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Projecting Urban Expansion in the Treasure Valley to 2100

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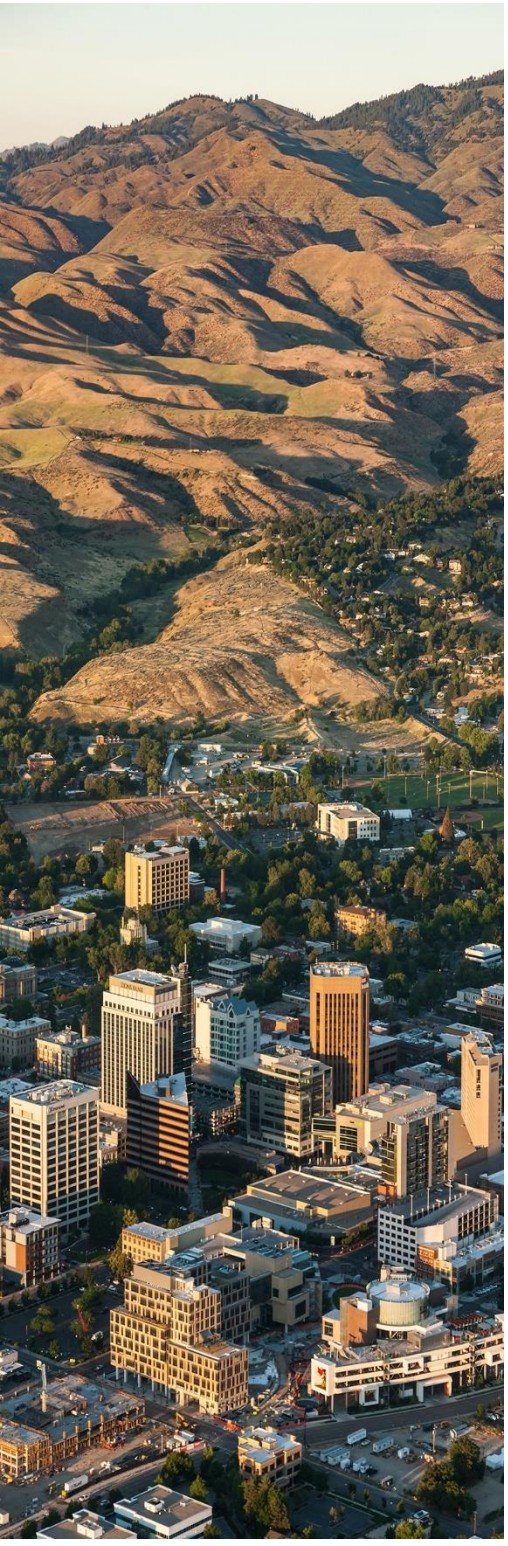
INTRODUCTION

