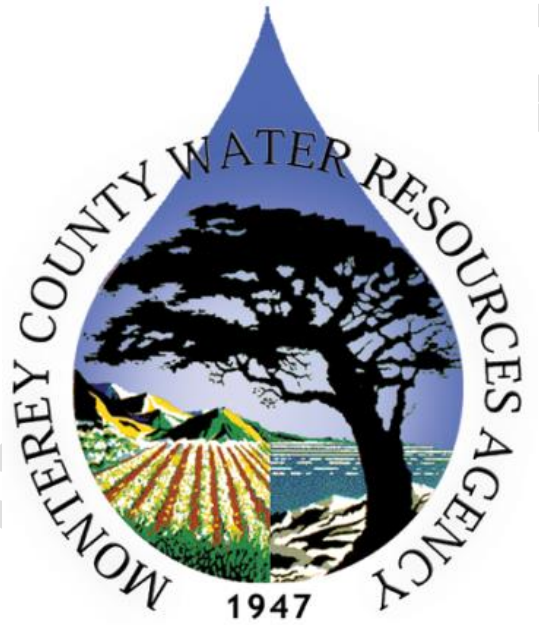
2019

Groundwater Extraction Summary Report

Monterey County Water Resources Agency

January 2021



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Overview of the Groundwater Reporting Program

History of the Groundwater Reporting Program

In 1993, the Monterey County Board of Supervisors adopted Ordinances No. 3717 and 3718 that require water suppliers within Zones 2, 2A, and 2B to report water-use information for groundwater extraction facilities (wells) and service connections, with a discharge pipe having an inside diameter of at least three inches, to the Monterey County Water Resources Agency (Agency).

The purpose of the Groundwater Reporting Program is to provide the Agency with the most accurate water-use information available to effectively manage groundwater resources. In order to obtain accurate water pumping information, methods of directly measuring water extractions have been implemented.

The Agency collects groundwater extraction data from well operators annually for a period beginning November 1 and ending October 31 ("reporting year"). Data collection began with the 1992-1993 reporting year. Information submitted by than three hundred well operators in Agency management zones of the Salinas Valley (Figure 1) is stored in an Agency database.

Since 1991, the Agency has required the annual submittal of Agricultural Water Conservation Plans (Ordinance 3851), which outline the best management practices (BMPs) that are to be adopted each year by growers in the Salinas Valley. In 1996, an ordinance was passed that requires the filing of Urban Water Conservation Plans (Ordinance 3886). Developed as the urban counterpart of the agricultural water conservation plans, this program provides an overview of the BMPs to be implemented by urban water purveyors as conservation measures.

For management purposes, the Agency divides a portion of the Salinas Valley Groundwater Basin into four hydrologic subareas or zones; Pressure, East Side, Forebay, and Upper Valley. These subareas are hydrologically and hydraulically connected, and their boundaries are defined by differences in local hydrogeology and recharge.

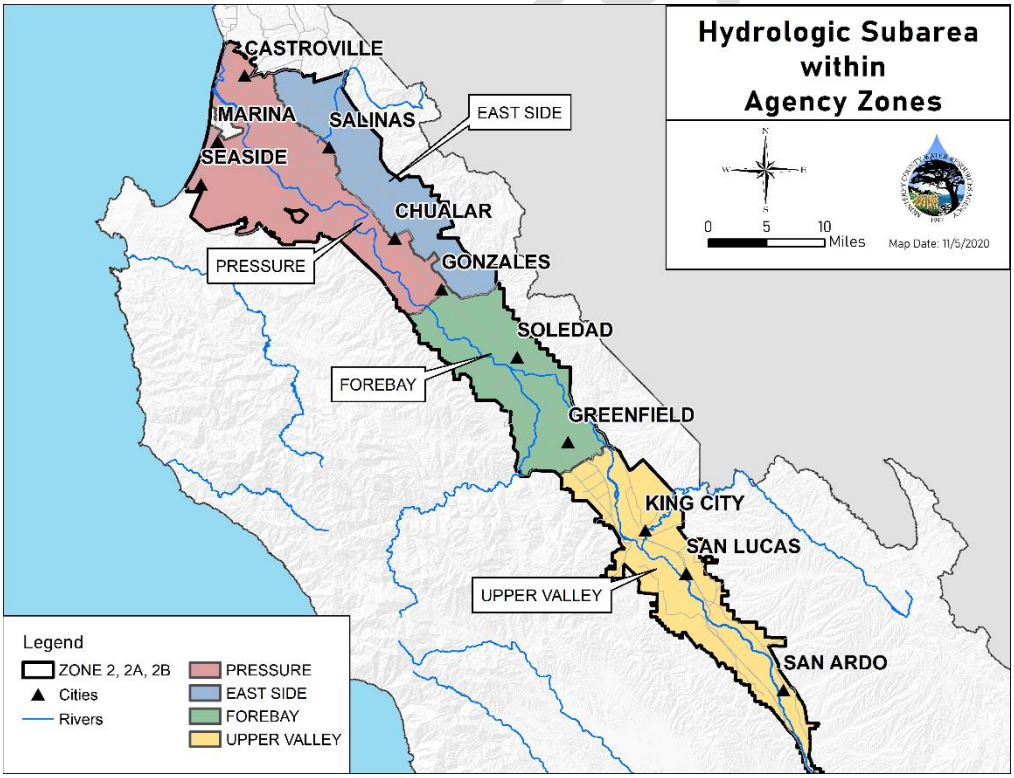
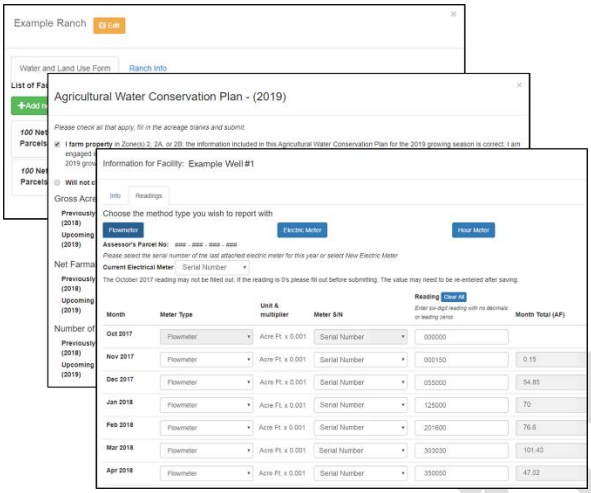


Figure 1. Salinas Valley Groundwater Basin Subareas and Agency Zones

Groundwater Summary Report

The purpose of this report is to summarize the data submitted to the Agency by well operators in February 2020 from the following annual forms:

- Groundwater Extraction Forms (agricultural and urban)
- Water Conservation Plans (agricultural and urban)
- Water and Land Use Forms (agricultural)



The agricultural data from the groundwater extraction program covers the reporting year of November 1, 2018, through October 31, 2019; the urban data covers calendar year 2019. The agricultural and urban water conservation plans for 2020 are also summarized. This report is intended to present a synopsis of current water extraction within the Salinas Valley, including agricultural and urban water conservation improvements that are being implemented to reduce the total amount of water pumped. It is not the purpose of this report to thoroughly analyze the factors that contribute to increases or decreases in pumping.

Reporting Format

Groundwater extraction data are presented in this report by measurement in acre-feet (AF). One acre-foot is equal to 325,851 gallons.

Reporting Methods

The Groundwater Reporting Program provides well operators with a choice of three different reporting methods: Water Flowmeter, Electrical Meter, or Hour Meter (timer). The summary of groundwater extractions presented in this report is compiled from data generated by all three reporting methods. Ordinance 3717 requires annual pump efficiency tests and/or meter calibration of each well to ensure the accuracy of the data reported. The distribution of methods used for the 2019 reporting year was: 82% Flowmeter; 17% Electrical Meter and <1% Hour Meter.

Disclaimer

While the Agency has made every effort to ensure the accuracy of the data presented in this report, it should be noted that the data are submitted by individual reporting parties. In addition, since so many factors can affect the extraction calibration, it is understood that no reporting method is 100 percent accurate. The Agency maintains strict quality assurance in the compilation, standardization, and entry of the data received. Changes to historical data may occur due to additional submittals after the due date. Rounding errors may cause the total extraction values displayed to be within 5 AF of actual totals. The Agency received Groundwater Extraction Reports from ninety-five percent (95%) of the 1,858 wells in Zones 2, 2A, and 2B of the Salinas Valley for the 2019 reporting year. Agricultural and Urban Water Conservation Plan submittal compliance for 2020 was eighty-two percent (82%) ninety-three percent (93%), respectively.

Groundwater Extraction Form – Data Summary

Total Extractions by Subarea and Type of Use

All data presented in this section are derived from the agricultural and urban Groundwater Extraction Forms.

Table 1. Extraction Data by Subarea and Type of Use.

Subarea	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
Pressure	93,829	15,885	**109,714**
East Side	73,006	12,822	**85,828**
Forebay	124,600	7,374	**131,974**
Upper Valley	119,477	3,430	**122,907**
Total (AF)	**410,912**	**39,511**	**450,423**
Percent of Total	**91.2%**	**8.8%**	**100.0%**

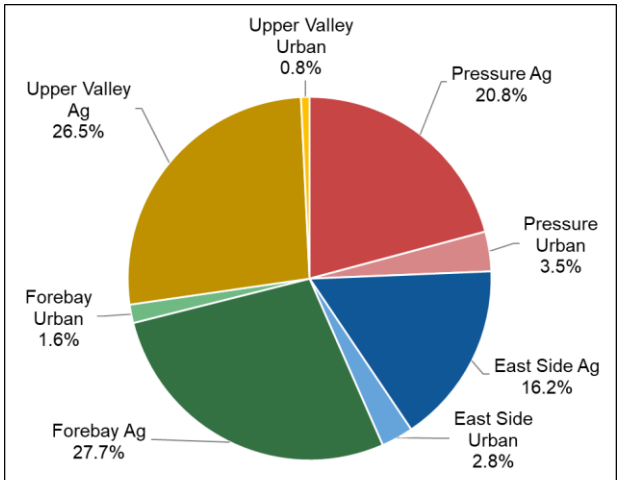


Figure 2. Percentage of Ag and Urban Extractions by Subarea.

