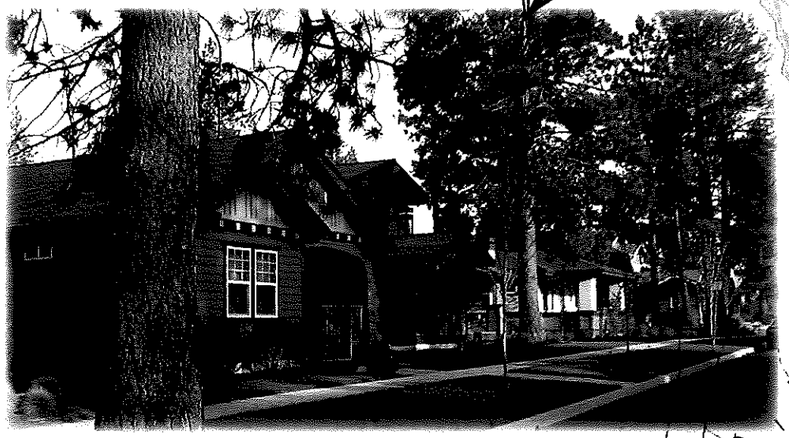
Local Road with
No Parking

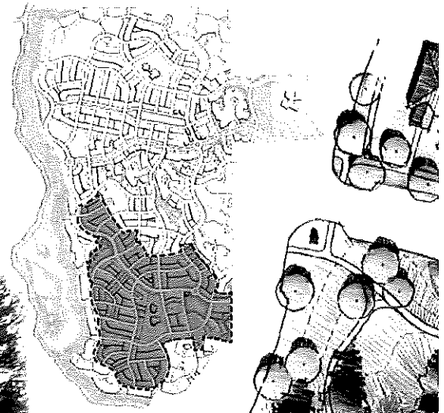
Street Sections



Meadows neighborhood

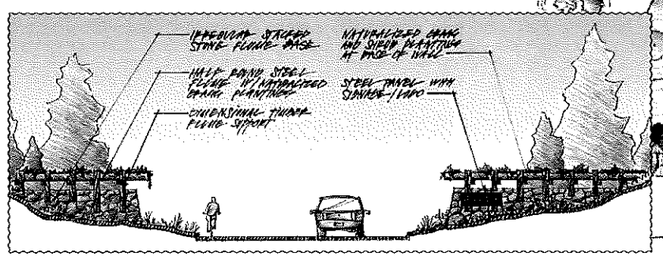
Riley Park



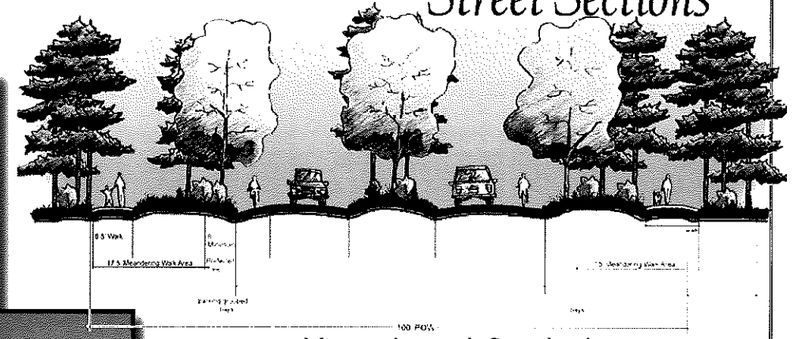


heritage park

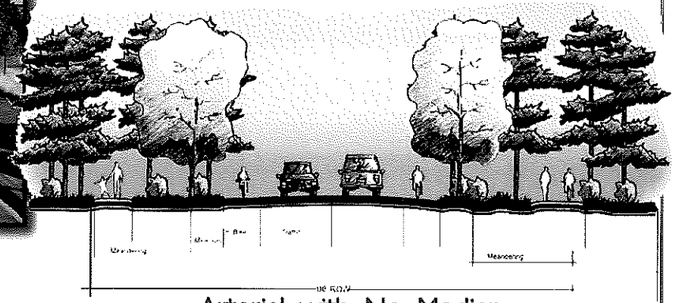
The Meadows Neighborhood in Riley Park can be defined as a comfortable blend of historic design characters with an "infusion" of New West elements. Predominantly open meadows surrounded by rock outcrops & existing tree stands, the Meadows Neighborhood possess strong western views when tree cover opens up. The overall character is of medium density, similar to NorthWest Crossing. Within the district is a secondary core with small retail use, high density housing and an elementary school. The architectural character is mostly traditional including styles such as Craftsman, Prairie, Farmhouse and Shingle. New West character will also be used but limited.



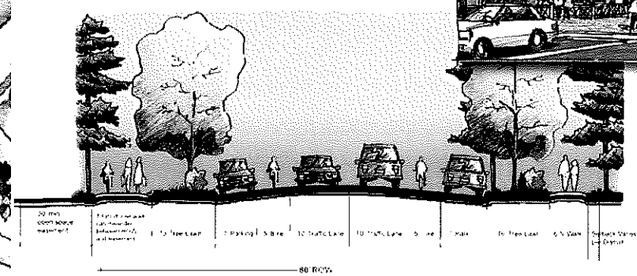
Street Sections



Minor Arterial Standard

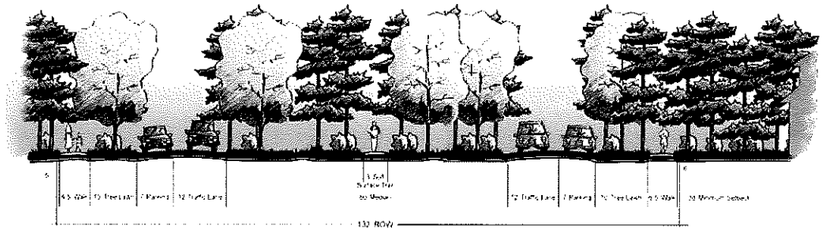


Arterial with No Median

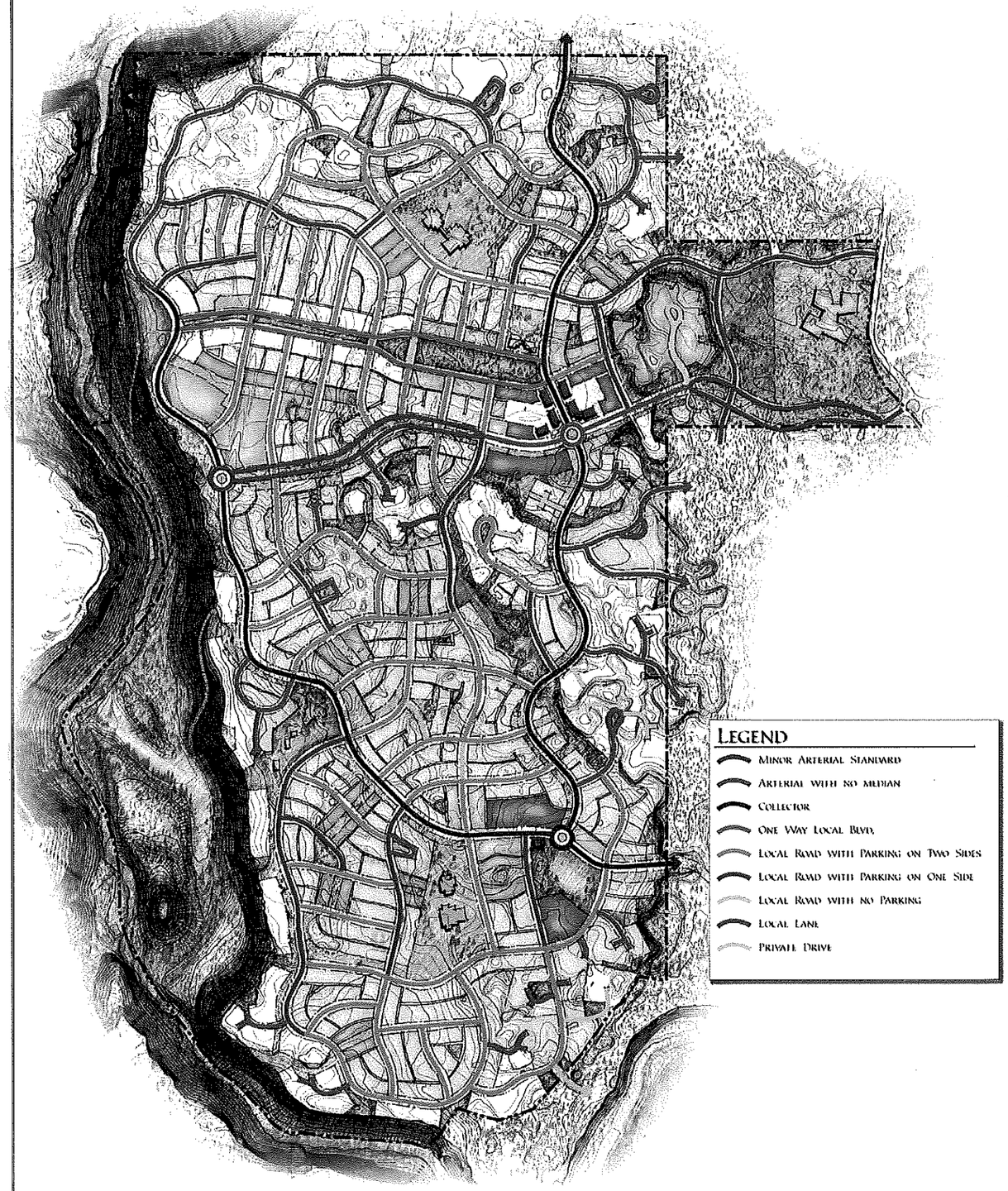


Collector

Note: On-street Parking on the Collector street section may be removed to preserve existing landforms or when not needed for adjacent homes



One-Way Local Boulevard

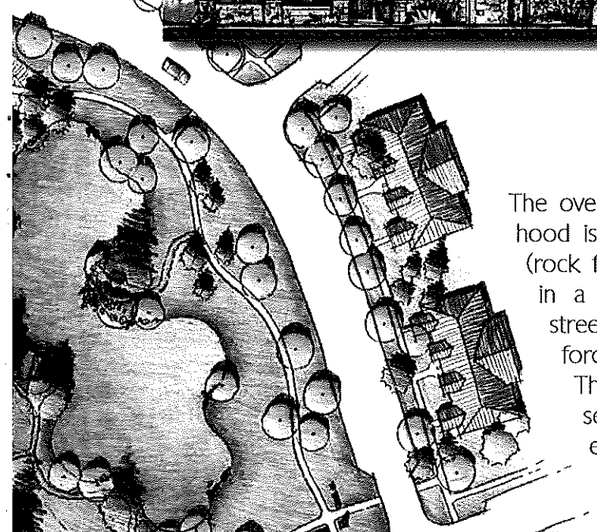


Street Sections Key Map

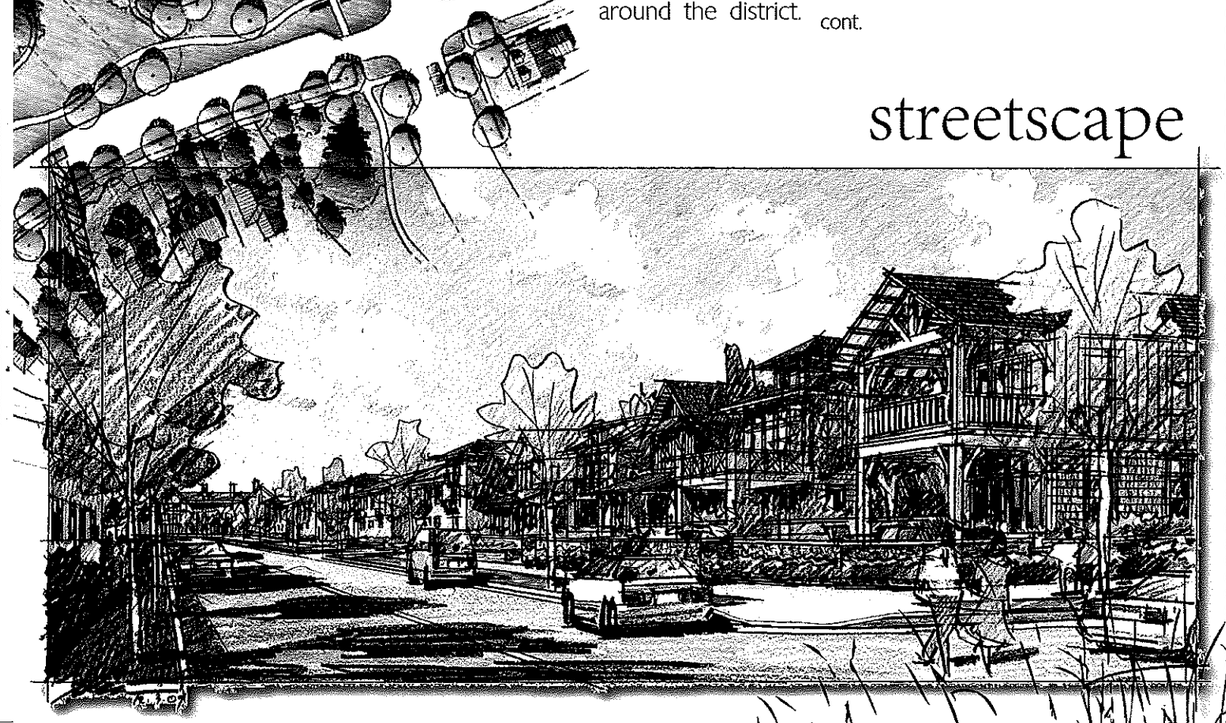
architecture

The overall goal of the street pattern in the Meadows Neighborhood is to experience as many different existing site conditions (rock formations, views, water, trails, meadows, etc.). Laid out in a modified grid radiating from the secondary core, the street system is oriented to catch westerly views and reinforce connections from east to west.

The Meadows Neighborhood is a smaller, more relaxed setting compared to the New West Village. With small enclaves separated by informal open space, the neighborhood provides options for pedestrians to access trail corridors that lead to several community parks in and around the district. cont.