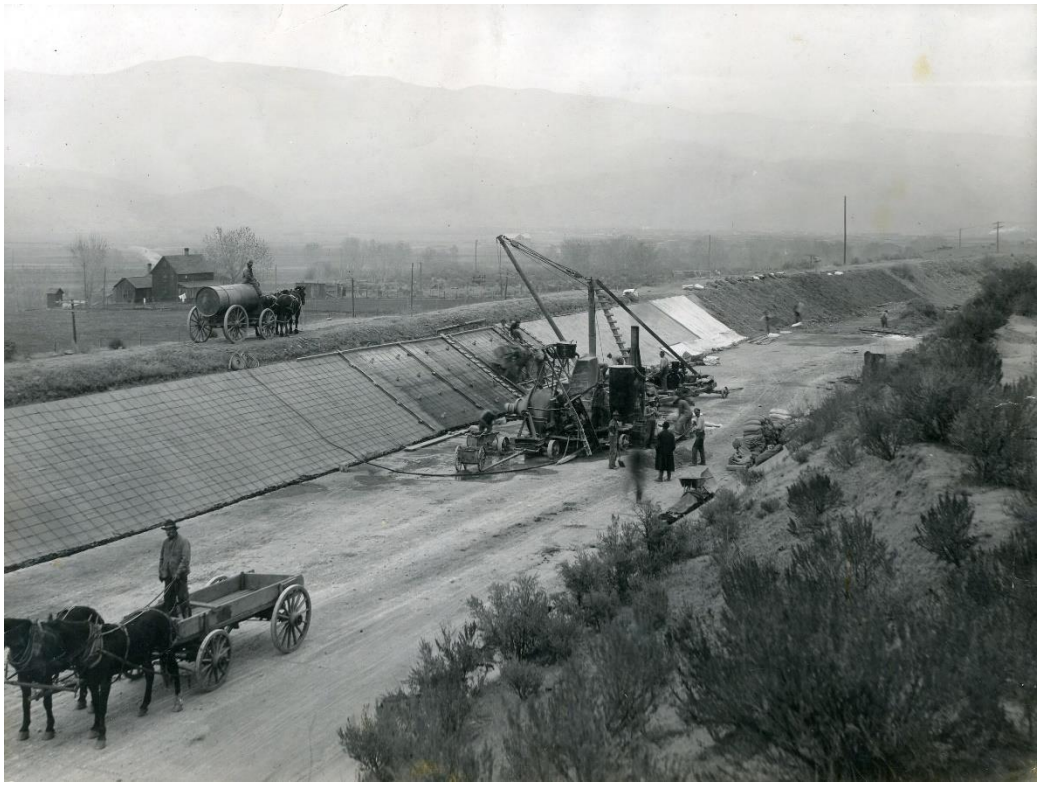


Most residents of the Treasure Valley in Southwestern Idaho will not be surprised to learn that urban development is rapidly affecting agricultural land, wetlands and forested areas. Between 2001-2011, over just a ten-year period, urban land area in the Treasure Valley increased by 10%, while agricultural land decreased by 5%. We can expect to see a continued decline in agricultural areas but what is not well understood is the rate at which they might continue to happen into the future. If we stay on our current path, what will the Treasure Valley look like in 25 years? 75? 100?

Humans are notoriously bad at visualizing future scenarios and engaging in long-term planning; this paper is an attempt to counter those tendencies, and to provide citizens and decision makers in the Treasure Valley with data regarding land use change. Population growth will continue, but there are a range of possibilities for what that growth will look like. Similarly, planning and zoning decisions may contain some variability--will we develop land in high, medium, or low density ways? The scenarios below aim to capture and graphically represent the range of possibilities decision makers may face.

HISTORIC URBAN GROWTH IN THE TREASURE VALLEY

Since its settlement in the late 19th century, the Treasure Valley has undergone episodic periods of rapid population growth. First, thousands of miners flocked to the region, creating the need for a steady source of food, goods and services. The Boise River and floodplain provided plentiful water and fertile soil for farming. Agricultural infrastructure within the valley quickly expanded as canals, dams, and reservoirs were built to accommodate the influx of new residents. Soon after, the establishment of amenities such as electricity and telephone services led to explosive population growth in the greater Boise area and along rivers and canals. In the 1950's, with the completion of Lucky Peak Dam and the expansion of highway networks, suburban development spread into agricultural areas as developers bought up cheap land with existing infrastructure. Throughout the 1990s, the Treasure Valley became known nationally as a region with high quality of life, and corporations like Albertson's, Morrison Knudsen Corporation, J.R. Simplot, Micron, and Boise Cascade in the region drew new residents. From 1990-2000, the Boise-Nampa metropolitan area was one of the fastest growing areas in the country, with a 45% growth rate.



Such rapid growth could be viewed through a variety of lenses. On the one hand, economic growth provides jobs and increases opportunities for economic advancement. On the other hand, some are rightly concerned about the changing biophysical and social character of the Valley as a result of this population growth. Cultural tensions between "insiders" (long-time residents) and "outsiders" (new arrivals) persist. Cities are experiencing growing pains, particularly related to infrastructure, such as traffic and parking. Continued growth may place increasing pressures on land and water resources, which have been relatively abundant up to now. In this project, our research team modeled future urban expansion scenarios as a first step in understanding the impact of future growth on local, highly valued resources.

MODELING LAND USE CHANGE

Based on historical LULC change in the Treasure Valley we determined two main drivers of urban expansion: (1) total population within an area and (2) population density (i.e. how tightly concentrated population is within the urban area).[1] Table 1 details the five scenarios we explored using these two drivers.