Urban Extraction Data by City or Area

The total groundwater extractions attributed to urban use include residential, commercial, institutional, industrial and governmental pumping, and are summarized below.

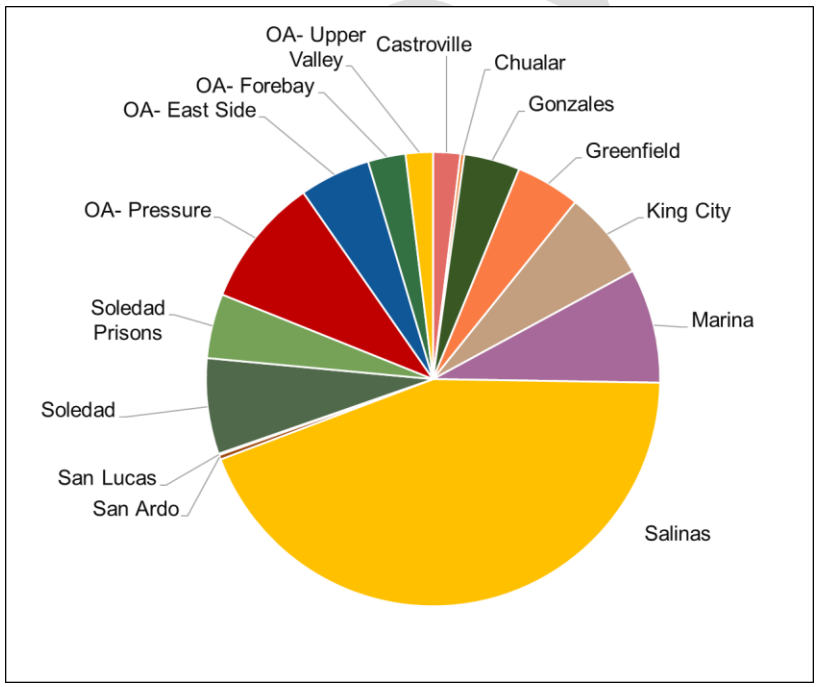


Table 2. Urban Extractions by City or Area

City or Area	Urban Pumping (AF)	Percentage
Castroville	767	1.94%
Chualar	107	0.27%
Gonzales	1,573	3.98%
Greenfield	1,811	4.58%
King City	2,495	6.32%
Marina	3,224	8.16%
Salinas	17,382	44.00%
San Ardo	128	0.32%
San Lucas	39	0.10%
Soledad	2,692	6.81%
Soledad Prisons	1,813	4.59%
OA- Pressure	3,656	9.25%
OA- East Side	1,998	5.06%
OA- Forebay	1,057	2.68%
OA- Upper Valley	767	1.94%
Total	**39,509**	**100.00%**

OA=Other Area

Total Groundwater Extractions in Zones 2, 2A, 2B

This figure provides a spatial representation of groundwater extractions within Zones 2, 2A, and 2B for the 2019 reporting year. The figures and tables on the next four pages provide extraction information by subarea. The number of wells shown in Figures 4 to 11 may be different than the total number of wells in the program, as stated on Page 2. This is due to delinquent extraction reports and the exact location of some wells being unknown.

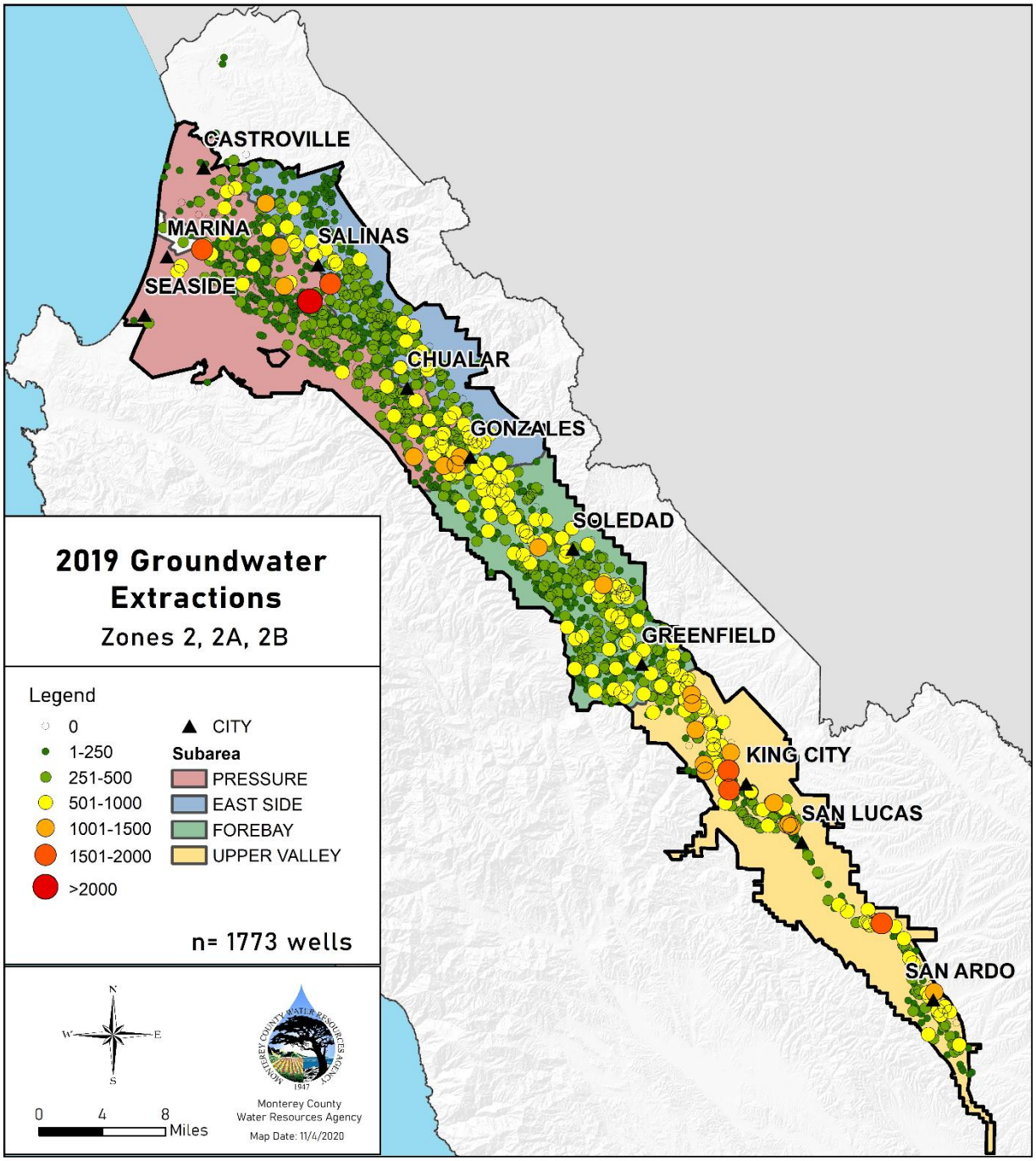


Figure 4. 2019 Groundwater Extractions (AF).

Pressure Subarea – Extraction Data

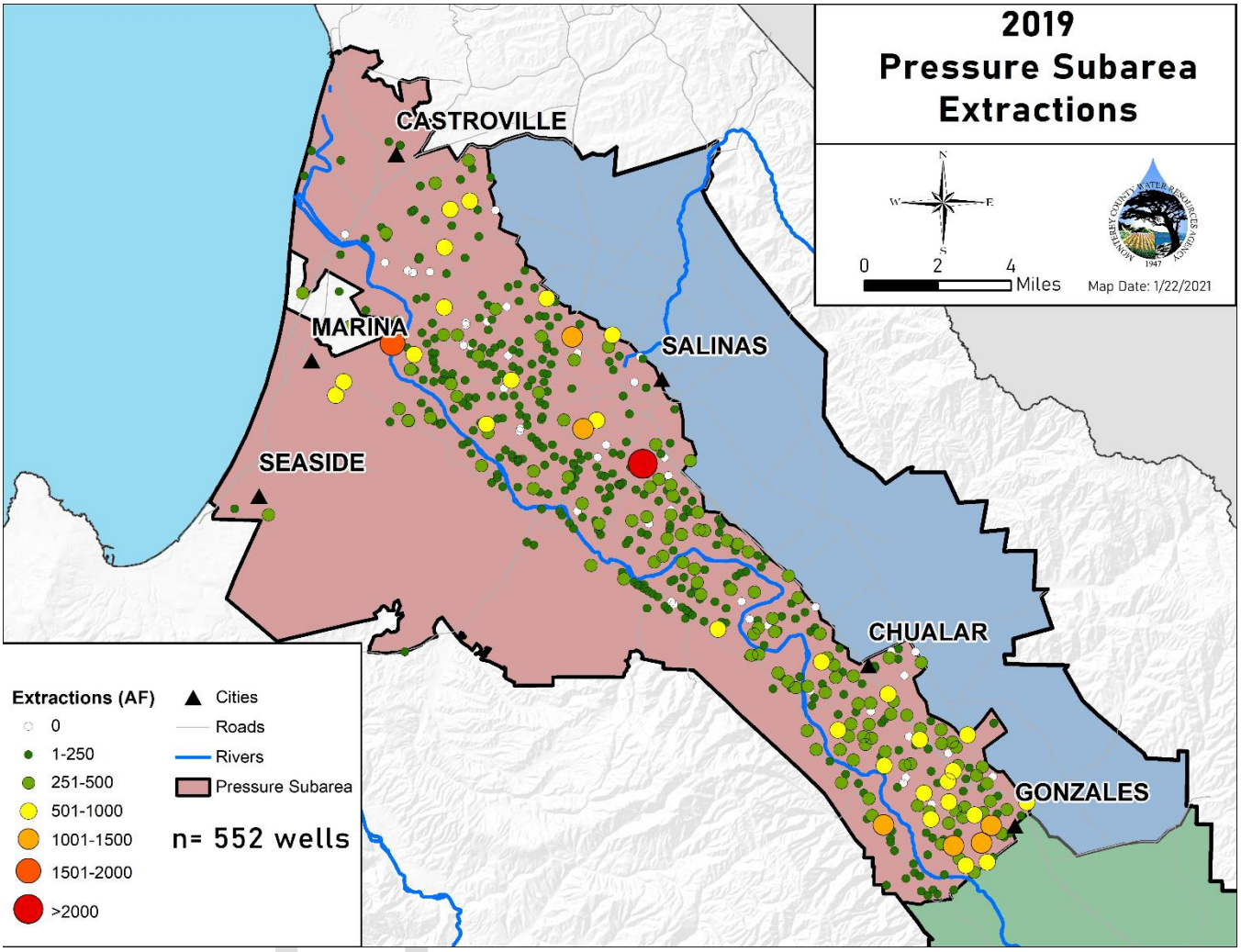


Figure 5. 2019 Groundwater Extraction in the Pressure Subarea.