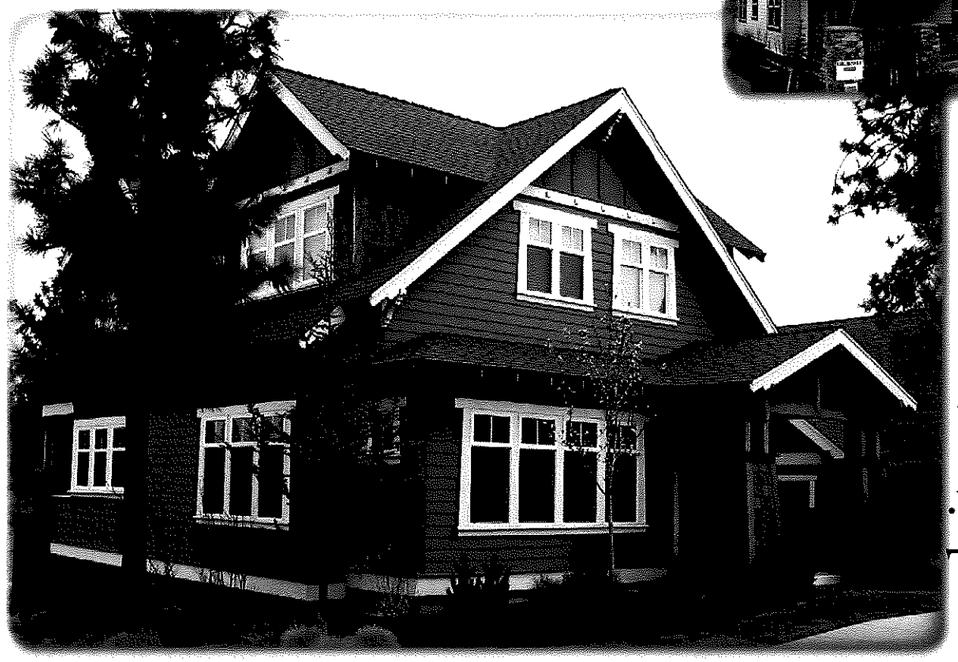


streetscape

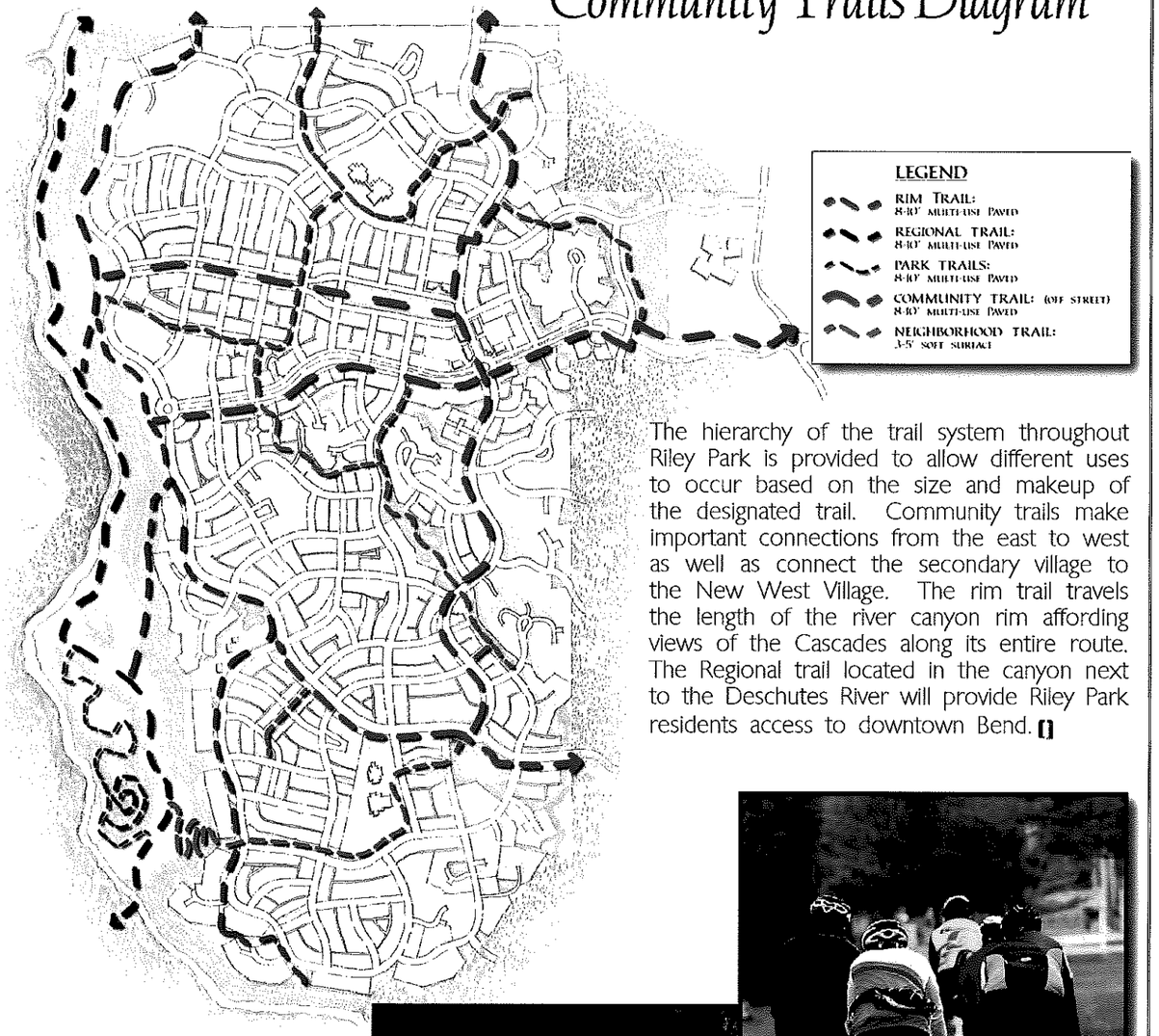


The open space and parks in the Meadows Neighborhood can be characterized as more informal than the New West Village. Natural open space areas, defined by rock outcrops, meadows, or tree stands, demonstrate a contrast of native vegetation and natural site features. Traditional forms of stone, wood, and metal are used in parks structures and monumentation.

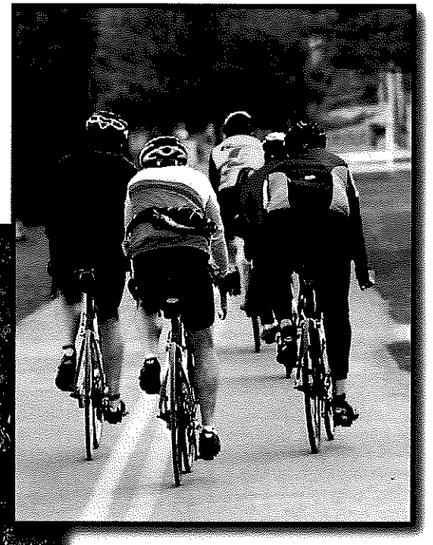
architecture

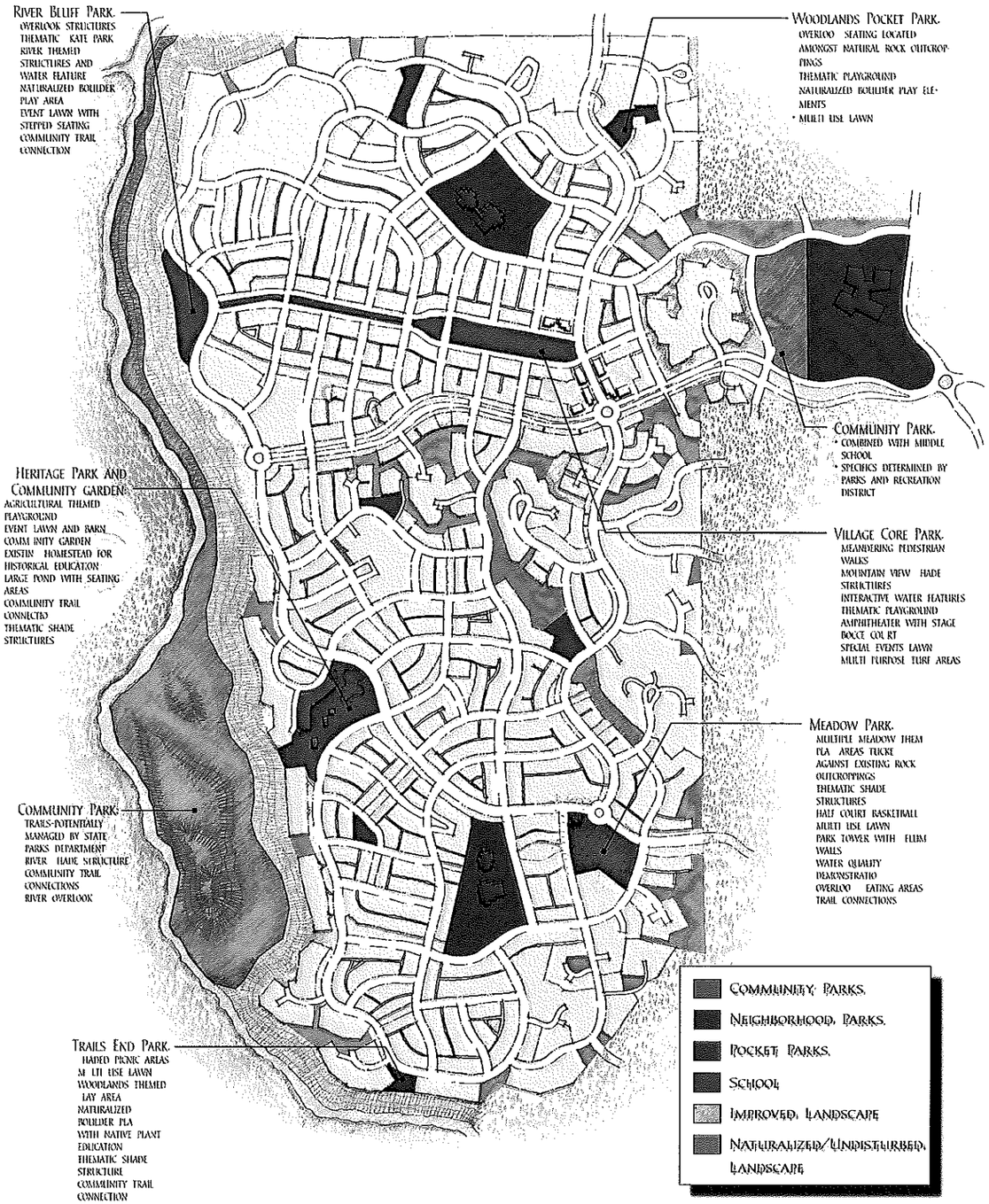


Community Trails Diagram



The hierarchy of the trail system throughout Riley Park is provided to allow different uses to occur based on the size and makeup of the designated trail. Community trails make important connections from the east to west as well as connect the secondary village to the New West Village. The rim trail travels the length of the river canyon rim affording views of the Cascades along its entire route. The Regional trail located in the canyon next to the Deschutes River will provide Riley Park residents access to downtown Bend. ❚





Community Open Space Diagram

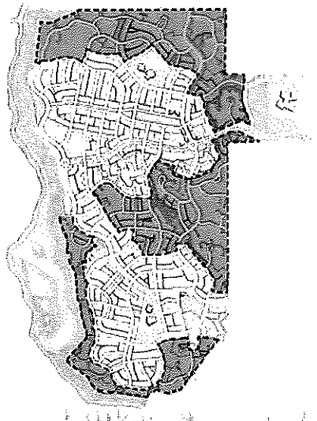
Meadow Park serves as an adventure park for kids of all ages, having three designated areas of play tucked into the existing rock formations. The park also has a number of other uses including a basketball court, water quality demonstration, park tower icon, multi-use lawn and strong trail connections to the elementary school. Further west along the river canyon rim, Heritage Park consists of a mix of Meadows and Woodland characteristics. The existing barn adds a historical flavor to the park where a variety of community events can be held. The park also offers community gardens, a large orchard, a formal event lawn, a playground, a pond, shade structure, and active play areas. ()

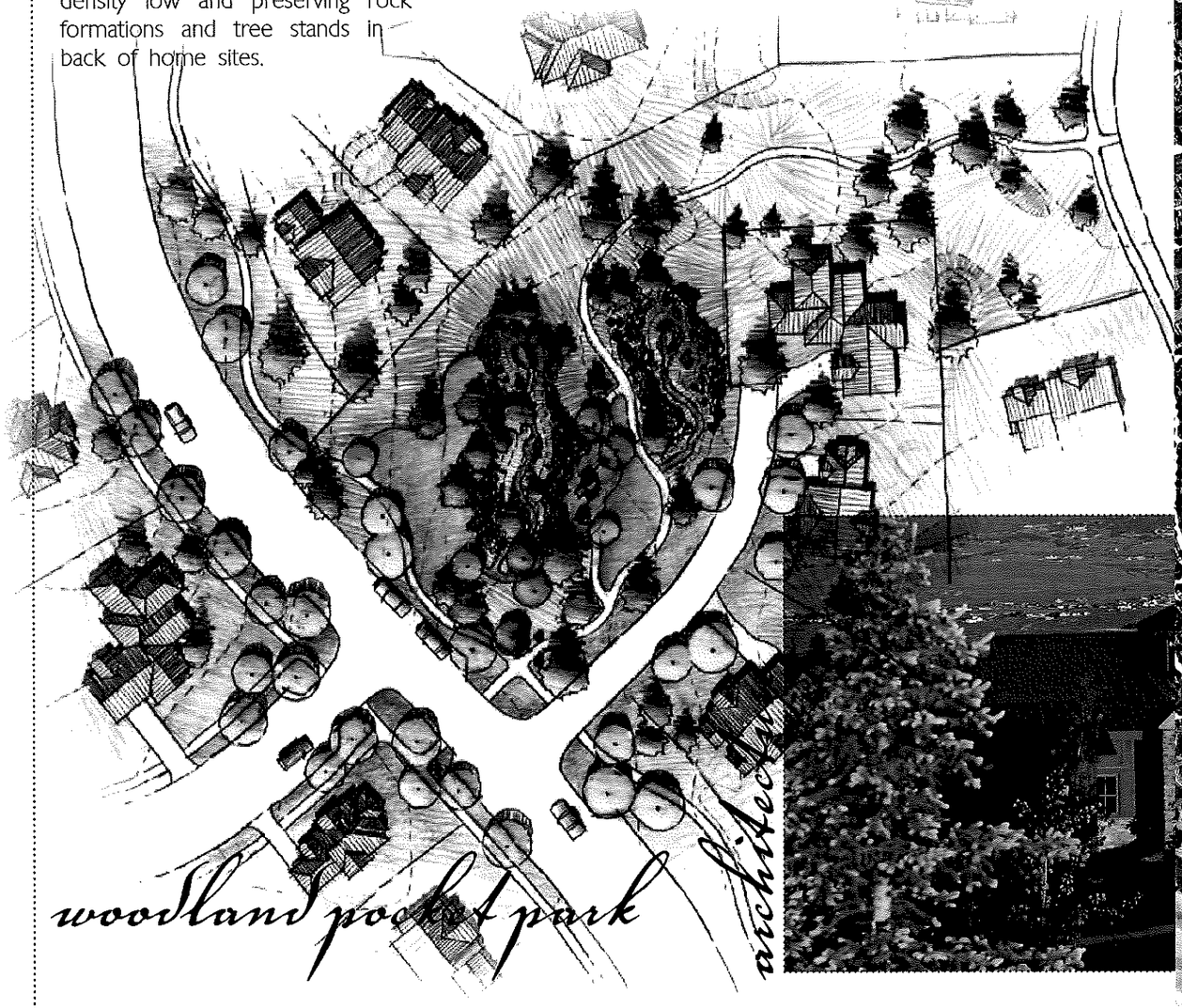
Meadows neighborhood
Riley Park

meadow park

WOODLAND *enclave*
Riley Park

The Woodland Enclave in Riley Park creates the feeling of living in a retreat in the woods. This district is the community's response to the existing site conditions of numerous rock outcrops and grade changes found on the edges of the site. With woodland meadows and grade changes, the layout of this neighborhood reacts gently to the existing features by keeping the overall density low and preserving rock formations and tree stands in back of home sites.