Table 1: Urban Expansion Scenarios

Scenario	Population 2100	Population Density
Low Population Growth	1.25 million	4.14 people/acre
High Population Growth	1.75 million	4.14 people/acre
Business as Usual	1.5 million	4.14 people/acre
Low Population Density	1.5 million	3.78 people/acre
High Population Density	1.5 million	5.41 people/acre

Population growth as a driver

Population growth is an important driver of urban development. Using local population growth rates in tandem with national population growth patterns, we applied regression techniques[2] to determine three plausible scenarios of population in the year 2100:

(1) Low Population Growth: 1.25 million people in 2100
(2) Business as Usual (moderate growth): 1.5 million people in 2100
(3) High Population Growth: 1.75 million people in 2100

Population density as a driver

Population density has a significant impact on how urban expansion occurs. By population density, we mean how many people per unit area, which can be driven by zoning decisions — for example restrictions on house lot sizes in a new development. We analyzed three different scenarios of density based on historic, local density trends, and nation-wide density trends:

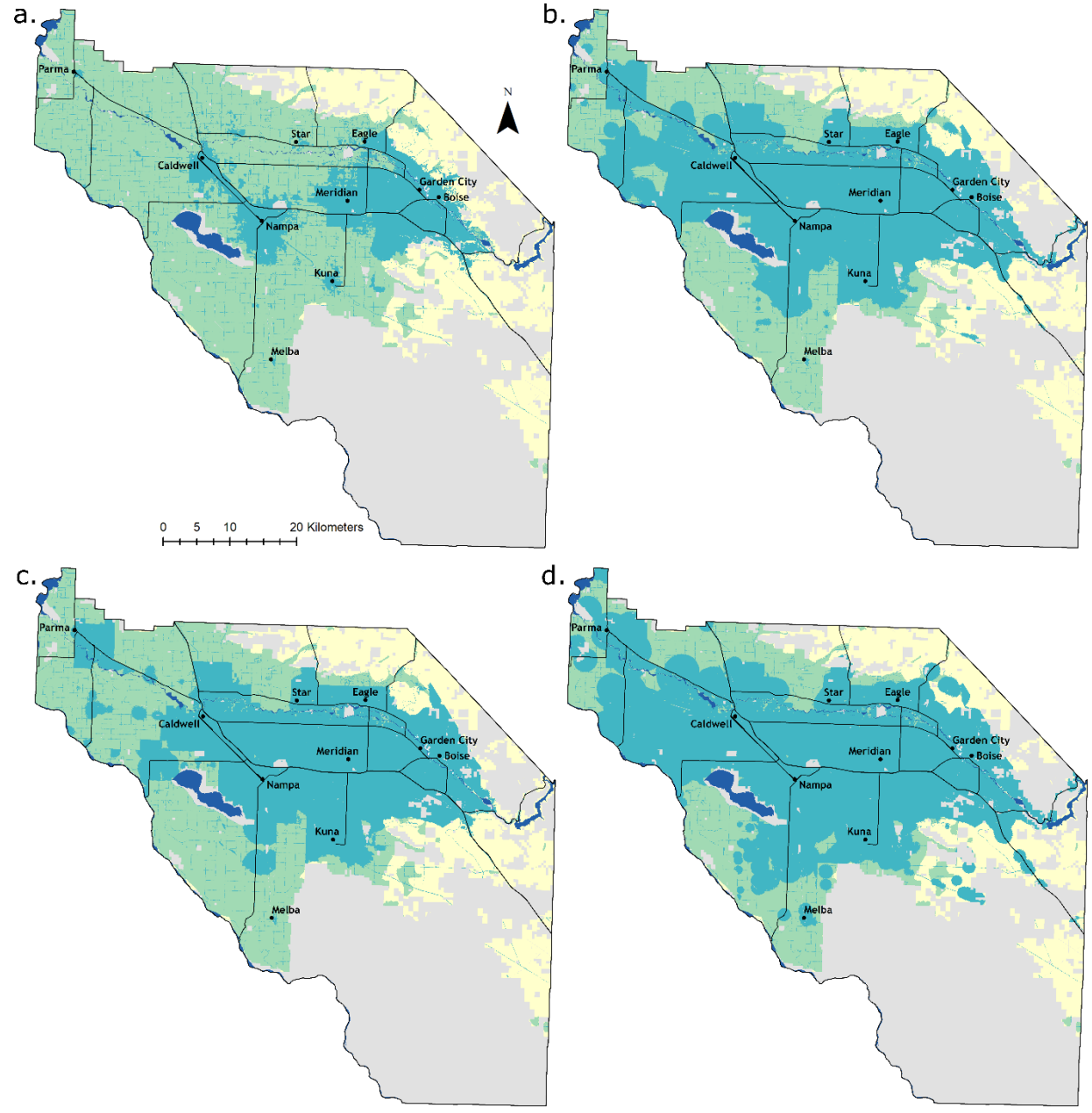
(4) High Population Density: 5.41 people/acre
(5) Business as Usual (no change): 4.14 people/acre
(6) Low Population Density: lot size of 3.78 people/acre

