

The Economic Impact of the Westlands Water District on the Local and Regional Economy: 2022 Update

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Westlands Water District

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EXECUTIVE SUMMARY

Agriculture is important to the economy of the California Central Valley. The agricultural products produced in the Central Valley are critical to meeting the food supply and food security needs of the United States and around the world. Those facts were in evidence and documented in our 2016 study and they remain today. This study revisits and updates the economic analysis released in 2016 titled *The Economic Impact of Westlands Water District on the Regional and Local Economy*. The purpose of this report is to both provide updated estimates of these impacts and to provide an update on the local community context in which these impacts play out, including an introduction to the complexities introduced by COVID-19 and associated impacts to the overall economy.

WESTLANDS WATER DISTRICT IS AN IMPORTANT CONTRIBUTOR TO THE LOCAL AND STATE ECONOMIES

Westlands Water District, in aggregate, is directly and indirectly responsible for some $4.7 billion dollars of economic activity and nearly 35,000 jobs across the economy as seen in Figure ES-1.

Figure ES-1—Overall Economic Impact of the Westlands Water District, By Activity Category, 2019

EMPLOYMENT	Jobs Created	Share
Crop Production	16,424.1	46.8%
Secondary Agricultural Production	17,711.3	50.4%
Westlands Operational Activity	979.2	2.8%
Total Effect	**35,114.5**	**100.0%**

ECONOMIC IMPACT	Total Impact	Share
Crop Production	$3,172,012,510	67.3%
Secondary Agricultural Production	1,416,214,229	30.0%
Westlands Operational Activity	126,764,976	2.7%
Total Effect	**$4,714,991,715**	**100.0%**

Most of these impacts are direct impacts, created through the growing of agricultural products and the added value associated with the processing and handling of those products. The direct impacts of activities that occur in Westlands Water District represent some $3.2 billion of economic impact. Secondary impacts of these activities (through indirect and induced economic

effects) add another $1.5 billion of economic impacts. Further, these direct and secondary activities account for more than 35,000 jobs.

WESTLANDS WATER DISTRICT IS AN IMPORTANT CONTRIBUTOR TO THE REGIONAL AND NATIONAL ECONOMIES

California's growing regions are the nation's primary source of fresh fruit, nuts, and vegetables. California growers account for well over half the total U.S. production of nearly every category of fresh fruit and vegetables consumed in the United States—accounting for more than 85 percent of the production for twenty-three crops and more than 45 percent of the U.S. production of 36 crops.

Farmers in the Westlands Water District are major contributors to the national production of many key agricultural products as seen in Figure ES-2. Farms in Westlands contribute almost 23 percent of fruit and nut production in Fresno County, and almost half of the vegetable and melon produced in the county. Similarly, for Kings County, the limited acreage that falls within Westlands Water District accounts for 13.4 percent of Kings County fruit and nut crops, and more than 36.3 percent of the vegetable and melon crops. Nationally, farms in Westlands provide 3.5 percent of the national production of fresh fruit and nuts and 5.4 percent of the national production of vegetables and melons—an impressive total given the small scale of the District relative to the total arable land in the United States. This 5.4 percent compares to 3.1 percent in the 2016 study, reflecting the fact that when the District receives more of its surface allocation (75 percent in 2019 versus 0 percent in 2014), it is able to contribute more to the national output in these healthy crops.

Figure ES-2—Westlands Water District Overall Share of Fresh Fruit, Nut, and Vegetable Crops, Estimated Crop Values by Category, 2019
(thousands of dollars)

	Westlands Water District	Fresno County	Kings County	California	United States
Fruit and Nut Crops	1,009,528	4,246,673	644,224	21,419,425	29,026,988
Vegetables and Melons	768,193	1,429,003	180,649	8,237,276	14,157,279
All other	169,171	394,555	479,059	7,723,771	
Total	**$1,946,893**	**$6,070,231**	**$1,303,932**	**$37,380,472**	

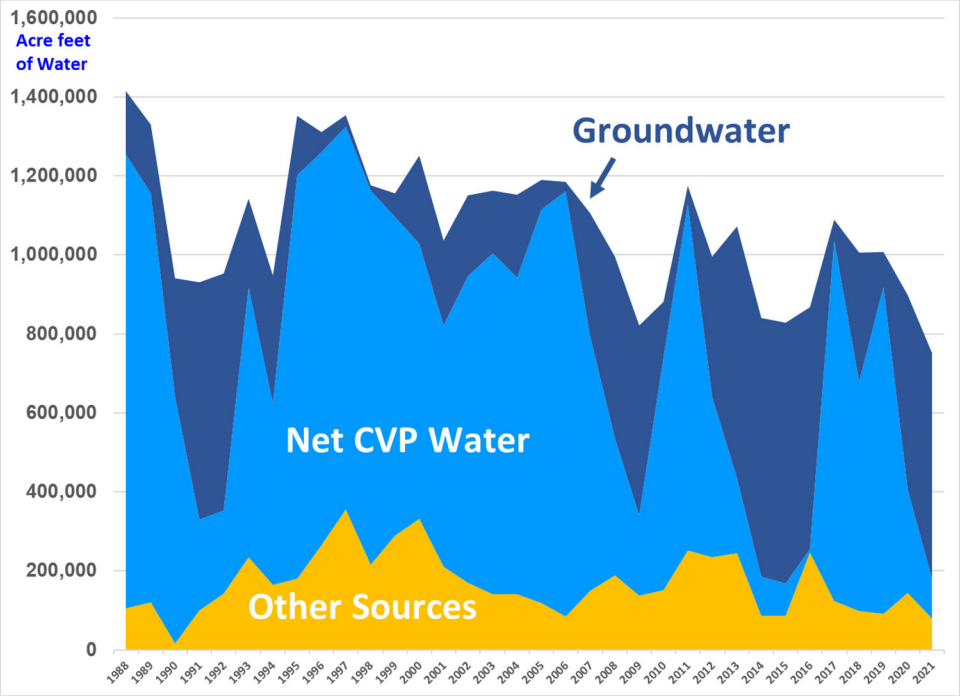
Westlands Water District - Share of Overall Output				
Fruit and Nut Crops	22.9%[a]	13.4% [a]	4.7%	3.5%
Vegetables & Melons	44.7% [a]	36.3% [a]	9.3%	5.4%
All other	24.1% [a]	3.8% [a]	2.2%	
Total	**28.1%** [a]	**13.1%** [a]	**5.2%**	

[a]-includes only the share of production of farms within the Westlands Water District that are within each respective county-imputed from 2019 data.

WESTLAND WATER DISTRICT'S WATER SUPPLIES ARE HIGHLY VARIABLE

The history of Westlands Water District's water supply over the past several decades is shown in Figure 3. The surface water from the CVP, shown in light blue, fluctuates up and down while the groundwater, shown in dark blue, fills in some of the gaps in years with low allocations.

Figure ES-3—History of Water Supply in Westlands Water District, Water Years Ending 1988 to 2021



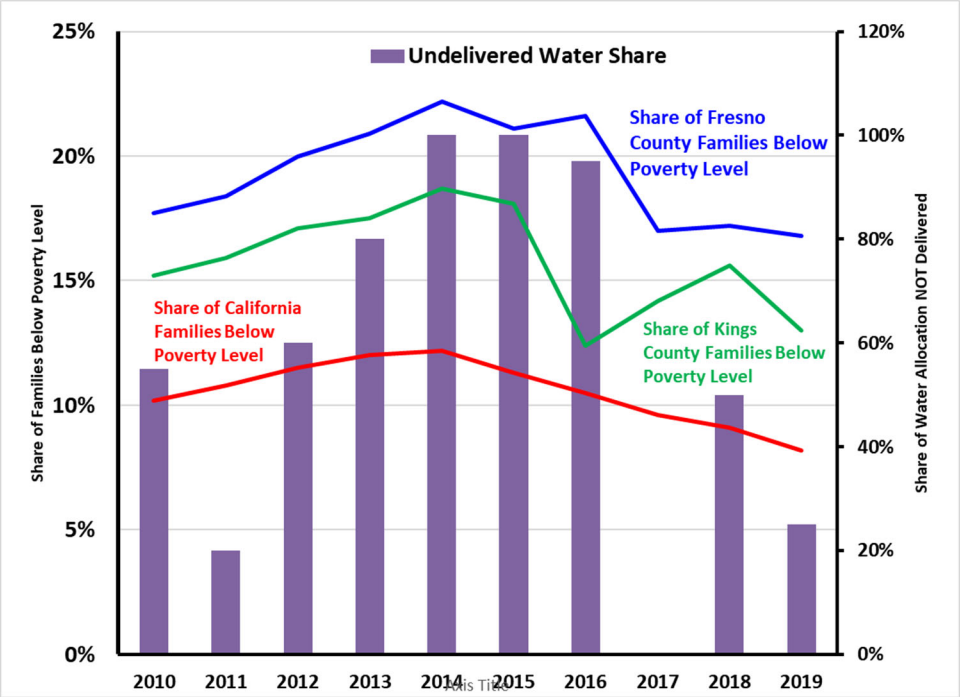
NOTE: "Net CVP Water" represents the CVP allocation adjusted for carryover and rescheduled losses. "Other Sources" includes private landowner water transfers and additional supplies acquired by the District.

Groundwater usage is higher in years when surface water is not made available. The use of groundwater is beginning to be impacted by the state's Sustainable Groundwater Management Act (SGMA) and is expected to be more of a limitation in the future—especially in periods of drought when surface supplies are constrained by policy and availability.

The Region Surrounding the Westlands Water District Is Relatively Poor and Agriculture Is the Key to Economic Opportunity

The region served by the Westlands Water District is poor compared to the state and that poverty is persistent over time. Figure ES-4 shows the trends in poverty rates for families over the past decade offset against a measure of how great the water restrictions were during the same periods (shown as vertical bars in the figure). Both Fresno (blue) and Kings Counties (green) not only show persistently higher poverty rates than the state average (red), but they are also steeper, reflecting a higher rate of growth of poverty in the region.

Figure ES-4—Percentage of Families with Incomes Below the Poverty Level, California, Kings and Fresno Counties and Undelivered Shares of Central Valley Project (CVP) Water, 2010-2019



On the right axis of Figure ES-4, the vertical bars represent the share of water from the Central Valley Project NOT delivered to the Westlands Water District in each water year. It is striking how closely the overall trend of these poverty levels in the two counties mimic the shortfalls in water deliveries from the CVP to the Westlands Water District. While not proof of causality, the visual correlation is quite high over the last decade, including significant declines in poverty rates in 2016 and 2017 when surface water was abundant in Westlands.[1] Even with the real declines in poverty rates over the past several years, poverty persists more strongly in Fresno and Kings Counties than across the state, and changes in the agricultural water supply are an important contributor to some of these trends.

[1] This is likely also impacted by changes in the minimum wage rules during the same period.

Growers in the Westlands Water District Continue to Be a Key National Resource for a Quality and Safe Food Supply

In reviewing the data for the current study, the team found that the conclusions from our 2016 study continue to be relevant today. That study found that growers in the Westlands Water District represented a key national asset in the following five areas:

1. Reliable domestic production of key foodstuffs is essential to a robust national security strategy. Especially with the labor market supply chain disruptions around COVID-19 on the production of foodstuffs and the complexities of moving goods across international borders, it is even more critical to have a predictable and reliable food supply.
2. Domestic food production continues to be held to higher quality and safety standards than production in countries from which the U.S. imports agricultural products.
3. Domestic producers must meet stringent standards to protect the environment while foreign producers, especial in Central and South America are held to lower environmental standards.
4. Labor regulation in these same foreign markets is typically much more relaxed and workers often bear greater risks for significantly less pay and benefits.
5. Production outside of the United States is often less effective at stewarding the precious resources upon which agriculture depends, including water and soil quality.

COVID-19 and Its Aftermath Also Impact the Economic Potential of the Westlands Water District's Contributions to the Economy

This analysis documents many of the beneficial economic impacts of the Westlands Water District on the local, regional, state, and national economies, however, it unfolds during a time of tremendous instability and uncertainty. There are many dimensions of the current demographic, economic, and public policy environments that could and will have significant impacts on how that impact varies in the future and, to a limited extent, how it has changed already. The final section of the analysis recognizes some of the potential challenges in each of the following areas:

- Climate change and precipitation levels: Variable precipitation patterns and volumes can and will reshape the availability of water resources throughout the state and region.
- Supply chain and support disruptions: Current and anticipated disruptions in the supply chain can and will impact how farmers get the resources they need to produce food and how those goods are brought to both domestic and international markets. Supply chain issues also affect what food can be imported into the United States, making domestically-produced crops not only more valuable, but also more reliable in politically uncertain times. Despite the current supply chain crisis, fresh fruit and produce continue to be available in the United States only because farms in California continue to provide some 80 percent of the nation's supply. If this domestic production is curtailed, it will make the nation dependent on foreign sources which are, in turn, much more subject to supply chain and transportation problems.
- Labor market shifts due to current immigration policies: Shifting labor and immigration patterns across the United States are likely to impact both the labor supply and wages for workers in the Westlands Water District's service area.
- The COVID-19 pandemic: The pandemic and the range of public policy responses to it are driving changes that impact supply chains, the overall economy, and labor markets throughout the nation, including within the boundaries of the Westlands Water District.