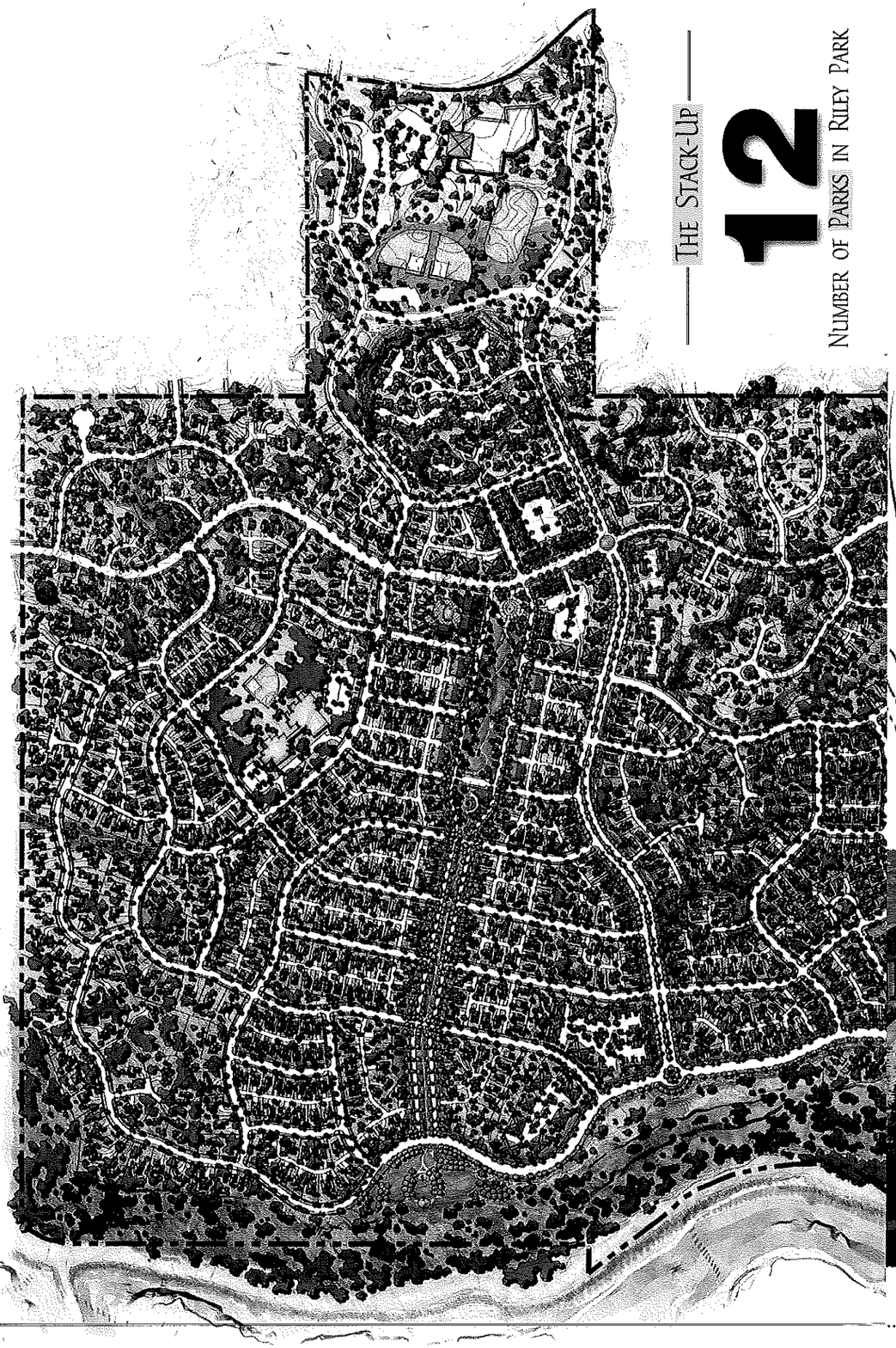
192
Acres of Community Open Space in Riley Park

11
Miles of trails in Riley Park

2
Miles of Deschutes River adjacent to Riley Park

Master Plan Illustrative

Riley Park



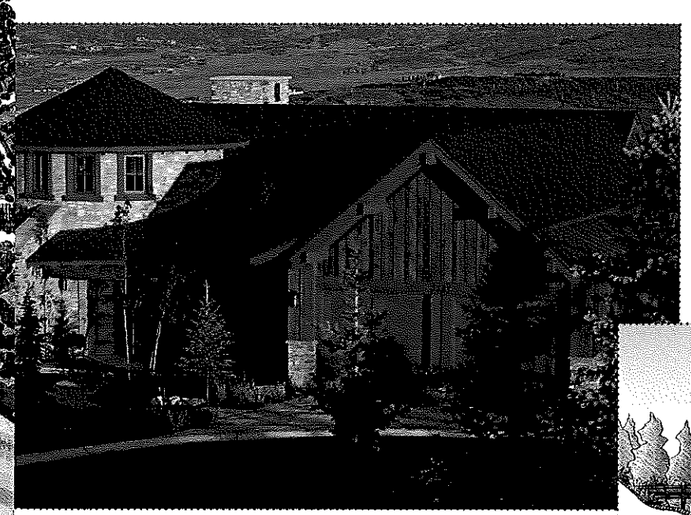
THE STACK-UP

12

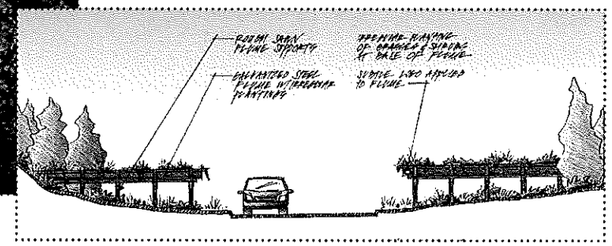
NUMBER OF PARKS IN RILEY PARK

parks

Pockets of higher density housing are used in flatter areas to provide texture and mass at key locations. The street patterning in the Woodland Enclave is more organic and circuitous, responding to natural terrain to preserve vegetation and landforms.

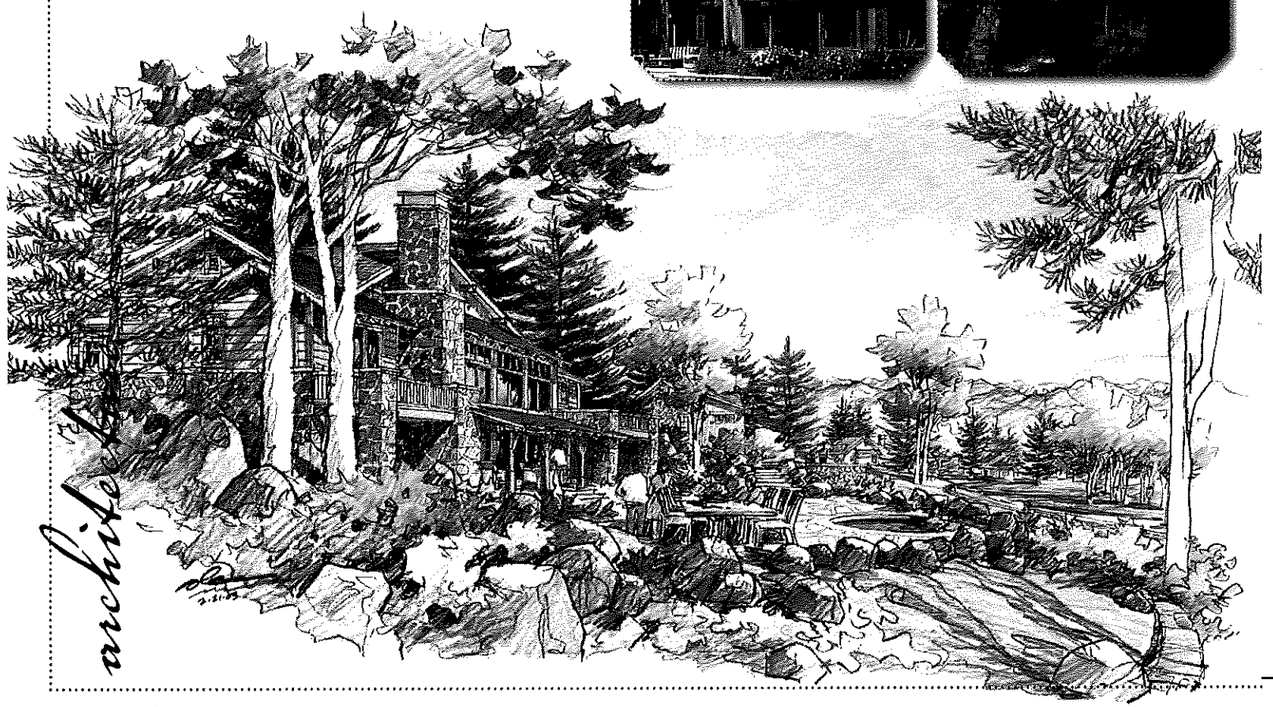


The style of the architecture is mostly of Woodland and Craftsman character with the use of materials such as stone and timber. Elements of the New West character will be introduced to the district but on a limited basis. Because of the nature of the district, a majority of the homes will be designed to live onto preserved tree stands or rock outcrops within their lot. cont.



Unlike the districts that have prominent parks anchoring certain regions of Riley Park, the Woodland Enclave relies on smaller, more intimate pocket parks. These parks are tucked way in special rock outcrops that have been preserved and turned into areas of retreat for residents.

The Woodlands Park is centered around a unique concave rock formation that is accessed by natural rock stairs. It possesses clear views of the Cascades and has natural areas for seating. Also located in the park are multi-use play areas and a playground.

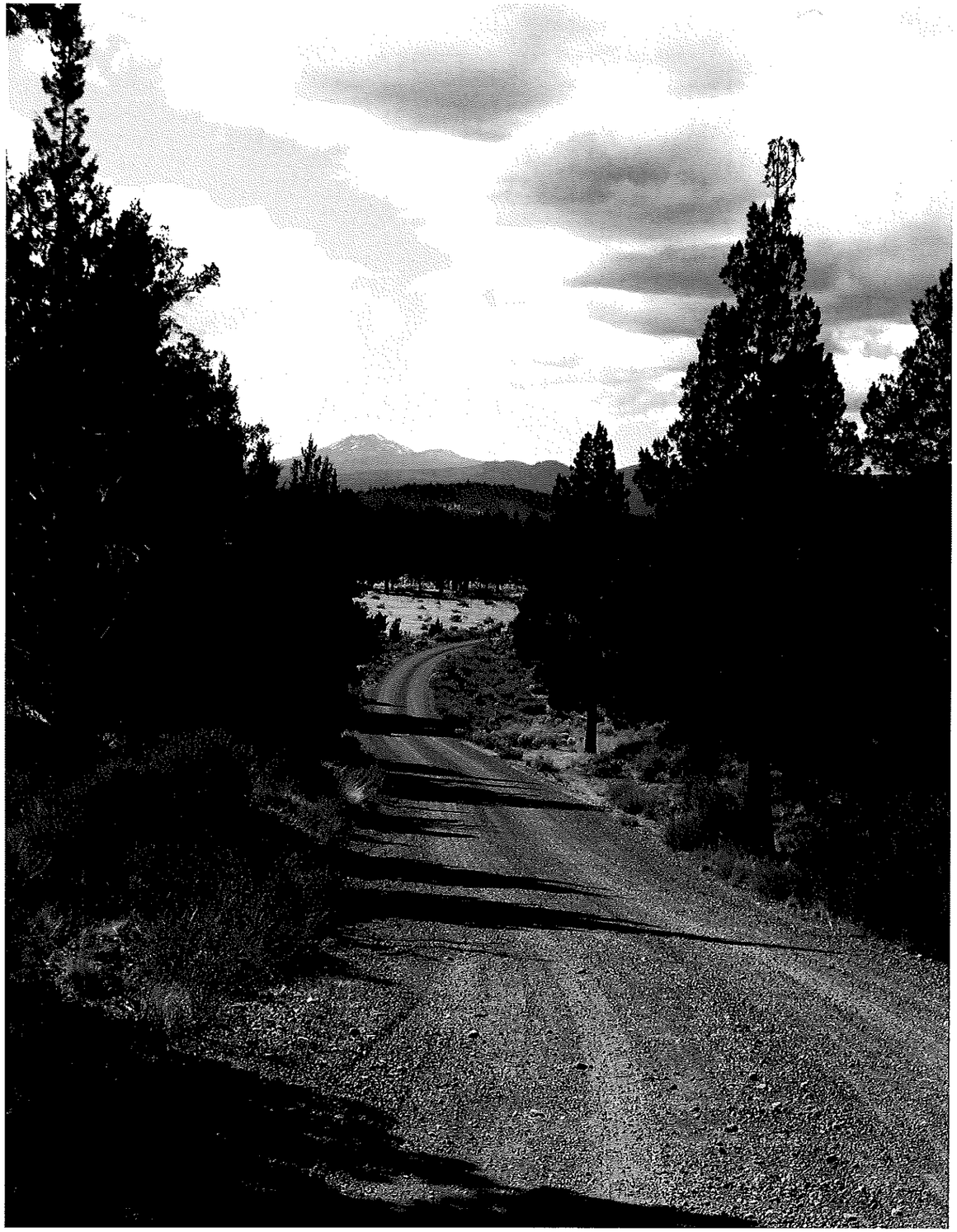


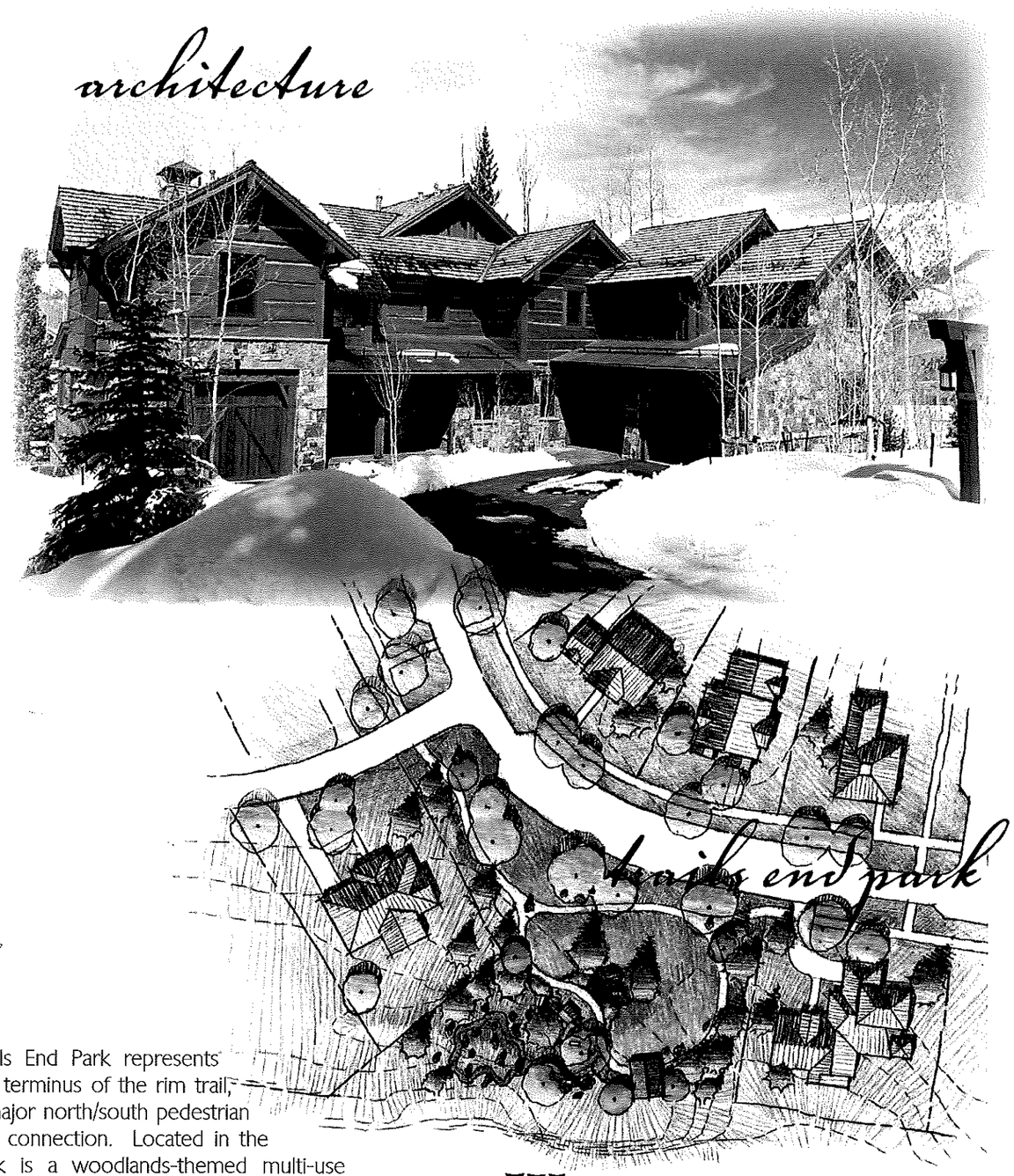
architecture

Living Life Outside Riley Park

Perched on top of a rock formation in the Woodlands Park, the warmth of the morning sun on my back puts a smile on my face. The majestic peaks of the Cascades emerge with the dawn of a new day. I feel at ease. Contemplating my surroundings with a cup of coffee in hand, I slowly realize the significance of my small retreat: The land came first.