IMPACTS OF URBAN GROWTH ON FARMLAND, FORESTS AND WETLANDS

Figure 1 summarizes the different scenarios of urban growth in 2100 based on population growth. The first panel shows the "current" (2011) extent of urban development, and the next three panels show the Low Population Growth, Business as Usual, and High Population Growth scenarios, respectively. The High Population Growth scenario is the most impactful of the scenarios in terms of total acreage converted to urban (280,000 acres), compared to 220,000 acres converted to urban under the Business as Usual scenario.

[1] To see how our projections compare with others, see appendix.
[2] For more information on methods used, visit http://scholarworks.boisestate.edu/miles_data/23/

Figure 1: Population growth as a driver of urban expansion



Projected urban expansion under different population growth scenarios, with the same population density: a. Current (2011) urban extent, b. Business as usual scenario of 1.5 million residents by 2100, c. Low population growth scenario of 1.25 million residents by 2100, and d. High population growth scenario of 1.75 million residents by 2100.

Figure 2 (page 7) summarizes the different scenarios of urban growth in 2100 based on development density. The first panel shows the "current" (2011) extent of urban development, and the next three panels show the Low Population Density, Business as Usual, and High Population Density scenarios, respectively. Under the High Population Density scenario, loss is minimized because growth is tightly clustered around existing city centers. Under the Business as Usual and Low Population Density scenarios urban areas expand in all directions, with development primarily occurring on agricultural land and some expansion into the eastern foothills. Of these scenarios, the Low Population Density scenario represents the largest area converted to urban (260,000 acres), compared to 220,000 acres converted to urban under the Business as Usual scenario.

