ANALYSIS OF CLASS A WATER INVESTOR OWNED UTILITY CUSTOMER ASSISTANCE PROGRAMS ENROLLMENT (2010-2022)

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INTRODUCTION

With the passage of the Human Right to Water Act (Assembly Bill (AB) 685) in 2012, the State of California legally declared that every human being has a right to safe, clean, affordable, accessible water adequate for human consumption, cooking, and sanitary purposes. Since the bill's passage, various additional laws and programs have sought to expand water access for Californians pursuant to this right. Affordable drinking water is out of reach for many low-income Californians who struggle to pay their water bill, among other basic services.

Customer Assistance Programs (CAPs) are one of the primary interventions that are and can be established by water utilities to provide rate or bill discounts to eligible, low-income customers to help them afford and access sufficient drinking water service. Drinking water can be provided to Californians by a range of different water system types, that vary in terms of ownership and governance structure. Investor-owned utilities (IOUs) differ from water systems operated by local governments (such as municipalities or special districts) or mutual water companies (in which all users own shares in the system), which face restrictions in offering substantial CAPs due to Proposition 218. Unlike other system types, IOUs in California are regulated by the California Public Utilities Commission (CPUC), which requires IOUs to operate CAPs (AKA Low-Income Rate Assistance or LIRA programs) (Pierce et al. 2020). There are 10 'Class A' IOUs in California, so-called because they have the largest customer bases of 10,000 or more service connections and therefore fall into Class A (as opposed to Classes B through D with fewer connections) (CPUC 2020).

While other water systems in California may operate their own CAPs to assist low-income customers with water access, IOUs are unique due to the mandate and regulation by the CPUC to provide CAPs. Class A IOUs serve about 14% of residents in California, and therefore play a pivotal role in ensuring water accessibility and affordability in the state. Studying the enrollment of customers in Class A IOU CAPs can provide important insight into the reach and efficacy of these programs to support California's Human Right to Water and ensure equity in water access for low-income residents across the state.

This document provides a novel analysis of CAP enrollment and eligibility for Class A IOUs in California, using statistical and spatial analysis methods. This study combines CAP enrollment and connection data from utilities from 2010-2021, spatial data on water system boundaries, and U.S. Census data on poverty from 2010-2021 to examine the reach and growth of IOU CAPs over time in the state. We examine trends in total enrollment over time for all 10 Class A IOUs in the state, as well as calculate the estimated reach of these programs to understand the extent to which eligible, low-income customers are being reached by these programs for regular utility bill relief to support broader affordability objectives. The findings show positive

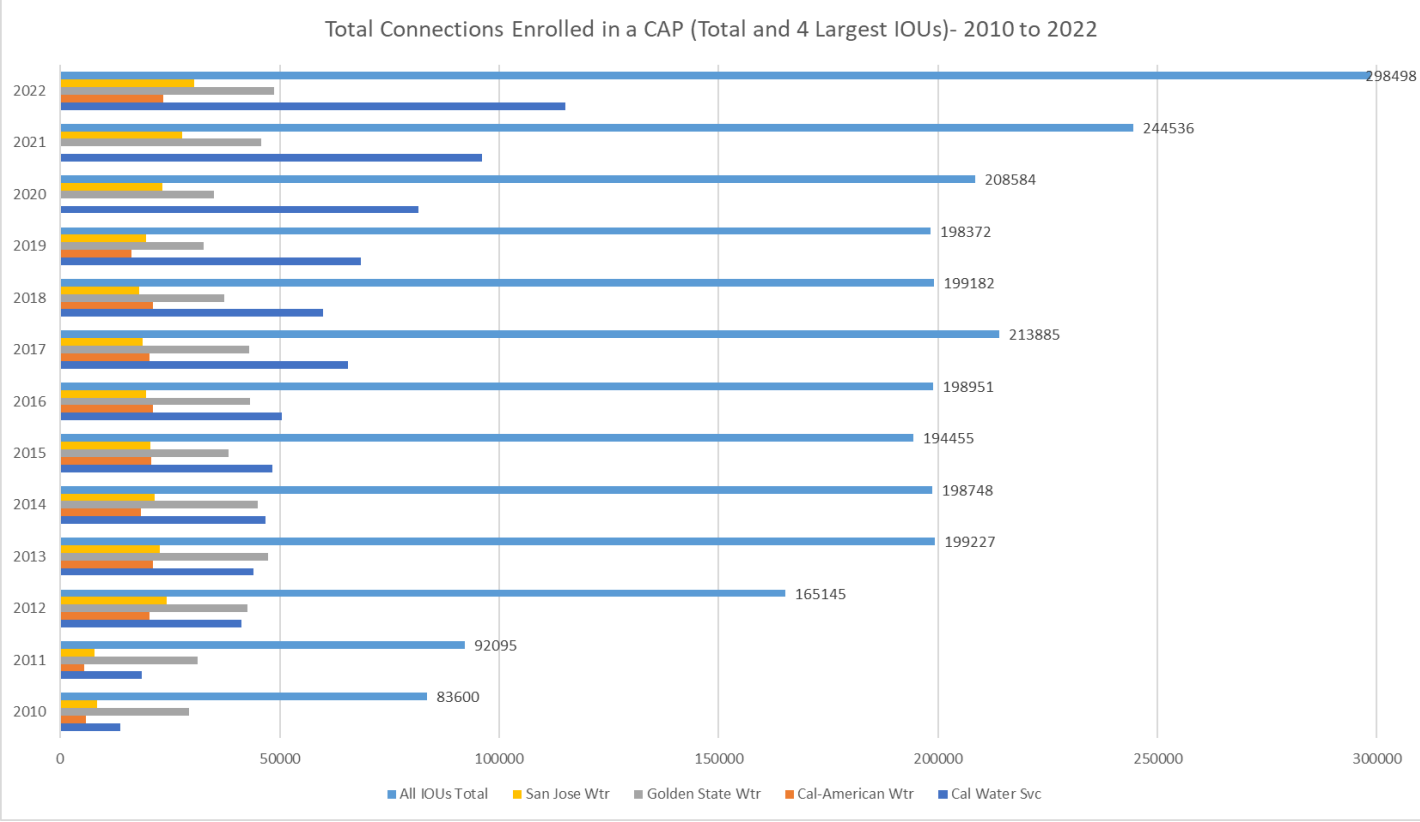
trends in CAP enrollment over time, but differing coverage among different IOUs in the state. The findings have implications for CAP enrollment efforts by the IOUs themselves as well as water access and affordability policy within the state.

DATA AND METHODS

CAP ENROLLMENT DATA

Data on Investor Owned Utility (IOU) Customer Assistance Programs (CAPs) were obtained manually from annual reports by the IOUs. Data collection used these reports to obtain, for each year from 2010-2022, the total number of residential connections enrolled in an IOU's CAP and the residential customer base (total service connections). Figure 1 shows the total number of connections enrolled in CAPs across all IOUs, as well as the values for each of the 4 largest Class A IOUs (California Water Service, Cal-American Water, Golden State Water Company, San Jose Water). These values were provided at the IOU level, rather than for individual community water systems (CWS) operated by each IOU. See the following sections for a description of how individual CWS-level data was collected and then aggregated to enable IOU-level comparisons.

Figure 1. Total Connections Enrolled in CAPs (All IOUs, Top 4 IOUs), 2010-2022



WATER SYSTEM DATA

Most Class A IOUs operate, in the eyes of the State Water Board for Safe Drinking Water Act regulatory purposes, as multiple different community water systems (CWS) that are within one broader company. These systems within the same company often have different water sources, rates (and rate-making regions, which

often differ from both the CWS and company level), and customer populations. These CWS are also typically not geographically connected, and encompass many otherwise disparate customer populations across counties. Thus, to understand population and CAP enrollment trends, it was necessary to conduct analysis at the CWS-scale and then aggregate to IOU-scale estimates. A manual data collection effort used two different sources to identify CWS within each IOU. For each of the 10 Class A IOUs, the names of the component CWS were identified via company websites. These were then cross-referenced in the California State Drinking Water Information System (SDWIS) to obtain the following information for each CWS: System Name, Public Water System ID Number (PWSID), Customer Population and County Served. Table 1 summarizes the aggregated system data collected for each of the 10 Class A IOUs. Based on the estimated service populations in SDWIS and an estimated California population of 39 million, Class A IOUs serve around 14% of the state.

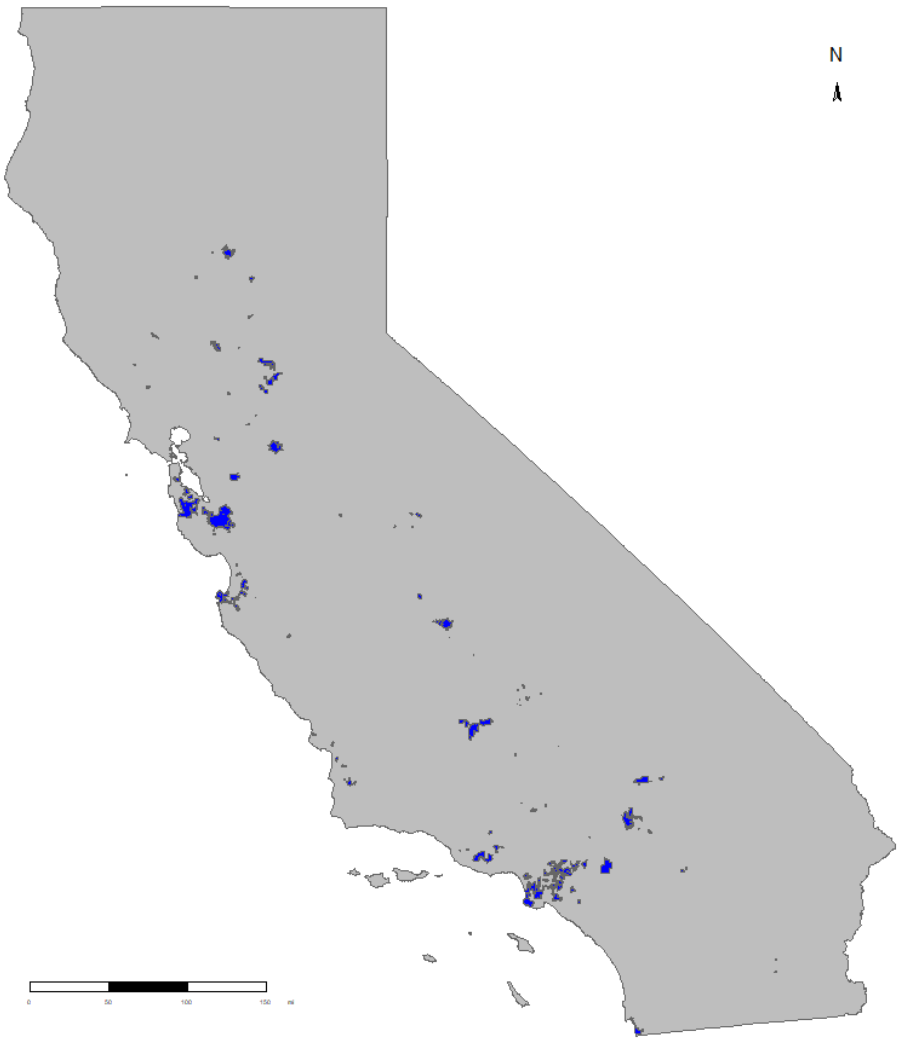
Table 1. Community Water Systems in 10 Class A Investor Owned Utilities