CONCLUSION

The economic effects of the Westlands Water District on the Fresno region, the Central Valley, the state of California, and the nation is undeniable. Westlands is a significant supplier to the nation and the world of quality fresh produce and agricultural products. In the production of that supply, it directly and indirectly employs and supports tens of thousands of households and creates billions of dollars of economic value. While there are a range of modern policy and economic crises that may influence the level of that production, there are no real domestic alternatives for production of these critical agricultural products—its climate, soil, people, and infrastructure are unique.

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INTRODUCTION

Agriculture is important to the economy of California's Central Valley. The agricultural products produced in this area are critical to meeting the food supply and food security needs of the United States and around the world. Those facts were in evidence and documented in our 2016 study and they remain today. This study revisits and updates the economic analysis released in 2016 titled *The Economic Impact of Westlands Water District on the Regional and Local Economy*. The purpose of this report is to both provide updated estimates of these impacts and to provide an update on the local community context in which these impacts play out, including an introduction to the complexities introduced by COVID-19 and associated impacts to the overall economy. Toward those ends, this report will replicate some of the descriptive aspects of our prior report while providing an updated and comparative analysis. In this way, this report can serve as a stand-alone resource for those wanting to understand the full economic impacts and context of the Westlands Water District (Westlands or District).

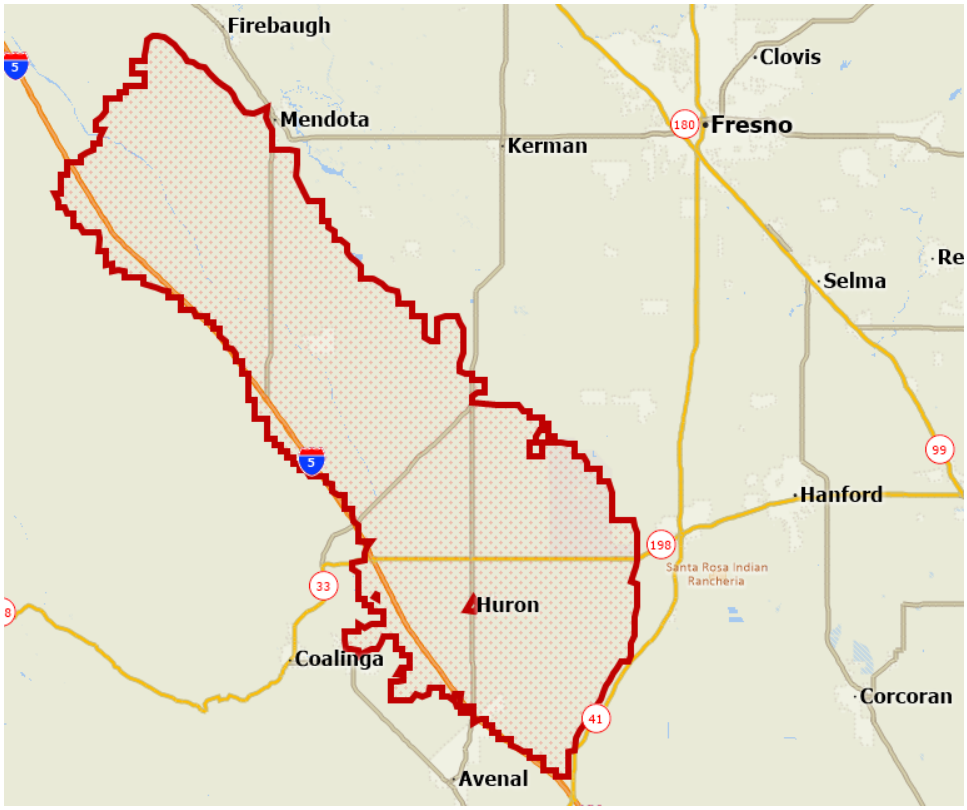
THE WESTLANDS WATER DISTRICT

To anyone who visits the Westlands Water District, the one reality that is most obvious to the observer is that agriculture ***IS*** (and continues to be) the economy in the communities within and immediately surrounding the Westlands Water District. It is an area characterized by wide open fields—often populated with crops and occasional small pockets of residential and (rarer) retail—usually at the intersections of roads. Not only is agriculture the primary employer, but government, agricultural support industries, and the limited general retail sector comprise the full course of jobs within the District and its immediate environs. Nearly every business in the District is related to agriculture or supports the needs of those working in agriculture.

The Westlands Water District sits largely on the eastern side of Interstate 5 in western Fresno County. Its eastern border generally follows the path from Firebaugh to Lemoore, while its western border reaches south to Kettleman City in Kings County. Its 1,000 square miles contains some of the richest farmland in the nation, producing approximately $2 billion in crops in 2019, with an overall economic impact of more than $4.7 billion. The land within the District itself is sparsely populated, with only one incorporated city within its borders—the City of Huron whose estimated population totals 6,206. As seen in Figure 1, it is surrounded on its edges by larger cities like

Firebaugh (pop. 8,096), Mendota (pop. 12,595), Lemoore (26,199), Avenal (12,373) and Coalinga (17,590). Fresno (pop. 542,107) is nearby and home to the District's administrative headquarters.[2]

Figure 1—Map of the Westlands Water District



SOURCE: Caliper Data Systems, Maptitude 2016.

The Westlands Water District, forged into its current scale in June of 1965 through a merger with the neighboring Westplains Water Storage District, is the largest agricultural water District in the United States. As such, it has a primary water contract with the federal government in excess of 1,150,000 acre-feet of water annually and additional contracts to transport water through its networks to the Lemoore Naval Air Station and the cities of Coalinga and Huron. In years when the federal government provides less than its contracted amounts, the District must provide less water to its customers and find additional water elsewhere. This is typically done through

[2] All population numbers are from the California Department of Finance and compiled from the 2020 decennial census. Further details can be found on the Department of Finance's website at: https://www.dof.ca.gov/Forecasting/Demographics/.

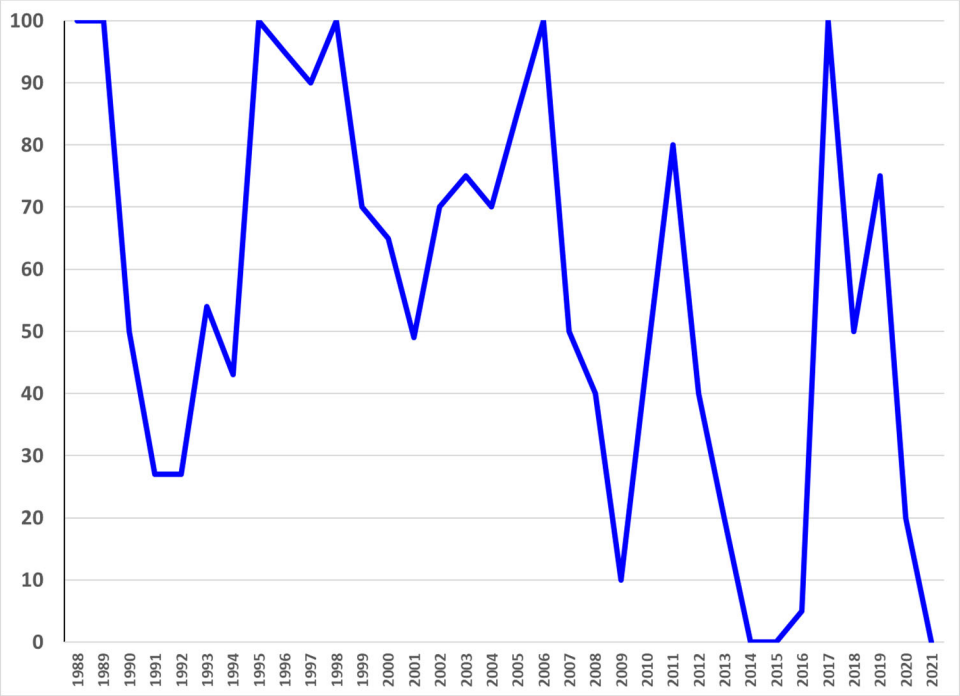
expensive purchases from other users, such as other public water agencies, or by the costly use of pumping groundwater.

Pumped groundwater is typically more expensive than the originally contracted surface water because of the investment necessary to install pumps and the electricity necessary to bring it to the surface and move it to the desired use. There is also a history of land subsidence in areas of the region if groundwater is over-used. When land subsidence occurs, it can have detrimental long-term structural impacts to conveyance systems, bridges, roads, and other facilities.

Beyond the potential for land subsidence, the use of groundwater for agricultural irrigation can also create salinity issues for crops leading to lower crop yields and possible long-term damage to permanent crops. Surface water is preferred in most applications to groundwater when it is available. However, with prospective environmental and statutory limitations on the future availability of groundwater, groundwater supplies will likely not be able to replace the shortages caused when surface water supplies are significantly reduced.

The District received its full allocation from the Central Valley Project (CVP) only three times in the past quarter-century-in 1998, 2006 and 2017, as seen in Figure 2. In the last ten years, the District has only averaged 31 percent of its contracted allocation of surface water from the CVP. In 2011, conditions were favorable enough that the District did receive 80 percent of its allocation—a threshold that has only been crossed three times out of the last twenty years. In the five years of drought from 2012 to 2016, the District received little or no water from its annual contracts with the CVP. A plentiful water year in 2017 saw Westlands receive its full contractual allocation, followed by a couple of years with lesser but significant allocations. The past two years of drought in California have seen these allocations plummet to zero.

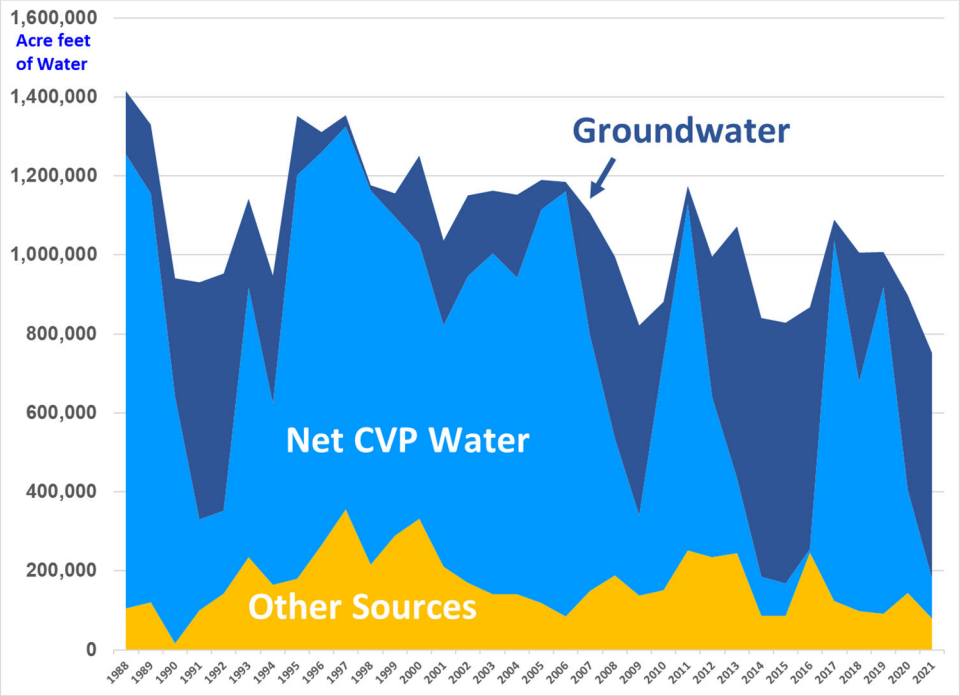
Figure 2—Net Share of Central Valley Project Water Allocation Received by Westlands Water District, 1988 to 2021



SOURCE: District data.

The history of Westlands Water District's water supply over the past several decades is shown in Figure 3. The surface water supply from the CVP, shown in light blue, fluctuates up and down while the groundwater supply, shown in dark blue, fills in some of the gaps in years with low allocations. The drought in recent years has led to a significant increase in pumped groundwater to replace the lost surface water as shown by the surge in the dark blue Groundwater area in years when light blue CVP water supply shrinks. Take note, however, of the larger downward trend in the total water supply over time. The peaks get lower, even as the valleys remain the same. This reflects a general decrease in overall water supply for the District. However, as will be discussed later, despite the downward supply trend, agricultural production has risen, due to increasingly effective use of available water supplies.

Figure 3—History of Water Supply in Westlands Water District, Water Years Ending 1988 to 2021



SOURCE: Westlands Water District data. NOTE: "Net CVP Water" represents the CVP allocation adjusted for carryover and rescheduled losses. "Other Sources" include private landowner water transfers and additional supplies acquired by the District.

Furthermore, the use of ground water is beginning to be impacted by the state's Sustainable Groundwater Management Act (SGMA). Under SGMA, water users in the areas serviced by Westlands (and other water districts) will become increasingly constrained in the amount of groundwater they can pump to replace the surface water that is not delivered because of state and federal regulations. This will have significant economic impacts going forward, especially in dry years.

This water context is important in understanding the economic structure and impact of the Westlands Water District because water supply and the cost of water, quite literally, drive the scale and character of the economic activity within the District. Water supply and water costs have also driven the District to invest heavily in technology, infrastructure and innovative farming practices that squeeze the last drop of value out of each drop of water.