Before the idea of Riley Park was conceived, the 704 acre site adjacent to the Deschutes River consisted of meadows, vegetation, and rock outcrops. These special conditions were the basis from which Riley Park was derived. Reading the land as if it was a detailed manual allowed Riley Park to preserve the most important features of the site. The community layout consists of different districts that are steeped in the natural land formations. Located 4 1/2 miles north of downtown Bend, Oregon, Riley Park is the epitome of a progressive community striving to create a unique experience, both familiar and memorable; provide diversity in the amenities offered throughout the community; and connects the community to the region by linking the history and heritage of the surrounding context. Being a part of Riley Park is a bit like that morning sun: When you begin to understand its significance, it will put a smile on your face.



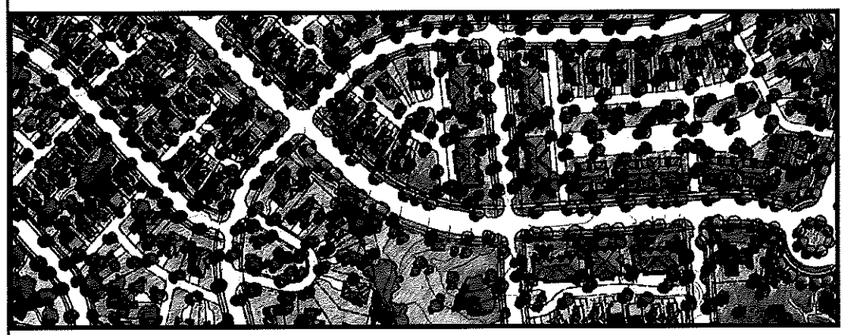


Trails End Park represents the terminus of the rim trail, a major north/south pedestrian trail connection. Located in the park is a woodlands-themed multi-use play area, a native plant education trail, and a shade structure and picnic area capturing long views of the Deschutes River to the south. ◊

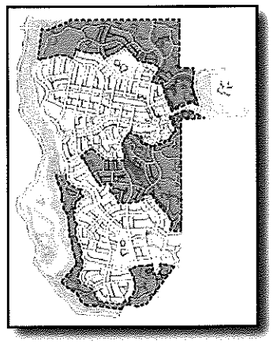
WOODLAND *enclave*
Riley Park

new WESTvillage

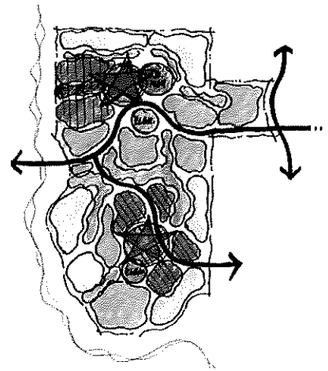
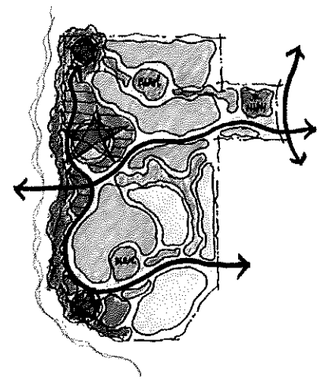
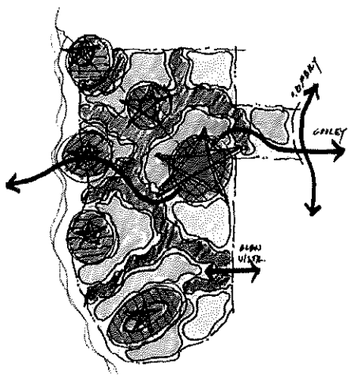
Meadows neighborhood



WOODLAND enclave



Planning

Concept Idea	Initial Concept Diagrams	Refined Concept Diagrams
Two Villages		
Community Rim		
Open Space & Villages		

Evolution of an Idea

What Drives the Design of Riley Park?

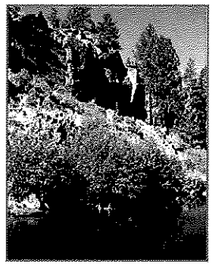
RESPECT THE SITE

RESPOND TO THE VARIED AND UNIQUE SITE CONDITIONS TO MAXIMIZE VALUE ASSOCIATED WITH EXISTING TREE STANDS, LAVA FORMATIONS, RIDGELINE AND ACCESS TO THE CANYON

- Capitalize on defined outdoor rooms
- Incorporate LEED / Green Design
- Leverage Views to the west
- Leverage River frontage and Access
- Utilize rock outcrops, trees, and the flume in parks and open space
- Use site features as a guide to landscape character

EVERYONE THEIR OWN SPECIAL PLACE

PLAN NEIGHBORHOODS FOR A THOUGHTFUL MIX OF USES, RELATIONSHIPS AND SPACES



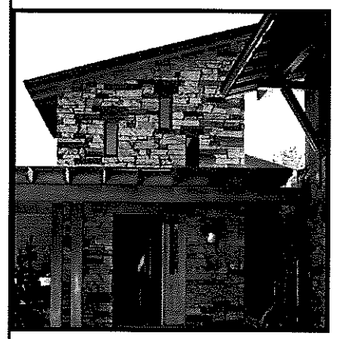
- Incorporate TND/ Smart Growth Principles; including pedestrian spaces, diverse housing types, recreational uses, ample open space, public spaces and connectivity
- Respect and Integrate affordable housing
- Locate civic and public spaces for greater walkability
- Thoughtful location of Primary, Secondary, and Pocket Parks
- Compliment Architectural Styles with appropriate landscapes

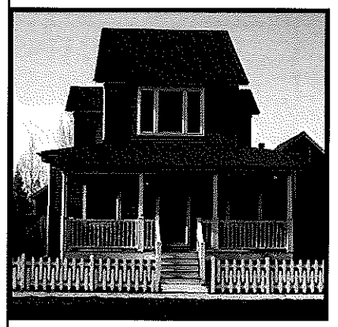
CREATE DISTINCT AND UNIQUE PLACES WITHIN THE COMMUNITY

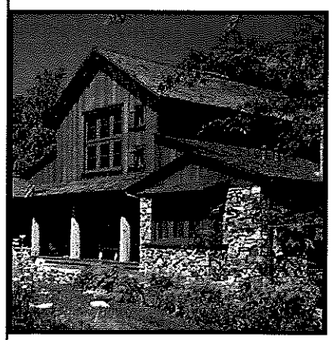
ELEMENTS INCLUDING NEIGHBORHOOD CHARACTER, ARCHITECTURE, SITE PLANS, OPEN SPACE, AND SITE CHARACTER SHOULD BE COMBINED TO CREATE SEVERAL UNIQUE PLACES ACROSS THE COMMUNITY

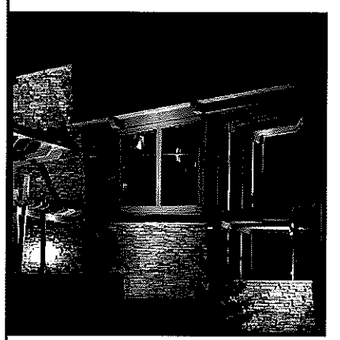
- Variety of streetscapes & setbacks
- Site plan solutions that are distinct to the place
- Unique amenities that maximize natural features
- Full spectrum of housing types & mix of uses
- Several "one-of-a-kind" destinations

Architecture



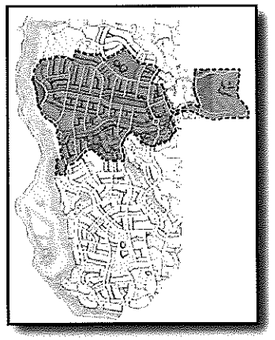






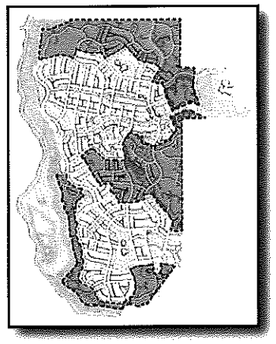
Community Districts Visual Comparison-Landscape Architecture

new WESTvillage



Meadows neighborhood

WOODLAND enclave



Key Landscape Elements

- Urban park character (more manicured with less native landscape)
- Community elements represent a New West character
- Formal open space areas, alee parks, urban plaza space, rim park
- Goal of trail pedestrian connectivity is to focus people to the rim
- Crisp and Organized Forms: Metal, Stone, and Dimensional Wood

- Community elements relate to a historical character with a New West "infusion"
- Natural open space areas defined by rock outcroppings, meadows or tree stands, demonstrating a contrast of native and natural
- Parks spaces are multi-use areas with lots of green and minimum hardscape elements
- Goal is to connect residents to historic farmstead and then to rim edge
- Turf against meadow grasses
- Traditional Forms: Wood, Metal, Stone

- Community elements are less refined and more rustic and historic in character
- Naturalized open space areas that take advantage of special features such as rim edge, rock outcroppings, tree clusters and view opportunities
- Larger consideration for trails instead of sidewalks
- Open space may be located in rear of lots versus in front of homes
- Turf in the tree groves
- Rough, Naturalized Forms: Rough Wood and Stone

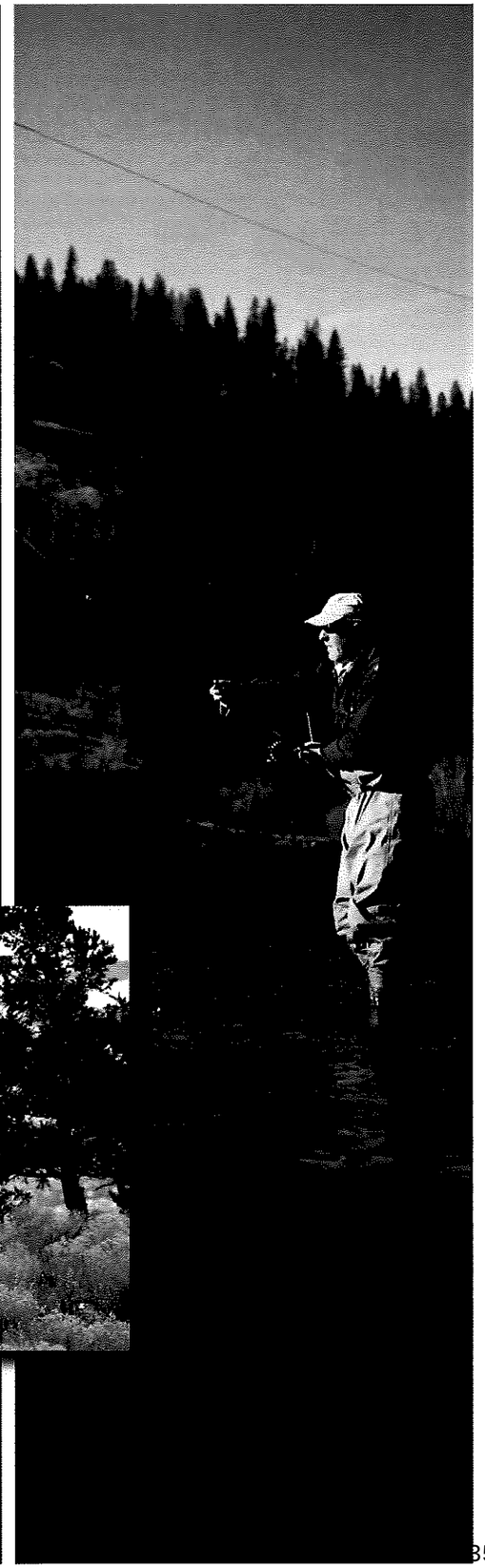
Parks

Deschutes River Park

come join the fun!

Access through the Riley Park Community

Deschutes River Park, 11234 Main Street, Bend, Oregon, 97701
T 541.385.1380 F 541.385.7359 www.deschutesstatepark.or.us



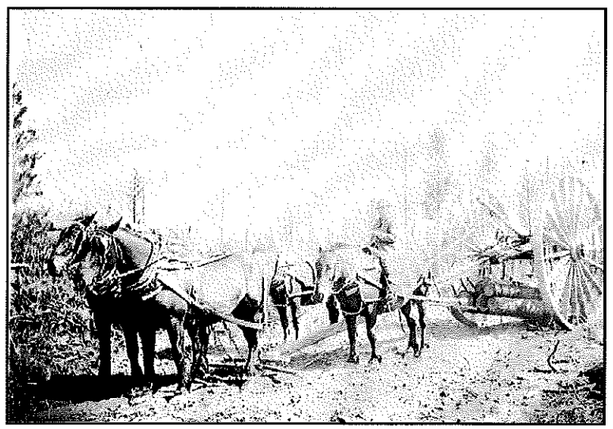
HISTORY

Riley's Homestead

It all began during a fishing expedition with friends in 1893. Mr. Ovid William Brockett Riley at the young age of 18 years travelled by horse and wagon from Portland into Deschutes country with aspirations of catching a big Dolly Varden. After several more trips to the area, Riley finally homesteaded in 1896 at age 21, four miles north of town next to the Deschutes River. Riley lived on the homestead for nearly forty years, growing rye hay and herding cattle that he would sell off for $25 a head.

O.B. Riley was born in Ohio in 1875. He moved to Portland with his family in the late 1880s, becoming a young pioneer of the West. After settling outside Bend, Riley married a young lady by the name of Alice Ward on September 10, 1917. She too was a central Oregon pioneer and settled with Riley helping him run his ranch. During his residence outside Bend, Riley had seen and shaped many changes that occurred around the region. He saw the influx of frontiers settling the area during the late 19th century and the incorporation of Bend as a city in 1905. He sat on the city election board when their was only 5 members. Riley witnessed the anticipated arrival of the railroad in 1911 as well as the evolution of the first irrigation system out of the Deschutes River.

In 1921, Riley and his wife moved from their ranch into Bend. He worked for the Shevlin-Hixon mill until it closed in 1950. O.B. Riley died on September 2, 1962 at the age of 87. He will forever have a lasting legacy of shaping the future of what Bend, Oregon, is currently today. For this reason, the community of Riley Park is named in his honor. ❚

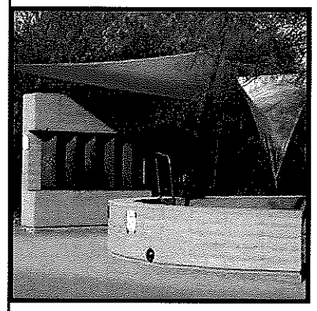


O.B. Riley Timeline

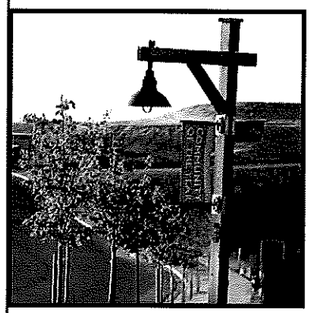
1875: Ovid William Brockett Riley born Ohio
1896: Filed for homestead on the river just north of Bend
1917: Married Alice Ward
1921: Moved from the ranch into Bend
1950: Worked at the Shevlin-Hixon Mill
1904: His mother, Mrs. Elsie Riley, operated the Pilot Butte Inn
1965: O. B. Riley dies at age 87

Present Day: Old cabins marked Bend in late 1800, as well as the Staats and Sisemore ranches.
O. B Riley Road was the old Bend-Redmond Highway.

Trailheads



Lighting



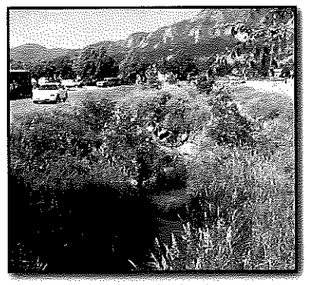
Walls

Community Elements

WATER MANAGEMENT

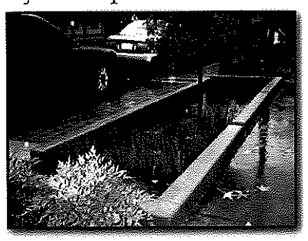
Just Add H_2O:
Riley Park
Stormwater Managment Planning

The Intent of the Stormwater Management Plan for Riley Park is to create a framework that can be used to facilitate a sustainable and economically feasible approach to handling water quality and storm water management. Three key factors that should be considered in every site-specific solution are the aesthetic impacts, the cost of the drainage infrastructure, and the effects on the amount of developable ground. For more information about the Riley Park Stormwater Managment Planning process, please refer to the Riley Park Water Quality Guidelines.