IOU Name	Number of Systems	Counties Served	Est. Pop (SDWIS 2023)
Cal-American Water	34	Los Angeles, Madera, Monterey, Placer, Sacramento, San Diego, Sonoma, Ventura, Yolo	609,920
California Water Service	41	Alameda, Butte, Fresno, Glenn, Kern, Lake, Los Angeles, Marin, Monterey, San Joaquin, San Mateo, Santa Clara, Solano, Sonoma, Tulare, Ventura, Yuba	1,813,062
Golden State Water	37	Contra Costa, Imperial, Lake, Los Angeles, Orange, Sacramento, San Bernardino, San Luis Obispo, Santa Barbara, Sutter, Ventura	1,076,933
Great Oaks Water	1	Santa Clara	99,199
Liberty Utilities Apple Valley	3	San Bernardino	63,857
Liberty Utilities Park	3	Los Angeles	120,908
San Gabriel Valley Water (Fontana)	1	San Bernardino	228,140
San Gabriel Valley Water (Los Angeles)	2	Los Angeles	257,000
San Jose Water	1	Santa Clara	1,007,514
Suburban Water	5	Los Angeles, Orange	299,447
Total	128	Across the state	5,575,980

Each CWS was then matched to spatial water system boundaries by PWSID. Shapefile boundaries for water systems are available from prior efforts by the state and UC Berkeley researchers (Pace et al. 2023). Figure 2 shows the boundaries of the 128 CWS operated by the 10 IOUs across California. The next section details how

socioeconomic data was collected from the U.S. Census at the Census Tract level and then matched to water system boundaries.

Figure 2. Map of Class A Investor Owned Utility Systems in California



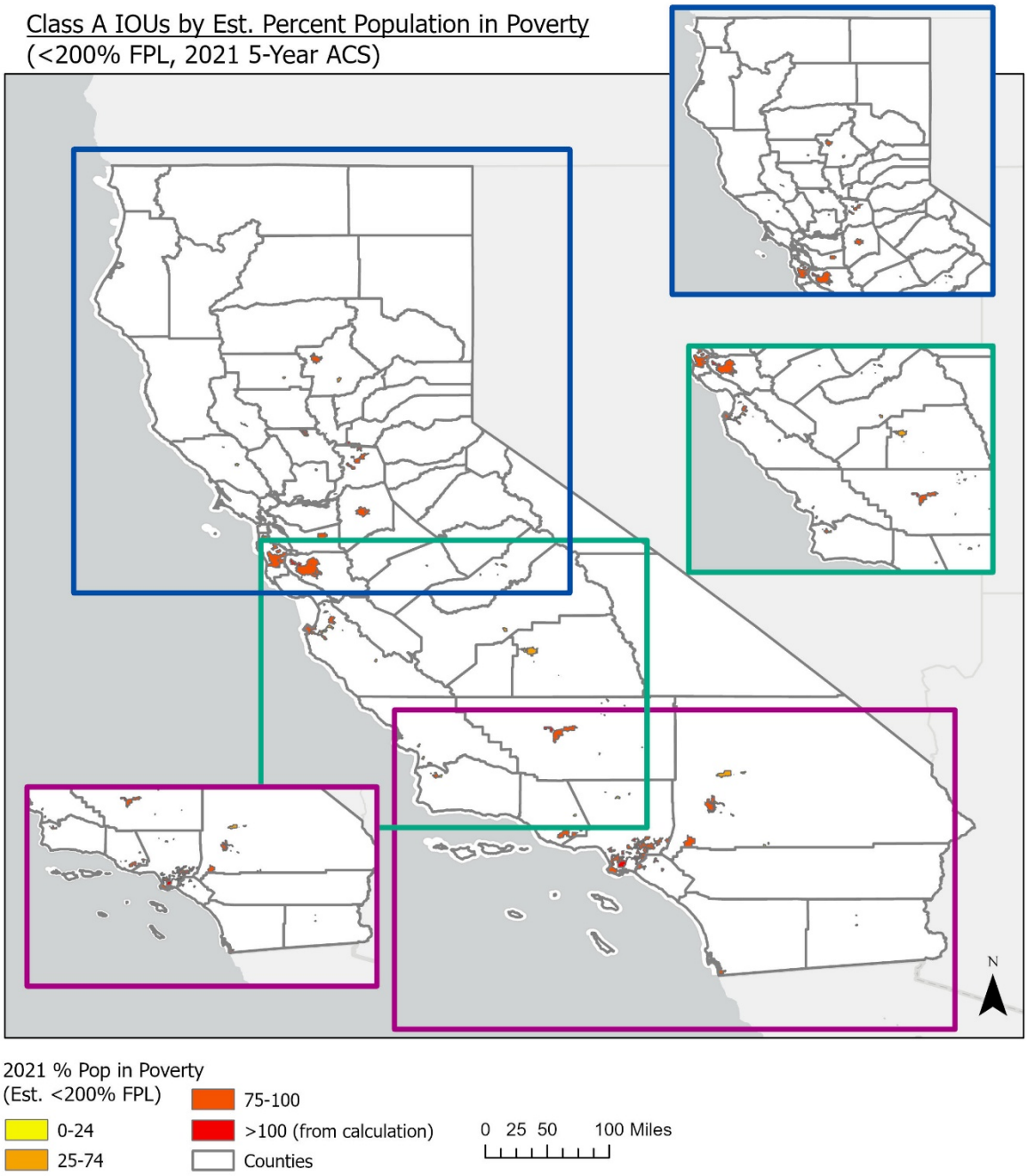
CENSUS SOCIOECONOMIC DATA

Socioeconomic data was collected from the U.S. Census Bureau's American Community Survey (ACS) in order to identify eligible populations within water system boundaries. Customers of Class A IOUs with incomes below 200% of the Federal Poverty Level (FPL) are eligible for customer assistance programs, as is common in the utility space. The population below 200% of the FPL was collected for California census tracts from 5-year ACS estimates with ending years from 2010 to 2021. The total population and population below 200% of

the FPL was collected using the 'tidycensus' package in R[1]. Figure 3 below maps the percent of the population below 200% of the FPL (i.e. eligible for a CAP) in all California Census Tracts in 2021 (from 5-year ACS estimates). Blue dots representing the centroids of the boundaries of Class A IOU CWS are plotted on top of the census tracts.

[1] Additional census data on housing types was also collected from 5-year ACS estimates for ending years 2010-2021. The total number of housing units and total number of multi-family housing units was collected for census tracts in the state using the 'tidycensus' package in R. The same area-weighted interpolation described in this section for population data was also performed to calculate estimates of the percentage of multi-family housing for each IOU's service population. See the Appendix for these figures.

Figure 3. Percent Population Below 200% FPL by Census Tract (2021 5-Year ACS)



Estimates of income eligibility for populations by census tract do not directly match the boundaries of CWS. Thus, spatial interpolation methods are required to estimate these statistics for CWS whose service boundaries cross multiple census tracts. Areal interpolation is a method of interpolation in which the area of intersection is used as a weight (Goodchild & Lam 1980). Areal interpolation can be either intensive or extensive; intensive estimation is used when the same value is expected across the spatial area (e.g. median household income) while extensive estimation is used when the values are to be added across the spatial area

(e.g. population counts) (Goodchild & Lam 1980). In this instance, extensive interpolation was applied to obtain estimates of total population counts for service boundaries of the CWS.

As an illustrative example, envision a CWS that spans two census tracts; 50% of tract 1 is in the CWS' spatial area while 10% of tract 2 is within the CWS. If the population of both tracts are 100 then a total CWS population of 60 would result ($0.5 * 100 + 0.10 * 100 = 60$). If the population below 200% of the FPL in these tracts were both 40, the total estimate for population eligible for a CAP would be 24 ($0.5 * 40 + 0.10 * 40 = 24$). This would then enable us to estimate a percentage of the CWS' service population eligible for a CAP of 40%. Such calculations were performed for the total population and total population below 200% of the FPL for each year of ACS data (2010-2021) for each individual CWS. The total population and total population below 200% of the FPL was summed across all CWS within an IOU to obtain total figures for each IOU across their respective CWS. The 'areal' package in R was used to calculate area-weighted (extensive) interpolation, specifically the *aw_interpolate* function. This function necessarily presumes equal distribution of a population within a census tract and then calculates a population for the CWS based on the portion of a census tract that a CWS includes. Such an assumption likely does not hold in practice for all census tracts, and thus values represent an estimate that may be an over or under count for CWS depending on the pattern of housing development within census tracts that encompass a given CWS. However, without publicly-available system-level data of customer income levels, this is the most straightforward method of obtaining estimates of census data for water systems across the state.