Overview of the Economic Context and Demographics

As a major agricultural production area, Westlands Water District has an economic impact not only on local markets, but also on regional and global markets. The District's almond production, for example, is part of one of the

U.S.'s major export successes. But there are two stories involved in understanding the economic impact that Westlands Water District has on surrounding economies. The first is rooted in the reality of the towns and communities that are found in and around the District. It is critical to understand that, absent a vibrant agricultural industry, these communities would have no economic base or activity from which to draw their livelihoods. The second is rooted in the broader and more traditional economic impact analysis of how the value added of an industry in a specific location impacts not only the local communities, but also the surrounding areas and, quite possibly, the nation. The balance of this paper is broken into two sets of analyses addressing each of these threads—first, addressing the local context and second, exploring the industrial-scale impacts.

DEMOGRAPHICS OF THE REGION

Locally, the two counties served by the Westlands Water District are expected to grow by almost 400,000 people in the period from 2010 to 2060, with an average increase in population of 5.6 percent per decade, as show in Figure 4. The region of the state serviced by Westlands is expected to see a growth rate that outstrips the state of California, which is projected to increase only 3.8 percent per decade. This population is also projected to be increasingly Hispanic, rising in Fresno County from 50.4 percent in 2010 to 56.4 percent in 2060 and, in Kings County, rising from 50.9 percent in 2010 to 55.0 percent in 2060. To sustain a consistent quality of life and a stable economy, the region will need to grow the employment base significantly over this period.

However, these trends do reflect a significant adjustment to the state's overall demographic expectations. Just five years ago, when the original economic impact analysis was prepared, the state forecasted a much higher growth rate for the region and for the state overall. The state's current projections (using a 2020 baseline) show much more modest expectations of growth.

Figure 4—Population Estimates and Projections, Fresno and Kings Counties and California, 2010-2060

Estimated and Projected Population			
Year	Fresno County	Kings County	California
2010	933,249	152,398	37,366,938
2020	1,026,358	154,745	39,800,373
2030	1,096,638	165,752	41,860,549
2040	1,170,525	176,940	43,353,414
2050	1,226,158	185,868	44,049,015
2060	1,272,559	192,955	44,228,057

Comparison to State Projections Reported in 2015 Study			
State Projn for 2060 Reported in 2015 Study	1,587,852	259,506	51,663,771
Change in Projection	-19.9%	-25.6%	-14.4%

Percent Growth by Decade

Period	**Fresno County**	**Kings County**	**California**
2010 - 2020	10.0%	1.5%	6.5%
2020 - 2030	6.8%	7.1%	5.2%
2030 - 2040	6.7%	6.7%	3.6%
2040 - 2050	4.8%	5.0%	1.6%
2050 - 2060	3.8%	3.8%	0.4%

Comparisons of State Projections of Overall Growth			
Growth 2010 - 2060 from 2015 Study	70.2%	68.2%	38.4%
Current Projected Growth 2010 - 2060	36.4%	26.6%	18.4%

Share of Population Claiming Hispanic Ethnicity

	Fresno County	**Kings County**	**California**
2010	50.4%	50.9%	37.7%
2020	52.7%	53.2%	39.4%
2030	54.1%	54.4%	40.6%
2040	55.5%	55.1%	41.8%
2050	56.2%	55.2%	42.7%
2060	56.4%	55.0%	43.0%

SOURCE: California Department of Finance, Demographic Research Unit, baseline population projections by county, series P-1 and P-3, http://www.dof.ca.gov/Forecasting/Demographics/projections/, accessed October 12, 2021.

The 2020 projections, presented in Figure 4, show a 19.9 and 25.6 percent decline in the overall number of residents in Fresno and Kings Counties, respectively, in the year 2060 relative to the same projections conducted five years ago. Statewide, the overall population projections dropped by more than seven million people—or 14.4 percent.

The demographic projections in Figure 4 reflect a more conservative estimate of the number of new Californians entering the state as well as decreased fertility among current populations and a portion of the net impacts of the exodus of Californians heading to other states (as evidenced by near zero to very slightly positive net migration estimates).

In aggregate, this has a significant effect on population change projections. The average 10-year growth rate over the period in Figure 4 for the two counties in Westlands' service area dropped from an average of 11.1 percent to 6.2 percent per decade.

Despite this slower growth, the county is expected to continue to diversify ethnically (although not as much as predicted by the 2015 study). Figure 5 shows the current and projected racial and ethnic makeup of Fresno and Kings Counties and the state. Reflecting a long-standing trend, Hispanics are the largest race/ethnic group statewide and within Fresno and Kings Counties and are expected to continue to grow as a share of the overall population, rising to almost half the statewide population by 2060.

As Figure 5 also shows, in both Fresno and Kings Counties, the percentage of both Hispanic and African-American residents is expected to grow significantly as the growth in these two groups outstrips the overall growth projected in each of the counties as well as outstripping the, already respectable, growth expected for these two groups statewide. Within Kings and Fresno Counties, however, Hispanics already comprise a majority of the population and are expected to rise to more than 55 percent in both counties by the year 2060.

It is worth noting that these growth levels are generally lower than those projected in the 2015 study, especially for Hispanics—rising by about half of prior expectations for Hispanics in Fresno County and about a third of prior expectations in Kings County. Even with these adjustments, however, the areas served by Westlands will continue to be one of the most diverse regions of the state.

Figure 5—Projected Population, By Race/Ethnicity, Fresno and Kings Counties and California, 2010-2060

Fresno County							
Year	**African-American**	**Hispanic**	**Asian-PI**	**White**	**Other**	**Total**	**Percent Hispanic**
2010	45,528	470,144	89,543	306,332	21,702	933,249	***50.4%***
2020	49,945	541,324	99,387	309,101	26,601	1,026,358	***52.7%***
2030	54,493	593,296	105,148	311,951	31,750	1,096,638	***54.1%***
2040	58,742	649,315	109,775	315,470	37,223	1,170,525	***55.5%***
2050	62,070	689,705	112,376	319,626	42,381	1,226,158	***56.2%***
2060	65,069	717,382	113,587	328,812	47,709	1,272,559	***56.4%***
50-year Change *(2015 report)*	***42.9%*** *(34.8%)*	***52.6%*** *(110.7%)*	***26.9%*** *(97.4%)*	***7.3%*** *(-0.8%)*	***119.8%*** *(156.0%)*	***36.4%*** *(70.2%)*	

Kings County							
Year	**African-American**	**Hispanic**	**Asian-PI**	**White**	**Other**	**Total**	**Percent Hispanic**
2010	10,500	77,628	5,687	54,116	4,467	152,398	***50.9%***
2020	9,786	82,387	5,639	52,020	4,913	154,745	***53.2%***
2030	10,783	90,127	5,869	53,424	5,549	165,752	***54.4%***
2040	11,869	97,457	6,156	55,247	6,211	176,940	***55.1%***
2050	12,919	102,554	6,451	57,257	6,687	185,868	***55.2%***
2060	13,795	106,030	6,753	59,337	7,040	192,955	***55.0%***
50-year Change *(2105 report)*	***31.4%*** *(23.2%)*	***36.6%*** *(101.3%)*	***18.7%*** *(120.3%)*	***9.6%*** *(17.8%)*	***57.6%*** *(143.3%)*	***26.6%*** *(68.2%)*	

California							
Year	**African-American**	**Hispanic**	**Asian-PI**	**White**	**Other**	**Total**	**Percent Hispanic**
2010	2,193,017	14,072,650	4,968,763	15,051,585	1,080,923	37,366,938	***37.7%***
2020	2,283,480	15,681,521	5,360,026	15,187,246	1,288,100	39,800,373	***39.4%***
2030	2,438,338	16,993,646	5,511,276	15,445,731	1,471,558	41,860,549	***40.6%***
2040	2,545,427	18,126,139	5,575,757	15,439,636	1,666,455	43,353,414	***41.8%***
2050	2,594,934	18,811,087	5,549,758	15,254,786	1,838,450	44,049,015	***42.7%***
2060	2,621,128	18,996,392	5,457,751	15,165,325	1,987,461	44,228,057	***43.0%***
50-year Change *(2015 report)*	***19.5%*** *(1.4%)*	***35.0%*** *(81.1%)*	***9.8%*** *(66.9%)*	***0.8%*** *(-13.2%)*	***83.9%*** *(142.9%)*	***18.4%*** *(38.4%)*	

SOURCE: California Department of Finance, Demographic Research Unit, baseline population projections by county, series P-1 and P-3, http://www.dof.ca.gov/Forecasting/Demographics/projections/, accessed October 12, 2021.

THE ECONOMIC ROLE OF AGRICULTURE IN THE WESTLANDS WATER DISTRICT AND ITS ENVIRONS

Westlands Water District provides critical core infrastructure to the economies of two Central Valley counties—Fresno County and Kings County. While most of its operations lie within Fresno County, significant acreage is located within Kings County. While Westlands Water District does not directly supply water to the communities of Avenal, Lemoore, and Kettleman City, the District's agricultural footprint does directly impact the lives and economies of each. The agricultural sector within both of these counties is a major driver of employment and economic activity and, in some instances, such as for the City of Huron, the existence of agriculture provides the economic base upon which the entire community's existence is predicated.

THE ECONOMY OF THE DISTRICT'S REGION LAGS THE STATE

The Fresno County economy is not experiencing the same level of economic recovery experienced by the state on average. While Fresno County's labor force has shown signs of recovery from the Great Recession, COVID-19, and the state's latest drought, the unemployment rate still remains high at 9.5 percent, compared to 8.1 percent for the state overall in 2021, as seen in Figure 6. While this is closer to pre-recessionary levels, the unemployment rate in Fresno County is 17 percent higher than the overall state unemployment rate. It is also worth noting that COVID-19 has equalized this ratio quite a bit by bringing statewide employment levels down sharply. Even so, the state unemployment rate was down to 4.2 percent in 2019, compared to 7.4 percent in Fresno County.

Figure 6—Labor Force, Employment and Unemployment in Fresno County and California, 2005-2021

	Fresno County				California				
Year	Civilian Labor Force *(000s)*	Employ -ment *(000s)*	Unem-ployment *(000s)*	Unem-ployment Rate *(%)*	Civilian Labor Force *(000s)*	Employ -ment *(000s)*	Unem-ployment *(000s)*	Unem-ployment Rate *(%)*	County Rate Exceeds State By *(%)*
2021*	443.6	401.5	42.1	9.5%	18,938.1	17,404.8	1,533.4	8.1%	17.1%
2020	445.5	395.3	50.3	11.3%	18,821.2	16,913.1	1,908.1	10.2%	10.5%
2019	450.5	417.3	33.2	7.4%	19,353.8	18,550.5	803.2	4.2%	77.7%
2018	446.3	412.3	33.9	7.6%	19,263.9	18,442.4	821.5	4.3%	78.1%
2017	444.8	406.6	38.2	8.6%	19,173.8	18,246.8	927.0	4.8%	77.9%
2016	444.7	402.4	42.4	9.5%	19,012.0	17,965.4	1,046.6	5.5%	72.9%
2015	440.3	395.2	45.1	10.2%	18,824.1	17,647.4	1,176.7	6.3%	63.4%
2014	437.6	386.4	51.2	11.7%	18,676.7	17,264.5	1,412.2	7.6%	55.0%
2013	436.6	378.1	58.6	13.4%	18,565.4	16,887.9	1,677.5	9.0%	48.6%
2012	439.5	372.0	67.5	15.4%	18,484.9	16,541.0	1,943.8	10.5%	46.0%
2011	443.3	368.8	74.5	16.8%	18,406.8	16,220.6	2,186.2	11.9%	41.4%
2010	440.6	365.3	75.3	17.1%	18,370.5	16,078.5	2,292.1	12.5%	37.1%
2009	437.0	370.3	66.7	15.3%	18,306.0	16,193.1	2,112.8	11.5%	32.4%
2008	429.9	384.4	45.5	10.6%	18,179.9	16,856.1	1,323.8	7.3%	45.4%
2007	419.0	383.5	35.4	8.5%	17,910.7	16,955.4	955.3	5.3%	58.9%
2006	411.1	378.2	32.9	8.0%	17,661.2	16,797.8	863.3	4.9%	64.3%
2005	407.2	370.7	36.5	9.0%	17,537.9	16,593.6	944.3	5.4%	67.1%

SOURCE: California Employment Development Department data. * - Includes data through September 2021.

Kings County, the other county in the District's service area, is even more dependent on agriculture but lacks the diversifying impact of the large metropolis of Fresno. From an overall labor market perspective, Kings County reflects the same disparities and trends seen in Fresno County, as evidenced in Figure 7. Kings County's unemployment is at 10.0 percent, also off the highs of both the Great Recession and the recent pandemic-induced surge, but well in excess (by 23.9 percent) of the statewide unemployment rate and significantly higher than even Kings County's pre-recessionary employment levels. The size of the labor force is significantly smaller than Fresno's but the overall patterns remain similar to those seen above.