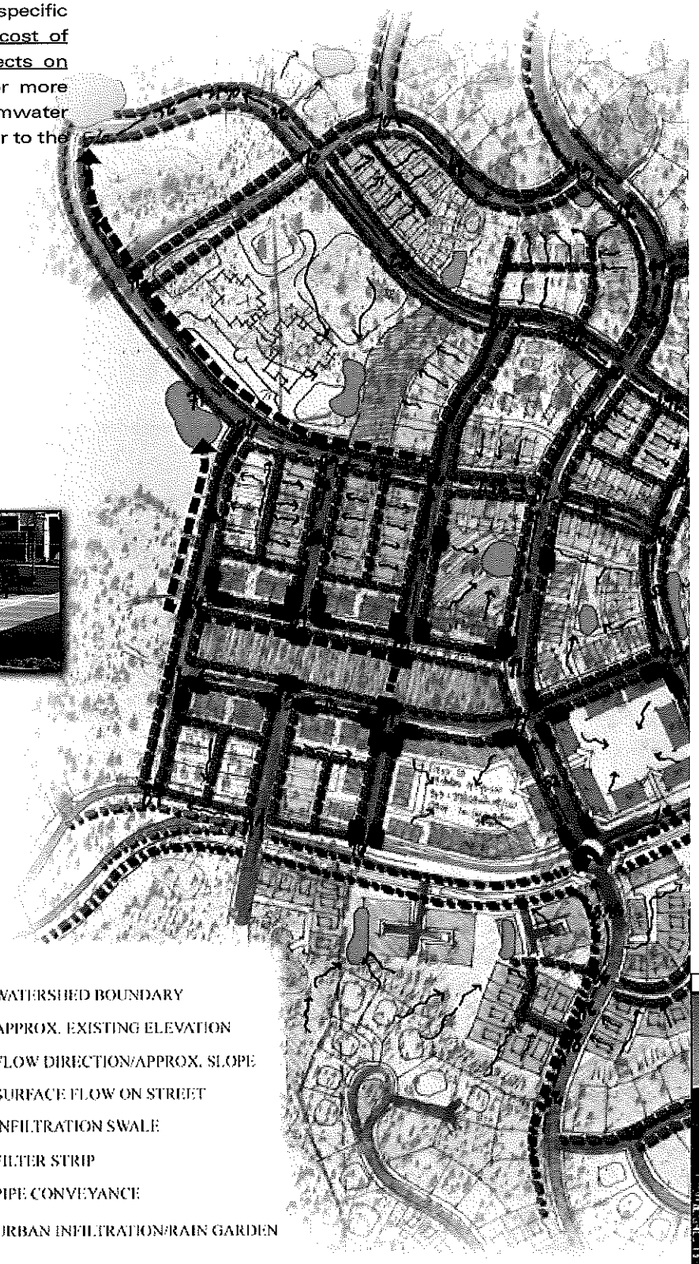
Infiltration Swale/Filter Strip

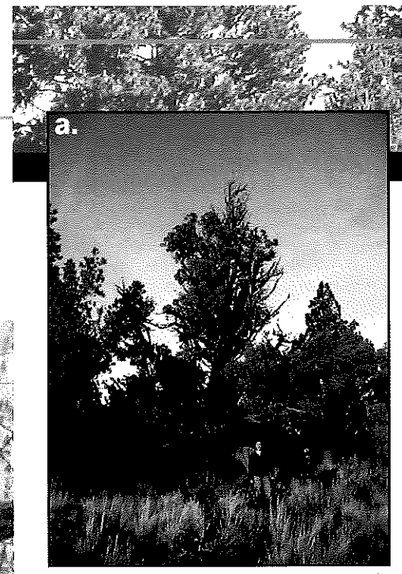
Infiltration pond

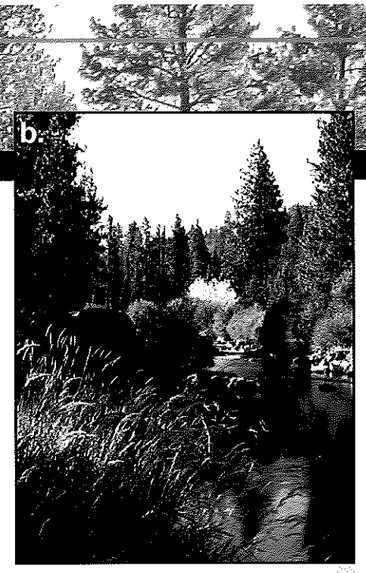


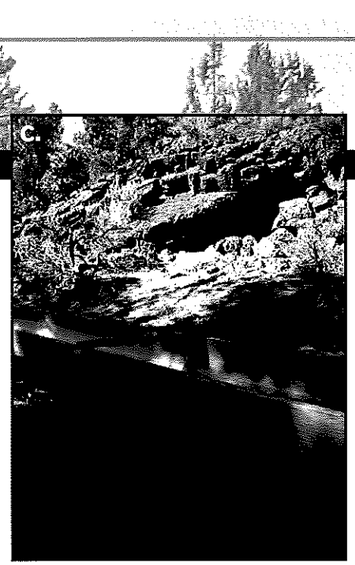
Urban Infiltration/Rain Garden

Wet/Dry Pond

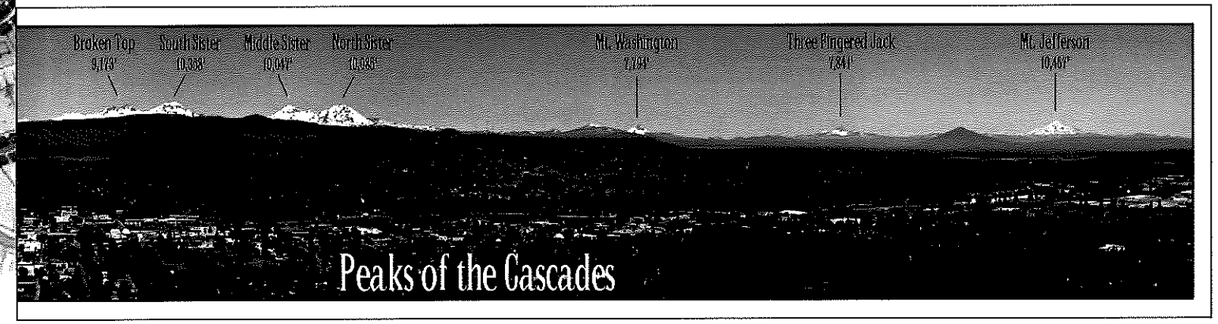








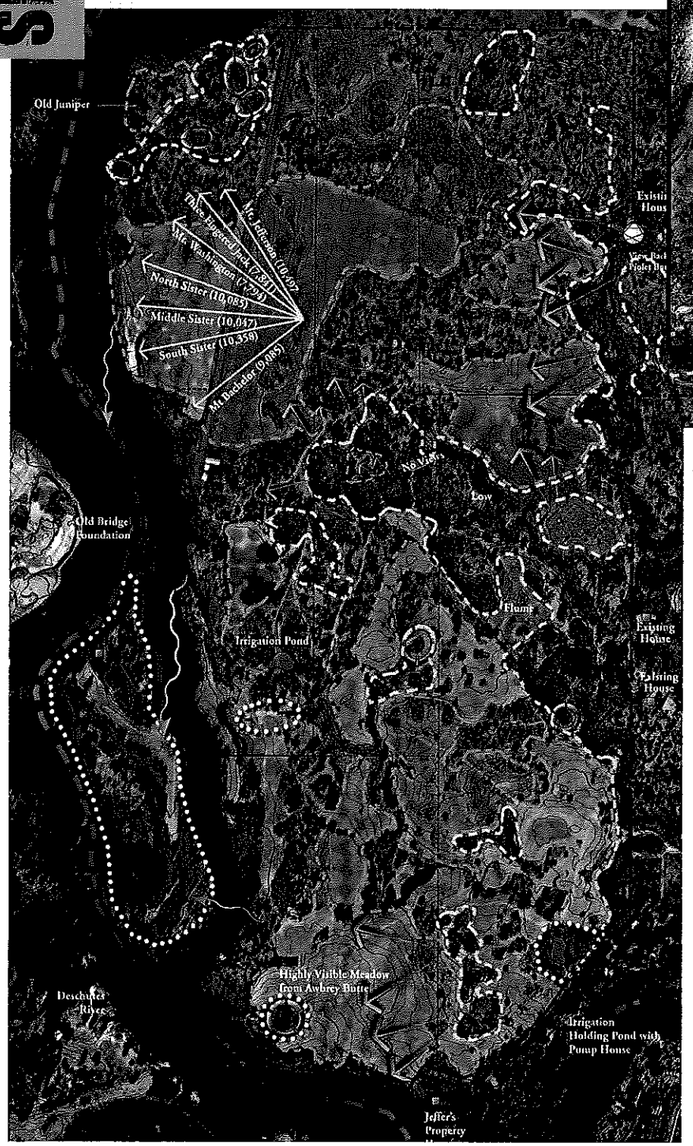
a. The existing vegetation of the site consists mainly of large stands of Ponderosa Pine and Junipers.
b. The Deschutes River borders the entire western and southern boundary of the site with approximately two miles of river canyon frontage.
c. The preservation of the existing flume that runs through the eastern half of the site represents the history of irrigation and farming that once existed on the site.
d. Lava pushing up from underneath the Earth's crust created the unique natural rock outcroppings found throughout the site.
e. Large open meadows on the site are created by the existing tree stands and rock outcrops.



SITE SCENE

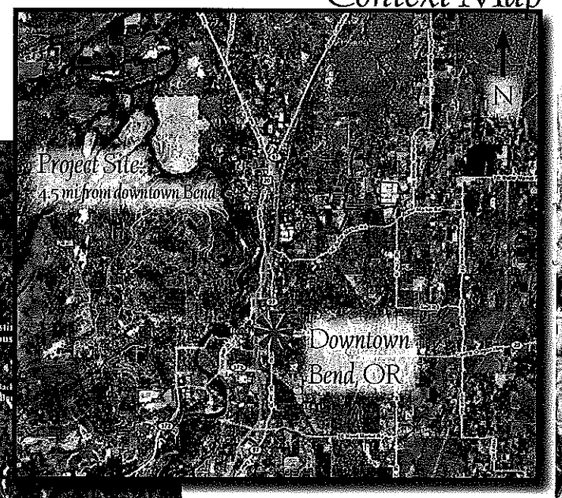
TERRA
Interpreting the Land

One of the most important aspects of community design is understanding the land. With the Riley Park site, a variety of natural features and site conditions have proven to be crucial to the overall character of the property.

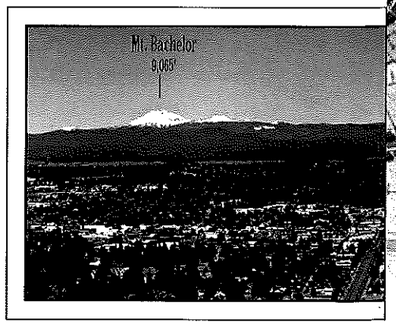


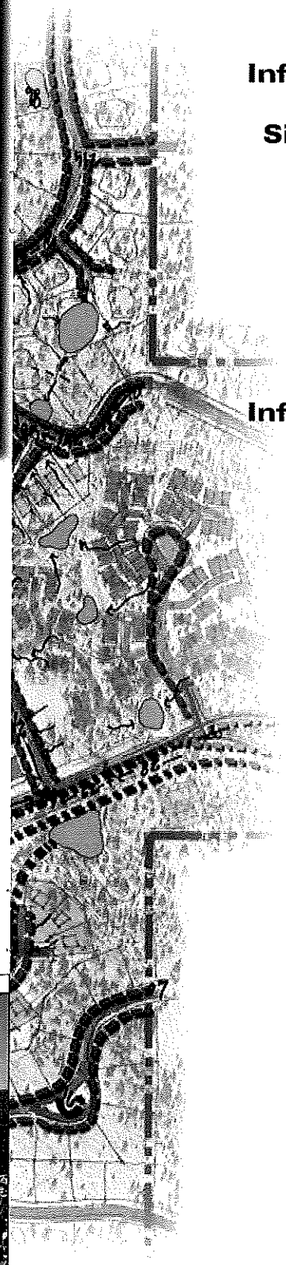
Site Analysis

Context Map



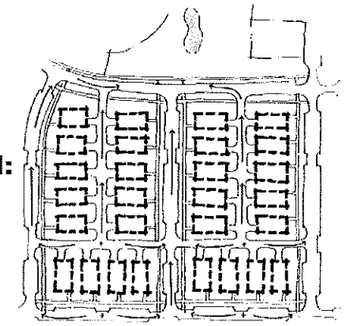
One main objective of Riley Park will be to enhance the existing land as part of the community's overall character. Identifying these unique site conditions through in depth analysis allows for the preservation of these amenities as part of the character of the community. Site conditions such as the existing tree stands, rock outcrops, Deschutes River, and incredible views of the Cascades offer a setting unique to Bend and the surrounding region.





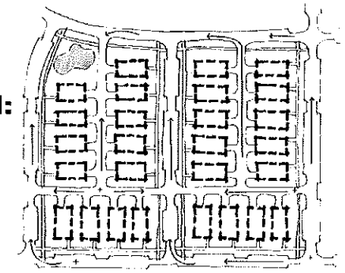
Residential Water Quality Examples

Infiltration Pond: Adjacent Site Treatment



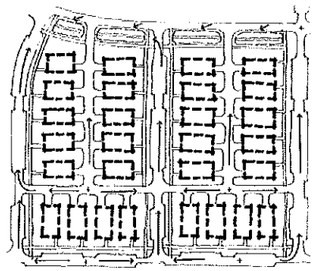
The 2 year water quality capture volume for the public drainage will drain along curb edge or be piped to an infiltration pond located on adjacent open space.

Infiltration Pond: In-Block Treatment



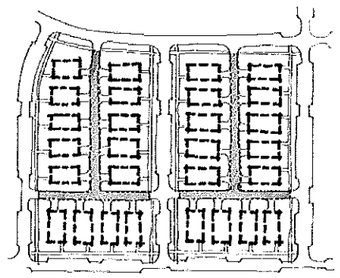
The 2 year water quality capture volume will sheet flow or be piped to an infiltration pond located within the traditional lot and block pattern.

Infiltration Swale



The 2 year water quality capture volume will sheet flow or be piped to an infiltration swale along a side yard.

Porous Paving



Porous paving may be used in the alleys to reduce the required water quality pond volume.