FINDINGS

CAP ENROLLMENT TRENDS

This section summarizes the total number and percentage of residential connections enrolled in Customer Assistance Programs across Class A IOUs. The 4 largest IOUs (as well as the total across all Class A IOUs) show a positive trend of increasing enrollment over time (see Figure 4). All four IOUs (California Water Service, Cal-American Water, Golden State Water, and San Jose Water) had less than 15% of their residential service connections enrolled in a CAP as of 2010. By 2022 (the final year with available data), all IOUs saw growth in enrollment but two IOUs had over 20% enrollment. In 2022, 28% of California Water Service's connections were enrolled in a CAP across their 41 CWS, while 23% of connections in Golden State Water's 37 systems were enrolled in a CAP. Cal-American Water and San Jose Water saw more modest growth in enrollment over time, both with 2022 enrollment of 14%. Across all IOUs, about 24% of all connections served by a Class A IOU were enrolled in a CAP in 2022, compared to only 9% in 2010. This demonstrates steady growth in CAPs over time, which may suggest improvement in advertising, education, and enrollment efforts by the IOUs. Figure 5 shows this positive trend holds across the remaining Class A IOUs. San Gabriel Valley Fontana Water Company, San Gabriel Valley Los Angeles, and Liberty Utilities Park have the highest enrollment as a proportion of connections (57%, 50%, and 49% in 2022 respectively). San Gabriel Valley Fontana Water Company serves Fontana in San Bernardino County while San Gabriel Valley Los Angeles serves customers in El Monte and Montebello in Los Angeles County. Liberty Utilities Park comprises systems in Los Angeles County serving areas of Lynwood, Compton, and Bellflower-Norwalk. These service areas include census tracts of comparatively larger low-income populations, as demonstrated by data on eligible customer populations in the next section.

Figure 4. Percent of Residential Connections Enrolled in CAP (4 Largest IOUs)

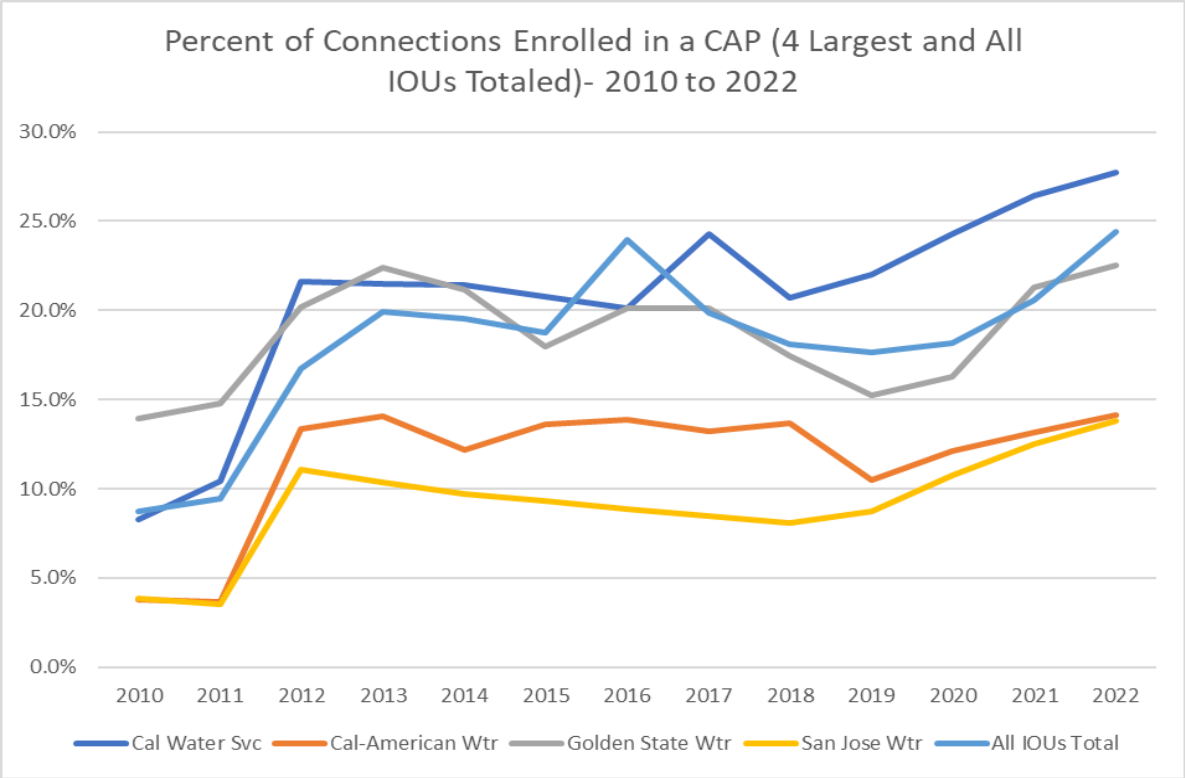
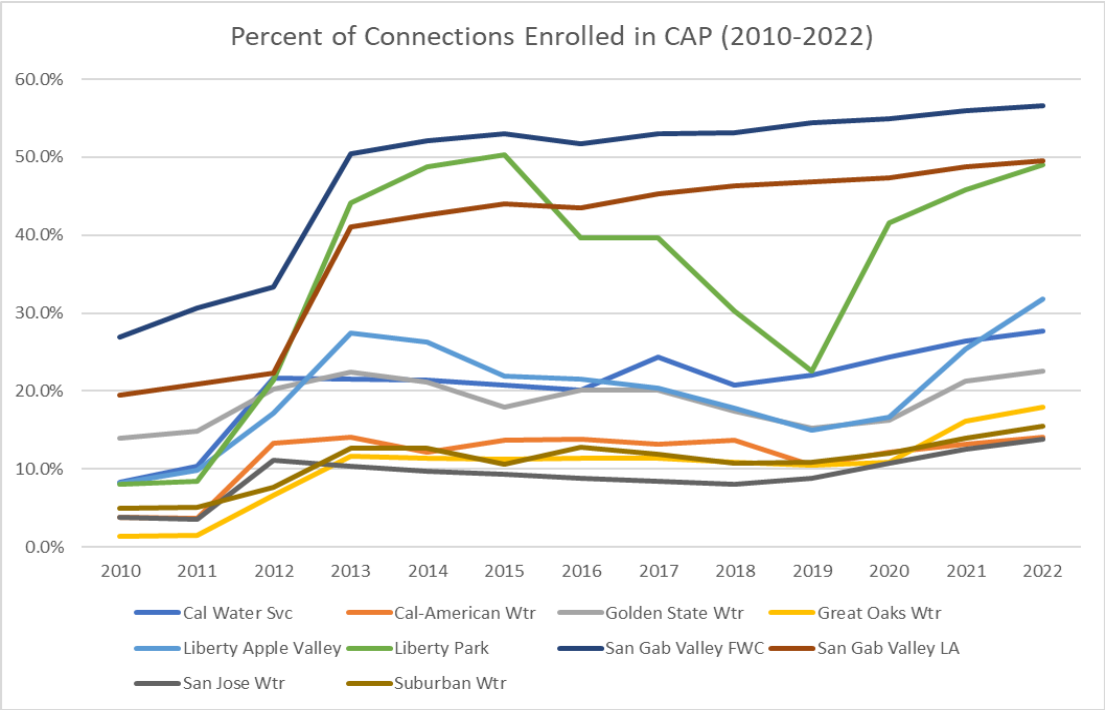


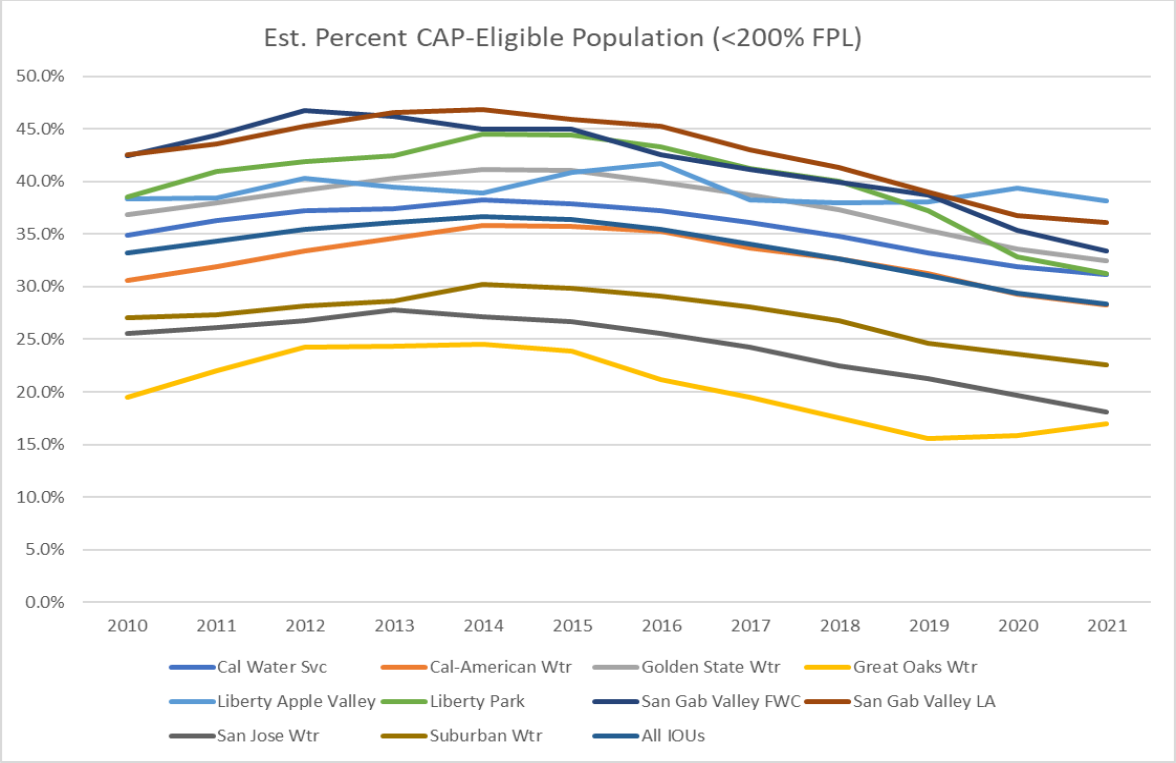
Figure 5. Percent of Residential Connections Enrolled in CAP by Each Class A IOU



ESTIMATED CUSTOMER SOCIOECONOMIC TRENDS

Of course, the total enrollment of connections in a CAP only tells part of the story for how IOUs are providing bill assistance to low-income customers. It is also important to consider how many customers are eligible for CAPs, with incomes below 200% of the federal poverty level. Figure 6 shows the estimated percent of the service population eligible for a CAP based on this income threshold for each of the IOUs, calculated using area-weighted interpolation. Overall, a slight decline in portions of the population in poverty can be seen over time across all systems. Paired with rising CAP enrollment, this could suggest IOUs are reaching increasingly larger portions of eligible customers over time (this will be explored in the next section). As noted earlier, San Gabriel Valley Water Fontana and Los Angeles as well as Liberty Utilities Park are in the top 3 IOUs for highest estimated portion of customers eligible for customer assistance, and are also the systems with the highest portion of connections enrolled in CAPs. The next section explores this further by calculating the estimated reach of the IOUs, i.e. the percentage of customers which appear to be enrolled in a CAP for which they are eligible.