Figure 7—Labor Force, Employment and Unemployment in Kings County and California, 2005 - 2021

	Kings County				California				
Year	Civilian Labor Force *(000s)*	Employ -ment *(000s)*	Unem-ployment *(000s)*	Unem-ployment Rate *(%)*	Civilian Labor Force *(000s)*	Employ -ment *(000s)*	Unem-ployment *(000s)*	Unem-ployment Rate *(%)*	County Exceeds State By *(%)*
2021*	55.7	50.1	5.6	10.0%	18,938.1	17,404.8	1,533.4	8.1%	23.9%
2020	56.4	49.9	6.6	11.6%	18,821.2	16,913.1	1,908.1	10.2%	13.2%
2019	57.8	53.2	4.6	8.0%	19,353.8	18,550.5	803.2	4.2%	93.4%
2018	57.5	53.0	4.6	7.9%	19,263.9	18,442.4	821.5	4.3%	85.4%
2017	57.3	52.2	5.1	9.0%	19,173.8	18,246.8	927.0	4.8%	85.7%
2016	57.2	51.4	5.7	10.0%	19,012.0	17,965.4	1,046.6	5.5%	81.2%
2015	57.7	51.6	6.1	10.6%	18,824.1	17,647.4	1,176.7	6.3%	68.8%
2014	57.4	50.5	6.9	12.1%	18,676.7	17,264.5	1,412.2	7.6%	59.4%
2013	58.0	50.2	7.9	13.6%	18,565.4	16,887.9	1,677.5	9.0%	50.5%
2012	58.7	49.8	8.9	15.1%	18,484.9	16,541.0	1,943.8	10.5%	43.7%
2011	59.1	49.5	9.6	16.2%	18,406.8	16,220.6	2,186.2	11.9%	36.2%
2010	59.6	49.7	9.8	16.5%	18,370.5	16,078.5	2,292.1	12.5%	32.5%
2009	60.9	51.9	9.0	14.8%	18,306.0	16,193.1	2,112.8	11.5%	28.4%
2008	58.8	52.5	6.3	10.6%	18,179.9	16,856.1	1,323.8	7.3%	45.9%
2007	57.4	52.5	4.9	8.6%	17,910.7	16,955.4	955.3	5.3%	61.1%
2006	55.1	50.4	4.6	8.5%	17,661.2	16,797.8	863.3	4.9%	73.5%
2005	53.8	48.8	5.1	9.5%	17,537.9	16,593.6	944.3	5.4%	76.0%

SOURCE: California Employment Development Department data. * - Includes data through September 2021.

The income distribution in Fresno County is also skewed toward more low-income households, as Figure 8 shows, relative to the state. Almost one in four households in Fresno County (22.7 percent) have incomes of less than $25,000 and almost half (44.4 percent) have incomes under $50,000, producing a median household income that is 44 percent lower than the state median and an average household income that is almost $50,000 lower than the state average.

In the past five years, incomes (both median and mean) in Fresno and Kings Counties have generally risen, but at a pace much slower than the rest of California. While the number of Fresno County households making over $200,000 per year almost doubled from 3.0 percent to 5.7 percent, they are far below the statewide average of 13.7 percent of households.

Figure 8—Household Income and Benefits, Fresno County and California, 2019

Income and Benefits	Fresno County, California			California		
	Number *(households)*	Percent	Cumulative Percent	Number *(households)*	Percent	Cumulative Percent
Less than $10,000	24,453	7.7%	8%	601,685	4.6%	5%
$10,000 to $14,999	16,677	5.3%	13%	490,306	3.7%	8%
$15,000 to $24,999	30,663	9.7%	23%	871,341	6.6%	15%
$25,000 to $34,999	32,033	10.1%	33%	897,875	6.8%	22%
$35,000 to $49,999	36,318	11.5%	44%	1,306,618	9.9%	32%
$50,000 to $74,999	53,838	17.0%	61%	2,016,079	15.3%	47%
$75,000 to $99,999	39,127	12.4%	74%	1,645,318	12.5%	60%
$100,000 to $149,999	45,606	14.4%	88%	2,284,679	17.4%	77%
$150,000 to $199,999	20,352	6.4%	95%	1,241,231	9.4%	86%
$200,000 or more	16,907	5.4%	100%	1,802,741	13.7%	100%
Median household income *(dollars)*	$57,518			$80,440		
Mean household income *(dollars)*	$76,573			$113,563		
Share of Households with Incomes Under $25,000	22.7%			14.9%		
Share of Households with Incomes Under $50,000	44.4%			31.7%		

SOURCE: US Bureau of the Census, American Communities Survey.

The income distribution for Kings County, presented in Figure 9, looks similar as well, with only slight improvements. The share of households with incomes under $25,000 in Kings County is slightly lower than Fresno County's with 18.4 percent instead of 22.7 percent, but the share with incomes under $50,000 is essentially the same at about 43 percent.

Median household incomes are slightly higher at $58,453 (versus $57,518 for Fresno County) and mean household incomes are pretty close at $72,461 in Kings and $76,573 in Fresno County. Both are dramatically below the statewide median household income of $113,563 and the statewide mean household income of $86,704. The latter effect is likely driven by the relative absence of *very* high incomes in the small share of households with incomes in excess of $200,000.

Figure 9—Household Income and Benefits, Kings County and California, 2019

Income and Benefits	Kings County, California			California		
	Number *(households)*	Percent	Cumulative Percent	Number *(households)*	Percent	Cumulative Percent
Less than $10,000	2,051	4.6%	5%	601,685	4.6%	5%
$10,000 to $14,999	1,117	2.5%	7%	490,306	3.7%	8%
$15,000 to $24,999	5,074	11.3%	18%	871,341	6.6%	15%
$25,000 to $34,999	4,974	11.1%	30%	897,875	6.8%	22%
$35,000 to $49,999	6,037	13.5%	43%	1,306,618	9.9%	32%
$50,000 to $74,999	9,906	22.1%	65%	2,016,079	15.3%	47%
$75,000 to $99,999	5,707	12.7%	78%	1,645,318	12.5%	60%
$100,000 to $149,999	5,393	12.0%	90%	2,284,679	17.4%	77%
$150,000 to $199,999	2,902	6.5%	96%	1,241,231	9.4%	86%
$200,000 or more	1,600	3.6%	100%	1,802,741	13.7%	100%
Median household income *(dollars)*	$58,453			$80,440		
Mean household income *(dollars)*	$72,471			$113,563		
Share of Households with Incomes Under $25,000	18.4%			14.9%		
Share of Households with Incomes Under $50,000	43.0%			31.7%		

SOURCE: U.S. Bureau of the Census, American Communities Survey.

In our last study, both counties had *much* lower income profiles than the state and the gap between the state overall and the two counties in the Westlands service area continued to widen over the 2010 through 2014 period. Part of the region's improvements relative to five years ago is likely driven by changes in the state minimum wages laws which pushed wages higher. The ability to observe and verify the expected accompanying decline in the number of available jobs (as minimum wages rise) has been confounded by the COVID-19 pandemic and its overall impacts on employment patters.

When inflation is added into the mix, the households in Fresno and Kings Counties saw an overall decrease of more than eight percent in their real household incomes. Furthermore, the number of households with annual incomes of less than $25,000 continue to grow relatively consistently each year in both Fresno and Kings Counties during that period.

The years since that analysis have seen a more optimistic story unfold for Fresno and Kings County households. For the 2015 to 2019 period, median household incomes reported in the American Communities data have generally risen, as seen in Figure 10. This is true for the state overall (growing 13.3 percent over that time), Fresno County (18.7 percent) and even more so for Kings County (rising 20.1 percent). Part of this is the concept of a rising tide raising all ships. There is some year-to-year messiness in the

data, but Fresno and Kings Counties' median household incomes remain at an average of 71 and 76 percent of the state's median household income over this period, pointing to the overall state economy as the force driving a significant part of the change.

On a per capita income basis, there is also a consistent improvement across all three geographies, although Kings County outperforms the statewide average while Fresno County grows more slowly. Figure 10 also shows the number of households with median incomes under $25,000 generally declining in Fresno and Kings Counties over this period while the state share bounces a bit and remains relatively flat.

Figure 10—Trends in Median Household Income, California, Fresno and Kings Counties, 2015-2019

Region	2015	2016	2017	2018	2019	Change 2014-2019
Median Household Income (dollars)						
California	73,581	67,739	71,805	75,277	80,440	*13.3%*
Fresno County	52,651	48,715	51,800	52,629	57,518	*18.7%*
Kings County	52,557	53,234	57,555	61,663	58,453	*20.1%*
County Median Household Income Relative to State						
Fresno County	71.6%	71.9%	72.1%	69.9%	71.5%	
Kings County	71.4%	78.6%	80.2%	81.9%	72.7%	
Per Capita Income (dollars)						
California	31,587	33,389	35,046	37,124	39,393	*29.4%*
Fresno County	21,079	22,518	23,670	23,834	25,260	*25.2%*
Kings County	20,377	20,471	20,825	22,628	22,979	*32.2%*
Percent Households Under $25,000 Income						
California	14.8%	18.5%	17.3%	16.5%	14.9%	
Fresno County	25.1%	28.2%	24.6%	23.9%	22.7%	
Kings County	21.1%	21.0%	19.1%	16.5%	18.4%	

SOURCE: U.S. Bureau of the Census, American Communities Survey.

While the number of households with median incomes under $25,000 is generally declining in both Fresno and Kings Counties, there is still a significant share of each County's population that endures the realities of poverty. As Figure 11 shows, Fresno County is one of the poorer counties in the state, with almost one in six of its households finding themselves below the poverty level—more than twice the state average. For families with children, nearly one-fourth are in poverty—again twice the state average. For female, single parent households with children, that total rises to almost half

at 44.0 percent. More than one-fifth of the population of Fresno County is in a household under the poverty level.

As discussed above, however, these numbers are improved from where the county was just five years ago when more than a fourth of the county was under the poverty level. And yet, poverty in Fresno County has shown some intransigence in that the county's improvements in reducing the number of people in poverty is lagging behind the changes statewide. For example, in 2014, the share of families in Fresno County in poverty was 80.5 percent more than the statewide average. In 2019, the share of impoverished families in Fresno County exceeded the state average by 104.9 percent, reflecting how much more slowly the local economy is moving them out of poverty.

Figure 11—Percentage of Families and People Whose Income is Below the Poverty Level, Fresno County and California, 2019

Category	Fresno County *(%)*	California *(%)*	Exceeds California By *(%)*
All families	16.8%	8.2%	104.9%
With related children under 18 years	*24.5%*	*12.4%*	*97.6%*
Families with female householder, no husband present	35.5%	20.2%	75.7%
With related children under 18 years	*44.0%*	*29.5%*	*49.2%*
All people	20.6%	11.8%	74.6%

SOURCE: US Bureau of the Census, American Communities Survey.

Poverty patterns in Kings County, as shown in Figure 12, are also very similar, although, not as stark as those seen in Fresno County. Overall, poverty for families in Kings County is at 13.0 percent of all family households and 15.2 percent of Kings County individuals are in households below the poverty level—well above the statewide average of 11.8 percent. However, the poverty rate for single mother households with children is one of the bright spots of the past five years as the rate dropped from 51.6 percent in 2014 down to 32.6 percent in 2019—almost equaling the statewide average of 29.5 percent.

At the same time, it is important to note that, even while the proportions of households below the poverty level in Kings County are lower than those in Fresno County, they still significantly outstrip the state average; for example, the poverty rate among all individuals is 28.8 percent higher in Kings County than statewide.

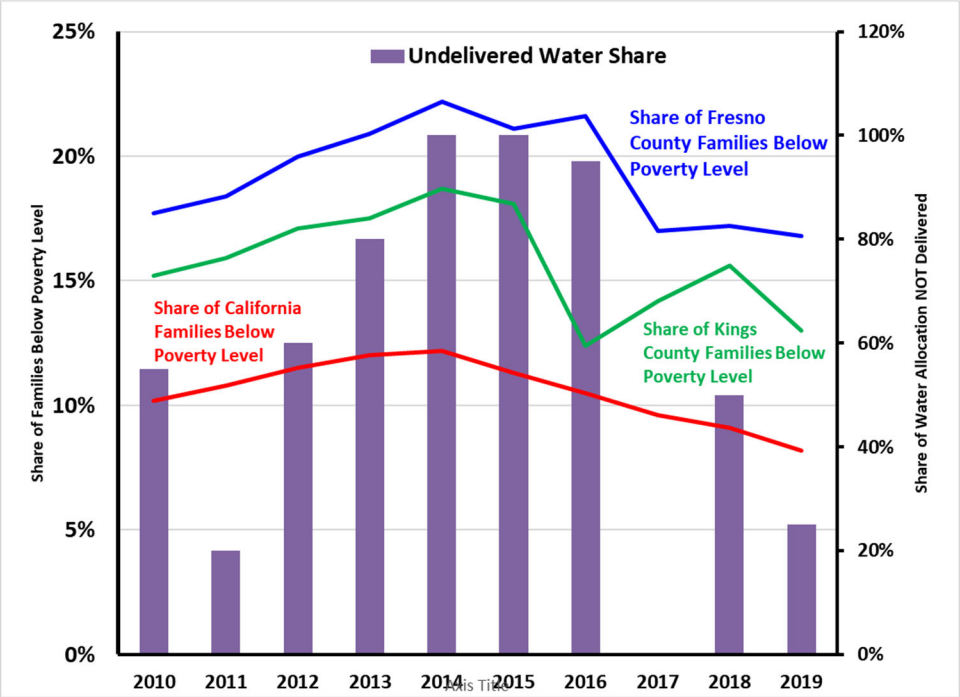
Figure 12—Percentage of Families and People Whose Income is Below the Poverty Level, Kings County and California

Category	Kings County *(%)*	California *(%)*	Exceeds California By *(%)*
All families	13.0%	8.2%	58.5%
With related children under 18 years	*17.5%*	*12.4%*	*41.1%*
Families with female householder, no husband present	27.2%	20.2%	34.7%
With related children under 18 years	*32.6%*	*29.5%*	*10.5%*
All people	15.2%	11.8%	28.8%

SOURCE: US Bureau of the Census, American Communities Survey.