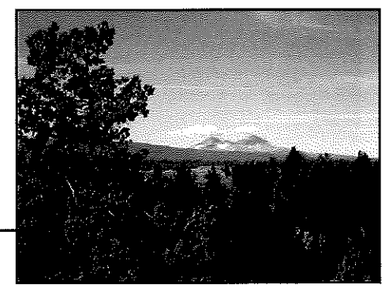
Riley Park Site Tabulations

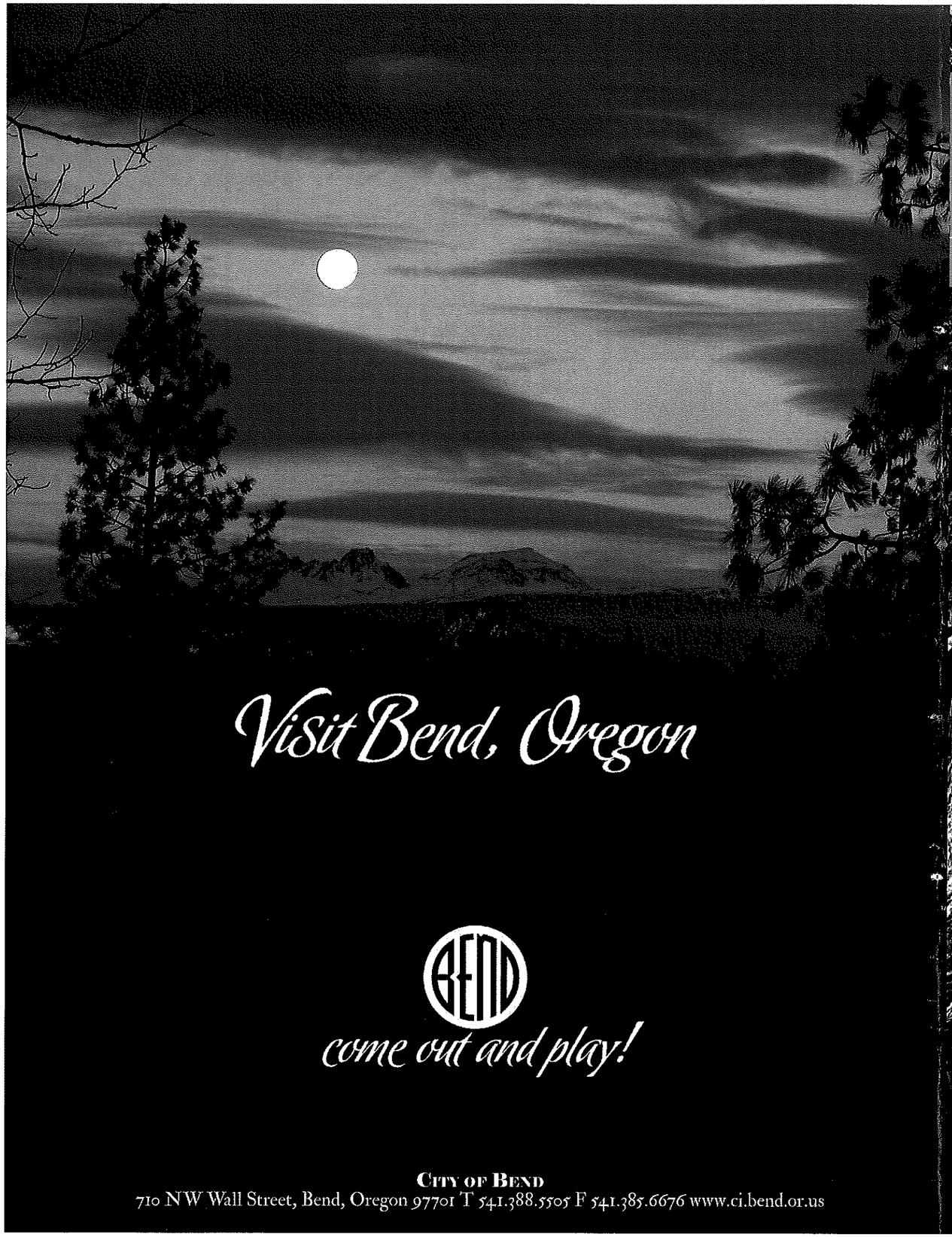
	Totals: Total Units	Total AC	% of Totals	
Neighborhood Commercial/Retail		1.75		
Recreation Center		1.77		
Total for Civic/Commercial		**3.52**	**1%**	
Schools:				
Elementary School (Phase 2)		8.39		
Elementary School (Phase 4)		8.77		
Middle School		16.82		
Total for Schools		**33.98**	**5%**	
Regional Park (1)		6.96		
Neighborhood Parks (3)		17.43		
Pocket Parks (6)		4.92		
Improved Open Space Areas		13.68		
Miscellaneous Open Space		31.14		
Rim Open Space/Trail		9.73		
On-Street Buffer/Trail		8.54		
Deschutes River Park (1)		46.70		
Rim Slope Bank		53.18		
Total for Parks & Open Space		**192.28**	**27%**	
Arterial Road R.O.W. - Cooley		17.04		
Collector Roads R.O.W.		24.24		
Local Roads R.O.W.		94.79		
Alleys		18.46		
Private Drives		4.45		
Total for Road R.O.W.		**158.98**	**23%**	
Multi-Family	245 - 270	8.20	12%	**28%**
Townhome Attached	321 - 353	29.29	16%	
SF Baby Cottage Lot (40'x80' Lot size)	144 - 158	17.16	7%	
SF Small Lot (50'x100' Lot size)	491 - 540	62.40	25%	
SF Medium Lot (60' or 70'x100' Lot size)	540 - 594	102.96	27%	**72%**
SF Large Lot (80' to 100'x120' Lot size)	235 - 259	94.13	12%	
Total AC for Land Use		**314.14**	**45%**	
Grand Total	**1976 - 2174**	**702.90**	**100%**	

CONTENTS

COVER STORY - RILEY PARK:

Bend, Oregon anticipates a community with an outdoor twist.





Visit Bend, Oregon

BEND

come out and play!

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CLOSING SHOT

The Deschutes River on the edge of Riley Park.
Photograph by **Cody Humphrey**

Riley Park

The Good Life Outdoors.

Riley Park Vision Summary

November 2008

Recvd 6/24/15

JL Ward Co

June 22, 2015

Mr. Brian Rankin
Principal Planner & Metropolitan Planning Organizational Staff
City of Bend
710 NW Wall Street
Bend, Oregon 97701

Brian,

I would like to commend you and your staff for organizing and facilitating the diverse and dedicated group of community volunteers working on the Urban Growth Boundary Remand. The collaborative process and commitment to work toward a successful outcome is motivating and warmly welcomed.

The J L Ward Company has a long history (spanning many decades) of creating attractive neighborhoods in our community, and we plan to continue this legacy created by Jan.

The Boundary Expansion Scenario Workshop results were very consistent and expressed the desire to build upon existing strengths to create new complete communities—both within the current City Limits and the Urban Growth Boundary expansion areas. This preference provides the opportunity for Master Planning large tracts of land as complete communities. We've consulted with Engineers and worked internally to develop two Conceptual Master Plans to present for your consideration.

Attached you'll find a Conceptual Master Plan of the "thumb" and a more detailed layout of a High School site; a letter of intent from Bend LaPine School District for a High School site on the "thumb" and an Elementary School site on SE 15th Street; and a Conceptual Master Plan of the J L Ward Company's SE 15th Street property including the 40 acres at the west end of the "elbow."

We look forward to having the opportunity to discuss our ideas with you at the Boundary TAC meeting on Jun 24th.

Sincerely,

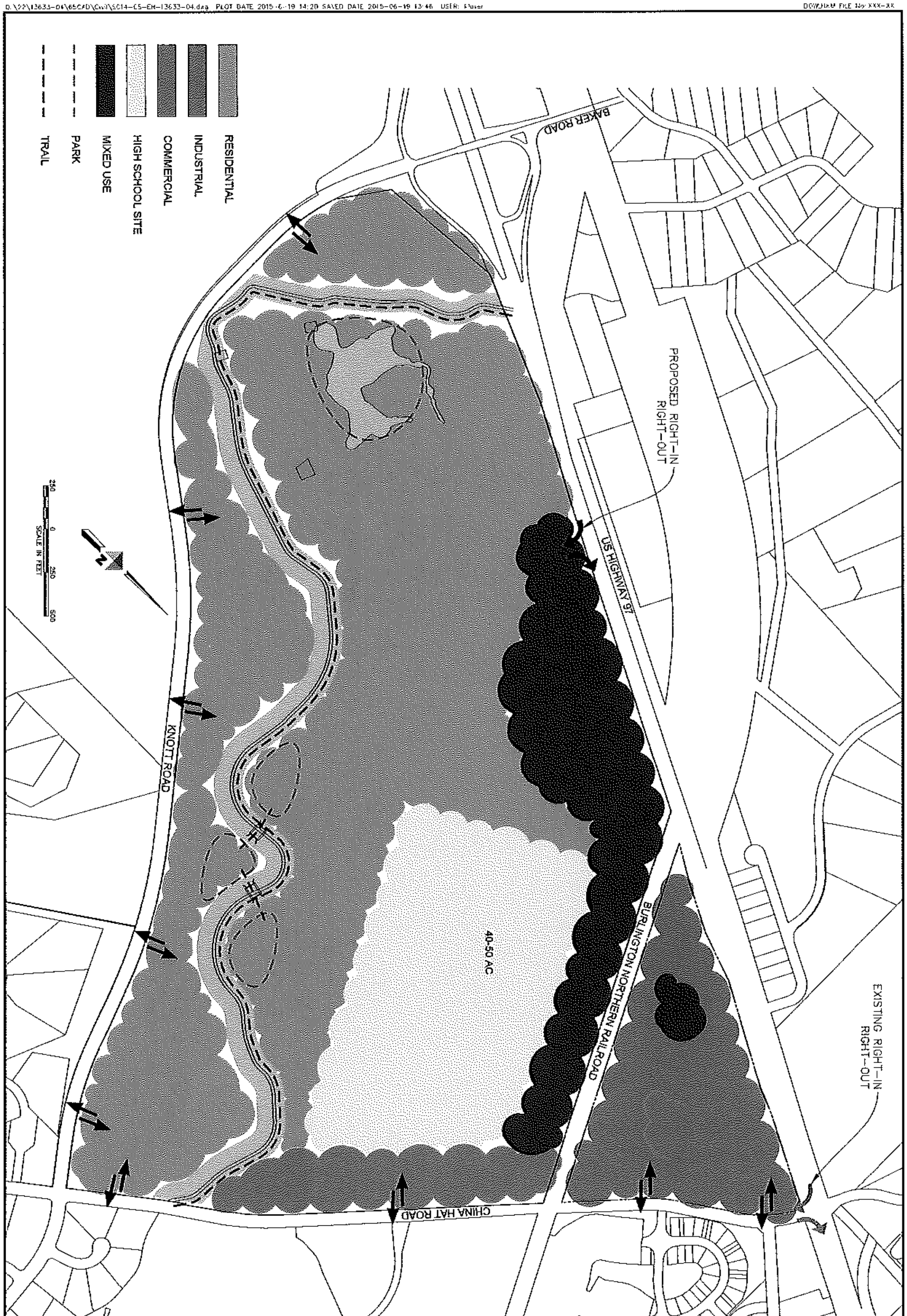
Jody Ward

Jody Ward
President
J L Ward Company

20505 Murphy Road • Bend, OR 97702 • (541) 382-0491 • Fax (541) 382-5082 • jlw@jlwardco.com

D:\22\13633-04\65CAD\Civil\SC14-C5-EH-13633-04.dwg PLOT DATE 2015-6-19 14:20 SAVED DATE 2015-06-19 13:46 USER:

DOWL HKM FILE No: XXX-XX



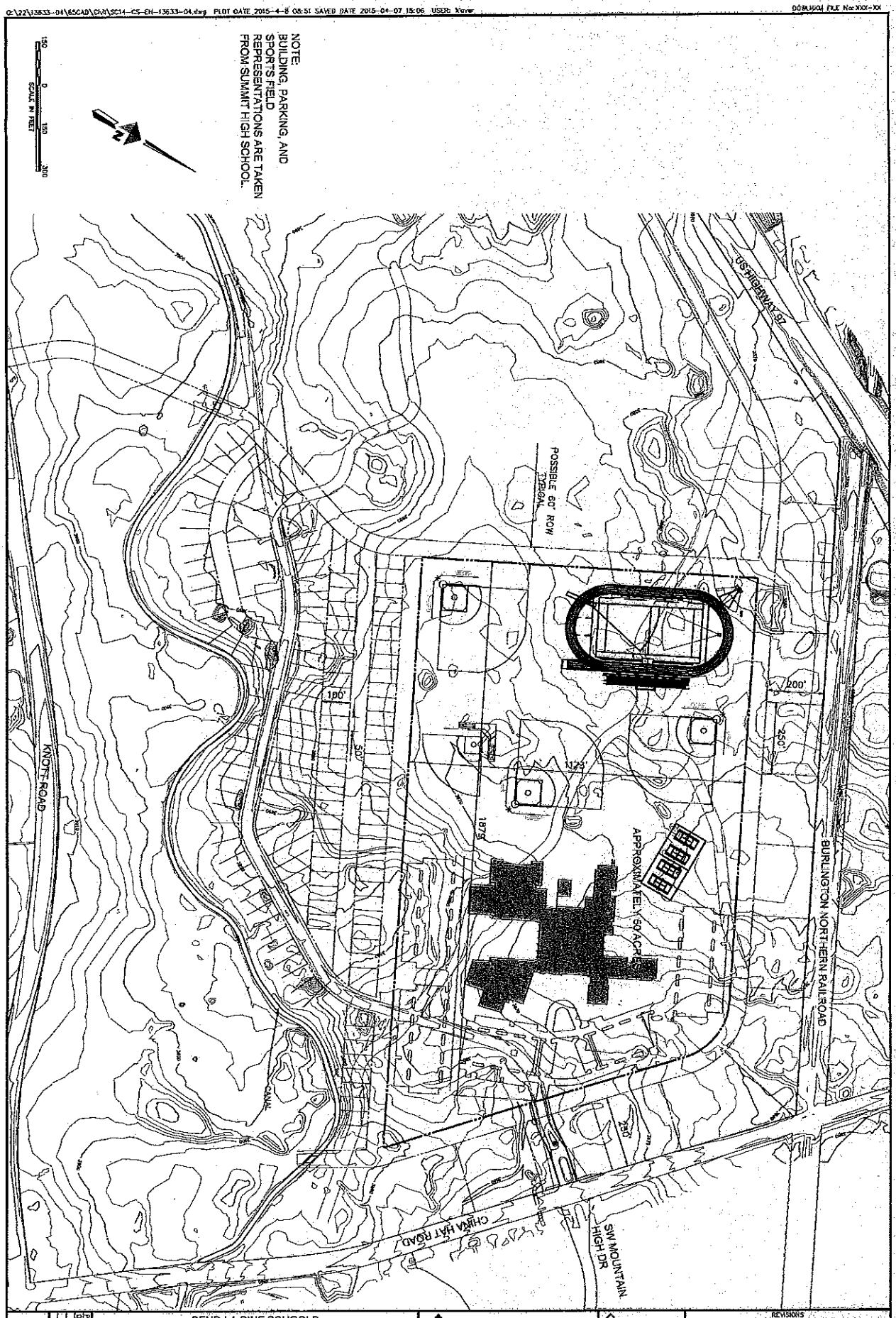
REVISIONS			
REV	DATE	DESCRIPTION	BY

PRELIMINARY

DOWL
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

BEND-LA PINE SCHOOLS
J.L. WARD PROPERTY
OVERALL PROPERTY EXHIBIT
CONCEPTUAL PLANNING
BEND, OR

PROJECT 13633-04
DATE 6/19/2015
SHEET
EX-1
1 of XX



BEND-LA PINE SCHOOLS
J.L. WARD PROPERTY
CONCEPTUAL PLANNING
BEND, OR

EX-2
1" = XX

PROJECT DATE: 4/7/2015
DESIGN: WEST
DRAWN: 2015

DOWL
www.dowl.com
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

PRELIMINARY

REVISIONS			
REV	DATE	DESCRIPTION	BY

Est. 1883
BEND LAPINE
Schools
EDUCATING THRIVING CITIZENS

OFFICE OF THE SUPERINTENDENT
Education Center
520 N.W. Wall Street
Bend, Oregon 97701-2699

June 19, 2015

Via: E-mail Only

Jody Ward

Re: Bend-La Pine Schools –School Site Interest

Dear Jody:

As we discussed, Bend-La Pine Schools ("BLP") has an ongoing interest in acquiring school sites in advance of capacity needs. We have had success in collaborating with property owners who desire to build complete, walkable neighborhoods. BLP would like to acquire an elementary school site from you in the south east area near the extension of Murphy Road anticipating future substantial residential development in that area once sewer is available. Also, BLP is interested in a possible future High School site in the south east quadrant on your property located at 20000 Knott Rd (commonly referred to as "the thumb"). That site has good transportation access and is generally flat which is critical for cost effective construction of schools. BLP is very interested in entering into an option to acquire approximately 15 acres for the elementary school and possibly 50 acres for a High School.