Figure 6. Estimated Percent CAP-Eligible Population (Area-Weighted Interpolation)



CALCULATED ELIGIBLE ENROLLMENT

Perhaps most important for evaluating the impact of IOU CAPs on water affordability and access is an understanding of whether eligible low-income customers are actually enrolling in CAPs and receiving water bill assistance. Ideally, CAP programs will be reaching a high portion of eligible customers and that trend will be increasing over time, but this has not proved to be the case in many previous studies which look across large utilities, regardless of ownership type.

CAP enrollment numbers are obtained from utility provided data, and reflect enrollment by water connection (e.g. a single residential account)[2] rather than population. Meanwhile, the income/poverty data collected from the ACS reflects total population numbers. Area-weighted interpolation estimates the total population and population eligible for a CAP (below 200% of the Federal Poverty Level) within CWS boundaries. These numbers are then summed for IOUs across all their operated CWS. To estimate the percent of eligible population that are currently enrolled in a CAP, the percent of *connections* enrolled in a CAP for each system was multiplied by the total estimated *population* (from interpolation) This resulted in an estimated total of *population* enrolled in CAPs for each IOU which was then divided by the estimated *population* below 200% of the FPL (from interpolation). The formula is shown below:

$$Percent\ Eligible\ Population\ Reached\ = \frac{Percent\ Connections\ in\ CAP\ *\ Total\ Service\ Population}{Service\ Population\ Under\ 200\%\ FPL}$$

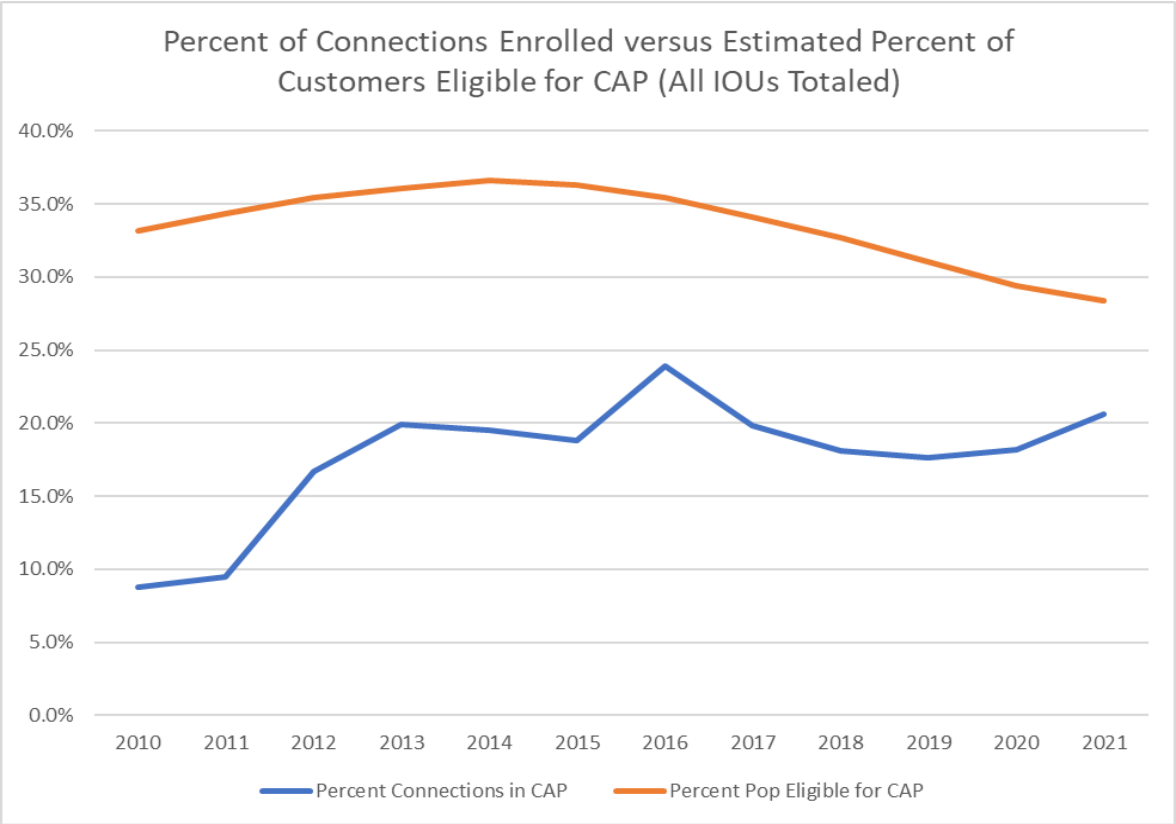
[2] As documented in multiple sources, multi-family residences, which tend to have higher poverty rates, also tend to be master-metered for water in California, and thus not hold their own individual utility accounts (often called, "hard to reach" customers). Master-metered residences are thus effectively precluded from CAPs in most circumstances, and utilities are unlikely to be able to reach 100% of households under poverty with CAPs for this same reason. We estimate the % of households in multifamily housing in each Class A utility geography (see Appendix Figure A-1), and recognize that differences in multifamily prevalence may impact practical maximum CAP enrollment rates.

These are estimates which rely on assumptions regarding the equal distribution of population within census tracts that are then weighted by service area boundaries of water systems. However, they provide the best currently available evidence regarding the extent to which IOUs' CAPs are reaching eligible populations to provide affordability assistance.

A positive trend over time is clearly visible, with 73% of estimated eligible population enrolled across all IOUs in 2021. Moreover, all but one IOU is now estimated to be reaching the majority of their low income customers with water bill affordability assistance. These percentages, however, should be interpreted with caution given limitations of the analysis methods described above.

Due to the area-weighted interpolation method, which assumes equal distribution of population within census tracts, census population was potentially over or underestimated for systems, as noted above. The underestimation was sufficiently large enough for systems in the San Gabriel Valley Water Company IOUs (Los Angeles and Fontana) to result in calculated percentages of enrolled customer reach over 100% (post 2012 for SGVWC Fontana and post 2016 for SGVWC Los Angeles). The proportion of enrolled connections was sufficiently high and the estimated service population low enough that the estimated enrollment was larger than the estimated low-income population. This is likely an artifact of the actual distribution of population within the relevant census tracts, which may be more concentrated in the portions of the census tracts within the IOU boundaries than the equal distribution assumption would predict. This would make the actual low-income service population of the systems larger than estimated, explaining the enrollment being larger than the estimated population. Overall, this still suggests relatively high enrollment of eligible customers in the San Gabriel Valley Water Company systems. The next highest estimated percentage of customer reach (but below 100%) was Great Oaks Water at 95%. While smaller IOUs may have less resources or capacity to operate CAPs, their smaller service population may also make it easier to reach and enroll eligible low-income customers into CAPs, resulting in these high percentages. Future, more detailed analysis into operation of individual CAPs may reveal what factors may influence the extent to which systems are able to reach and enroll their eligible customers.

Figure 7. Est. Percent CAP-Eligible Customers versus Percent CAP-Enrolled Connections (All IOUs)



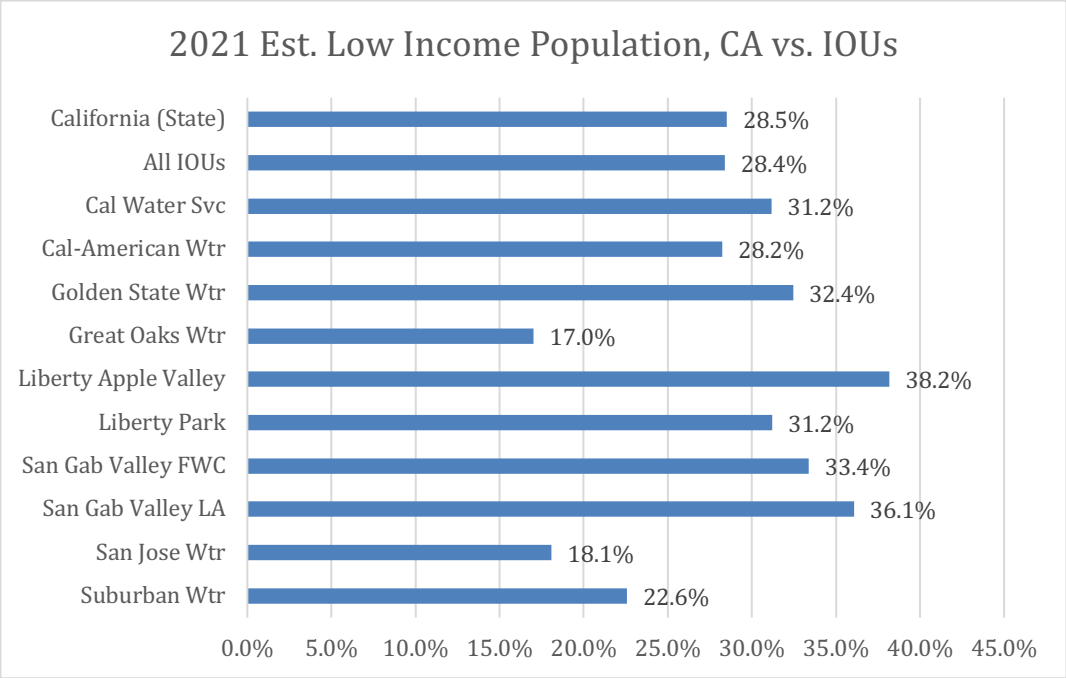
COMPARISONS OF ELIGIBLE CUSTOMERS BY GEOGRAPHY

For a better understanding of how CAP-eligible, low-income customers of IOUs are distributed within the state, several additional comparisons were calculated using the aforementioned interpolated Census sociodemographic data. The estimated populations served by Class A IOUs below 200% of the FPL (and therefore eligible for CAPs) was examined for CWS in Los Angeles County and within urban areas in the state. This analysis helps identify the patterns of CAP eligible customers within IOUs and whether different trends are notable for IOU customers in Los Angeles County or Urban Areas compared to the rest of the state. Prior research already has noted that Los Angeles County represents a unique water system governance structure, with its dense, urban population served by a particularly large range of water systems (Pierce & Gmoser-Daskalakis 2020). The following analysis finds that a large portion of the customers served by Class A IOUs are within urban areas, while estimated CAP-eligible, low-income populations in Class A IOUs in Los Angeles County, Urban Areas, and statewide follow largely similar trends.