The divergence between the state and Fresno and Kings Counties' poverty rates is persistent over time. Figure 13 shows the trends in poverty rates for families over the past decade offset against the undelivered share of the District's CVP contract amount during the same periods (shown as vertical bars in the figure). Both Fresno and Kings Counties not only show persistently higher rates than the state average, but they are also steeper, reflecting a higher rate of growth (and sometimes decline) of poverty in the region.

Figure 13—Percentage of Families with Incomes Below the Poverty Level, California, Kings and Fresno Counties, 2010-2019



SOURCE: US Bureau of the Census, American Communities Survey, Westlands Water District data.

Perhaps even more importantly, the overall trend of these poverty levels moves concurrently with the reductions in water deliveries from the CVP to

the Westlands Water District. While certainly not proof of causality, the visual correlation is quite high over the last decade, including significant declines in poverty rates in 2016 and 2017 when surface water was abundant in Westlands.[3] The key insight here, however, is that even with the real declines in poverty rates over the past several years, poverty persists more strongly in Fresno and Kings Counties and fluctuations in the agricultural water supply are likely important contributors to some of these changes.

It is also critical to remember that the onset of the COVID-19 pandemic follows these improvements and that, while Census data for the COVID-19 era are not yet available for households in this period, these rates will certainly surge with the onset of COVID-19 as workers lost jobs to business failures and to government imposed regulations, closures, and mandates. Add to that the need for many multi-earner households to curtail their work to care for children sent home from local schools and these numbers will be dramatically higher over the next several years.

In summary, Kings and Fresno Counties are both expected to experience significant population growth over the next few decades. They currently experience relatively high unemployment rates and an income distribution that is significantly lower than the statewide average. As a result, those in poverty, both the number of people in poverty and the share of the overall population in poverty, are rising and at a rate higher than is found statewide. Median household incomes within the region not only lag the state averages but are continuing to fall each year both in nominal and real terms.

AGRICULTURE'S ROLE IN THE WESTLANDS WATER DISTRICT ECONOMY

Employment in Fresno County is heavily reliant on agriculture. Figure 14 shows the breakdown in employment presented in the last report for the years 2010 through 2015. Direct jobs on farms accounted for more than one in eight jobs in the County during this period. This share had been dropping over those several years, as reduced crop outputs and changing crop mixes impacted the demand for farm labor in the County.

[3] This is likely also impacted by changes in the minimum wage rules during the same period.

Figure 14—Employment by Census-defined Industry Category, Fresno County, 2010-2015

Jobs by Industry	2010	2011	2012	2013	2014	2015
Farm Jobs	46,000	47,900	48,900	49,200	48,800	47,300
Mining, Logging & Construction	12,200	11,700	12,400	13,400	14,200	15,200
Manufacturing	24,100	23,800	23,700	23,000	24,000	25,500
Trade, Transportation & Utilities	55,100	57,300	58,200	60,700	61,900	63,500
Services	132,100	132,700	135,400	141,000	146,500	151,600
Government	67,100	65,700	64,100	64,200	66,300	68,800
Total Employment	**336,600**	**339,100**	**342,700**	**351,500**	**361,700**	**371,900**
Percent Employment by Industry	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Farm Jobs	13.7%	14.1%	14.3%	14.0%	13.5%	12.7%
Mining, Logging & Construction	3.6%	3.5%	3.6%	3.8%	3.9%	4.1%
Manufacturing	7.2%	7.0%	6.9%	6.5%	6.6%	6.9%
Trade, Transportation & Utilities	16.4%	16.9%	17.0%	17.3%	17.1%	17.1%
Services	39.2%	39.1%	39.5%	40.1%	40.5%	40.8%
Government	19.9%	19.4%	18.7%	18.3%	18.3%	18.5%
Total Employment	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Statewide - Farm Share of Jobs	**2.6%**	**2.6%**	**2.6%**	**2.6%**	**2.6%**	**2.6%**
Statewide - Food Mfg Share of Jobs	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**0.9%**
Statewide - Manufacturing Share of Jobs	**8.5%**	**8.4%**	**8.3%**	**8.1%**	**8.0%**	**7.8%**

SOURCE: California Employment Development Department data.

Figure 15 presents updated data for this overview of the Fresno County economy for the period 2015 through 2020. Most striking in this chart is the continued slow decline in farm jobs from their peak in 2012 and 2013 through 2019. From 2015 to 2019, the farm jobs declined from one in eight jobs in the region to one in nine. In 2020, there was another sharp drop, fueled in part by continued declines in water availability and in part by the disruptions that COVID-19 imposed on agricultural communities and farm production. Interestingly, agriculture's statewide share of employment has declined only slowly from 2.6 percent to 2.4 percent over this decade. 2020 saw a slight uptick to 2.5 percent as other parts of the economy suffered due to COVID-19. Another important measure of agriculture's importance to the economy is the fact that one in eight manufacturing jobs in the state is related to agriculture.

Figure 15—Employment by Census-defined Industry Category, Fresno County, 2015-2019

Jobs by Industry	2015	2016	2017	2018	2019	2020
Farm Jobs	47,300	46,900	46,100	44,200	44,100	41,100
Mining, Logging & Construction	15,300	16,400	17,700	19,000	19,300	18,900
Manufacturing	25,500	25,200	25,600	25,900	26,200	25,800
Trade, Transportation & Utilities	63,400	66,100	67,000	68,800	70,000	70,000
Services	151,700	157,900	161,300	165,900	172,600	161,900
Government	68,700	71,000	72,600	74,500	75,200	72,500
Total Employment	**371,900**	**383,500**	**390,300**	**398,300**	**407,400**	**390,200**
Percent Employment by Industry	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Farm Jobs	12.7%	12.2%	11.8%	11.1%	10.8%	10.5%
Mining, Logging & Construction	4.1%	4.3%	4.5%	4.8%	4.7%	4.8%
Manufacturing	6.9%	6.6%	6.6%	6.5%	6.4%	6.6%
Trade, Transportation & Utilities	17.0%	17.2%	17.2%	17.3%	17.2%	17.9%
Services	40.8%	41.2%	41.3%	41.7%	42.4%	41.5%
Government	18.5%	18.5%	18.6%	18.7%	18.5%	18.6%
Total Employment	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Fresno County - Farm Share of Jobs	**12.7%**	**12.2%**	**11.8%**	**11.1%**	**10.8%**	**10.5%**
State - Farm Share of Jobs	***2.6%***	***2.5%***	***2.4%***	***2.4%***	***2.4%***	***2.5%***
Fresno County - Mfg Share of Jobs	**6.9%**	**6.6%**	**6.6%**	**6.5%**	**6.4%**	**6.6%**
State - Mfg Share of Jobs	***7.9%***	***7.7%***	***7.6%***	***7.5%***	***7.4%***	***7.6%***
State - Food Mfg Share of Mfg Jobs	***12.1%***	***12.3%***	***12.5%***	***12.3%***	***12.3%***	***12.2%***

SOURCE: California Employment Development Department data.

Kings County's economy is even more dependent on agriculture than Fresno County's, as seen in Figures 16 and 17. Farm employment accounts for one in six jobs in Kings County compared to one in nine jobs in Fresno County. Government employment in Kings County is a major driver, accounting for almost one-third of all jobs, whereas it only accounted for 18.6 percent of Fresno County employment in 2019. In fact, government employs nearly twice the number of people directly employed on farms in Kings County.

Figure 16—Employment by Census-defined Industry Category, Kings County, 2010-2015

Jobs by Industry	2010	2011	2012	2013	2014	2015
Farm Jobs	6,600	6,200	6,500	6,900	6,900	7,500
Mining, Logging & Construction	900	900	800	800	800	900
Manufacturing	4,100	4,300	4,400	4,500	4,600	4,900
Trade, Transportation & Utilities	5,200	5,300	5,400	5,600	5,700	5,800
Services	11,500	11,300	11,600	11,800	12,300	12,400
Government	15,000	14,800	14,600	14,300	14,300	14,500
Total Employment	**43,300**	**42,800**	**43,300**	**43,900**	**44,600**	**46,000**

Percent Employment by Industry	2010	2011	2012	2013	2014	2015
Farm Jobs	15.2%	14.5%	15.0%	15.7%	15.5%	16.3%
Mining, Logging & Construction	2.1%	2.1%	1.8%	1.8%	1.8%	2.0%
Manufacturing	9.5%	10.0%	10.2%	10.3%	10.3%	10.7%
Trade, Transportation & Utilities	12.0%	12.4%	12.5%	12.8%	12.8%	12.6%
Services	26.6%	26.4%	26.8%	26.9%	27.6%	27.0%
Government	34.6%	34.6%	33.7%	32.6%	32.1%	31.5%
Total Employment	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Statewide - Farm Share of Jobs	**2.6%**	**2.6%**	**2.6%**	**2.6%**	**2.6%**	**2.6%**
Statewide - Food Mfg Share of Jobs	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**0.9%**
Statewide - Manufacturing Share of Jobs	**8.5%**	**8.4%**	**8.3%**	**8.1%**	**8.0%**	**7.8%**

SOURCE: California Employment Development Department data.

The overall share of jobs across each sector of the economy has remained relatively stable over the past ten years, although there have been very modest gains in the number of farm jobs through 2017 when subsequent limits on water availability began to adversely affect agricultural hiring. It is also important to note that a significant share of the manufacturing jobs in Kings County are agricultural-related jobs processing the products of its farmlands.

Figure 17—Employment by Census-defined Industry Category, Kings County, 2015-2019

Jobs by Industry	2015	2016	2017	2018	2019	2020
Farm Jobs	7,400	7,400	7,800	7,600	7,500	7,200
Mining, Logging & Construction	900	900	900	1,000	1,000	900
Manufacturing	4,900	4,800	4,900	4,900	4,900	4,600
Trade, Transportation & Utilities	5,900	6,300	6,700	7,200	7,200	6,700
Services	12,400	12,300	12,700	13,000	13,200	12,700
Government	14,500	14,700	14,700	14,900	15,100	14,300
Total Employment	**46,000**	**46,400**	**47,700**	**48,600**	**48,900**	**46,400**

Percent Employment by Industry	2015	2016	2017	2018	2019	2020
Farm Jobs	16.1%	15.9%	16.4%	15.6%	15.3%	15.5%
Mining, Logging & Construction	2.0%	1.9%	1.9%	2.1%	2.0%	1.9%
Manufacturing	10.7%	10.3%	10.3%	10.1%	10.0%	9.9%
Trade, Transportation & Utilities	12.8%	13.6%	14.0%	14.8%	14.7%	14.4%
Services	27.0%	26.5%	26.6%	26.7%	27.0%	27.4%
Government	31.5%	31.7%	30.8%	30.7%	30.9%	30.8%
Total Employment	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Kings County - Farm Share of Jobs	**16.1%**	**15.9%**	**16.4%**	**15.6%**	**15.3%**	**15.5%**
State - Farm Share of Jobs	***2.6%***	***2.5%***	***2.4%***	***2.4%***	***2.4%***	***2.5%***
Kings County - Mfg Share of Jobs	**10.7%**	**10.3%**	**10.3%**	**10.1%**	**10.0%**	**9.9%**
State - Mfg Share of Jobs	***7.9%***	***7.7%***	***7.6%***	***7.5%***	***7.4%***	***7.6%***
State - Food Mfg Share of Mfg Jobs	**12.1%**	**12.3%**	**12.5%**	**12.3%**	**12.3%**	**12.2%**

SOURCE: California Employment Development Department data.

At the same time, these tables understate the true impact of farming on the local economy. For each farm job identified in Figures 14 through 17, the regional economic models[4] predict there will be another 1.49-1.75 jobs directly related to providing support activities for agriculture in activities such as packing, soil preparation, processing, labor management, etc. In another study about agriculture's impact on the southern California economy published in 2012, 195,000 farming jobs *directly* supported some 198,000 jobs in agricultural processing and another 187,000 jobs in "Ag-support

[4] From IMPLAN regional modeling multiplier tables.

activities."[5] When the full economic impact of these farming jobs was counted, each farming job was associated with nearly 2.18 additional jobs elsewhere in the economy and each job in processing created by this production was associated with another 3.33 jobs. While there is some variation by region, it is likely that the regional models for the two-county region are conservative in their estimations because they are only capturing economic impacts of economic activity within the specified region (Fresno and Kings Counties) while the southern California models capture a broader sense of the impacts that agricultural output region has on production that happens elsewhere in the state.

But the "Farm Jobs" category denoted in Figures 14 through 17 and these multipliers tell only part of the story. Within all the employment sectors denoted in these tables are employers and businesses for who significant shares of their businesses are dependent on agricultural customers—especially in the areas of transportation, retail sales, and business services. While the multipliers capture the incremental impact of employment and economic impacts of direct agricultural production for some of these companies, many of the retailers who sell farm equipment, vehicle fuel, plumbing and irrigation supplies, etc. are heavily dependent on agricultural customers. Thus, the impact of losing sales across the sector adds up quickly. At some point, much as is the case with farmers, there comes a tipping point where the entire firm goes out of business. When this happens, the overall impact on employment is much greater than the marginal impacts identified in the regional impact models because the entire staff becomes unemployed. Even in the government employment sector, these impacts are significant. As agricultural employment in the region declines, as is seen in Figure 14 in Fresno County, agricultural workers are forced to migrate to other regions of the state. This in turn leads to fewer residents in the region and thus lower enrollment in local schools and thus fewer dollars to hire teachers and staff and purchase materials and supplies in the local school Districts. These impacts are likely to be exacerbated as limited access to water supplies and shifting crop mixes put downward pressure on the core agricultural employment base in the region.

