7-2022

Regional Water Providers Consortium: Population, Housing Unit, and Household Estimates 2020 and 2021

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Citation Details

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Portland State
UNIVERSITY
Population Research
Center

PRC
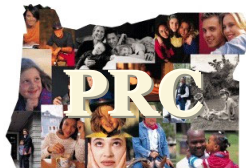
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JULY 2022

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Background

Water providers have an ongoing need for estimates and forecasts of the total population and the number of housing units and households within their service areas. The Portland State University (PSU) Population Research Center (PRC) has prepared annual population, housing unit, and household estimates each year since 2014 for the water service areas of the municipalities and water districts in the Regional Water Providers Consortium (RWPC), as well as the wholesale customers of the Portland Water Bureau (PWB) that are not Consortium members. Previous estimates used the 2010 Census as a baseline, with boundaries collected in 2013 and updated in 2019. For this report, population, housing unit, and household counts from the 2020 Census were allocated to each water service area using boundaries as of March 2022.

This report includes a description of the methodologies used to allocate the April 1, 2020 census data and prepare estimates for July 1, 2021. Tables 1 and 2 present these estimates in detail for each provider. Under the current agreement between PRC and PWB, future work will include updates to the estimates each year from 2022 to 2025, and forecasts through 2060.

Service Area Boundaries

Because water services are funded primarily by user fees, "boundaries" of water providers don't exist in the same way that they might for services funded by property taxes such as schools, fire, etc. Water service areas are more likely to be defined by the infrastructure that they maintain rather than the parcels that they serve. In some cases, the agency responsible for billing customers is different than the agency providing water to those customers. To allow customers to enter an address and learn which agency provides their water and whether their home or business is affected by an emergency, the Drinking Water Advisory Tool (DWA Tool) was developed to alert customers of Consortium members if there are emergency notices in effect regarding their drinking water. The DWA Tool is maintained and updated by PWB based on information from RWPC member agencies, and requires a current parcel-based boundary file. PWB provided the March 2022 version of the boundary file to PRC for the current study.[1]

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[1] PWB also now maintains a web service of the boundaries at
https://www.portlandmaps.com/arcgis/rest/services/Public/Utilities_Water/MapServer/6

2020 Estimates

The 2020 estimates are derived from the April 1, 2020 census. The smallest geographic areas for which census results are published are census blocks. Census blocks are "bounded by visible features such as roads, streams, and railroad tracks, and by nonvisible boundaries such as property lines, city, township, school district, county limits and short line-of-sight extensions of roads."[2] In urban areas, most census blocks are identical to city blocks, bounded on all sides by streets.

The characteristics required for the estimates — total population (POP), household population (HHPOP), group quarters population (GQPOP), total housing units (HU), and total households (HH) — are published for every block. These block-level characteristics were aggregated to 2022 water provider service areas from the 2020 Census Redistricting Data File published in August 2021. However, many blocks are split by water provider boundaries. Therefore, we used a housing unit inventory (HU inventory), described below, and building footprints, to allocate census results to each provider on a split block.

HUs, HHs, and HHPOP were allocated to providers based on computed shares. Most census blocks were assigned to only one provider, resulting in shares of 1.00. Shares for split blocks were based first on the number of units in the HU inventory. In rare cases where the Census Bureau assigned housing units to blocks in which no units had been identified in the inventory, we used counts of building footprints to assign shares.[3] As a last resort, in even rarer cases where the Census counted units on blocks with no building footprints, we used land area to assign the shares.

GQPOP was also allocated to providers based on their shares of census blocks. There was GQPOP on 113 split blocks, but only 10 of those blocks had a GQPOP of over 33. Each of these were manually inspected and the group quarters population was assigned to either one provider or the other by overriding GQPOP shares to 1.00 and 0.00. For split census blocks with GQPOP of

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[2] U.S. Census Bureau, "What are Census Blocks?" at https://www.census.gov/newsroom/blogs/random-samplings/2011/07/what-are-census-blocks.html.

[3] The source for building footprints was the Oregon Department of Geology and Mineral Industries, Digital Data Series, Statewide Building Footprints for Oregon, Release 1.0, by Matt C. Williams.

33 or less, shares were computed based on building footprint area, because smaller facilities, including some that look like single family homes, are harder to identify.

In addition to total counts by service area of the five characteristics, we report persons per household (PPH), also known as average household size, and vacancy rate (VAC) from the 2020 Census allocation. These are derived using the following formulas:

$$PPH = HHPOP / HH$$

$$VAC = 1 - (HH / HU)$$

Results of the 2020 Census allocation are reported in Table 1, "2020 Census Population, Housing Units, and Households."