As a general comparison, the portion of the general state population with incomes below 200% of the FPL was obtained from 2021 5-Year ACS estimates. Roughly 11million people in California are below 200% of the FPL, for about 29% of the total population. This total is nearly identical to the estimated 28.4% of populations served by Class A IOUs with incomes below 200% of the FPL (1.4 million from 2021 5-Year ACS). Figure 8 With the exception of lower low-income population proportions served by Great Oaks Water and San Jose Water, most IOUs have low-income population proportions estimated to be similar to California as a whole (within 10 percentage points different). This suggests that Class A IOUs are not necessarily serving a different

type of population than other types of water systems across the state in terms of socioeconomic factors such as CAP-eligibility and water affordability assistance need.

Figure 8. Estimated Percent of Population <200% of the FPL (CAP-Eligible) Statewide Compared to Population Served by Class A IOUs (From 2021 5-Year ACS Estimates and Area-Weighted Interpolation)



LOS ANGELES COUNTY WATER SYSTEMS

Prior research has examined Los Angeles County CWS, identifying a water provision landscape with a high number of systems serving a dense urban population with large disparities in water quality, access, and system management (Pierce et al. 2019; Pierce & Gmoser-Daskalakis 2020). Thus, this analysis examines Class A IOUs specifically in Los Angeles County to determine if trends in low-income populations served by CWS in these counties differ from statewide trends for targeting water affordability assistance needs by region. Table 2 shows the total number of CWS listed as serving Los Angeles County in SDWIS; several regionally based IOUs entirely serve populations within Los Angeles County while larger IOUs like Cal-American Water and California Water Service tend to serve other areas of the state.

Class A IOU	Systems Serving Los Angeles County
Cal-American Water	4 of 34 CWS (12%)
California Water Service	7 of 41 CWS (17%)
Golden State Water Company	12 of 37 CWS (32%)
Liberty Utilities Park	3 of 3 CWS (100%)
San Gabriel Valley Water Company Los Angeles	2 of 2 CWS (100%)
Suburban Water	5 of 5 CWS (100%)
All IOUs	33 of 128 CWS (26%)

Table 2. CWS of Class A IOUs Serving Los Angeles County

The low-income, CAP-eligible population calculated from area-weighted interpolation (see sections above) were used for this portion of the analysis, filtering only for those CWS within Class A IOU companies that are listed in SDWIS with 'Los Angeles' as the county served. The estimated total population and population with income below 200% of the FPL was summed for Los Angeles County CWS by each IOU. Figure 9 below shows the proportion of the population estimated to be eligible for a CAP served by IOU CWS in Los Angeles County compared to all IOU CWS in the state, and California as a whole. Figure 10 compares the proportions estimated for IOUs from all CWS in each IOU and for only the CWS in Los Angeles County. From this figure we can see that no drastic differences emerge. Cal-American Water (24% in LA County and 28% statewide) and California Water Service (24% in LA County and 31% statewide) serve a slightly smaller portion of low-income customers in Los Angeles County than for their service population as a whole, while Golden State Water Company has the opposite trend (36% and 32% in LA County and statewide respectively). The remaining 3 IOUs are entirely within Los Angeles County. While appearing unremarkable in terms of income eligibility compared to the rest of the state, Los Angeles County does contain a significant portion of the state population and a high number of water systems, suggesting it remains important to study further for understanding CAP enrollment and water affordability outcomes (Pierce & Gmoser-Daskalakis 2020).

Figure 9. CAP-Eligible Population Proportion Served by IOUs in Los Angeles County (From area-weighted interpolation of 2021 5-year ACS estimates)

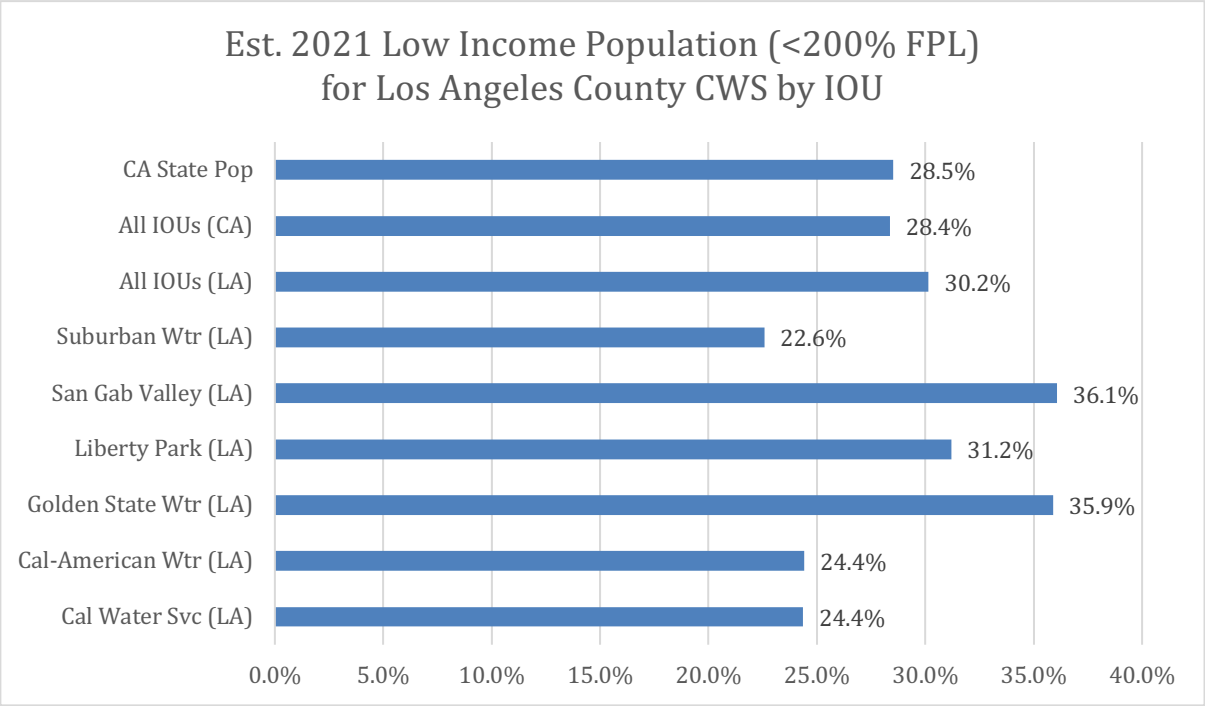
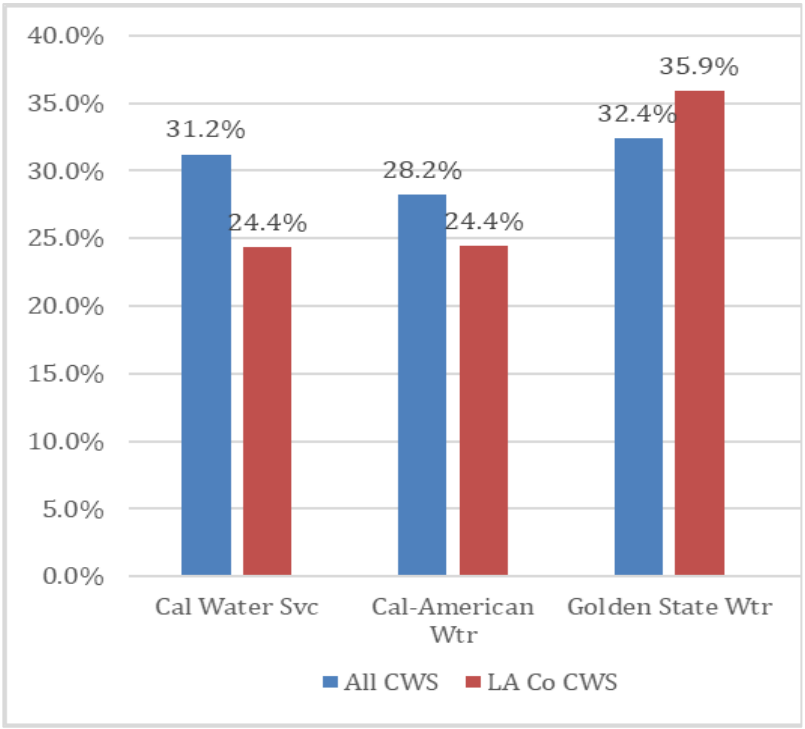


Figure 10. IOUs serving other areas of the state in addition to LA County (From area-weighted interpolation of 2021 5-year ACS estimates)



Prior research recognizes that water access, affordability, and quality outcomes often differ dramatically for water systems in urban versus rural contexts. It may be instructive to understand the extent to which Class A IOUs currently serve urban versus rural populations, and the low-income, CAP-eligible customers in these different areas of the state. As state and regional policymakers and regulators actively consider and encourage consolidations of smaller, resource-constrained systems with larger (often IOU) systems, it is unclear how consolidations may affect the ability for more low-income populations to be eligible for enrollment in IOU-operated CAPs.

This analysis estimates customer populations served by IOUs in urban areas using area-weighted interpolation for comparison purposes. All IOUs have systems that serve some portion of urban areas. Urban was defined as the Urban Areas boundaries designated by the 2020 US Census, which was downloaded as a TIGER shapefile from the US Census Bureau . Only 33 CWS do not intersect urban areas and thus were excluded from this portion of the analysis. The centroids of all 128 IOU CWS are plotted on top of 2020 Census Urban Areas in Figure 11 below, demonstrating that most CWS fall within urban areas with fewer water systems serving rural populations.