We look forward to continuing to work with you as you master plan your property.

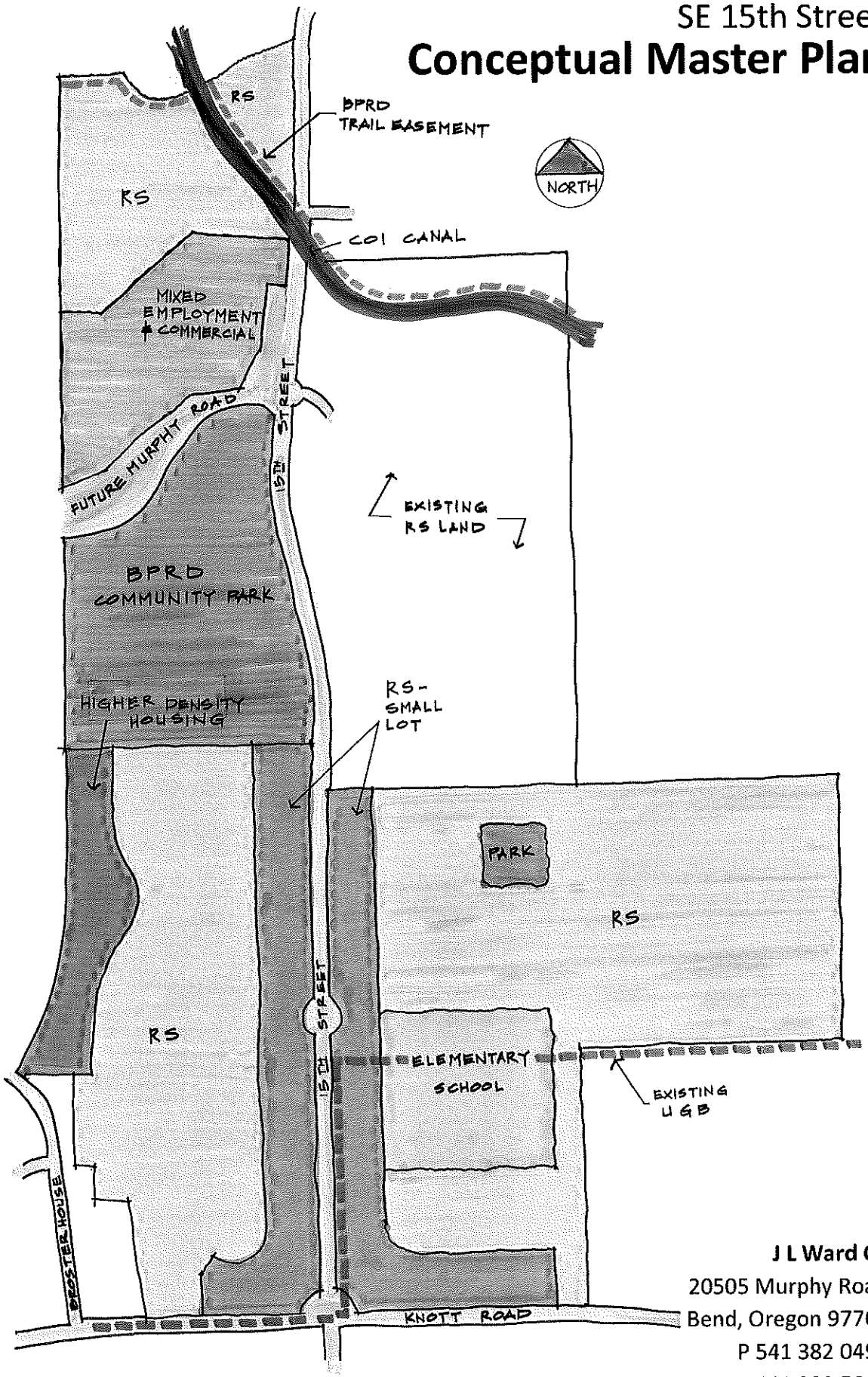
Sincerely,

Brad Henry

{000131467-00570129;1}

SE 15th Street

Conceptual Master Plan



J L Ward Co
20505 Murphy Road
Bend, Oregon 97702
P 541 382 0491
F 541 382 5082
jlw@jlwardco.com

URBAN GROWTH BOUNDARY REMAND

BEND

Sign in Sheet

Meeting: Boundary TAC

Date: 6/24/15

Location:

Name	Organization	Email Address
John Fassini	N/A	johnfassini@yahoo.com
Pam Hudspeth		pammayphellps@gmail.com
Derek Hopp		derek@cwhopp.com
Carl W. Hopp Jr.		bill@cwhopp.com
Jody Ward	J L Ward Co.	Jody@JLWard Co.com
John Lynch		bombcnyl@gmail.com
Myles Conway		MConway@martenlaw.com
Tia Lewis		tlewis@schwabe.com
Doug CRISTAFER	N/A	
Suzanne Butterfield	Swalley I.D	suzanne@swalley.com
Jack Schmucker	Schmucker Const	—
GARDNER William		GARDNERWL@OUTLOOK.com
Mark Smuland	Oxford Hotel Group	marks@oxfordsuites.com
LEAH HANSEN	ROMAINE VILLAGE PARK OWNERS (forming)	lhansen17@yahoo.com
Bruce Sagen	Elliott Anderson et al.	~~bs~~ Tim@eaattorneys.com
MARK CAMPBELL		campbelldevelopment44@gmail

URBAN GROWTH BOUNDARY REMAND

Sign in Sheet

Meeting: Boundary TAC

Date: 6/24/15

Location:

Name	Organization	Email Address
JD Thomsen	N/A	masada72ce@gmail.com
DAVE DICKSON	N/A	MrdickSome@bendbroadband
Sid Snyder	RL TAC	seppsid@gmail.com
Gary Vodden		randrvr@gmail.com
Mary Peters	N/A	mmlpeter@yahoo.com
Ron Ross		
Jim Dillman	Schumacher	JD8369@Gmail.com
JOHN DOTSON		
RUTH WILLIAMSON	BEND 2030	ruthw@bendcable.com
Mary Newbold	COLW	
Kurt Petrun	KAFP	
Andy High	LOBA	
Jim Young	Pacwest Builders	
Mike DiTullio	Desch. County Title	mikeadeschutestitle.com
WAYNE RUSSELL	SELF	wayne@riversedgegolf.com

URBAN GROWTH BOUNDARY REMAND

BEND

Sign in Sheet

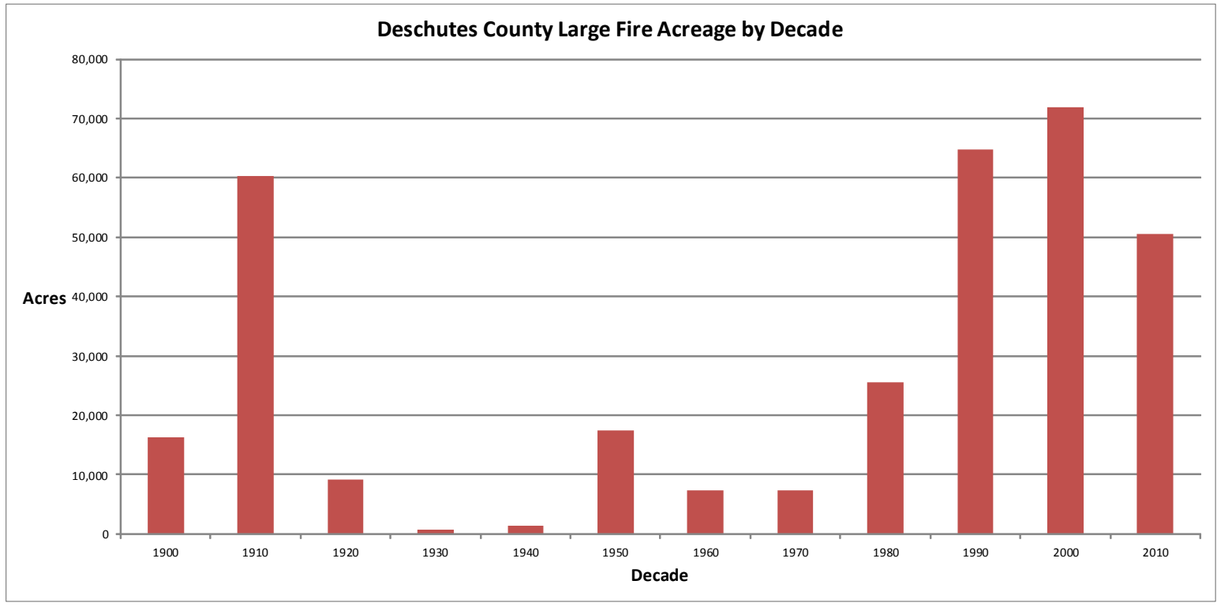
Meeting: Boundary TAC

Date: 6/24/2015

Location:

Name	Organization	Email Address
John Russell	Oregon DSL	john.russell@state.or.us
Jan Kemper	Hearing Works	Hkemper@hearing-works.org
Gary Timm	—	gary.timm7@gmail.com
Robin Vora		robinvora1@gmail.com
BRIAN MEECE	COAR / 2004 RLS.	brian@REALoregon.com
Ron Ross		rross@compasscommercial.com
Wes Price	Price/Frank & Co.	

Deschutes County Large Fire History
1900 - 2014



Map Prepared by Deschutes County
Forestry
Ed Keith
61150 SE 27th Street
Bend, OR 97702
541-322-7117

0 5 10 20 Miles

FIRE OCCURENCE BY DECADE

1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

NORTH

June 25, 2015

Brian T. Rankin, Project Manager
Damian Syrnyk, Senior Planner
City of Bend, Oregon

RE: Urban Growth Expansion

Please consider the land we currently own for inclusion in the urban growth boundary. It appears from the map you have included the west side of Hamby Road and excluded the east side. We have owned this property for over 20 years, and it is designated EFU. After reviewing the history as to how this property received this designation when surrounding parcels are utilized differently, I believe its designation made with the intention of going back later and reviewing the designation, which was never done. These are the reasons why I consider it to be better utilized as residential property rather than "farm" property. This property is 2 parcels – one 20 acre and one 28 acre parcel. Both parcels have combined water rights of 28 acres. More than 42% of this property is unsuitable for farmland.

1. Location – Proximity to schools and parks: This property borders Buckingham School and Big Sky Park. Two sides border subdivisions and the final side is along Hamby Road. This location has excellent north-south as well as east west access. Utilities available include Cascade Natural Gas, electricity and Avion Water (upgraded their piping within the last 10 years). The sewer line is at the school. The fire station is less than 1 mile away. Hospital, health care services and shopping are close and easy to get to.
2. Flat, easily buildable land with low fire risks. This land is not forested, nor is it in a forested area. This makes it an excellent candidate for reasonably priced family housing, and the need for that in Deschutes County is great.
3. Poor quality farmland. It has several lava flows going through the middle of the field of the portion that is irrigated that make it difficult to manage. Soil depth in many areas is minimal. Lava rocks are continually coming to the surface. Anytime the soil is disrupted, lava rocks must be picked up from that area. The soil must be given heavy doses of nitrogen just to produce grass hay. After many experiments we have concluded that this is the what this land can consistently produce. Because of the climate, frosts can be expected at any time. Years ago, we tried animals. With livestock, we ended up with school children in the field wanting to "pet the animals". I have found a lost 3-year-old child on the property. People come onto our land to retrieve lost balls. We also have had dogs belonging to other people stampede cattle around the property just as parents were dropping their children off to school. Neighborhood dogs have killed chickens and turkeys. We have neighbors who do not control their weeds or rodents, so we must continually battle these pests. Farmland adjacent to other farmland does not have these problems. The school, park and road produce trash that we are continually cleaning up.
   The neighborhood complains about dust, and our attempts to control pests and weeds. Just as I believe that subdivisions should not be put in the middle

of farmland, exclusive farm use should not be in the middle of a subdivision. I believe surrounding areas should be compatible and congruent with usage.

Please keep me notified of all opportunities for me to be involved, or if there are any questions you have. I have signed up several times to receive meeting notifications from the City, but have never received any. Thank you for your time and efforts.

Sincerely,

Jeri Boe
21699 Eastmont Dr.
Bend, OR 97701
541-390-6965
jeriboe@gmail.com

From: Stephen Ireland [mailto:spireland@bendbroadband.com]
Sent: Sunday, June 28, 2015 9:40 PM
To: Damian Syrnyk; Brian Rankin
Subject: UGB Expansion — Bend

Dear Sirs,

I own property located at 63109 Cole Rd. I write to urge the UCG TAC, staff and facilitators to include this property and adjacent property, totaling 240 acres and described as Butler Market Village, in the UGB expansion.

The owners of these properties have demonstrated a willingness to work together to develop a master plan for development which incorporates the principles of smart growth. It is our vision to develop a unique neighborhood centered on affordable housing but, also, including parks, schools, commercial and economic centers. Existing and proposed roads make this area very accessible. The area is flat and is located next to critical infrastructure, significantly reducing the costs of development. It poses a low wildfire risk.

Thank you for your consideration.

Sncerely,

Steve Ireland

From: Edward Elkins [mailto:thumper2@centurylink.net]
Sent: Monday, June 29, 2015 12:04 PM
To: Brian Rankin
Subject: UGB Swalley

Based on Swalley Irrigation District's (SID) presentation at the June 9th 2015 Urban Growth Boundary Technical Advisory Committee meeting regarding the Urbanization impact to the District. I submit the following with regards to Gopher Gulch Ranch for the record.

SID has no facilities located within the boundaries of Gopher Gulch Ranch.

Gopher Gulch Ranch will withdraw from SID in accordance with ORS 545.009 whenever the property is Annexed into the city limits

Gopher Gulch will Quit Claims It's water rights to SID, Deschutes River Conservancy, or the State of Oregon which ever best benefits the Deschutes River.

Please reply by return Email your receipt of this submission.

Respectfully,

Edward J. Elkins & Doris E. Elkins

FOR THE RECORD 6/30/2015

Editorial: Don't give into pressure on Bend UGB

Published Jun 27, 2015 at 12:10AM

There are going to be winners and losers as Bend makes decisions about what land to bring into its proposed expansion. But the decisions shouldn't be about what's best for people who own that land. It should be about what's best for Bend.

That's why it was a relief to hear the argument that the city should not put all the city's new industrial land at Juniper Ridge.

Juniper Ridge has seemingly become the home for anything people don't want nearby. Opponents of the 10-acre site of Oregon State University-Cascades Campus suggested moving it to Juniper Ridge. Recently, the suggestion was to move all the new industrial land to Juniper Ridge.

It's not hard to understand why the industrial land suggestion came up. Let's say you own land outside the city's urban growth boundary. If it's one of the plots the city is thinking about bringing into the expansion, that could mean a big difference in the property's value.

But there's also a difference between having property designated for residential development and industrial development.

The demand for residential housing is something that a landowner can capitalize on relatively quickly. Developing land zoned for industry can be a long, indeterminate wait.

Should the city-owned land in one corner of the city be the only place targeted for industrial land? No.

It doesn't give owners of industry options. That could make Bend less desirable to the technical and research companies that cities across the country are trying to attract.

Another direction about Bend's UGB expansion is worth noting. There's concern about fire danger on Bend's west side and the ensuing suggestion that all the new land added to the UGB should therefore be on the east side. As Bend City Councilor Doug Knight and others have pointed out, wildfire risk isn't only on Bend's west side.

If Bend wants to demonstrate that its planned boundary expansion makes sense, it needs to keep making decisions like these.