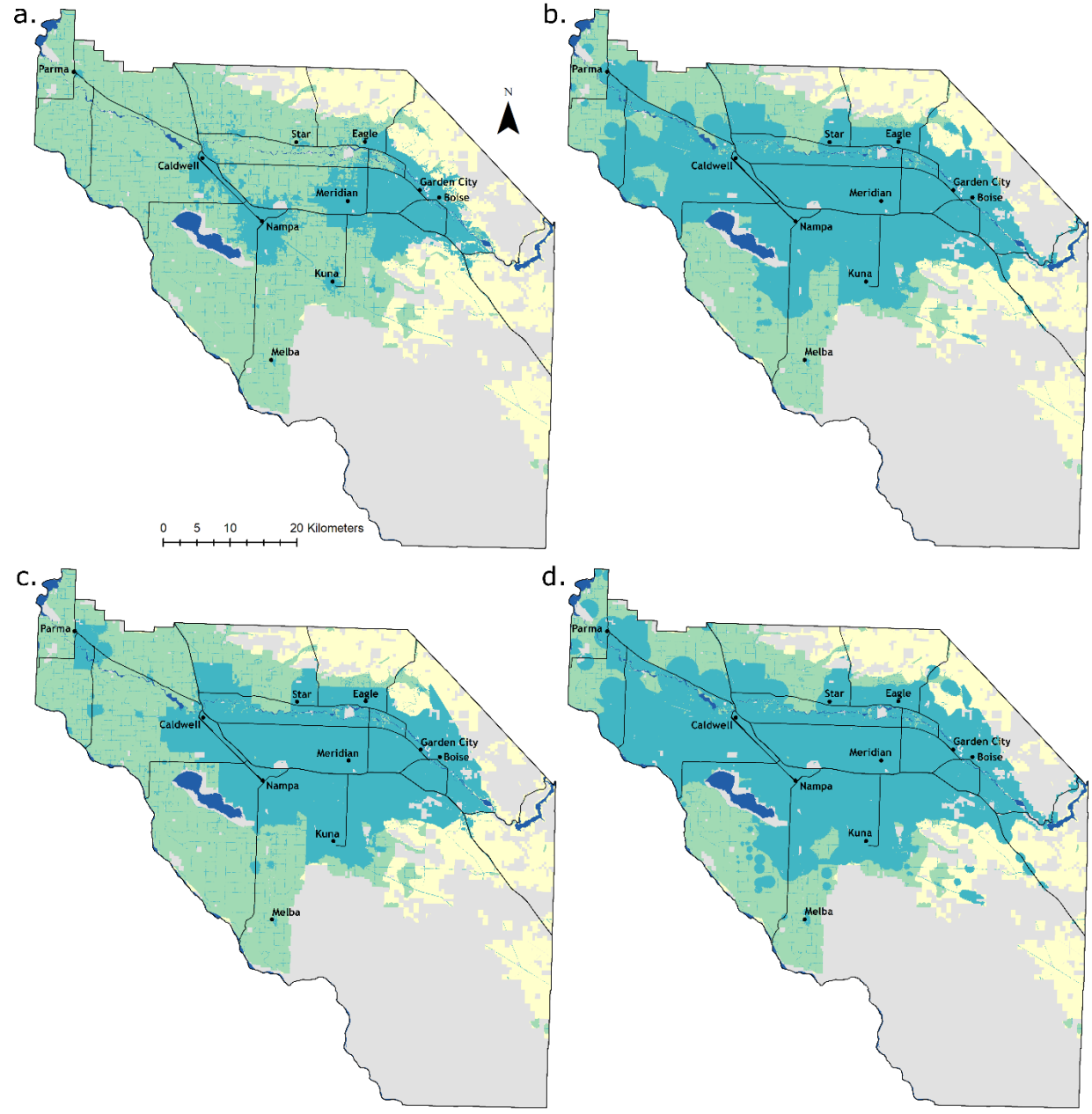
Table 2: Comparison of urban expansion impacts to land use-land cover

Scenario	Urban Gain (acres)	Agriculture Loss (acres)	Forest Loss (acres)	Wetland Loss (acres)	Sagebrush-Steppe Loss (acres)
Low Population Growth	160,000	-140,000	-730	-490	-22,000
High Population Growth	280,000	-240,000	-860	-980	-44,000
Business as Usual	220,000	-190,000	-820	-590	-30,000
Low Population Density	260,000	-220,000	-840	-800	-38,000
High Population Density	140,000	-110,000	-700	-460	-20,000

Our projections demonstrate that urban expansion replaces agriculture, wetlands, forested areas, and sagebrush-steppe, with the largest losses occur in agricultural areas. In the High Population Growth and Low Population Density scenarios, our model predicts that 59-64% of current agricultural land will be lost by 2100, amounting to 190,000-220,000 acres. In contrast, if high density development occurs, about half as much — 31% — agricultural land would be lost by 2100, amounting to 110,000 acres.

Our model predicts that wetlands and forested areas will also be significantly impacted by urban development. In our High Population Density scenario, our model predicts a 12% loss of forests and a 13% loss of wetlands. The High Population Growth scenario results in a 15% loss of forests and a 28% loss of wetlands. Sagebrush-steppe remains relatively unchanged, largely due to much of it being protected under different levels of public ownership.

Figure 2: Population density as a driver of urban expansion



Projected urban expansion under different population density scenarios, all using a baseline of 1.5 million residents by 2100: a. Current (2011) urban extent, b. Business as usual scenario using current average people/acre of 4.14 c. High density scenario where average people/acre is 5.41, and d. Low density scenario where average people/acre is 3.78.