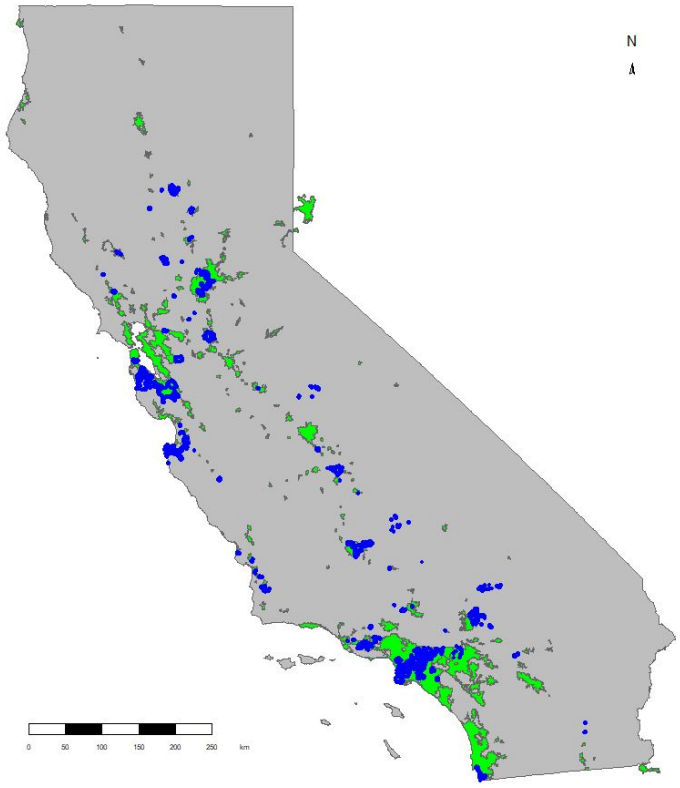


Figure 11. Urban Areas (per 2020 US Census) in Green with Centroids of Class A IOUs (Blue Dots)

Using the 'st' package in R, the *st_intersection* function determined the spatial portion of each CWS (% of total area) that was contained within the urban areas defined by the US Census. This was calculated as the 'percent urban area' for each CWS, and ranged from 0% (33 rural CWS) to 100% (37 fully urban CWS). The median spatial area of IOU CWS within urban areas is 97.1% with a mean value of 85.9%. For systems with some portion of their service area within urban areas (95 systems), this value was used to estimate the urban customer population. An assumption of equal population distribution within water system boundaries was made (as with the area-weighted interpolation analysis) to enable calculations. This percent urban area was multiplied by the 2021 population data calculated earlier for each CWS (from area-weighted interpolation of

2021 5-year ACS data). This returned estimates of the total population served by each CWS residing within urban areas and the population residing in urban areas with incomes below 200% of the FPL (i.e. CAP eligible). These totals were then summed at the IOU company level to obtain estimated urban populations and estimated CAP-eligible, low-income urban populations for each Class A IOU. Table 3 below depicts the results from this analysis, along with Figure 14.

Class A IOUs	Systems Serving Urban Areas (US Census 2020)	2021 Est. Urban Pop. (% of Total Est. Pop)	2021 Est. % Low Income of Urban Pop. (<200% FPL)
Cal-American Water	20 of 34 CWS (59%)	456,617 (80.6%)	29.6%
California Water Service	29 of 41 CWS (71%)	1,366,997 (85.9%)	30.6%
Golden State Water	31 of 37 CWS (84%)	950,256 (96.7%)	32.4%
Great Oaks Water	1 CWS (100%)	79,984 (97.6%)	17.0%
Liberty Utilities Apple Valley	2 of 3 CWS (67%)	28,888 (54.4%)	38.2%
Liberty Utilities Park	3 CWS (100%)	109,432 (100%)	31.2%
San Gabriel Valley Water (Fontana)	1 CWS (100%)	200,400 (95.6%)	33.4%
San Gabriel Valley Water (Los Angeles)	2 CWS (100%)	218,043 (97.5%)	36.0%
San Jose Water	1 CWS (100%)	881,687 (95.8%)	18.1%
Suburban Water	5 CWS (100%)	281,164 (99.9%)	22.6%
Total	95 of 127 CWS (75%)	4,573, 467 (91.1%)	28.2%

Table 3. Estimated Urban Customers for Class A IOUs (Spatial Intersection of CWS Boundaries with 2020 Census Urban Area Boundaries and Area-Weighted Interpolation of 2021 5-Year ACS Data)

For all Class A IOUs, the majority of CWS operated serve some portion of their population within urban areas. Several IOUs, particularly those operating in Southern California, serve entirely urban populations (e.g. Suburban Water, Liberty Utilities Park). Summing across all IOU CWS, 91% of the estimated population is located within urban areas. The IOU with the lowest share of estimated urban customers is Liberty Utilities Apple Valley—while it does serve a slim majority urban residents (54%), its service areas of San Bernardino County likely capture more customers outside of urban areas than other IOUs. The next two IOUs with the lowest estimated proportion of urban populations are Cal-American Water and California Water Service which both have a wide geographic reach across the state.

However, these differences do not translate into noticeable differences in low-income populations, as demonstrated by Figure 12. Most IOUs have identical estimated low-income populations in urban areas as within all CWS service areas, and all others differ by less than one percentage point. Given that most IOUs serve majority urban populations, sociodemographic trends in urban areas largely drive the water affordability and customer assistance needs of the Class A IOUs.

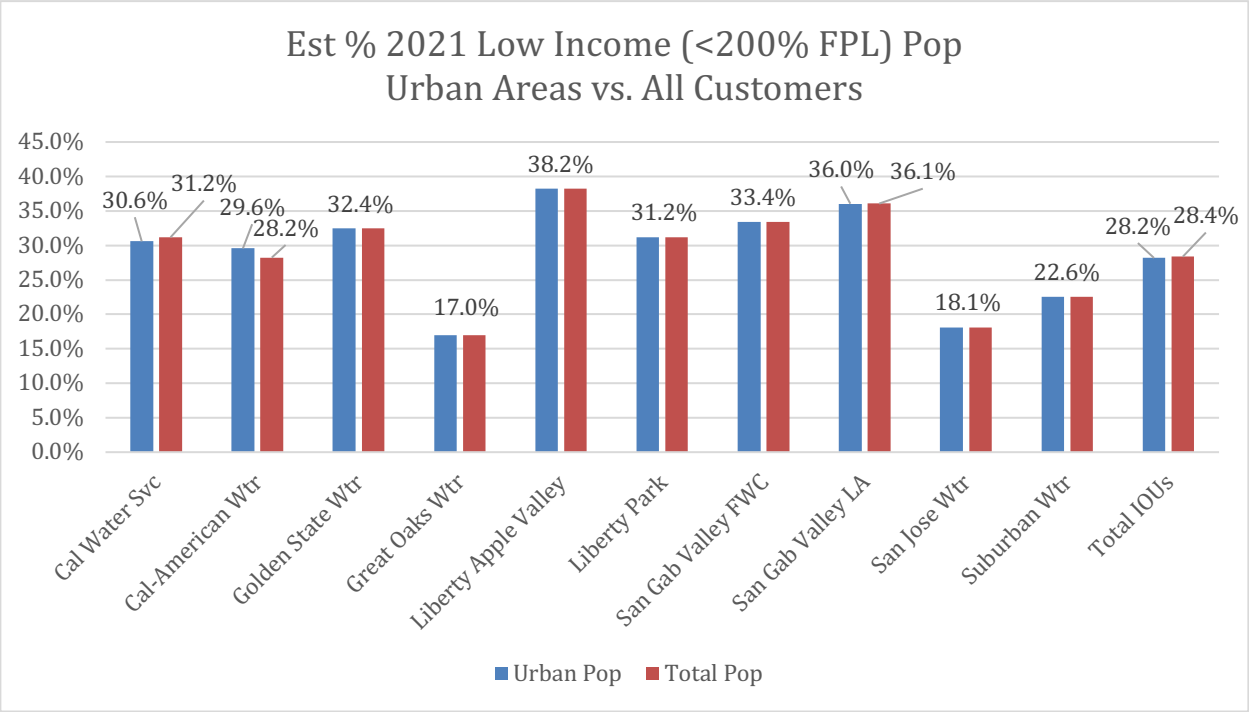


Figure 12. Estimated Percent Below 200% of FPL for Urban and Total Populations in IOU Service Areas (2021 5-Year ACS)

CLIMATE ZONES (HYDROLOGIC REGIONS)

To additionally examine potential regional variation in IOU customers bases, estimated IOU system-level customer population data (via spatial interpolation of 2021 5-year ACS estimates to IOU CWS) were grouped by hydrologic regions, from California Department of Water Resources (2017, via California State Geoportal). Class A IOU CWS were assigned based on which of the 10 hydrologic regions intersected the CWS boundaries; at least 1 Class A IOU serves each hydrologic region with the exception of the North Lahotan Hydrologic Zone. Estimate customer populations (from census tract data) and estimated low-income, CAP-eligible customer populations (<200% of the FPL) were summed for all Class A IOU CWS within each hydrologic zone to produce the choropleth map shown in Figure 13. As demonstrated here, and following from the above analysis of Los Angeles County, the vast majority of Class A IOU customers are located in the South Coast hydrologic region (2.4 million), followed by the San Francisco Bay and Central Coast hydrologic regions (1.4 million and 1.1 million customers, respectively). All other hydrologic regions have an estimated population within Class A CWS service boundaries of less than 500,000.

Additionally, the population under 200% of the FPL (i.e. CAP-eligible) in Class A IOU CWS boundaries was also estimated for each hydrologic region. The percentage of the estimated Class A customers that have income below 200% of the FPL for each hydrologic region is shown in Figure 14. The distribution of customers in poverty does not directly match that of overall customers across the hydrologic regions. The highest proportion of CAP-eligible customers is estimated for the San Joaquin River hydrologic region (49.4%), which ranks 6th of the 10 hydrologic regions for total customers (167,000 customers). Meanwhile, the South Coast hydrologic region contains the highest total number of customers but ranks 4th lowest in terms of proportion of low-income customers (29.2%). Nearly half of the estimated Class A IOU customers in the San Joaquin Valley have incomes eligible for CAPs, fitting with recent research on water affordability finding particular challenges for disadvantaged communities in the Central and San Joaquin Valleys (London

et al. 2018). Another case study examined water affordability challenges in the Tulare Lake Basin, which also has higher values of CAP-eligible populations in our estimates (45.5%, 3rd highest hydrologic region) (Christian-Smith et al. 2013). This suggests targeting of CAP enrollment may need to place increased focus on relative regional poverty levels rather than total customers. However, it is crucial to consider the types of water systems serving customers in different regions; despite high water affordability challenges for low-income populations in places like the San Joaquin Valley, these rural regions also feature less service coverage by Class A IOUs and may be out of reach of the relevant CAPs (Onda & Tewari 2021; London et al. 2018).