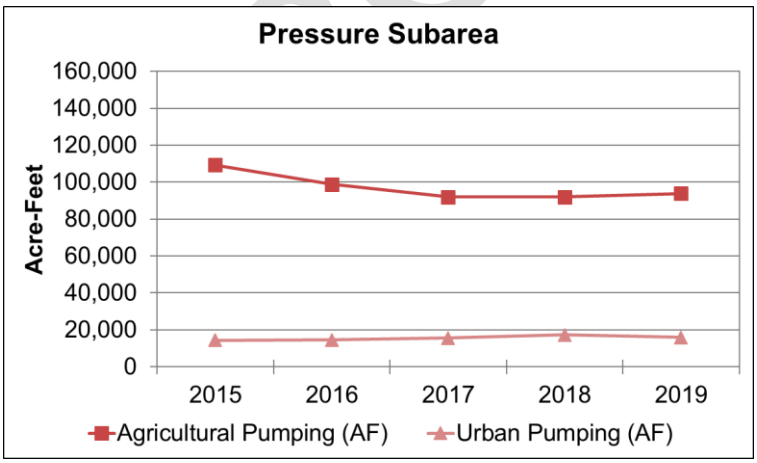


Figure 6. Agricultural and Urban Extractions (AF) in the Pressure Subarea 2015-2019.

Year	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
2015	109,214	14,443	123,657
2016	98,890	14,605	113,495
2017	91,901	15,523	107,424
2018	92,010	17,246	109,256
2019	93,829	15,885	109,714

Table 3. Total, Agricultural, and Urban Extractions (AF) in the Pressure Subarea 2015-2019.

CSIP, Zone 2B and Area of Impact- Extraction Data

The Castroville Seawater Intrusion Project (CSIP) delivers recycled water from the Salinas Valley Reclamation Project, treated Salinas River water from the Salinas River Diversion Facility, and groundwater from ten supplemental wells to 12,000 acres of irrigated land in the Castroville area, referred to as Zone 2B, in an effort to reduce groundwater pumping near the coast. Pumping from non- CSIP supplemental wells has decreased since CSIP began operations in 1998 but is still occurring (Figure 8). The Area of Impact encompasses the region where chloride concentrations in the 180-Ft and 400-Ft Aquifers are 250 mg/L or greater. Groundwater within the Area of Impact is considered vulnerable due to the presence of pathways for seawater intrusion (Figure 7, Table 4).

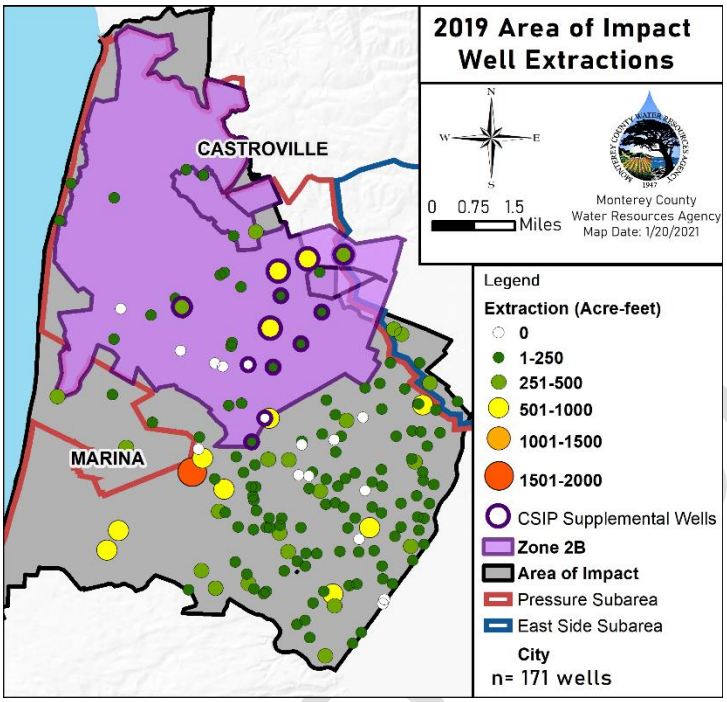


Figure 7. 2019 Groundwater Extraction (AF) in the Area of Impact.

Aquifer	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
180-Ft Aquifer or East Side Shallow	2,311	11	2,322
180 and 400-Ft Aquifers	1,113	337	1,450
400-Ft Aquifer or East Side Deep	14,329	1,151	15,480
Deep Aquifers	5,100	1,967	7,067
Unknown	3,042	303	3,345
Total (AF)	25,895	3,769	29,664

Table 4. 2019 Extraction Data in the Area of Impact by Aquifer and Type of Use

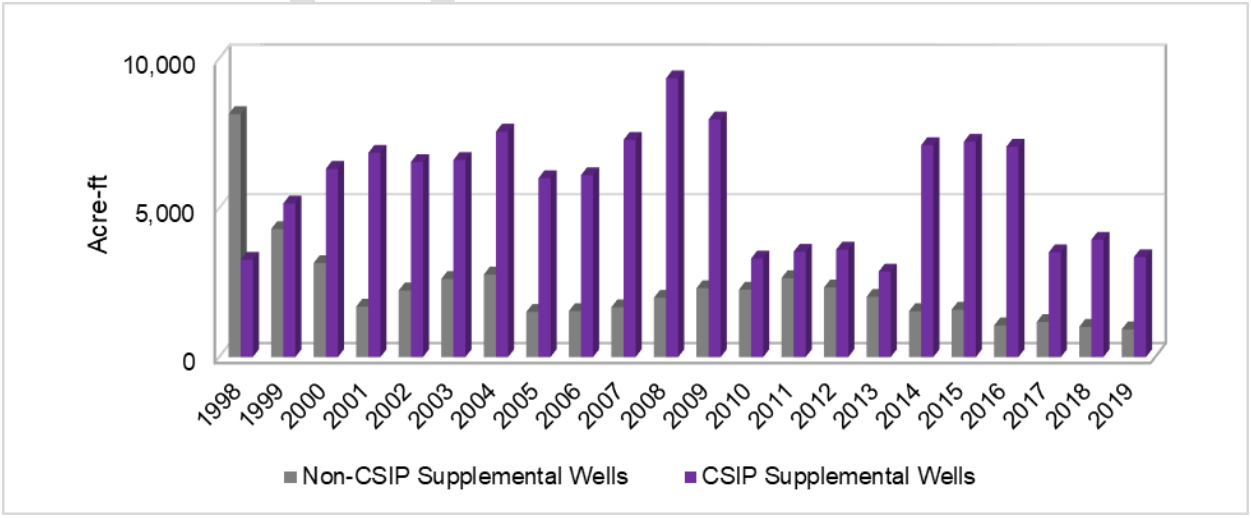


Figure 8. Groundwater Extractions in Zone 2B from CSIP and Non-CSIP Supplemental Wells, 1993-2019

Deep Aquifers – Extraction Data

The first production well in the Deep Aquifers was installed in 1974. As of December 2020, fifty-seven wells have been installed in the Deep Aquifers, with seventeen installed in the last three years (Figure 9). Twelve out of these seventeen wells have not yet to begun report extractions as of 2019. Similar to the number of wells installed, the amount of water extracted from the Deep Aquifers has increased in recent years (Figure 10, Table 5). The potential for inducing leakage from the overlying impaired aquifers is a growing concern as groundwater extractions from the Deep Aquifers continue to increase.

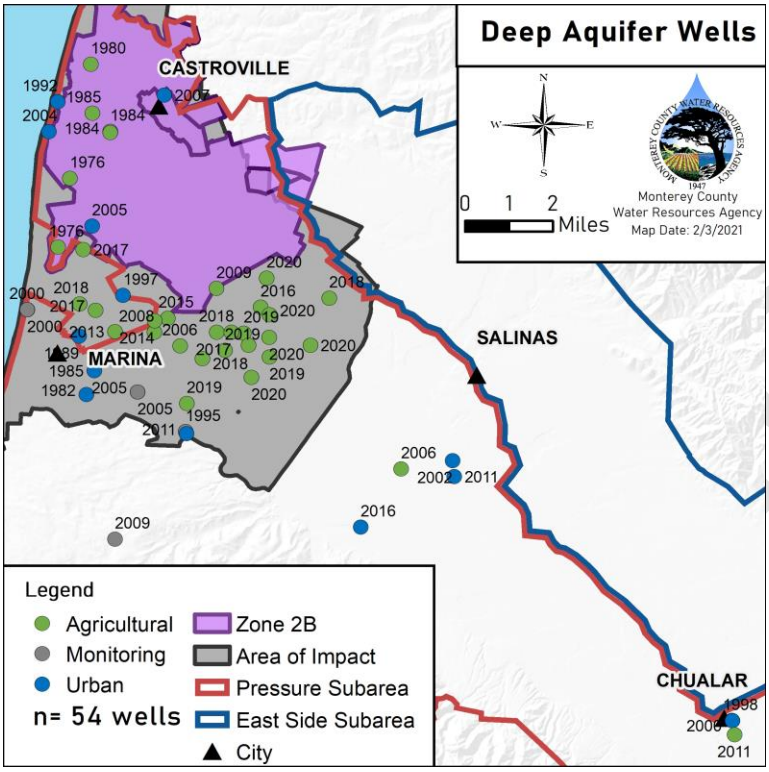


Figure 9. Deep Aquifers wells by Year Drilled and Type of Use

Reporting Year	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
1993	1,507	2,054	3,561
1994	2,620	1,992	4,612
1995	2,302	2,036	4,338
1996	1,990	2,137	4,127
1997	2,556	2,170	4,726
1998	1,648	1,906	3,554
1999	96	2,055	2,151
2000	1	2,305	2,306
2001	0	2,368	2,368
2002	0	2,416	2,416
2003	0	2,745	2,745
2004	0	2,747	2,747
2005	0	2,701	2,701
2006	0	2,341	2,341
2007	58	2,131	2,189
2008	384	2,375	2,759
2009	696	2,450	3,146
2010	982	2,236	3,218
2011	927	2,173	3,100
2012	1,397	2,424	3,821
2013	1,097	2,505	3,602
2014	2,031	4,404	6,435
2015	2,010	4,363	6,373
2016	4,293	4,259	8,552
2017	4,958	4,558	9,516
2018	4,855	4,790	9,645
2019	5,331	5,016	10,347