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[5] Vergati, Jessica A. and Daniel A. Sumner, *Contributions of Agriculture to Employment and the Economy in Southern California*, University of California Agricultural Issues Center, July 2012, p. 45.

Another way to see the importance of agriculture in the region is to look at its major employers. The major employers in Fresno County also reflect the strong and dominant role of agriculture to the local economy, as shown in Figure 18.

Figure 18—Major Employers in Fresno County, Grouped by Size, Employers with More than 500 Employees, 2021

Employer Name	Location	Industry	Size
Community Regional Medical Ctr	Fresno	Hospitals	5,000 - 9,999 Employees
County of Fresno	Fresno	Government Offices - County	
State Center Community College	Fresno	Schools-Universities & Colleges	
Air National Guard	Fresno	Veterans & Military Organizations	1,000 - 4,999 Employees
Amazon	Fresno	Distribution Services	
California State University, Fresno	Fresno	Schools-Universities & Colleges	
California State Hospital – Coalinga	Coalinga	Government-Specialty Hosp	
California Teaching Fellows	Fresno	Employment Service-Govt Co Fraternal	
Cargill Meat Solutions	Fresno	Meat Packers (manufacturers)	
City of Fresno	Fresno	Government Offices - Local	
Clovis Unified School District	Clovis	Schools – K-12	
Foster Farms	Fresno	Poultry Farms	
Fresno VA Hospital Medical Center	Fresno	Government-Specialty Hosp	
Internal Revenue Service	Fresno	Government Offices - Federal	
Kaiser Permanente Fresno Medical Cntr	Fresno	Hospitals	
Lion Dehydrators	Selma	Dehydrating Services	
Pacific Gas and Electric	Fresno	Utilities	
Phebe Conley Art Gallery	Fresno	Art Galleries & Dealers (Part of Fresno State University)	
Pitman Farms	Sanger	Farms	
Pleasant Valley State Prison	Coalinga	Government Offices-State	
Shehadey Pavilion At St Agnes	Fresno	Hospitals	
St Agnes Medical Ctr	Fresno	Hospitals	
Stamoules Produce Co	Mendota	Fruits & Vegetables & Produce-Retail	
Wawona Frozen Foods, Inc	Clovis	Frozen Food Processors	
Gap Pacific Distribution Center	Fresno	Distribution Services	500 - 999 Employees
Pelco Inc	Fresno	Security Control Equip & Systems	
Save Mart Center	Fresno	Stadiums Arenas and Athletic Fields	
Sun Maid Growers	Kingsburg	Fruit & Vegetables & Produce	
Table Mountain Casino	Friant	Casinos	

SOURCE: California Employment Development Department data with updates from California Central Valley Economic Development Center (www.centralcalifornia.org).

While the list of largest employers is dominated by government, hospitals, and educational institutions (15 out of the 29 listed), half of the remaining private employers are farming and agricultural-related. Seven out of the fourteen non-government/health/education employers with more than 500

employees are agriculturally based. Agriculture is the dominant private contributor to the Fresno County economy.

Figure 19—Major Employers in Kings County, Grouped by Size, Employers with More than 100 Employees, 2021

Employer Name	Location	Industry	Size
Lemoore Naval Air Station	Lemoore	Government Offices-US	5,000 - 9,999 Employees
Adventist Health	Hanford	Hospitals	1,000 - 4,999 Employees
California State Prisons	SATF, Corcoran. Avenal	Correctional Institutions	
Del Monte Foods Inc	Hanford	Food Products & Manufacturers	
Hanford Community Med Center	Hanford	Health Services	
Hanford Regional Healthcare	Hanford	Physicians & Surgeons	
Kings County	Hanford	Government Offices-County	
Kings County School Districts	Various	Schools – K-12	
Leprino Foods Co	Lemoore	Cheese Processors (manufacturers)	
Olam Tomato Processors	Lemoore	Tomato Processors (manufacturers)	
Tachi Palace Hotel & Casino	Lemoore	Casinos	
Walmart Supercenter	Hanford	Department Stores	500 - 999 Employees
Central Valley Meat Co Inc	Hanford	Meat Packers (manufacturers)	250 - 499 Employees
Lemoore High School	Lemoore	Schools	
Marquez Brothers Intl Inc	Hanford	Mexican Food Products-Wholesale	
Naval Hospital - Lemoore	Lemoore	Hospitals	
Warmerdam Packing	Hanford	Fruits & Vegetables-Growers & Shippers	
Zepeda's Farm Labor Svc	Corcoran	Labor Contractors	
Badasci & Wood Transport	Lemoore	Trucking	100 - 249 Employees
Hanford Sentinel	Hanford	Newspapers (publishers/manufacturers)	
Excelsior Farming	Hanford		
J G Boswell Co	Corcoran	Manufacturers - Wine Barrels	
Keller Ford Lincoln	Hanford	Automobile Dealers-New Cars	
Lemoore Main Navy Exchange	Lemoore	General Merchandise – Retail	
Nichols Farms, Inc	Hanford	Farms	
Shiny Sugar	Hanford	Sugar Refiners (manufacturers)	
TC Transcontinental Packaging	Hanford	Plastics-Foil & Coated Paper Bags	
West Hills College-Lemoore	Lemoore	Schools-Universities & Colleges	

SOURCE: California Employment Development Department data with updates from California Central Valley Economic Development Center (www.centralcalifornia.org).

Kings County shows a similar pattern. Its list of major employers shown in Figure 19 reflects this dependence on government and agriculture for employment. Of the 28 top employers, 10 are again hospitals, governments, or educational institutions—fewer than Fresno County. Of the remaining 18, two-thirds (12 out of 18) are agriculturally-related. Given the relatively

smaller size of the economy, the firms are also smaller, but agriculture dominates.

These profiles are almost identical to those of five years ago. The bottom line is that both Fresno and Kings Counties continue to be heavily dependent on agriculture to fuel their local economies. Significant degradations in this sector will likely impact the counties' already-elevated poor populations and put increasing impacts on the social safety net and infrastructure of the region. While the thrust of assessing the potential risks of this dependence is left for a later study, the analysis will now turn to the direct economic impacts associated with the operations of the Westlands Water District.

UNDERSTANDING THE BROADER IMPLICATIONS OF WESTLANDS WATER DISTRICT'S ECONOMIC IMPACT AT THE INDUSTRY LEVEL

The economic impact of the Westlands Water District is primarily driven by the output of its two main customer bases: farmers growing crops in the District and the businesses and governments in the area who rely on the Westlands Water District to transport water for their uses. In the latter case, the District provides infrastructure to transport water from the state and federal water projects to customers in adjoining communities, such as the Lemoore Naval Air Station, and the cities of Huron and Coalinga. In these instances, the District does not provide water treatment for these customers, but rather delivery of the water to their sites for handling and treatment. Since each of these jurisdictions is then responsible for preparing the water for customer and business uses, this analysis will not include an economic impact footprint for these communities other than the transport function. However, the Westlands Water District does play a vital role in each of these communities since they would need to replace Westlands with another service provider absent its deliveries to them.

On the agricultural side, however, Westlands Water District's provision of water resources and infrastructure leads directly to the creation of economic value in the form of crops and the business of creating them. Whether it is through the direct delivery of "allocated," transferred, or purchased water; the provision of transport infrastructure; or the measuring, tracking, and pricing locally-derived water supplies, the Westlands Water District plays a leading role in the creation of farm products that have measurable and direct economic benefits.

The extent of agricultural crop production within the Westlands Water District is considerable, as shown in Figure 20, totaling nearly $1.76 billion of estimated crop value in 2015 and $1.95 billion in 2019.

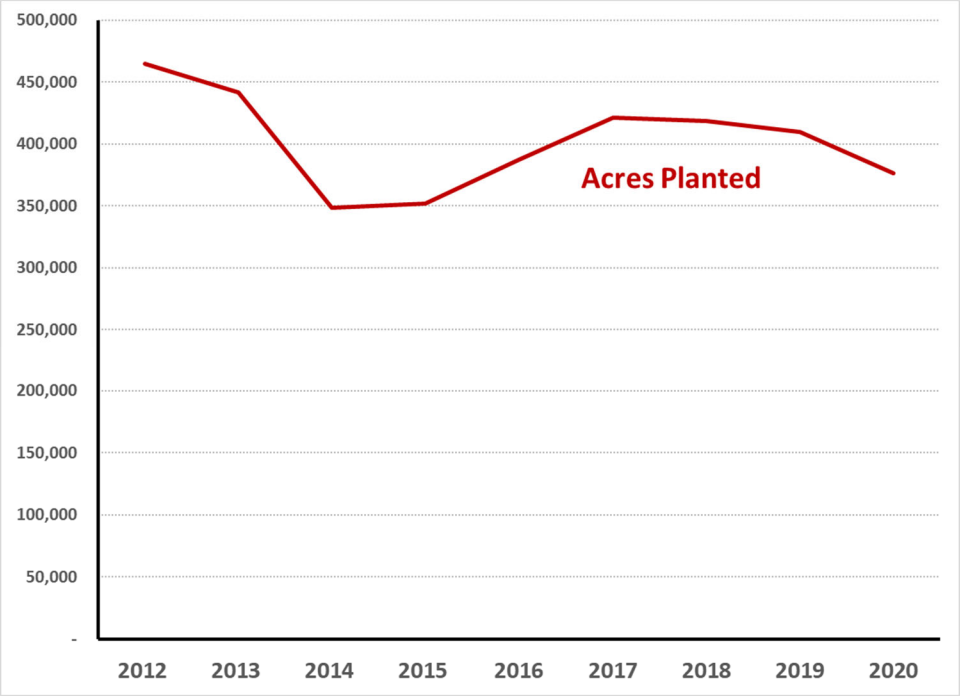
Figure 20—Estimated Crop Acreage and Value with the Westlands Water District, 2015 and 2019 Growing Seasons

	2015		2019	
Sector	**Acres**	**Estimated Value**	**Acres**	**Estimated Value**
Grain farming	33,187	25,334,037	18,013	11,950,542
Vegetable and melon farming	109,947	573,137,179	118,540	768,193,284
Fruit farming	27,166	160,801,620	27,704	168,452,354
Tree Nut farming	149,324	869,169,854	176,803	841,075,935
All other crop farming	32,269	132,318,569	68,447	157,220,952
Total Farming	**351,893**	**$1,760,761,260**	**409,507**	**$1,946,893,067**

SOURCE: District data and Fresno Farm Bureau *Annual Crop Report, 2014, Annual Crop Report 2019.*

Crop values are influenced not only by the amount of acreage planted, but also the yields on these parcels (units of crops produced per acre), and market prices. In terms of productive acreage, the 2019 growing season saw an increase in 16.4 percent increase in acres relative to the 2015 growing season. However, these need to be considered in the longer-term sequence of acres of crops planted rather than the point-to-point comparison. Figure 21 shows the number of cropped acres for the past several years. The cycles in this diagram correspond almost exactly to the level (share of contractual allocation) of water made available to Westlands through its CVP contracts.

Figure 21—Westlands Water District Estimated Acres Planted, 2012 – 2020 Growing Seasons



SOURCE: District data.

FARMING SERVES AS THE REGION'S ECONOMIC ENGINE

Farming, as an economic process, functions much like many natural resource-driven industries. One must first find a location that has the critical resources available to produce the product in question. For mining, as an example, it is the presence of the requisite ores in enough concentrations to be commercially feasible to harvest. In the case of farming, one must find locations with the right types of soils, farmable geography (mostly flat), appropriate growing seasons, consistently mild (or predictable) weather patterns, and water. The Central Valley is richly endowed with all but the last of these—water.

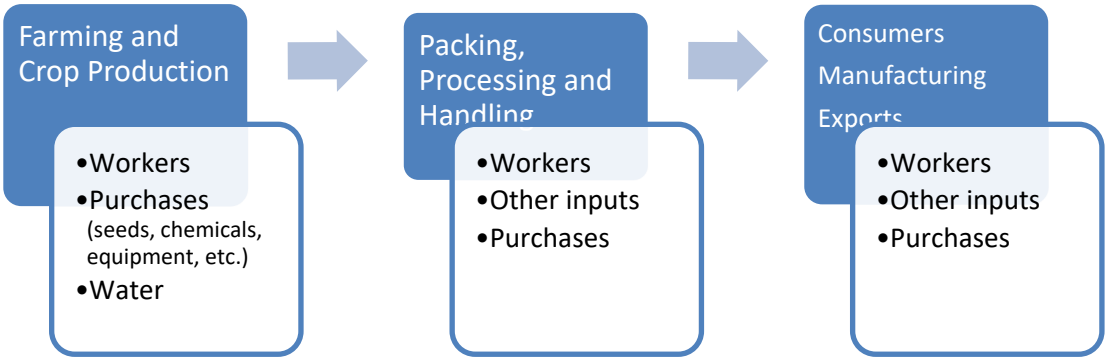
California and the U.S. government, with unusual foresight and planning, addressed the need for water by investing, in partnership with local landowners, in the infrastructure to provide water in commercially viable quantities and, as a result, California produces the vast majority of fresh produce, nuts and vegetables consumed in the United States and, for some types of products, the world. In Westlands' case it was the foresight of the federal government that led to the Central Valley Project and its resulting production.