Figure 13. 2021 Estimated Class A IOU Customers by Hydrologic Region

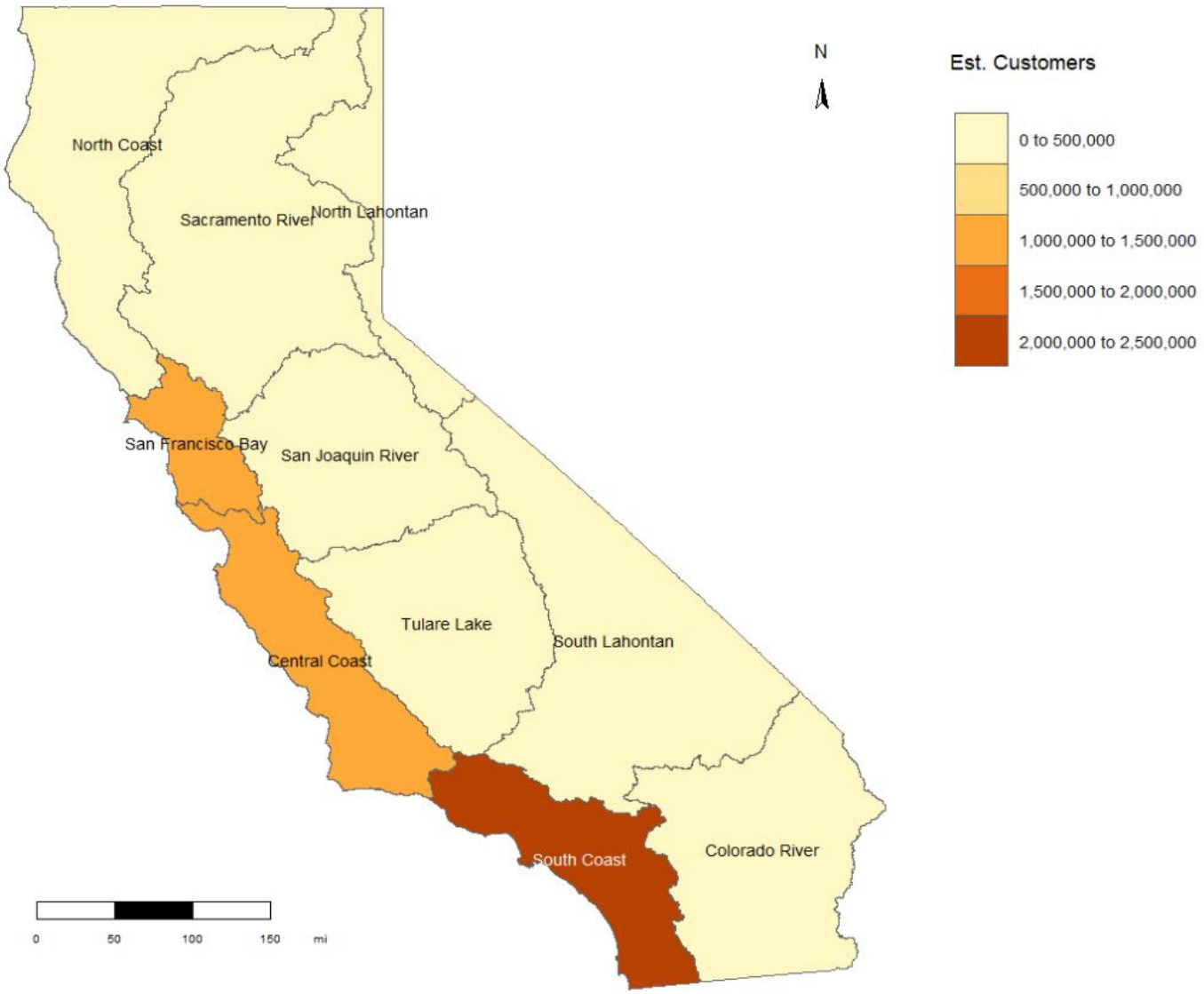
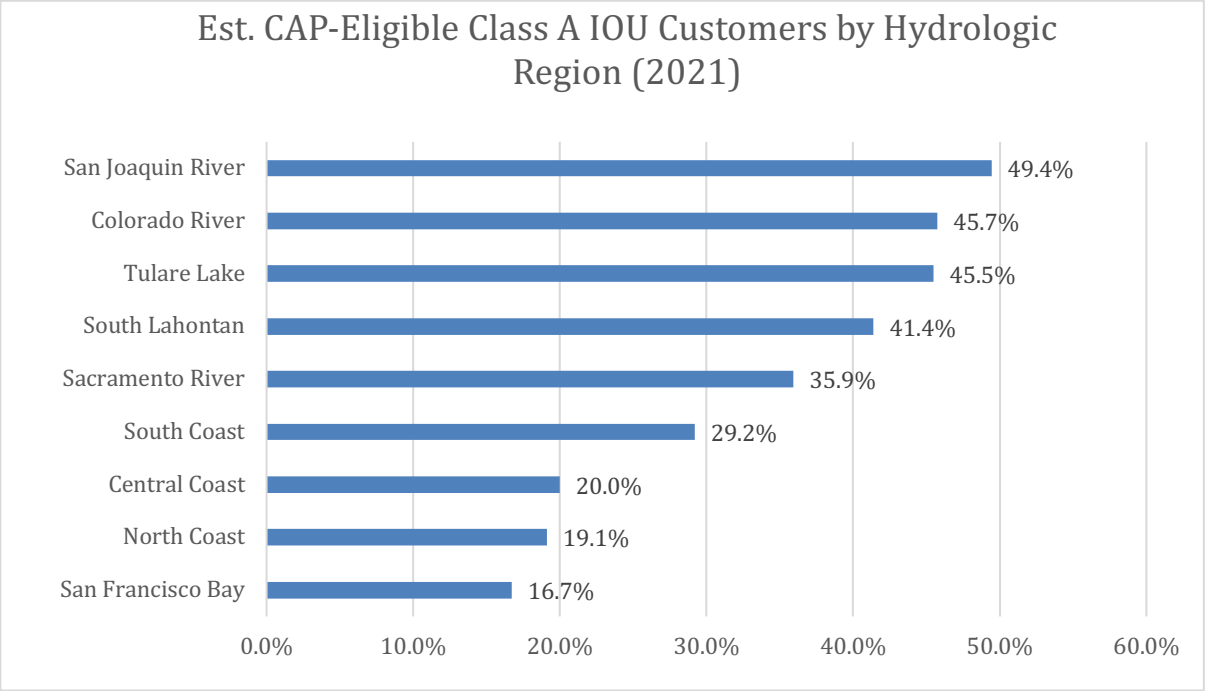


Figure 14. Estimated Percent CAP-Eligible Customers by Hydrologic Zone



DISCUSSION AND CONCLUSION

This report has provided a preliminary analysis of customer assistance programs (CAPs) operated by the 10 largest (Class A) investor owned water utilities in California from 2010 to 2022. Overall, a positive trend in enrollment is seen over time, with increasing numbers of connections benefiting from CAPs in all IOUs over time. With relatively stable, and even slightly declining, low-income populations (defined by the eligibility criteria of incomes below 200% of the federal poverty level) served by these systems, we can determine that the portion of eligible customers reached by IOU CAPs is also expanding over time. Furthermore, the systems with the highest proportions of low-income customers also demonstrate the highest overall proportion of CAP-enrolled connections.

This suggests positive trends in low-income water bill assistance for customers served by IOUs in California. Proportions of low-income, CAP-eligible populations do not appear to differ dramatically between Class A IOUs or compared to the state as a whole or Los Angeles County systems alone. The vast majority of customers served by Class A IOUs are located within urban areas. Prior research recognizes that rural populations may face unique water access and affordability challenges, as well as water system types, and thus may be outside the reach of most existing Class A IOU CAPs (Onda & Tewari 2021). Indeed, analysis of IOU customers by hydrologic region reveals that, despite much smaller portions of customers served by Class A IOUs located in regions like the San Joaquin River region, these areas have particularly high proportions of low-income populations that would benefit from water affordability assistance. Future work to expand or targeting CAP enrollment should consider how geographies of poverty intersect (or differ) from that of the customer coverage of IOU water systems with dedicated CAPs that could provide water affordability assistance.