Table 5. Deep Aquifer Groundwater Extractions by Type of Use, 1993-2019

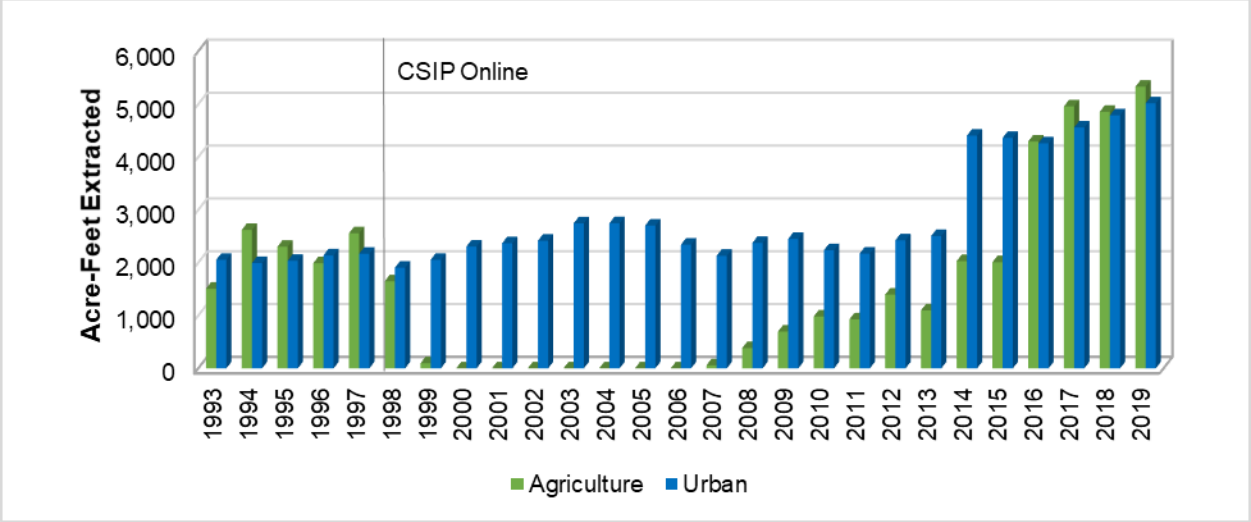


Figure 10. Deep Aquifer Groundwater Extractions by Type of Use, 1993-2019

East Side Subarea – Extraction Data

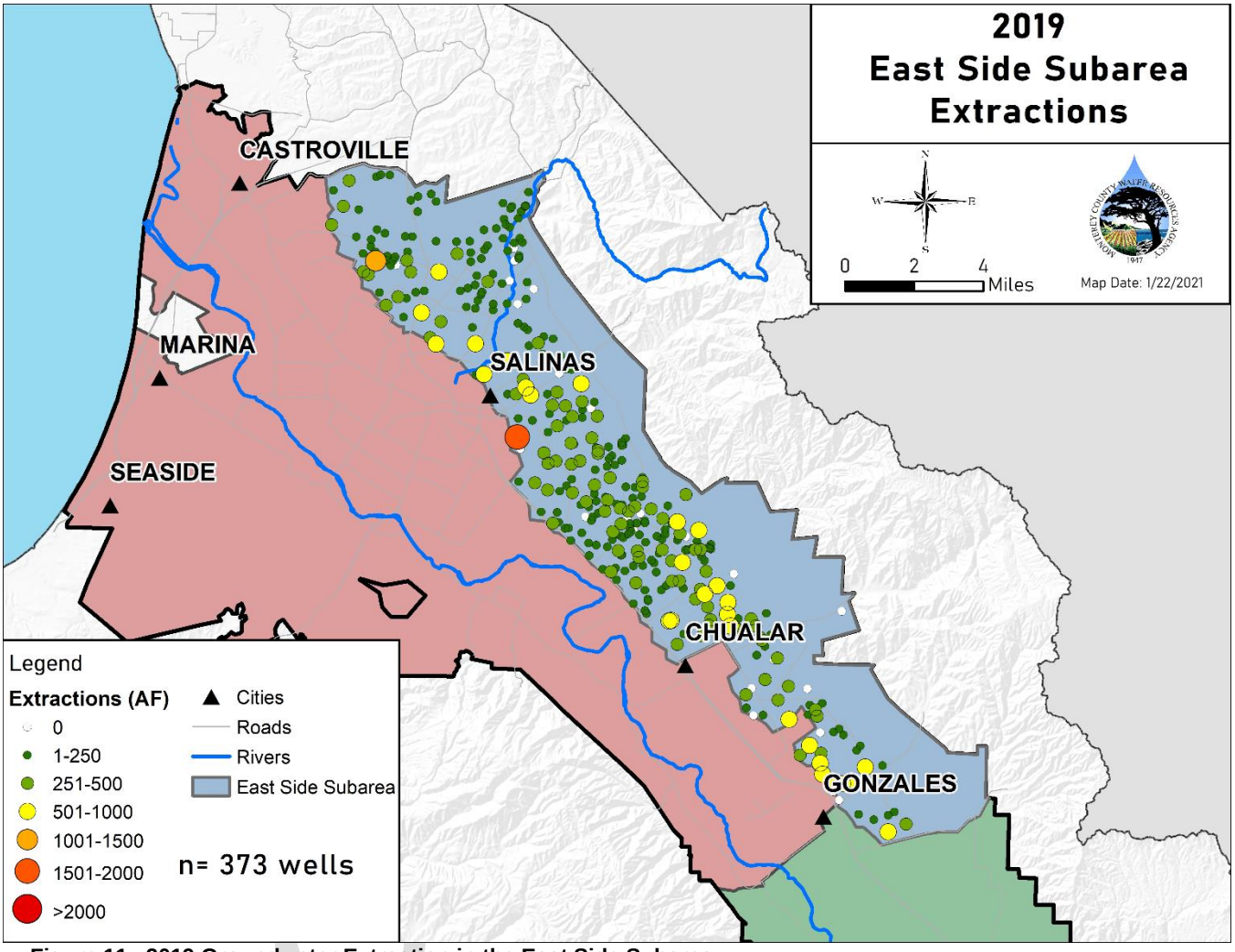


Figure 11. 2019 Groundwater Extraction in the East Side Subarea.

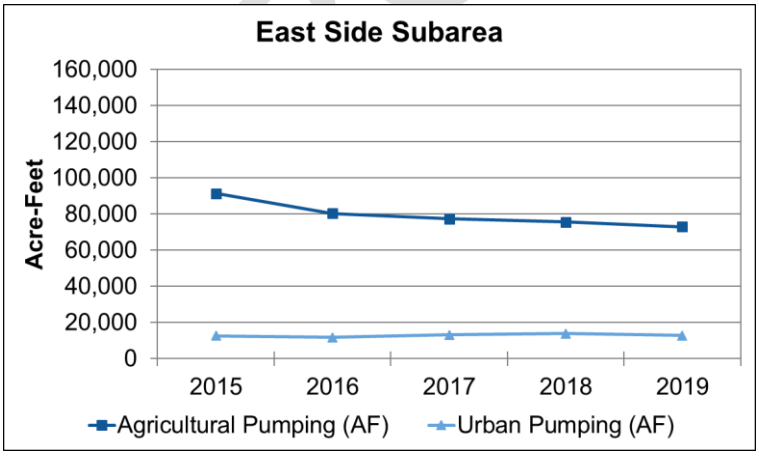


Figure 12. Agricultural and Urban Extractions (AF) in the East Side Subarea 2015-2019.

Year	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
2015	91,491	12,631	104,122
2016	80,379	11,802	92,181
2017	77,353	13,258	90,611
2018	75,629	13,938	89,567
2019	73,006	12,822	85,828

Table 6. Total, Agricultural, and Urban Extractions (AF) in the East Side Subarea 2015-2019.