While the current drought combined with state and federal regulatory actions have hampered the effective functioning of this system, farmers in the state's Central Valley have adapted to this changing environment through the use of technology and modified planting strategies. This has resulted in some significant changes to local planting patterns in recent years that, if sustained into the future, will affect the price and portfolio of fruits and vegetables available to consumers.

To produce these crops, the farmers hire employees; buy seed, fertilizers, farm equipment, fuel, water, irrigation equipment and supplies, fuel, and other supplies; hire attorneys, accountants, consultants, and other experts; build facilities, homes, and roads; and, in today's tech-savvy farming, develop computer and electronic monitoring infrastructure to track the status of their crops in real time. All of these activities contribute to the economic footprint of their farming activities.

Beyond this, as Figure 22 shows, these crops are then transported to other locations for packing and processing for eventual distribution to consumers, food product manufacturing, animal feeding, and other uses—both locally, domestically, and internationally. Within each of these steps in the food production process, additional inputs are required including labor (workers), infrastructure, production inputs (e.g., containers, electricity, other food products, etc.), and utilities like vehicle fuel, electricity, and gas.

Figure 22—Model of Farming's Economic Impact



Each of the steps in the production process is dependent on the preceding steps and factors—affecting one step in the process will affect the prices, will restrict supplies, or will result in fewer crops, which will in turn result in less produce available for packaging or processing, and eventually less produce available to food manufacturers and consumers. This ripple effect is important in estimating the economic impact that farming has because it goes

beyond the traditional "multipliers" people think of in economic processing to affect other entire sectors of the economy.

ESTIMATING THE ECONOMIC IMPACT OF THE WESTLANDS WATER DISTRICT

To estimate the economic impact of the Westlands Water District, this analysis will look at three components of its role in the local economy: (1) the economic value of the crops produced by the farmers who use its water and water infrastructure; (2) the economic value associated with the secondary markets that take these crops to their ultimate market destination; and (3) the economic value of the goods and services directly purchased by the District to provide the water infrastructure and services incumbent in its mission and business model. Each of these components is analyzed and aggregated to provide an overall impact.

METHODOLOGY

To estimate the economic impact of the three areas listed above, the primary economic value of each of the activities was inputted into the IMPLAN® economic modeling program. IMPLAN is the industry standard for providing economic impact analyses of specific activities. It is an "input-output" type simulation model that uses detailed economic data to calibrate its estimates of the subsequent impacts of various economic and policy-related activities. It breaks the economy down into approximately 400 sectors and uses detailed coefficient matrices to estimate the dynamic effects of policy choices through multiple iterations of impacts.

IMPLAN requires breaking the policy or impact to be analyzed into specific activities that fit its framework of sectors. With these inputs the model then provides the detailed impacts on employment, total economic output, proprietor income, labor income, and government tax revenues.

Generally, there are four steps to building these models: (1) defining the geography for the modeling; (2) breaking the policy or entity's impact into the requisite model sectors; (3) inserting them into the model; and (4) assembling and interpreting the results from the many scenarios.

For purposes of this analysis, Fresno County-level data were used to assess the economic impacts. Similar models were constructed using census tract-delineated boundaries for the District and building separate models for both

the Fresno and Kings County components of the Westlands Water District, however, those results are excluded here because adding the complexity associated with each did not materially affect the findings, presented here, using the Fresno County-based model. Crop acreage data were combined with the most recent available valuation information published in the Fresno County *2019 Annual Crop & Livestock Report*[6] to estimate crop values. Industry-specific studies of Secondary Agricultural Production levels were reviewed in combination with geographically-generated estimates from the IMPLAN model's 2019 data to create the requisite estimates of Secondary Agricultural Production valuations. Finally, sensitivity analyses were prepared for each to ensure that the uncertainty around each estimate did not materially reverse any of the findings presented here.

DATA AVAILABILITY

In preparing this economic impact analysis, data from the 2019 agricultural year were used to estimate the economic impacts described in this report. This is driven by the fact that detailed crop and crop valuation data were not yet available for the 2020 crop year. COVID-19 and the disruptions it introduced to the workflow and employment models in both the public and private sectors has delayed the timely release of the data that normally would be used in this analysis.

Preliminary crop acreage data for the 2020 crop year were available at the time of this analysis. To assess the robustness of the results, these available data were compared to the year used in this analysis. Figure 23 shows a comparison of the data for acres grown by crop type in the Westlands Water District for the 2019 and 2020 crop years.

[6] It should be noted that while the 2020 Kings County crop report was available to the author, the narrow range of crops detailed there limited its usefulness for building the models. COVID-19-related issues delayed the availability of the Fresno County Annual Crop Report, thereby limiting our ability to properly value and model the most recent acreage data available from 2020. Some sensitivity around this question will be provided later in this section.

Figure 23—Comparison of Acreage Planted in the

Westlands Water District, 2019 and 2020

Sector	2019	2020
Oilseed farming	120	191
Grain farming	18,013	15,325
Vegetable and melon farming	118,540	113,319
Fruit farming	27,704	27,525
Tree Nut farming	176,803	193,066
Horticulture and nursery	-	-
All other crop farming	68,327	27,148
Total Acres Planted	**409,507**	**376,574**

SOURCE: Westlands Water District data.

Figure 23 shows that there was an eight percent reduction in the acreage planted between 2019 and 2020, with the largest part of the shift coming in the "All other crop farming category," which was accounted for, mostly, by decreases in acreage producing cotton and hay. In fact, if the crop yield and value multipliers from 2019 are applied to the 2020 acreage totals, the total crop yield only decreases 3.7 percent, well within the tolerable error limits for an analysis of this time. The bottom line is that we believe that the estimates using the available data that are included in this analysis will fairly represent a reasonable estimate of the current economic footprint of the Westlands Water District.

WESTLANDS WATER DISTRICT HAS A MAJOR ECONOMIC IMPACT

With the methodological issues addressed, it is possible to estimate the overall impact of the operations of Westlands Water District on the economy. Figure 24 provides the results of this analysis.

Westlands Water District, in aggregate, is directly and indirectly responsible for some $4.7 billion dollars of economic activity and nearly 35,000 jobs across the economy. Most of these impacts are through what the model calls "direct effects"—specifically through the growing of agricultural products and the value added associated with the processing and handling of those products—representing some $2.9 billion of the economic impact and more than 25,000 jobs.

"Indirect effect" impacts, which account for another $757 million in economic impacts, are the economic activity associated with the activities necessary to accomplish the main production process but are not actually part of it. For example, when a farmer buys a truck to haul produce as part of their

operation, this will create jobs in the truck manufacturing sector as the demand for trucks goes up by one. In this case it generally represents the economic activity fueled by the non-labor inputs necessary to farm—including things like chemicals, planting and harvesting equipment, irrigation equipment and supplies, electricity, seed, spare parts, etc. It is worth noting that while these indirect impacts are proportionately smaller than the direct effects, this difference is NOT a measure of profitability. This model looks more directly at the value added of the activities, not their relative profitability.

Figure 24—Overall Economic Impact of the Westlands Water District, 2019

EMPLOYMENT	Jobs Created	Share
Direct effects of agricultural production	25,239.9	71.9%
Economic impact due to inputs to agricultural production (indirect effects)	3,004.7	8.6%
Impacts due to increased employee income and consumption (induced effects)	6,869.9	19.6%
Total Effect	**35,114.5**	**100.0%**

ECONOMIC IMPACT	Total Impact	Share
Direct effects of agricultural production	$2,858,124,930	60.6%
Economic impact due to inputs to agricultural production (indirect effects)	756,620,698	16.0%
Impacts due to increased employee income and consumption (induced effects)	1,100,246,086	23.3%
Total Effect	**$4,714,991,715**	**100.0%**

SOURCE: IMPLAN Pro and this analysis.

"Induced effect" economic activity is associated with the new spending power that individuals and firms have as a result of their participation in the production of the crops and its successor activities. It reflects the things that individuals and firms buy in the economy as the result of their wages and earnings. As people work in the sector and earn wages, they go out and buy food, clothes, cars, etc. These purchases then create economic demand for these products which in turn creates more jobs and economic activity in other sectors. As a result of the jobs created directly and indirectly through the Westlands Water Districts and its customers, almost $1.1 billion in new economic activity and 6,800 additional jobs are created.

Figure 25 shows this economic activity separated across the three tasks delineated above (growing crops, subsequent food production,[7] and Westlands' spending).

Figure 25—Overall Economic Impact of the Westlands Water District, By Activity Category, 2019

EMPLOYMENT	Jobs Created	Share
Crop Production	16,424.1	46.8%
Secondary Agricultural Production	17,711.3	50.4%
Westlands Operational Activity	979.2	2.8%
Total Effect	**35,114.5**	**100.0%**

ECONOMIC IMPACT	Total Impact	Share
Crop Production	$3,172,012,510	67.3%
Secondary Agricultural Production	1,416,214,229	30.0%
Westlands Operational Activity	126,764,976	2.7%
Total Effect	**$4,714,991,715**	**100.0%**

SOURCE: IMPLAN Pro and this analysis.

As this analysis shows, while the primary economic impact on total output of the Westlands Water District is through the direct production of crops, its employment impacts are concentrated in the secondary agricultural production dimension—in the packing, handling, processing, and subsequent manufacturing of food products derived from the agricultural products of farms in the District. There are two important implications of this result. First, as Figure 22 shows, none of these jobs will exist if the crop production does not happen—there must be tomatoes to process if you are a tomato processor. Second, many of these jobs may occur well beyond the physical boundaries of the Westlands Water District. One of the challenges of modelling a relatively small and sparsely populated geographic area like Westlands is that much of the subsequent economic activity, especially the Secondary Agricultural Production, will likely occur at regional processing facilities that may be located in nearby towns, or perhaps even in distant

[7] Subsequent food production (also called "Secondary Agricultural Production") was difficult to model due to the large variety of crops produced in WWD and the limited literature on value added in each. Our literature review focused on two of the largest contributors to the agricultural output of the region—almonds and processed tomatoes—for which there is some detailed literature available. Sensitivity analyses were performed that showed the results presented here to be robust under a range of assumptions.

locations. For example, tomatoes and garlic grown in the region are often processed outside the boundaries of Fresno County in Modesto.

ESTIMATING THE IMPACT OF THE DROUGHT ON THE WESTLANDS WATER DISTRICT'S CONTRIBUTION TO THE ECONOMY

As a major water provider and the largest agricultural water district in the nation, the recent, prolonged drought has had a significant impact on the District's ability to deliver water, and the ability of its growers to fully contribute to the economy. This has been driven by the decision by the state and federal governments for regulatory reasons to limit the share of the overall water allocation that the District receives. As a result, the level of water received by the District, and hence available to provide to their customers for farming purposes, has fluctuated dramatically over the past two decades.

ESTIMATING THE ECONOMIC IMPACT OF FALLOWING PRIME FARMLAND

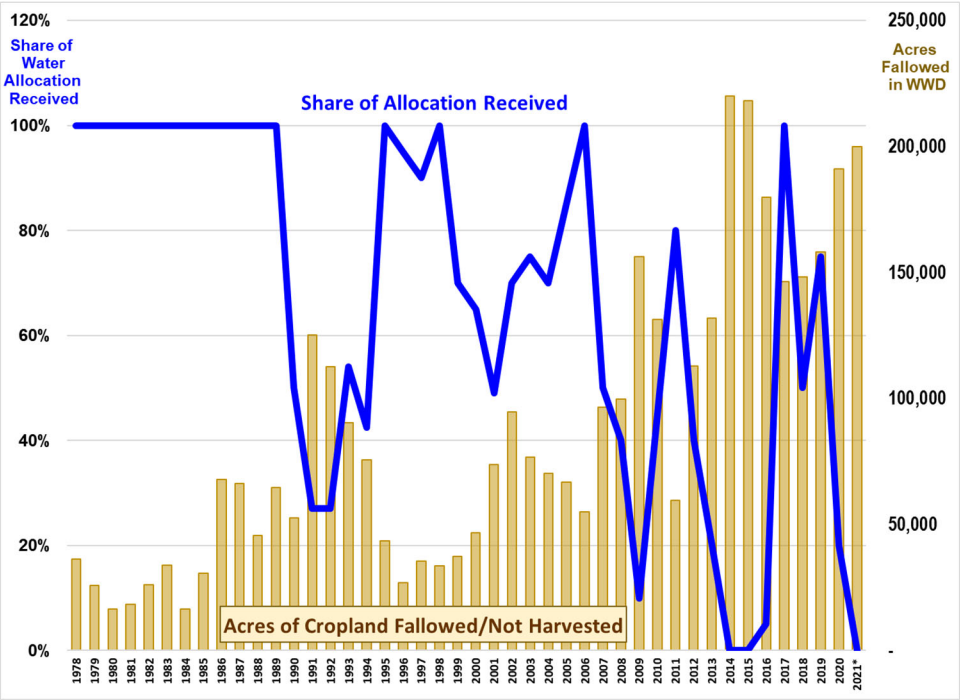
In years of restricted deliveries of surface water through the CVP, the reduced supply not only affects the volume of water available to the District's customers, but also impacts the availability of water in the region overall—making it more difficult to secure additional water from other sources. Both of these factors increase the cost of water to farmers as they either have to purchase more expensive water from other sources or pay to pump groundwater.[8] Consequently, farmers are more likely to fallow ground during years when the District receives a lower share of its allocation, as seen in Figure 26.