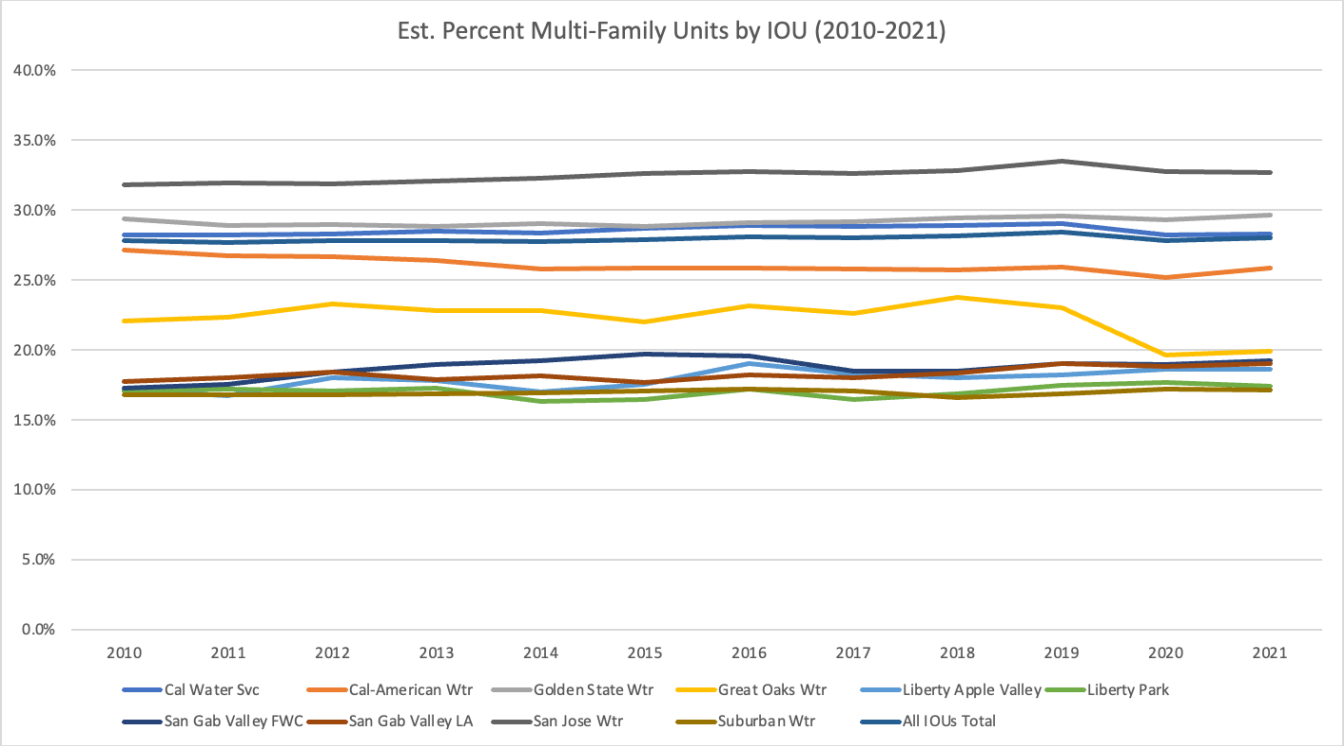
However, this analysis strictly examines enrollment in CAPs as a binary (enrolled or not) and does not consider water rates nor the amount of assistance that these programs provide. Thus, determining the extent

to which utility cost-burdened, low-income households receive sufficient assistance with water affordability and access is outside the scope of this analysis. Also not considered, is the extent to which acquisitions of additional water systems by IOUs may affect CAP enrollment. While connections and CAP enrollment figures account for increases in service populations over time, it is unclear how new customers from existing systems acquired by IOUs are incorporated into existing CAPs over time and what these customers experience in the process. This could potentially be an avenue to explore with future research, as efforts to use consolidation to improve water quality, access, and affordability outcomes increase across the state (SWRCB 2023; Pierce et al. 2019; Green Nylen et al. 2018).

Furthermore, while Class A IOUs serve around 14% of the state population, many low-income households across the state are served by other types of CWS which may or may not have CAPs to provide water affordability assistance. Ongoing efforts to realize the Human Right to Water in California include determining the viability of a statewide CAP that could apply across water systems. Given the fragmented nature of water systems across the state, with widely varying financial, technical and managerial capacities and costs for systems, a statewide CAP could provide more standardized assistance and reach than the current piecemeal, system-based approach (Pierce et al. 2020; Pierce et al. 2019; Pierce & Gmoser-Daskalakis 2020). The growth of CAPs by Class A IOUs across the state, visible from this analysis, may provide valuable lessons learned for continuing to improve water affordability and access for low-income Californians.

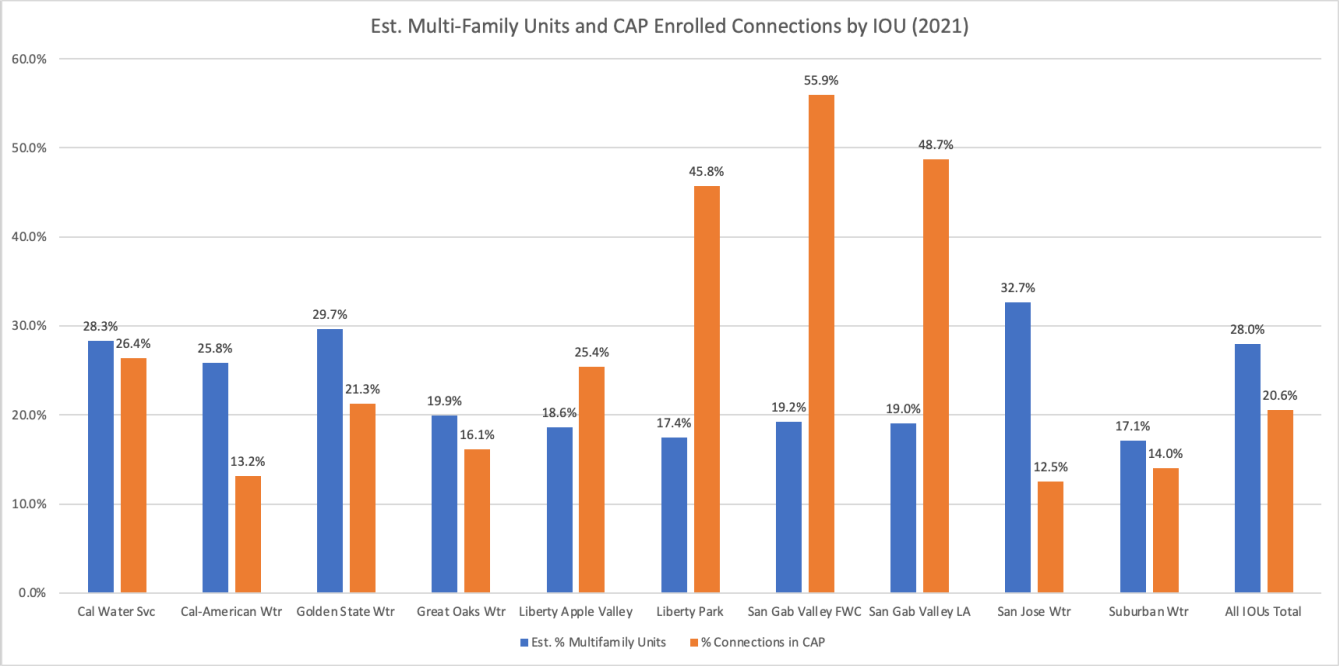
APPENDIX: MULTI-FAMILY AND RENTER POPULATIONS

Appendix Figure A-1. Estimated Percent Multi-Family Units by IOU (from area-weighted interpolation), 2010-2021



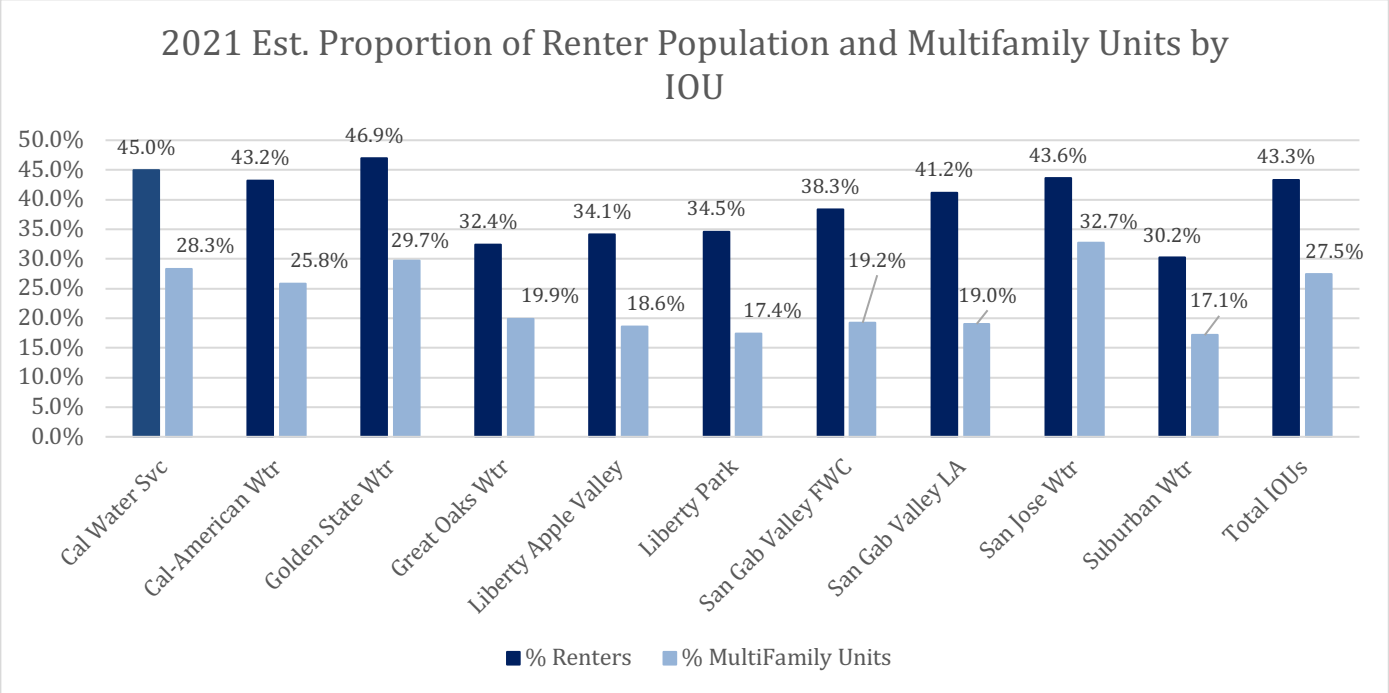
Note: Percentage multi-family units is calculated using area-weighted interpolation of each IOU's CWS service area boundaries. Total units and total multi-family units were interpolated by census tract from 5-year ACS estimates ending in each year from 2010 to 2021.

Appendix Figure A-2. Estimated Percentage of Units in IOU Service Boundaries that are Multi-Family with Percentage of Connections Enrolled in CAP, 2021



Note: Percentage multi-family units is calculated using area-weighted interpolation of each IOU's CWS service area boundaries. Total units and total multi-family units were interpolated by census tract from 2021 5-year ACS estimates.

Appendix Figure A-3. Est. 2021 Population Percentage of Renters, Multifamily Units, CAP-Eligible Customers versus Percent of CAP-Enrolled Connections by IOU



Note: Percentage multi-family units and percentage renter population is calculated using area-weighted interpolation of each IOU's CWS service area boundaries. Total units, total multi-family units, total renters and total population (renters and owners) were interpolated by census tract from 5-year ACS estimates ending in each year from 2010 to 2021.

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