Forebay Subarea – Extraction Data

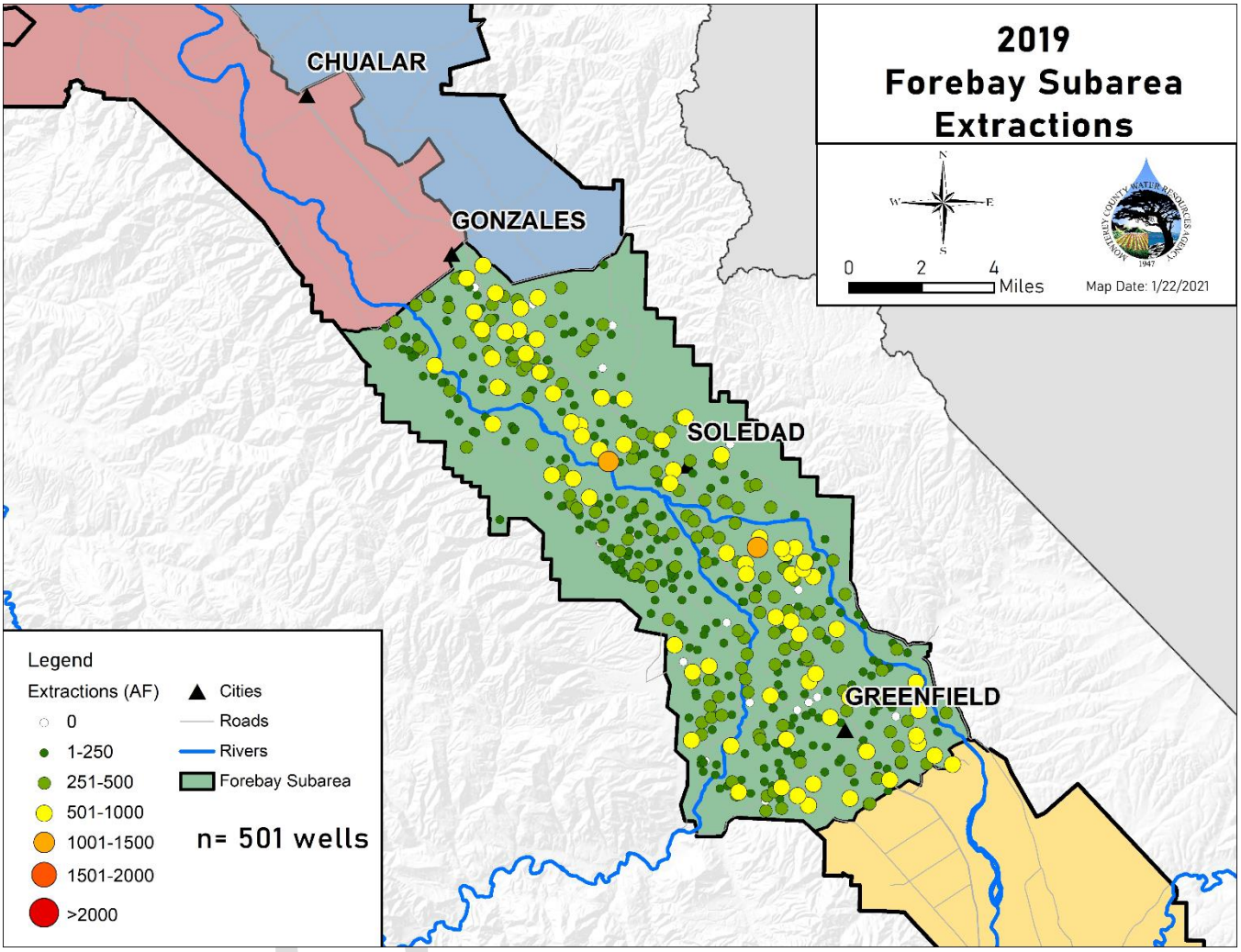


Figure 13. 2019 Groundwater Extraction in the Forebay Subarea.

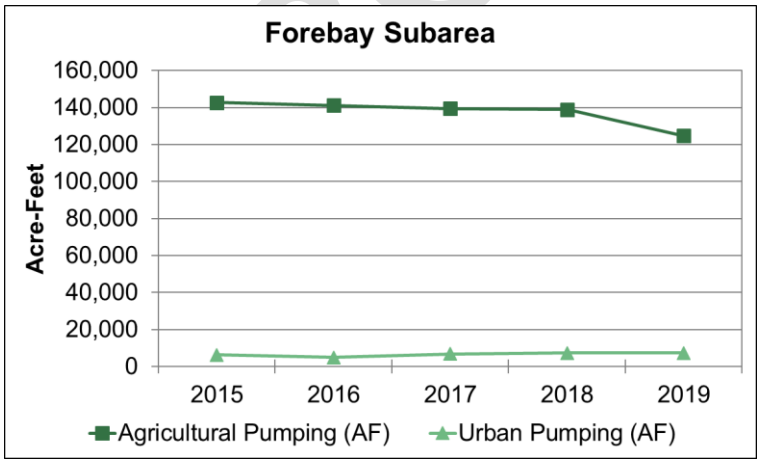


Figure 14. Agricultural and Urban Extractions (AF) in the Forebay Subarea 2015-2019.

Year	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
2015	142,668	6,221	148,889
2016	141,163	4,866	146,029
2017	139,359	6,764	146,123
2018	138,838	7,303	146,141
2019	124,600	7,374	131,974

Table 7. Total, Agricultural, and Urban Extractions (AF) in the Forebay Subarea 2015-2019.

Upper Valley Subarea – Extraction Data

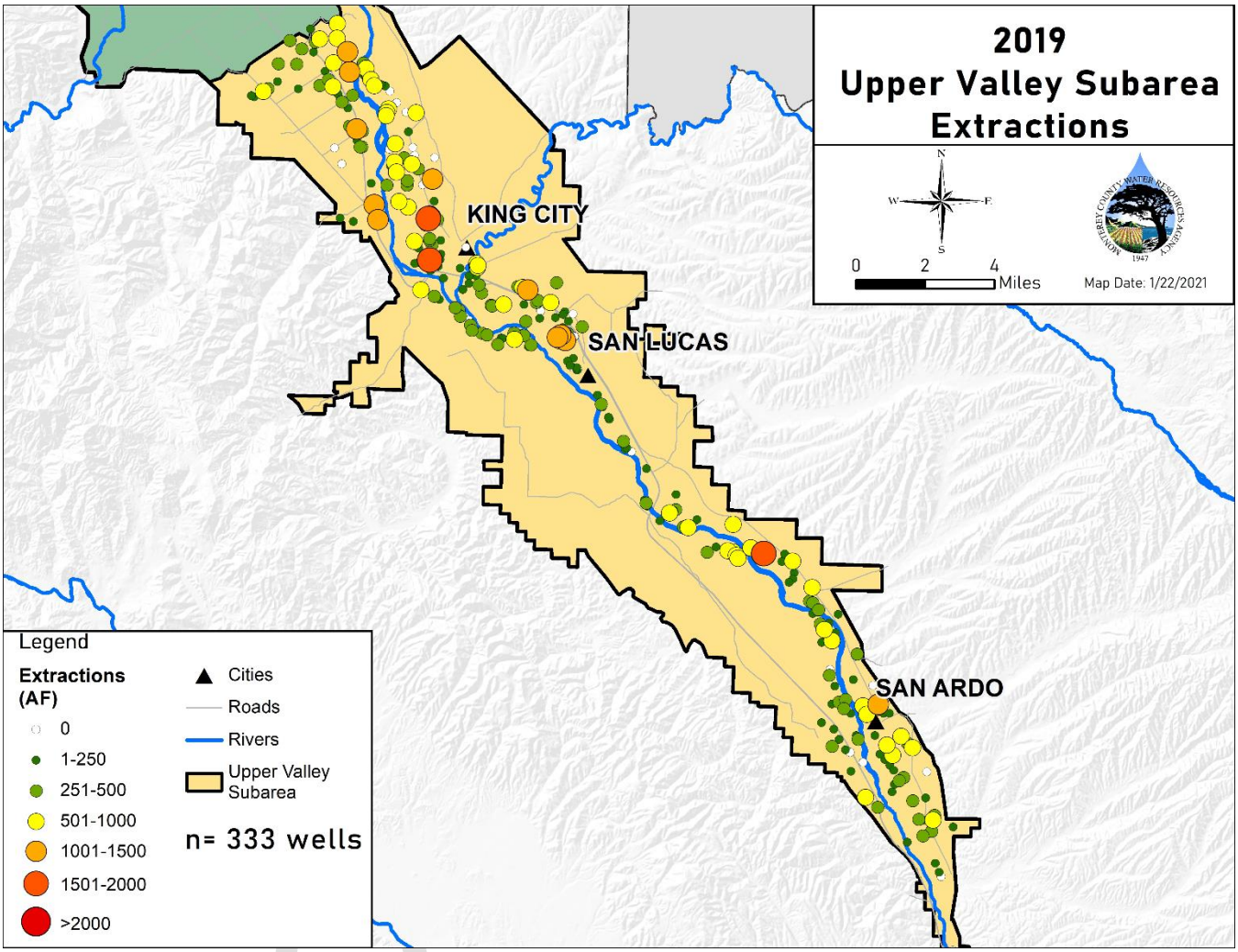


Figure 15. 2019 Groundwater Extraction in the Upper Valley Subarea

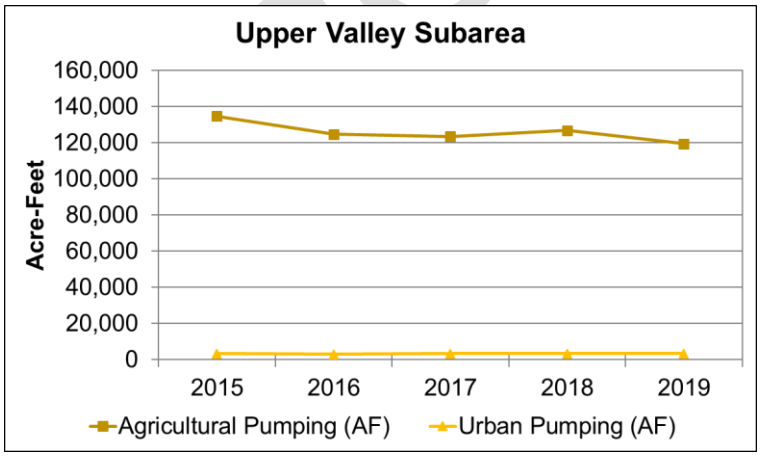


Figure 16. Agricultural and Urban Extractions (AF) in the Upper Valley Subarea 2015-2019.

Year	Agricultural Pumping (AF)	Urban Pumping (AF)	Total Pumping (AF)
2015	134,740	3,306	138,046
2016	124,678	2,991	127,669
2017	123,446	3,407	126,853
2018	126,919	3,418	130,337
2019	119,477	3,430	122,907

Table 8. Total, Agricultural, and Urban Extractions (AF) in the Upper Valley Subarea 2015-2019.

Agricultural Water Conservation – Data Summary

The Agricultural Water Conservation Plans include information on net irrigated acreage, irrigation methods, and crop type. This information is forecasted and indicates what the grower plans to do in the upcoming year. The first figure (17) and table (9) present a breakdown of irrigation methods by crop type. The next figure (18) shows the change in irrigation methods over the length of the program and the final figure (19) shows the top ten Best Management Practices (BMPs) to be implemented in 2020.