Housing Unit Inventory

PSU subscribes to Metro's Regional Land Information System (RLIS). RLIS' spatial data includes a multifamily housing inventory and county tax assessors' tax lots with associated property data. We combined the data to create a single file with the goal of accounting for all housing units in Clackamas, Multnomah, and Washington counties. The resulting HU inventory was essential for allocating the 2020 Census data, as described above, and also the HU change between the census and the July 1, 2021 estimates date.

The multifamily attribute data includes a year built, but it is often assigned based on the year that a permit was issued rather than the year that it was completed and ready for occupancy. Therefore, we conducted additional research on 139 records with a year built of 2018, 2019, or 2020, determining whether they had been completed and included in the 2020 Census count. This included all properties with 30 or more units. This unit threshold was large enough that a comparison between the census block HU counts from the census and from the HU inventory would make it obvious whether a new development had been included in the census or not. Additional research included final occupancy permits from cities, as available, and apartment websites or resident reviews (e.g. the existence of a November 2019 review from a resident suggests that the development should have been included in the census). Multifamily properties

included in the census were used in the census data allocation, and those not included were used in the 2020 to 2021 HU change if they were completed by July 1, 2021.

2021 Estimates

The 2020 estimates form the baseline for the 2021 estimates. First, the July 1, 2021 HU estimate was established for each service area by adding a 15-month change to the April 1, 2020 HU count. Research on several large multifamily properties with a year built of 2020 or 2021 and not counted in the 2020 Census established whether or not they had been completed by July 1, 2021. For single family units and multifamily units with a specific completion date unknown, we allocated 75 percent of HUs built in 2020 and 50 percent of HUs built in 2021 to the 15-month change. This change based on the HU inventory was compared with information from PRC's Annual Housing Unit and Population Survey (AHUPS), through which cities report housing unit change to PRC for our population estimates program.

For cities with water service areas coterminous with municipal boundaries or with only minor differences the AHUPS results were used in place of the HU inventory. For those with significantly different areas, we found the HU inventory to be consistent with AHUPS. For example, we would expect fewer new units in the HU inventory than in the AHUPS results for a city whose water service area was smaller than its municipal boundaries. This consistency between the data sources also gave us confidence to use the HU inventory for non-municipal water districts.

The HH estimate followed, based on the formula:

$$HH = HU * (1 - VAC)$$

Once the HH estimate was established, the HHPOP estimate was calculated:

$$HHPOP = HH * PPH$$

Information on population change in group quarters facilities provided by cities for PRC's Population Estimates Program was used to adjust the GQPOP for each service area, as needed. The total population estimate is:

$$POP = HHPOP + GQPOP$$

Initial population estimates using 2020 Census VAC and PPH to derive HH and HHPOP may differ slightly from PRC's 2021 population estimates for cities, due to methodological differences. Four cities — Sandy, Sherwood, Tualatin, and Wilsonville — have water service areas coterminous with their city boundary. For these four cities, PRC's 2021 city estimates are used as the POP estimate, HHPOP is the difference between POP and GQPOP, and HH is estimated using HUs and the 2020 Census VAC, with VAC adjusted if appropriate. Several other cities have water service areas differing only slightly from municipal boundaries. For these cities, VAC and/or PPH were adjusted to ensure consistency with PRC's city estimates. For example, Forest Grove was found to have 105 residents of the water service area outside of the city boundaries. We wouldn't expect this to change significantly in a 15-month period, so a nearly imperceptible change in VAC from 3.69 percent in 2020 to 3.76 percent in 2021 was applied to ensure consistency between the service area and city estimates. A larger vacancy rate adjustment from 6.7 to 7.2 percent was required for the Portland Water Bureau service area, due to a large number of completed apartments coinciding with a slowdown in population growth during the COVID-19 pandemic.

Results of the 2021 estimates are reported in Table 2, "2021 Census Population, Housing Unit, and Household Estimates."

Glossary

The following definitions are furnished by the U.S. Census Bureau.[4]

Group Quarters	The Census Bureau classifies all people not living in housing units as living in group quarters. A group quarters is a place where people live or stay, in a group living arrangement, that is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories.
Household	A household includes all the people who occupy a housing unit (such as a house or apartment) as their usual place of residence. It includes the related family members and all the unrelated people, if any, such as lodgers, foster children, wards, or employees who share the housing unit. A person living alone in a housing unit, or a group of unrelated people sharing a housing unit such as partners or roomers, is also counted as a household. The count of households excludes group quarters.
Housing unit	A house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have direct access from outside the building or through a common hall. For vacant units, the criteria of separateness and direct access are applied to the intended occupants whenever possible.
Population	All people living in a given geographic area.
Vacant Housing Unit	A housing unit is vacant if no one is living in it at the time of enumeration, unless its occupants are only temporarily absent. Units temporarily occupied at the time of enumeration entirely by people who have a usual residence elsewhere are also classified as vacant.