UGB steering committee urges speed

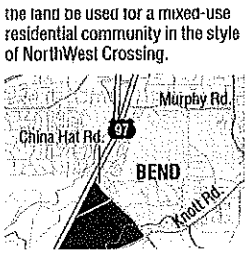
By Tyler Leeds The Bulletin Published Jun 26, 2015 at 12:01AM

At a meeting Thursday afternoon, the body in charge of Bend's urban growth boundary expansion resisted clustering new industrial sites and urged the city's consultants and advisers to avoid any delays.

The process is overseen by a steering committee composed of the Bend City Council, two planning commissioners and Deschutes County Commissioner Tony DeBone. The expansion of the boundary, beyond which the state restricts development, is intended to accommodate the city's growth through 2028.

At Thursday's meeting, the steering committee considered for approval the work of an appointed advisory committee, which has been developing three different growth scenarios that map out where and how the city should grow.

Related articles:



UGB process may add a month (http://www.bendbulletin.com/bo 151/ugb-process-may-add-a-month?related=1)
06/25/2015

Over the summer, consultants hired by the city will test how these scenarios impact traffic, sewers and drinking water, among other factors. A final growth scenario will be settled on based on that information.

At a meeting on Wednesday, the advisory committee had supported moving all large industrial areas to the city-owned Juniper Ridge property in northeast Bend.

The thinking behind the move was that large industrial sites are hard to sell and develop, and no single property owner should be burdened with such a designation.

Because of the difficulty of finding a developer, such a designation is considered less profitable than a residential or commercial designation.

"Moving all these large lot industrial sites to Juniper Ridge is a bad idea; it's like putting all our eggs in one basket," said Mayor Jim Clinton. "And what kind of basket is it? It's a pile of rocks."

Councilor Victor Chudowsky agreed, saying, "I don't think the city should be the sole owner of these large parcels." He added that spreading them out will possibly make them more attractive, as buyers may want options about where to place a business.

In the end, the steering committee voted to model the placement of industrial properties at a number of sites across the city, instead of grouping them all at Juniper Ridge.

The steering committee also approved the modeling of land not included in any of the three scenarios, a move the advisers had requested but which may add more time and costs to the process.

The supplemental land is intended to give the advisers flexibility if there are major problems with one scenario.

To explain the rationale behind this move, Senior Planner Brian Rankin noted that the modeling may reveal a scenario that pushes a sewer line beyond where it can operate. Having more land to work with could allow one property to be swapped for another in order to relieve the sewer line. However, he also noted having more information may require more time to digest.

Rankin said each additional month would cost between $80,000 and $100,000, based on expenses to date. The advisers stated they hope to be able to work within the current time frame and not add an additional month, but Rankin said more time may be needed if the results are complex.

"The results from the analysis could be straightforward and clear, in which case this would go relatively smoothly," he said. "Or it could be a lot more info that isn't all that helpful in making a tough decision."

The steering committee voted to include the supplemental lands in the modeling, but cautioned the group to work efficiently, with Chudowsky saying, "Extending by two or three months is frightening."

A proposal by a single adviser to create a model of growth only on the city's east side was also struck down, with Councilor Doug Knight saying he wanted to fight the misunderstanding that wildfire risk only exists to the west of the city.

Councilor Casey Roats agreed, saying the decision to vote down the proposal will help to fight the perception that "we just dump things on the east side."

The results of the modeling are scheduled to be finalized by the fall.

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UGB process may add a month

By Tyler Leeds The Bulletin Published Jun 25, 2015 at 12:03AM

The city of Bend is nearing a crucial point in its urban growth boundary expansion process, but a decision to be more thorough could add about a month to the process.

At a meeting with a committee of citizen advisers Wednesday morning, city staff discussed what's next for the boundary, a line beyond which development is heavily restricted. This is the second attempt to gain state approval for more land to accommodate population growth through 2028. The first attempt was struck down in 2010 after the state said the size of the proposed 8,000-acre expansion was unjustified.

So far, the advisers and staff have developed three expansion scenarios that map out where and how the city could add 2,000 acres of new land for houses, industry, parks, schools and commercial areas.

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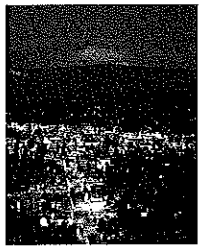

Who stands to gain from UGB growth?

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06/21/2015

These scenarios will be considered for approval at a meeting today by the steering committee, a group composed of the Bend City Council, two planning commissioners and Deschutes County Commissioner Tony DeBone.

After the scenarios are approved, models will be run to test how each new boundary impacts things such as sewers, drinking water and traffic patterns.

Once the models have been run, the advisers will gather again in the fall to evaluate the results and hone in on a final scenario for the steering committee to consider.

To prepare for the meeting today, the advisers voted on two things — whether to include supplemental land in the modeling and what, if any, changes to make to the three scenarios. The addition of supplemental land to the modeling, noted Senior Planner Brian Rankin, gives the city more pieces to play with if any of the scenarios need tweaks to avoid overrunning an intersection or overloading a sewer line, for example.

"We'll end up with more land to learn from as we settle on a final, preferred scenario," Rankin said.

However, adding more land will put more information into the mix, which could slow down the process. That added time, which Rankin said could total about a month, could also add to costs, though no estimate was available Wednesday. So far, the city has spent about $1 million on the project, with another roughly $1 million commitment allocated this spring.

Despite reservations about how easy it will be to compare the supplemental land to the land included in each scenario, the advisers voted to recommend the supplemental land be forwarded to the steering committee. The supplemental land wasn't chosen at random, but instead represented land that scored the highest on a number of factors relevant to the expansion and yet was left out of the three scenarios.

The advisers also approved a series of changes to the scenarios, including a decision to move large industrial sites out of private property and into the city-owned Juniper Ridge area.

John Russell, a member of the advisory committee, called the industrial designation "onerous," a reference to the difficulty of finding a buyer and developer.

A number of changes also involved property on the city's southern edge owned by the J. L. Ward Co. Sharon Smith, another adviser, successfully suggested moving more residential land into that property, something Jody Ward, president of the Ward Co., advocated for during public testimony.

Ward said she supported the concept of complete communities, developments that have a mix of uses, including residences, commercial areas, schools and parks. In Bend, NorthWest Crossing is often pointed to as an example of such an area. Some of the uses being considered for the Ward property within the scenarios included industrial and other nonresidential purposes not well suited for a complete neighborhood.

To support her case, Ward submitted a letter that showed a plan for two pieces of her property, one containing land for a new high school along U.S. Highway 97 near China Hat Road and the other a new elementary school on SE 15th Street. Included was a letter from Bend-La Pine Schools' Chief Operations and Financial Officer, Brad Henry, saying the district "would like to" acquire the elementary school site and "is interested in a possible future high school site" on the Ward property.

Due to concerns about adjacent uses being compatible, the city is unlikely to place industrial land next to schools, which are generally seen as being more consistent with residential and small commercial areas.

As recently as September, the district had plans to use a separate but nearby property (http://www.bendbulletin.com/home/2407390-151/bend-la-pine-schools-surveys-vacant-land) for a new high school. At the time, Henry said the district "has all along intended for a high school" to be developed on a roughly 50-acre site the district owns adjacent to Bend Golf and Country Club.

Henry did not return a call for comment.

The city intends to complete the boundary process by the end of 2016.

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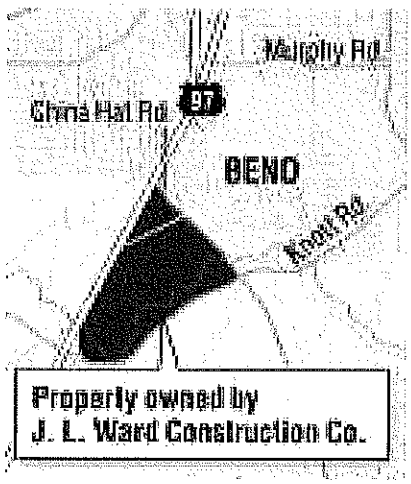
'The thumb'

Some urban growth boundary expansion scenarios have called for a mix of industrial and commercial uses for the property. The owners are advocating that the land be used for a mixed-use residential community in the style of NorthWest Crossing.



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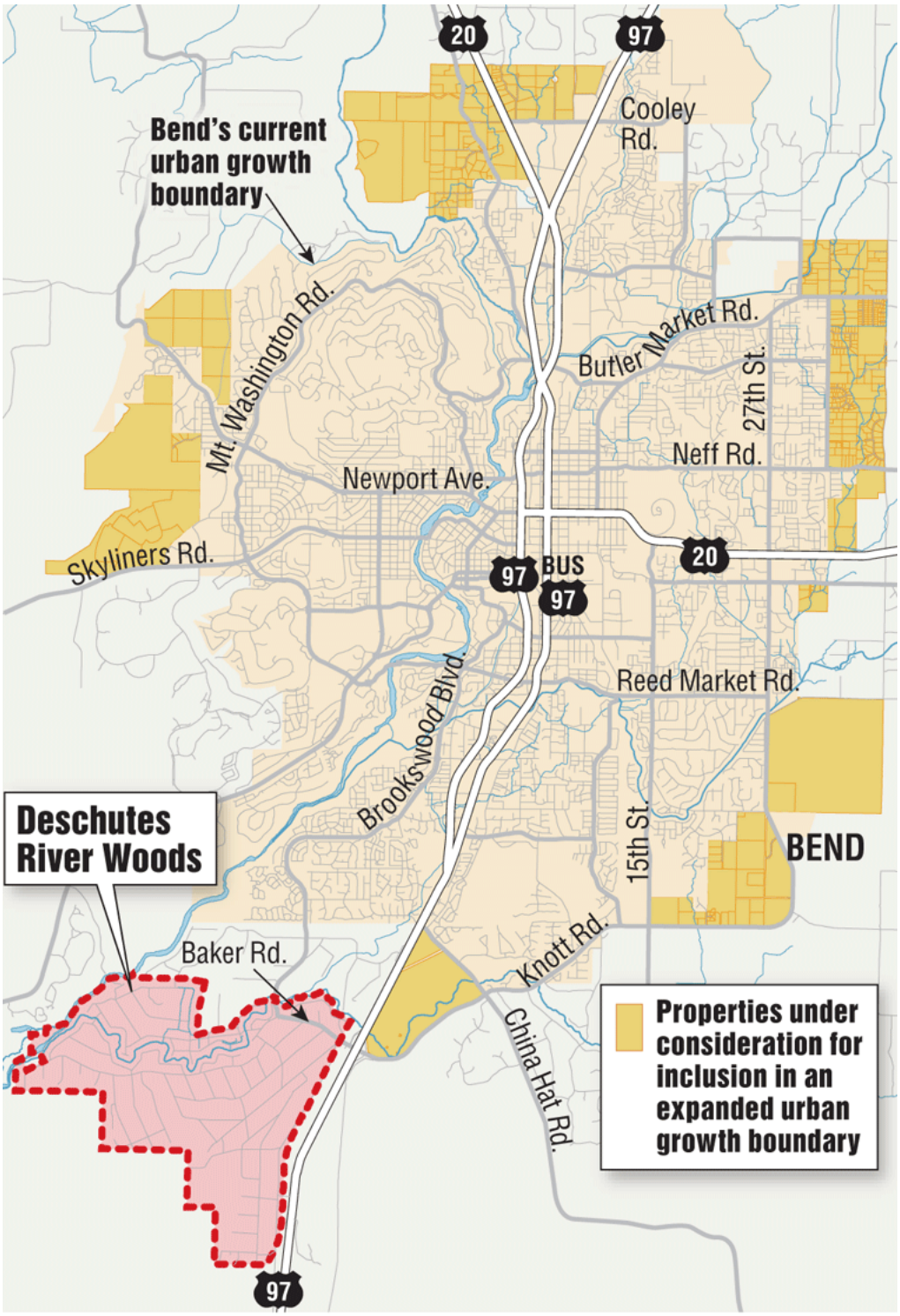

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Deschutes River Woods to stay outside the UGB

Why the area south of Bend won't make the city's expansion plan

By Tyler Leeds (http://www.bendbulletin.com/NewsroomStaffList/?person=77) / The Bulletin

Published Jul 12, 2015 at 12:03AM

A set of state-mandated goals guides the process of expanding Oregon cities, and because of their design, a relatively dense area close to Bend stands no chance of being brought into the city.

Bend is in the process of expanding its urban growth boundary, a line beyond which new development is restricted and subject to Deschutes County's rural development code. The state controls the boundary, and in 2010, it rejected Bend's bid to make room for growth through 2028 with 8,000 new acres.

At the time, the state said the city's plan failed to make good use of open land within its existing footprint, an objective set out in what's called Goal 14.

The city is now at work planning a second expansion proposal, one with a greater emphasis on density. Goal 14 isn't just about how much land a city can absorb, but also considers the placement of roads, sewers and environmental resources to decide which land should be brought in. Because of these rules, Deschutes River Woods to the southwest of Bend, with its upscale riverfront homes and clusters of trailers, was one of the first areas ruled out.

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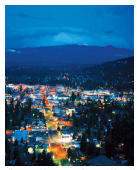
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06/21/2015

Brian Rankin, a city planner overseeing the boundary expansion, noted the city put together a map that ranks parcels on all the factors of Goal 14. Combining all of the traits that make a spot ripe for inclusion, the city created a heat map that shows how each parcel outside the city fared. Areas that appear green on the map, like a piece of land just south of the city along U.S. Highway 97, scored the best, while those in red performed the worst.

"When you add it all up, most of Deschutes River Woods came up red," Rankin said. "I think that analysis speaks for itself. You can look at it a number of different ways analytically, but you'll come up with similar results. It wasn't just one factor that ruled it out."

One major difficulty with the land is how much it would cost to build pipes and sewers, but the invisible, legal lines that divide property owners also stand in the way.

"The area is highly parcelized, meaning there's a lot of different, small landowners," Rankin said. "What we're trying to accomplish with urbanization is to create complete neighborhoods, meaning a place with a variety of uses, such as a school, a commercial area and different types of housing. When you're working with one, big property owner, that can be easy to plan. But when you have hundreds of landowners, it can be quite difficult."

If the city were to bring in the neighborhood, it would also have to work with all those residents to find a way to fund new infrastructure and upgraded roads that meet the city's standards. It's possible those costs would be carried by current city of Bend residents in the form of bonds or utility bills. Reed Market Road was once a county road, Rankin noted, and it has cost the city millions to complete that upgrade.

Given how densely populated the area already is, Rankin added, it's not clear if the neighborhood would help the city meet its goal of accommodating future growth, as dense redevelopment schemes would be tricky to piece together.

Robin Vora, a member of the boundary expansion advisory group, wonders if despite the challenges, there may be a social justice benefit to bringing Deschutes River Woods into the city.

"It's hard to tell, but driving around the area, it seems the infrastructure is not up to the same level and that things aren't in great shape," he said. "If people are willing, I think it'd make sense to talk about the idea, to see if we could provide the same level of service as folks in the city enjoy. My guess is there's a lot of low-income people who couldn't afford the upgrades on their own. It just seems like there may be an opportunity."

Vora noted his suggestion was shot down at a boundary meeting by those worried about costs.

"It would cost a lot, but so will anything we do with the expansion," he said. "Whichever direction we go, some of the improvements, which are expensive, will be paid by the city."

Vora said he's met residents of the area behind the idea, but said he'd definitely want to make sure the expansion was welcome before pushing it further.

From his time as a planner in Sisters, Rankin said there can be strong resistance from rural neighborhoods being brought into a city.

"People are supposing the city has something to offer Deschutes River Woods, and I wonder if that's true," he said. "Do they want the city to come in, pave roads and allow for more dense developments? I just don't know, and I think some people would want the area to stay as it is."

When an area has an established feel, Rankin said, "It's best for the boundary process to respect that character and find other lands."

If other land wasn't available, he added, the city might be looking at Deschutes River Woods. But that's not the case.

"We went through almost a year's worth of analysis," he said. "The area isn't being treated different than any other, and there is land we're ruling out in every single direction for a variety of reasons. We have thousands of other acres to look at, areas able to be developed sooner and better meet the state's goals."

The city plans to finish its expansion proposal by the end of 2016.

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