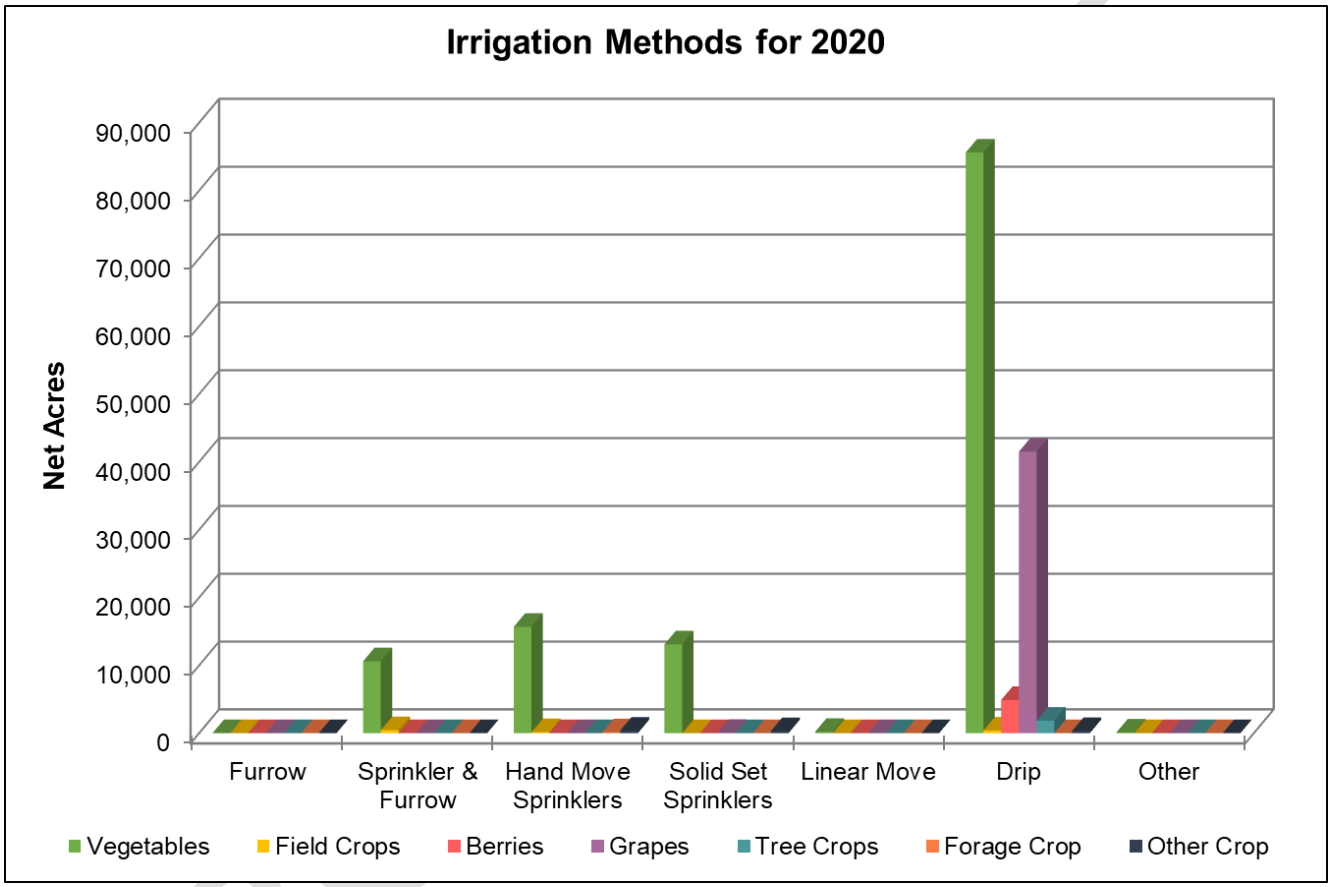


Figure 17. 2020 Forecasted Net Acre Distribution of Irrigation Methods by Crop Type.

2020	Furrow	Sprinkler & Furrow	Hand Move Sprinklers	Solid Set Sprinklers	Linear Move	Drip	Other	Total
Vegetables	0	10,602	15,679	13,096	194	85,609	104	125,284
Field Crops	0	445	149	0	0	393	0	987
Berries	0	0	0	0	0	4,898	0	4,898
Grapes	0	0	0	39	0	41,500	0	41,539
Tree Crops	0	0	0	0	0	1,843	0	1,843
Forage Crop	0	0	126	0	5	0	0	131
Other Crop	0	0	366	288	0	316	0	970
Unirrigated								2,037
Total	**0**	**11,047**	**16,321**	**13,423**	**199**	**134,560**	**104**	**177,690**

Table 9. Net Acres by Irrigation Method and Crop Type.

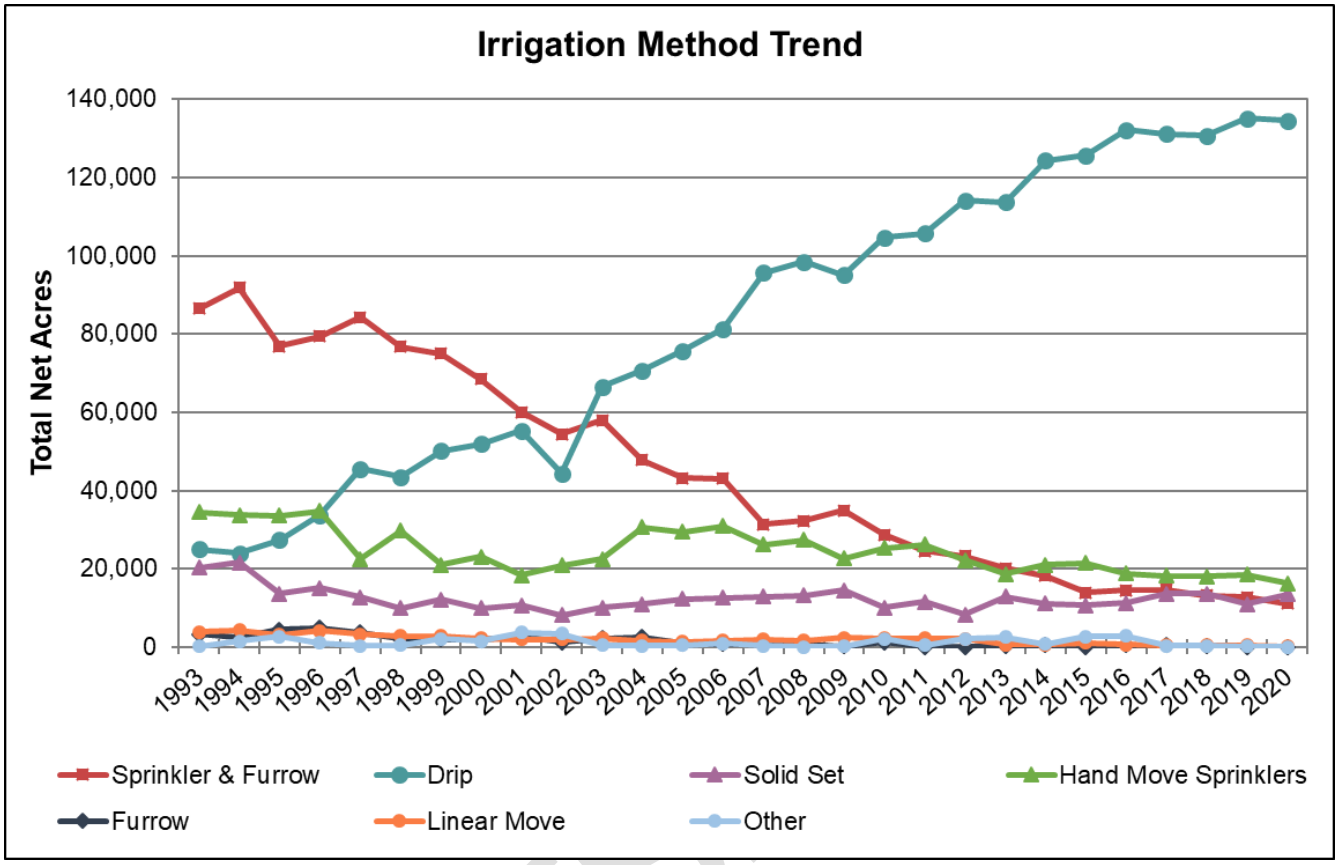


Figure 18. Changes in Irrigation Methods Used Over Time (1993 – 2020) in Zones 2, 2A, and 2B.

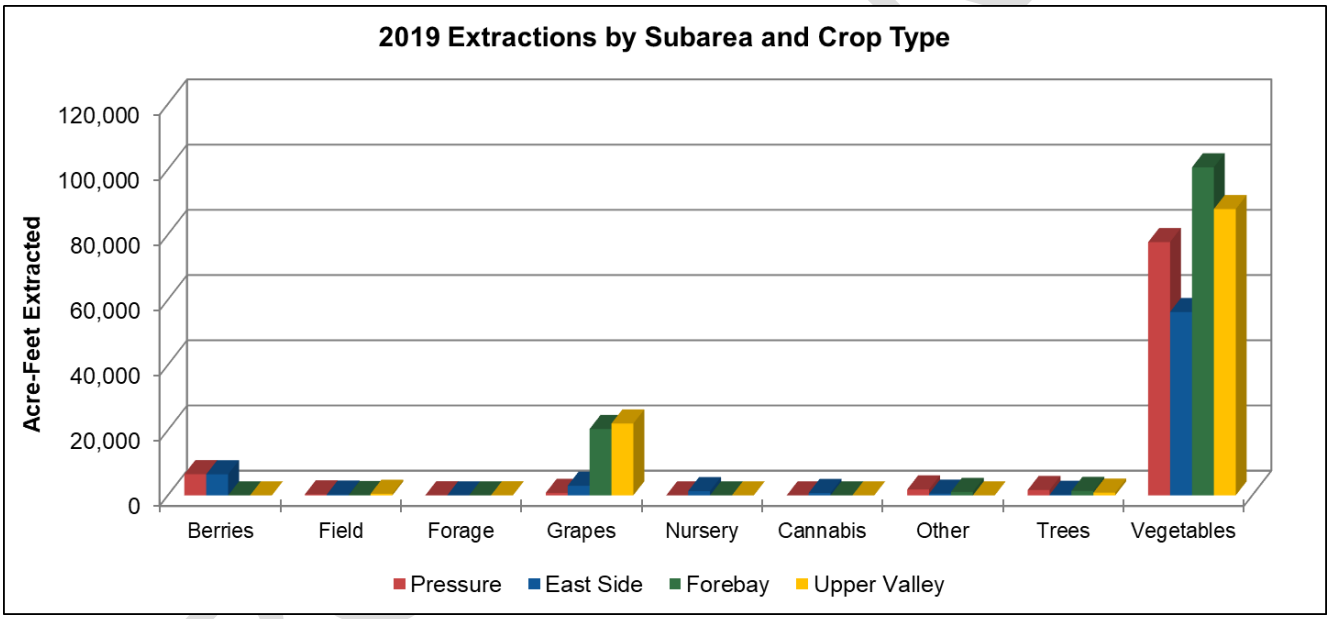
Figure 19. Top Ten BMPs Forecasted for 2020 Based on Reported Net Acres.