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[4] U.S. Census Bureau, Decennial Management Division Glossary. Available at https://www.census.gov/glossary/.

Table 1
2020 Census Population, Housing Units, and Households*

Cities	Population (POP)	Household Population (HHPOP)	Group Quarters Population (GQPOP)	Housing Units (HU)	Households (HH)	Persons per Household (PPH)	Vacancy Rate (VAC)
City of Beaverton Water Service Area	89,188	88,420	768	38,166	36,330	2.43	4.8%
City of Cornelius Water Service Area	12,760	12,506	254	3,702	3,651	3.43	1.4%
City of Forest Grove Water Service Area	26,330	24,930	1,400	9,414	9,067	2.75	3.7%
City of Gladstone Water Service Area	11,631	11,494	137	4,801	4,565	2.52	4.9%
City of Gresham Water Service Area	75,253	74,120	1,133	28,792	27,800	2.67	3.4%
City of Hillsboro Water Service Area	86,729	85,656	1,073	32,464	31,067	2.76	4.3%
Cherry Grove (City of Hillsboro) Water Service Area	1,624	1,624	0	580	531	3.06	8.4%
City of Lake Oswego Water Service Area	38,275	37,959	316	17,433	16,291	2.33	6.6%
City of Milwaukie Water Service Area	20,461	20,220	241	9,346	8,882	2.28	5.0%
City of Oregon City Water Service Area	36,996	36,267	729	14,290	13,792	2.63	3.5%
Portland Water Bureau Service Area	630,126	610,395	19,731	293,693	274,102	2.23	6.7%
City of Sandy Water Service Area	12,612	12,535	77	4,697	4,528	2.77	3.6%
City of Sherwood Water Service Area	20,450	20,277	173	7,132	6,893	2.94	3.4%
City of Tigard Water Service Area	67,268	66,972	296	27,865	26,795	2.50	3.8%
City of Troutdale Water Service Area	16,300	16,234	66	6,031	5,871	2.77	2.7%
City of Tualatin Water Service Area	28,323	28,040	283	11,398	11,055	2.54	3.0%
City of West Linn Water Service Area	27,522	27,269	253	10,552	10,152	2.69	3.8%
City of Wilsonville Water Service Area	26,664	24,901	1,763	11,128	10,599	2.35	4.8%
Districts							
Clackamas River Water District	47,817	47,158	659	19,608	18,579	2.54	5.2%
Oak Lodge Water District	28,082	27,664	418	12,206	11,693	2.37	4.2%
Raleigh Water District	4,527	4,451	76	2,327	2,203	2.02	5.3%
Rockwood Water PUD	65,592	64,616	976	24,243	23,160	2.79	4.5%

Population Research Center, Portland State University, June 2022

*2020 Census Redistricting File, PL94-171. Water provider data allocated from whole and partial blocks.   www.pdx.edu/prc

Table 1 (continued)
2020 Census Population, Housing Units, and Households*

Districts (continued)	Population (POP)	Household Population (HHPOP)	Group Quarters Population (GQPOP)	Housing Units (HU)	Households (HH)	Persons per Household (PPH)	Vacancy Rate (VAC)
Sunrise Water Authority	55,091	54,814	277	19,636	19,001	2.88	3.2%
Tualatin Valley Water District (Total)	220,990	219,852	1,138	87,507	83,860	2.62	4.2%
TVWD (Metzger sub-area)	20,918	20,651	267	9,352	8,851	2.33	5.4%
TVWD (Wolf Creek sub-area)	200,072	199,201	871	78,155	75,009	2.66	4.0%
West Slope Water District	10,591	10,391	200	4,687	4,506	2.31	3.9%
PWB Wholesale Customers							
Burlington Water District	305	294	11	197	156	1.88	20.8%
GNR Water Company	43	43	0	20	19	2.26	5.0%
Green Valley Water Company	7	7	0	3	3	2.33	0.0%
Hideaway Hills Water Company	14	14	0	9	6	2.33	33.3%
Lake Grove Water District	3,433	3,433	0	1,495	1,404	2.45	6.1%
Lorna Water Company	299	297	2	112	107	2.78	4.5%
Lusted Water District	996	995	1	382	358	2.78	6.3%
Palatine Hill Water District	1,730	1,730	0	635	566	3.06	10.9%
Pleasant Home Water District	1,439	1,432	7	550	520	2.75	5.5%
Skyview Acres Water Company	36	36	0	16	13	2.77	18.8%
Two Rivers Water Association	7	7	0	4	4	1.75	0.0%
Valley View Water District	1,153	1,150	3	423	410	2.80	3.1%