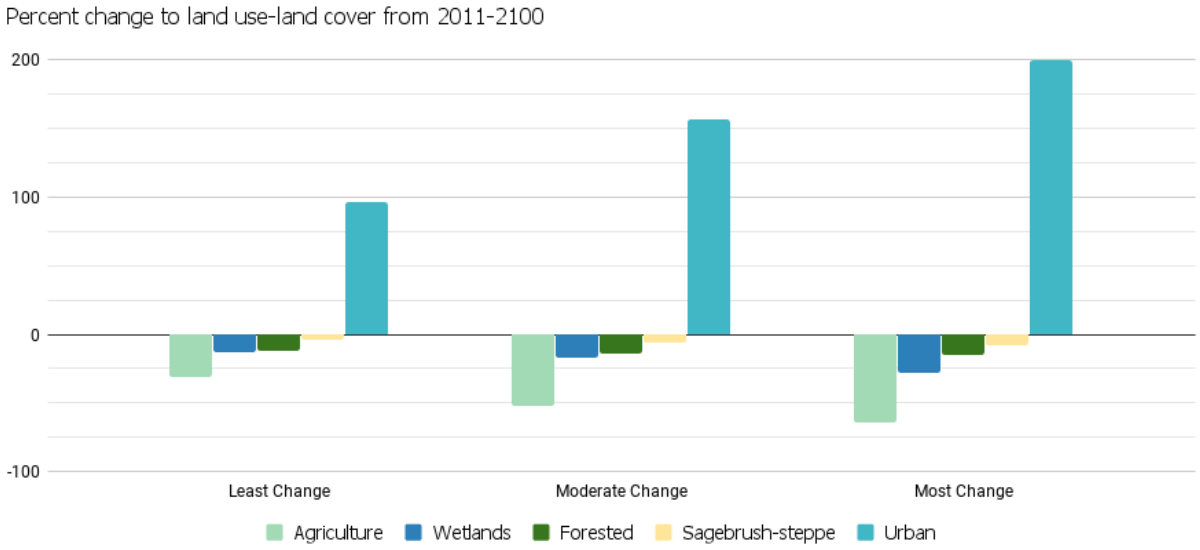


Figure 3: A comparison of three scenarios representing the least amount of change (High Population Density), moderate change (Business as Usual), and most amount of change (High Population Growth).

CONSIDERATIONS

In summary, the future of farmland, forests and wetlands in the Treasure Valley will be greatly influenced by how much population grows, as well as the decisions made about housing density. This envisioning exercise gives important insights about potential future development patterns in the Treasure Valley and will be used to help us understand the impacts of future development on farmland, water supply, habitats, recreational opportunities, and quality of life. These implications and more should be considered when planning for the future.

APPENDIX

How do our projections compare with others'?

Due to concerns about changes in water demand the Idaho Water Resource Board (IDWR) also projected population growth for the Treasure Valley in 2010 and 2015. While there were many similarities in expected changes (Table A1), all three groups had different estimates for population growth. For instance, our estimate for our High Population Growth scenario still falls short of estimated population totals given by the IDWR reports. We also had more conservative estimates concerning density; in our scenarios we estimate ~14-20 households (HH)/acre while the 2015 IDWR report estimates ~34 HH/acre. However, we used the current average for household size for all projections. Lastly, overall land use-land cover change is similar to the 2010 IDWR report with no significant differences between projections. The largest difference found is between urban acreages, which may be partially explained due to differences in land use-land cover categorization and defined study areas.

Table A1: Comparison of projected population and land use change reports

	BSU 2017	IDWR 2015	IDWR 2010
2060 Population (million)	1.23	1.57	1.65
2070 % population Ada County	43	63	
2011 Business as Usual HH/acre	16.7		
2070 Low Density HH/acre	14.3		
2070 High Density HH/acre	20		
2015 HH/acre		14.6	
2065 HH/acre		34	
2011 People/HH	2.7		
2070 People/HH	2.7		
2015 People/HH		2.66-2.97	
2065 People/HH		2.43-2.51	
2060 Urban (acres)	343,237		286,095
2060 Agricultural (acres)	197,280		193,307
2060 Native* (acres)	500,231		525,337
2060 Rural (acres)			40,651
2060 Riparian (acres)	2,854		6,446
2060 Other (acres)	21,303		26,816

*Comparison to sagebrush-steppe

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Photos

Cover: Bureau of Reclamation: https://www.flickr.com/photos/usbr/7071670041
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