Water and Land Use Form – Data Summary

The following three figures show the agricultural water extracted (Fig. 20), irrigated net acres (Fig. 21), and amount of water used per acre (Fig. 22) by hydrologic subarea and crop type based on data submitted on the Water and Land Use forms. The data account for all crop types reported and all reporting methods: water flowmeter, electrical meter, and hour meter.

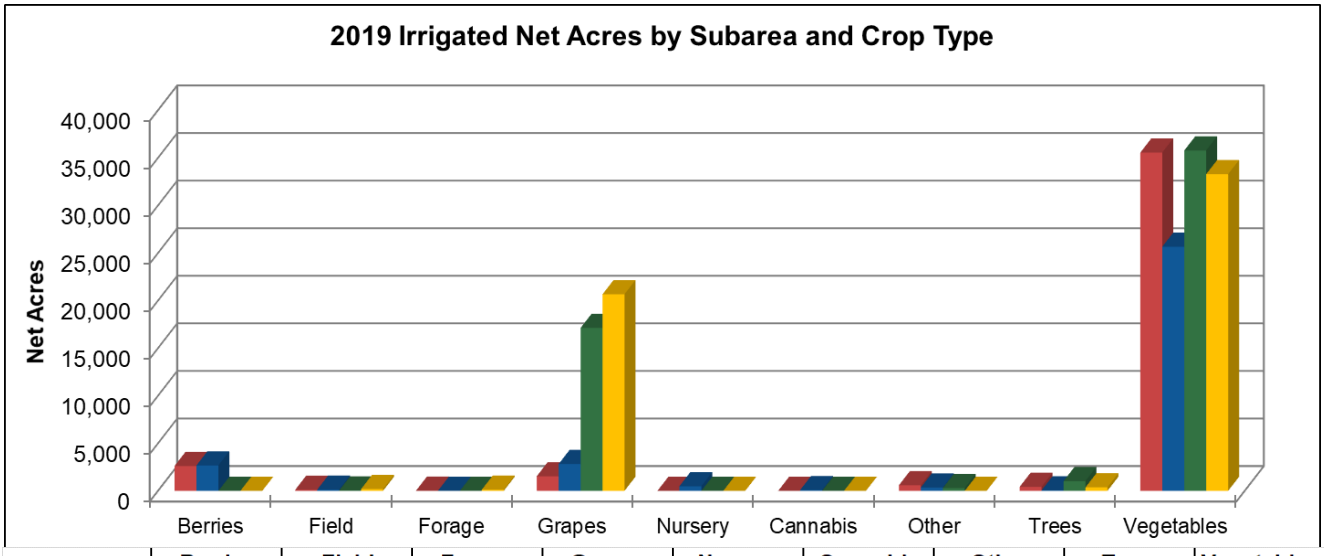
Changing weather patterns, variable soil types, and crop types affect the amount of water needed for efficient irrigation. Even during a normal rain year, pumping rates will vary from one subarea to another and crop types will vary depending on economic demand.

Examples of Crop Type categorizations include: strawberries and raspberries under Berries; beans and grains under Field Crops; alfalfa and pasture under Forage Crops; avocados and lemons under Tree Crops; and sod, flower bulbs, ornamentals, and cactus pears under Other Crops.



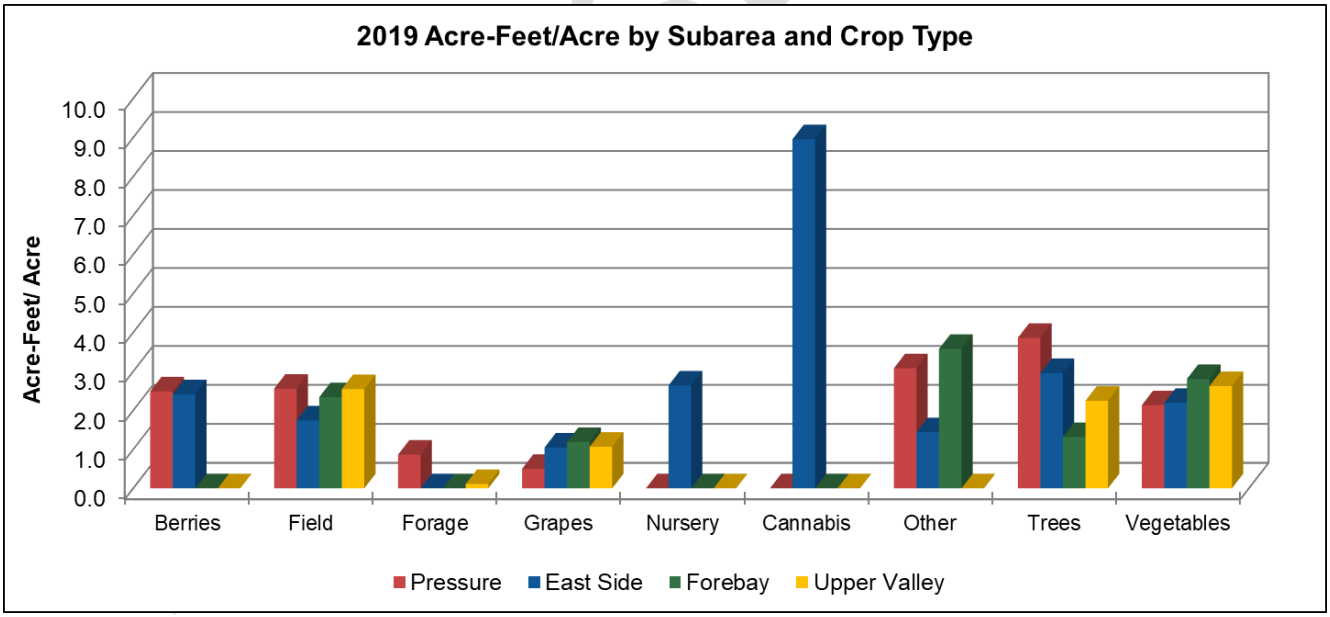
2019	Berries (AF)	Field (AF)	Forage (AF)	Grapes (AF)	Nursery (AF)	Cannabis (AF)	Other (AF)	Trees (AF)	Vegetables (AF)
Pressure	6,484	293	12.1	764	-	-	1,811	1,624	77,667
East Side	6,448	217	-	2,951	1,301	710	503	148	56,232
Forebay	-	87.8	-	20,345	-	-	1,053	1,351	100,599
Upper Valley	-	484	13.6	22,044	-	-	-	831	87,789

Figure 20. 2019 Extractions Reported by Crop Type and Subarea.



2019	Berries (Net Acres)	Field (Net Acres)	Forage (Net Acres)	Grapes (Net Acres)	Nursery (Net Acres)	Cannabis (Net Acres)	Other (Net Acres)	Trees (Net Acres)	Vegetables (Net Acres)
Pressure	2,609	115	14.0	1,530	-	-	588	421	35,556
East Side	2,672	125	-	2,820	483	79.3	349	50.0	25,660
Forebay	-	37.6	-	17,123	-	-	295	1,027	35,770
Upper Valley	-	190	125	20,662	-	-	-	370	33,286

Figure 21. 2019 Irrigated Net Acres Reported by Crop Type and Subarea.



2019	Berries (AF/Acre)	Field (AF/Acre)	Forage (AF/Acre)	Grapes (AF/Acre)	Nursery (AF/Acre)	Cannabis (AF/Acre)	Other (AF/Acre)	Trees (AF/Acre)	Vegetables (AF/Acre)
Pressure	2.5	2.6	0.9	0.5	-	-	3.1	3.9	2.1
East Side	2.4	1.7	-	1.0	2.6	9.0	1.4	3.0	2.2
Forebay	-	2.3	-	1.2	-	-	3.6	1.3	2.8
Upper Valley	-	2.5	0.1	1.1	-	-	-	2.2	2.6

Figure 22. 2019 Acre-Feet/Acre by Crop Type and Subarea.

Urban Water Conservation – Data Summary

Since 1996, the Agency has collected data on the Urban Water Conservation Plan program. Tables 10 and 11 show the top ten Best Management Practices (BMPs) for 2020, as a percentage of total acreage reported for "large" water systems (200 or more customer connections), and "small" water systems (between 15 and 199 customer connections). Tables 12 and 13, and figures 23 and 24 give the reported Water Use per Connection for different Connection Classes for both "large" and "small" water systems.

Table 10. Top Ten BMPs – Large Water Systems.

Top Ten BMPs Implemented for Large Water Systems	2020
Advise customers when it appears possible that leaks exist on customer's side of water meter	100%
Complete an audit of water distribution system at least every three years as prescribed by American Water Works Association	100%
Implement requirements that all new connections be metered and billed by volume of use	100%
Enforcement and support of water conserving plumbing fixture standards, including gradual requirement for High Efficiency Toilets (HET) in all new construction	99%
Perform distribution system leak detection and repair whenever the audit reveals that it would be cost-effective	97%
Provide conservation information in bill inserts	92%
Coordinate with other entities in regional efforts to promote water conservation practices	92%
Support of legislation prohibiting sale of toilets using more than 1.6 gpf	92%
Offer free interior and exterior water audits to identify water conservation opportunities	90%
Provide speakers to community groups and media	89%

Table 11. Top Ten BMPs – Small Water Systems.

Top Ten BMPs Implemented for Small Water Systems	2020
Perform distribution system leak detection and repair whenever the audit reveals that it would be cost-effective	99%
Complete an audit of water distribution system at least every three years as prescribed by American Water Works Association	96%
Advise customers when it appears possible that leaks exist on customer's side of water meter	94%
Implement requirements that all new connections be metered and billed by volume of use	93%
Establish a program to retrofit any existing unmetered connections and bill by volume of use	91%
Provide conservation information in bill inserts	81%
Encourage local nurseries to promote use of low water use plants	71%
Support of legislation prohibiting sale of toilets using more than 1.6 gpf	69%
Provide individual historical water use information on water bills	62%
Enact and enforce measure prohibiting water waste as specified in Monterey County Water Resources Agency Ordinance No. 3932 or as subsequently amended, and encourage the efficient use of water	50%

Table 12. Water Use per Connection – Small Water Systems (2015-2019).