Population Research Center, Portland State University, June 2022

*2020 Census Redistricting File, PL94-171. Water provider data allocated from whole and partial blocks.   *www.pdx.edu/prc*

Table 2
2021 Population, Housing Unit, and Household Estimates*

Cities	Population (POP)	Household Population (HHPOP)	Group Quarters Population (GQPOP)	Housing Units (HU)	Households (HH)	Persons per Household (PPH)	Vacancy Rate (VAC)
City of Beaverton Water Service Area	89,462	88,994	468	38,486	36,598	2.43	4.9%
City of Cornelius Water Service Area	13,564	13,310	254	3,977	3,917	3.40	1.5%
City of Forest Grove Water Service Area	26,349	25,260	1,089	9,546	9,187	2.75	3.8%
City of Gladstone Water Service Area	11,647	11,505	142	4,805	4,574	2.52	4.8%
City of Gresham Water Service Area	75,483	74,352	1,131	29,102	28,002	2.66	3.8%
City of Hillsboro Water Service Area	88,536	87,367	1,169	33,331	31,852	2.74	4.4%
Cherry Grove (City of Hillsboro) Water Service Area	1,628	1,628	0	583	534	3.05	8.4%
City of Lake Oswego Water Service Area	38,338	38,009	329	17,516	16,345	2.33	6.7%
City of Milwaukie Water Service Area	20,584	20,343	241	9,427	8,954	2.27	5.0%
City of Oregon City Water Service Area	37,154	36,425	729	14,397	13,880	2.62	3.6%
Portland Water Bureau Service Area	636,206	616,475	19,731	300,037	278,290	2.22	7.2%
City of Sandy Water Service Area	12,869	12,794	75	4,808	4,633	2.76	3.6%
City of Sherwood Water Service Area	20,496	20,282	214	7,173	6,933	2.93	3.4%
City of Tigard Water Service Area	68,432	68,130	302	28,309	27,239	2.50	3.8%
City of Troutdale Water Service Area	16,319	16,253	66	6,039	5,868	2.77	2.8%
City of Tualatin Water Service Area	28,291	28,040	251	11,398	11,055	2.54	3.0%
City of West Linn Water Service Area	27,593	27,365	228	10,593	10,208	2.68	3.6%
City of Wilsonville Water Service Area	27,186	25,423	1,763	11,391	10,844	2.34	4.8%
Districts							
Clackamas River Water District	48,412	47,753	659	19,906	18,851	2.53	5.3%
Oak Lodge Water District	28,199	27,781	418	12,288	11,766	2.36	4.2%
Raleigh Water District	4,535	4,459	76	2,331	2,207	2.02	5.3%
Rockwood Water PUD	66,397	65,421	976	24,704	23,517	2.78	4.8%

Population Research Center, Portland State University, June 2022

Table 2 (continued)
2021 Population, Housing Unit, and Household Estimates*

Districts (continued)	Population (POP)	Household Population (HHPOP)	Group Quarters Population (GQPOP)	Housing Units (HU)	Households (HH)	Persons per Household (PPH)	Vacancy Rate (VAC)
Sunrise Water Authority	57,054	56,777	277	20,408	19,721	2.88	3.4%
Tualatin Valley Water District (Total)	222,195	221,057	1,138	88,235	84,499	2.62	4.2%
TVWD (Metzger sub-area)	21,009	20,742	267	9,469	8,961	2.31	5.4%
TVWD (Wolf Creek sub-area)	201,186	200,315	871	78,766	75,538	2.65	4.1%
West Slope Water District	10,614	10,414	200	4,697	4,516	2.31	3.9%
PWB Wholesale Customers							
Burlington Water District	304	293	11	197	156	1.88	20.7%
GNR Water Company	45	45	0	21	20	2.26	5.1%
Green Valley Water Company	7	7	0	3	3	2.33	0.0%
Hideaway Hills Water Company	14	14	0	9	6	2.33	33.7%
Lake Grove Water District	3,438	3,438	0	1,501	1,409	2.44	6.1%
Lorna Water Company	298	296	2	112	107	2.77	4.8%
Lusted Water District	997	996	1	383	359	2.77	6.3%
Palatine Hill Water District	1,733	1,733	0	637	568	3.05	10.8%
Pleasant Home Water District	1,444	1,437	7	555	523	2.75	5.8%
Skyview Acres Water Company	36	36	0	16	13	2.76	18.9%
Two Rivers Water Association	7	7	0	4	4	1.75	0.0%
Valley View Water District	1,148	1,145	3	423	409	2.80	3.3%

Population Research Center, Portland State University, June 2022