Small Water Systems: Water Use (AF) Per Connection Class	2015	2016	2017	2018	2019
Single-Family Residential	0.416	0.426	0.516	0.411	0.429
Multi-Family Residential	0.603	0.640	0.689	0.567	0.763
Commercial/ Institutional	0.963	0.709	0.940	0.769	0.864
Industrial	5.001	12.652	12.562	12.055	84.342
Landscape Irrigation	1.945	1.100	1.934	3.220	3.559
Other	1.130	0.454	1.098	2.819	3.066

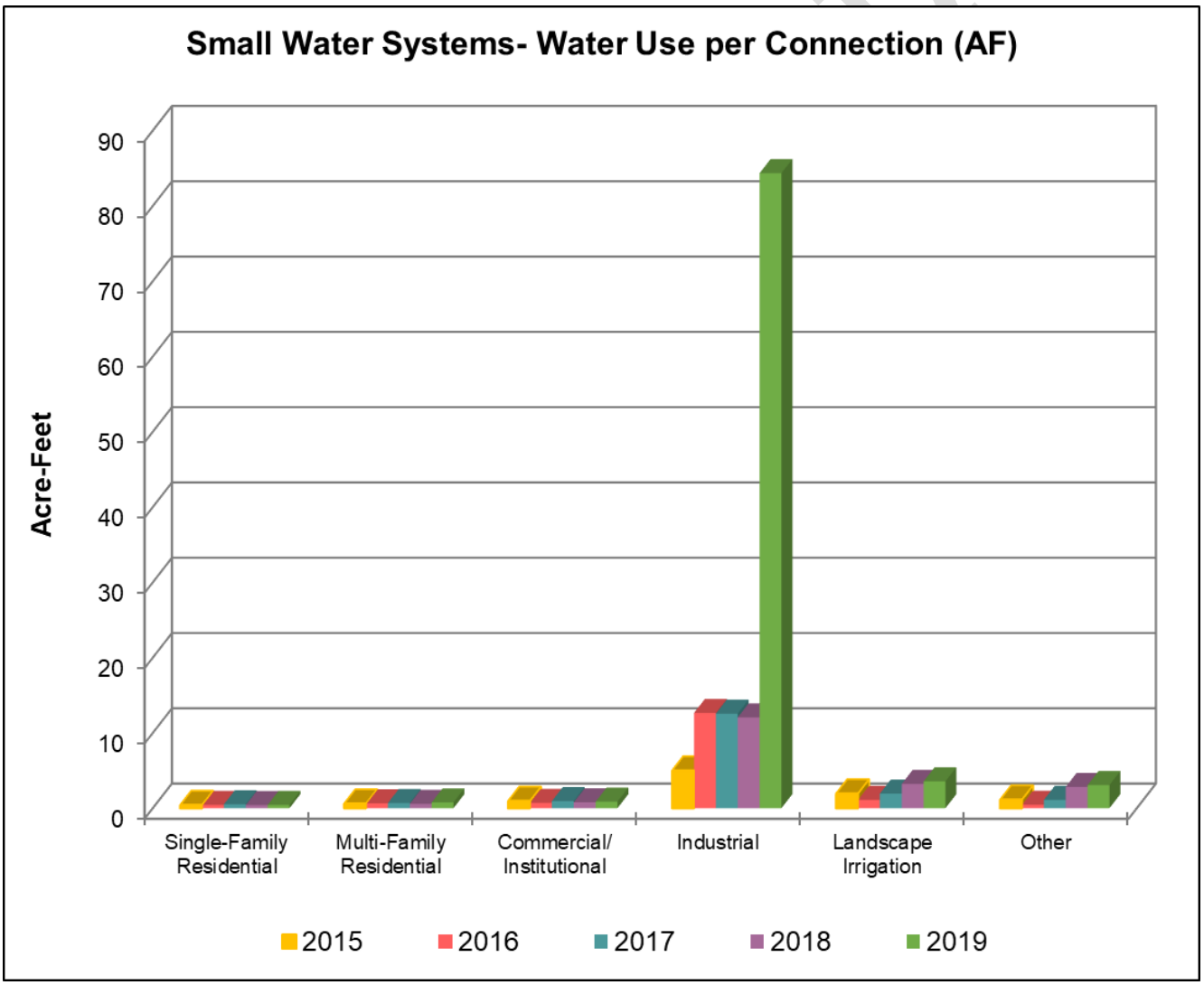


Figure 23. Urban Water Use per Connection – For Small Water Systems

Table 13. Water Use per Connection – Large Water Systems (2015-2019).

Large Water Systems: Water Use (AF) Per Connection Class	2015	2016	2017	2018	2019
Single-Family Residential	0.314	0.274	0.292	0.282	0.277
Multi-Family Residential	1.296	0.858	1.026	0.892	0.827
Commercial/ Institutional	0.965	1.579	1.583	1.635	1.553
Industrial	3.910	15.491	15.718	19.879	18.712
Landscape Irrigation	4.828	1.195	2.138	2.157	2.133
Agricultural Irrigation	-	38.649	21.223	87.650	110.451
Other	15.591	1.918	0.934	2.382	2.034

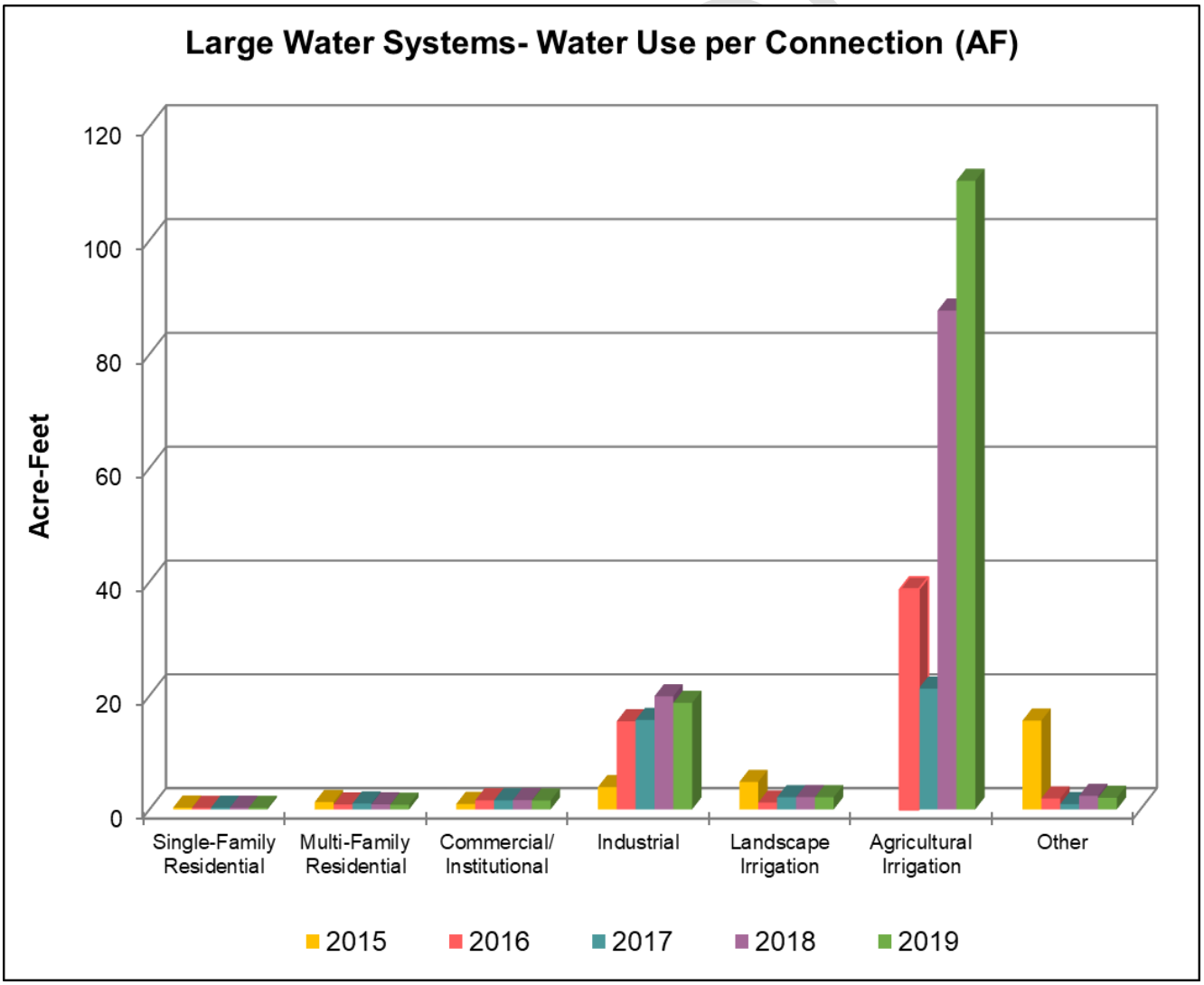


Figure 24. Urban Water Use per Connection – For Large Water Systems

Monterey County
Board of Supervisors

Luis Alejo	District #1
John M. Phillips	District #2
Chris Lopez	District #3
Wendy Root Askew, Chair	District #4
Mary Adams, Vice- Chair	District #5

Monterey County Water Resources Agency
Board of Directors

Mark Gonzalez	District #1
Mike Scattini	District #2
Marvin Borizini	District #3
Deidre Sullivan	District #4
Ken Ekelund	District #5
Matt Simis	Grower-Shipper Association
Jason Smith	Monterey County Farm Bureau
John Baillie, Chair	Agricultural Advisory Committee
Mike LeBarre	City Select Committee

Monterey County Water Resources Agency

Brent Buche, General Manager
Elizabeth Krafft, Deputy General Manager

Groundwater Extraction Summary Report Team

Howard Franklin, Senior Hydrologist
Tamara Voss, Associate Hydrologist
Nicole Koerth, Water Resources Hydrologist
Marinn Browne, Water Resources Technician

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