There is a direct and inverse relationship between the share of the water allocation received by Westlands and the level of acreage fallowed by farmers within the District. Because of the volatility in the CVP allocation as depicted by the blue line, and its persistence at extremely low levels over the past two decades, Westlands Water District farmers have become global leaders in water-efficient farming. Driving through the Central Valley, it is a sure sign that you have passed out of the Westlands Water District when you

[8] Groundwater also has more salinity issues involved which can be detrimental to crop health and yields.

spot flood irrigation. All water delivered for irrigation within Westlands is distributed through buried pipes and more than 95 percent of farmers' irrigation is typically through drip or concentrated delivery systems.

Figure 26—Share of Water Allocation Received and Acres Fallowed/Not Harvested, Westlands Water District, FYE 1979 through 2021



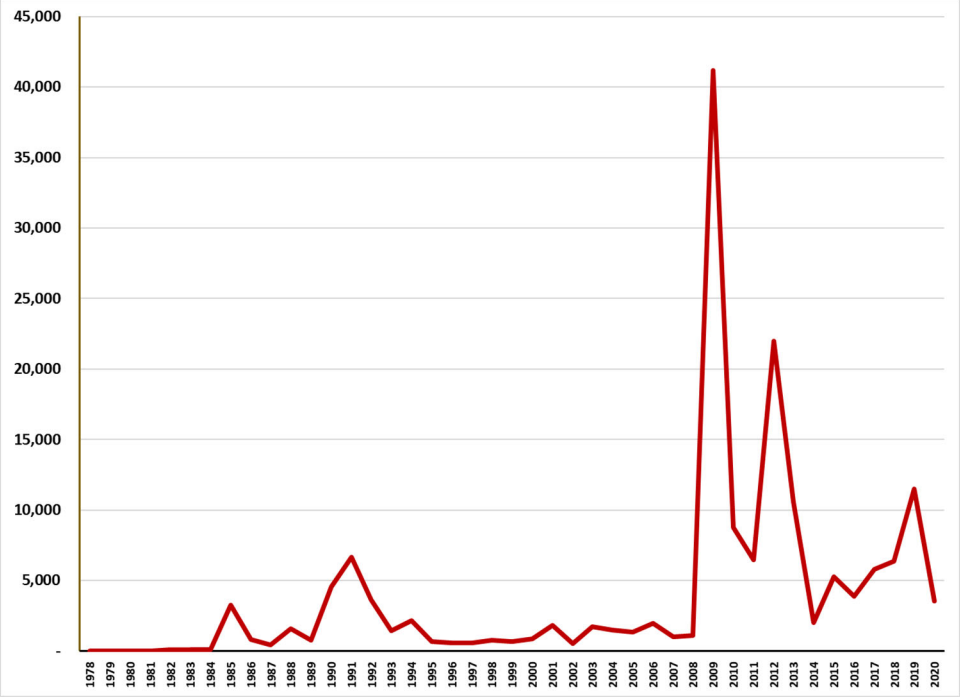
SOURCE: Westlands Water District data.

The brown columns in Figure 26 represent acres of otherwise potentially agriculturally productive land each year that is lost to fallowing. In recent years, another trend has risen into greater prominence—planting a crop and then choosing not to harvest it. In the recent drought years, when water supplies have been unreliable, this lost harvest has skyrocketed, as shown in Figure 27.

These trends are of particular concern because, not only do they represent lost revenues and value added for the local economy, but they also add additional financial pressure on local farmers because they incur many of the costs of soil preparation and planting and cultivation (including the application of scarce water resources) and then receive no or limited revenues

as a result of that investment.[9] Consequently, this is done only as a last resort when the net costs of sustaining and eventually harvesting the crop exceed the expected revenues from selling it in the marketplace.

Figure 27—Acreage Planted but Not Harvested, Westlands Water District, 1978-2020



SOURCE: Westlands Water District data.

To provide insight into the overall impact of the unavailability of water to the District, a simple calculation was done wherein the level of croplands fallowed by farmers was reduced from its current level to the level they fallowed in FY 2011-12 when the District received 80 percent of its water allocation. To minimize crop composition effects, the tree nut and grapevine acreage planted was held constant at current levels and the new acreage was allocated to other categories of crops.[10] Figure 28 shows the results of that analysis.

[9] Insurance payouts may compensate these farmers for some of these lost revenues. Additionally, farmers sometimes use these cycles to push out older trees or vines.

[10] This was done to be conservative about the estimated crop value. It is likely that farmers would, given the spotty recent history of water supplies, invest in more acres of tree nuts and grapevine if given access to additional water. These investments would in turn produce a

Figure 28—Economic Impacts of Fallowed Acreage in Westlands Water District, FY 2019

EMPLOYMENT	Current Jobs	Jobs with Restored Production	Percentage Lost to Fallowing
Direct Effect	25,239.9	30,830.7	-18.1%
Indirect Effect	6,315.5	7,783.1	-18.9%
Induced Effect	6,869.9	8,349.6	-17.7%
Total Effect	**38,425.4**	**46,963.4**	**-18.2%**

ECONOMIC IMPACT	Current Total Output	Total Output with Restored Production	Percentage Lost to Fallowing
Direct Effect	2,858,124,930	3,497,931,831	-18.3%
Indirect Effect	756,620,698	947,121,759	-20.1%
Induced Effect	1,100,246,086	1,337,225,661	-17.7%
Total Effect	**4,714,991,715**	**5,782,279,250**	**-18.5%**

SOURCE: IMPLAN Pro and this analysis.

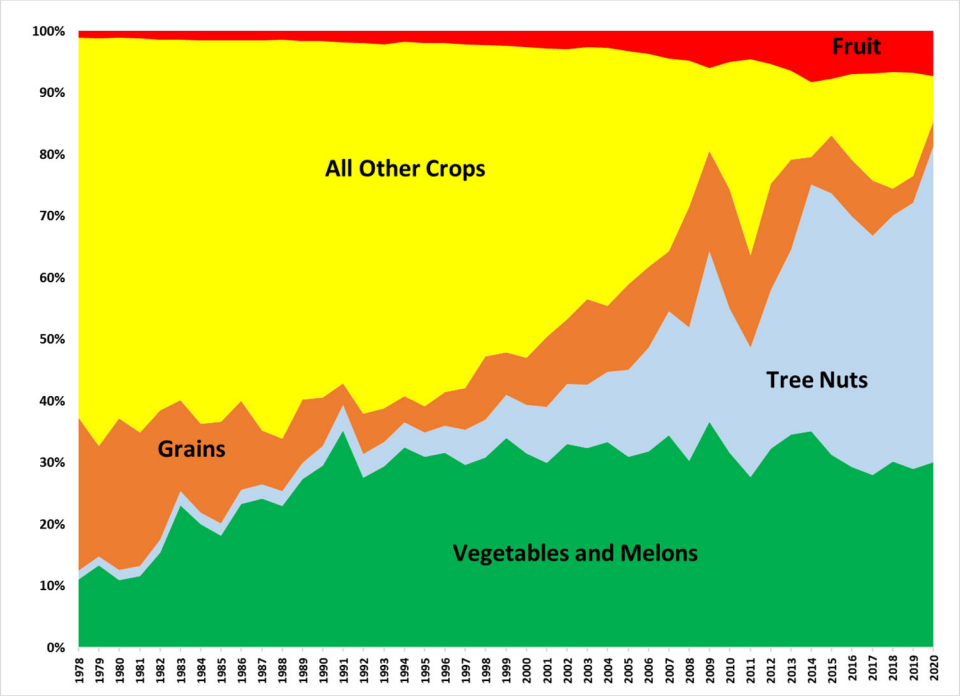
As Figure 28 shows, the overall impact of this fallowing is significant—causing an 18 percent decline in both overall output and jobs available—a loss of more than 8,000 jobs and nearly a billion dollars in overall economic output.

UNDERSTANDING THE IMPLICATIONS OF THE CHANGING CROP COMPOSITION ON THE DISTRICT'S ECONOMIC IMPACT

Despite significant investments in innovations and investments to minimize unnecessary water loss within the District, water availability has reshaped the way that crops are farmed and the types of crops that are farmed. Over time, the types of crops farmers raise within the Westlands Water District have changed, switching from more water and labor intensive crops like grasses, cotton, and beans to higher-margin crops like almonds, pistachios, and wine grapes. This transition has been accelerated and amplified by the recent drought as shown in in Figure 29.

larger total output because of the higher overall margins associated with these crops but a mixed to minor negative impact on the levels of employment induced.

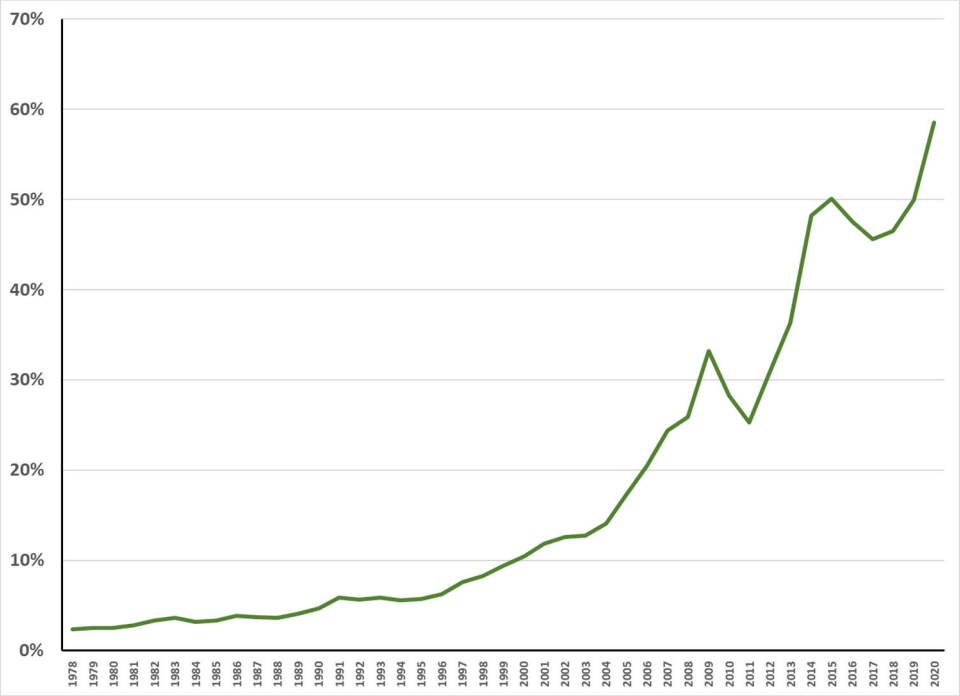
Figure 29—Agricultural Acreage Planted in Westlands Water District, by Category, FYE 1979 through 2020



SOURCE: Westlands Water District data.

Vegetables and melons have continued to remain relatively constant in recent years, while selected fruit and tree nuts have generally increased. It is worth noting that in higher water years (such as 2011 and 2017), the overall acreage of permanent crops remains relatively constant but the percentage may shrink as fallowed acres are placed back into production—usually through an expansion of the acreage growing "grains" and "other crops." which include grasses and cotton. This is seen in in Figure 29 as a larger yellow "spike" reflecting the higher share of acreage planted with All Other Crops, and a narrowing of the "gray" area reflecting acres planted with Tree Nuts. This has had two impacts—the first has been to reduce the flexibility of the farmers to respond to changes in global demand for crops and products. Tree nuts and wine grapes are long-term investments that require several years of lead time to get into production and, once producing, are relatively expensive to clear. That makes them a long-term commitment by farmers and any acreage committed to them is committed for the long term. Figure 30 shows the rising importance of these permanent crops to the Westlands growing area. This makes it more difficult for farmers to shift production in response to changing market demand, or even the availability of more water. The elevated availability of fallowed land can offset this inflexibility a bit, but it is a long-term issue for the region's economy.

Figure 30—Share of Planted Acreage with Permanent Crops, Westlands Water District, 1978-2020



NOTES AND SOURCE: Crops included here as permanent crops include tree nut crops, grapes, and fruit trees. Westlands Water District data.

The second implication of this shifting portfolio of agricultural production within the District has to do with displacing local temporary workforces. Many of the displaced crops require significant interactions with workers as they are planted, weeded, cared for, and harvested. Crops like lettuce and tomatoes, for example, require a temporary workforce. Additionally, many of these crops have shorter growing seasons and, for some of them, multiple crops can be planted, grown, and harvested on a piece of land in a single growing season. Tree nuts have modestly high labor needs up front and then require less manpower over the life of the production. As a result, shifting from labor-intensive production to less labor-intensive production for the same acreage should produce a reduced demand for agricultural labor which means we would expect to see fewer jobs under the "direct effects" listed in Figures 24 and 25. At the same time, if the crops produce much higher yields in terms of value added (part of why farmers are turning to these crops during the drought), these direct job losses may be offset in part by slightly higher "induced effects" and (if inputs are more expensive) "indirect effects."

THE IMPORTANCE OF WESTLANDS WATER DISTRICT'S CONTRIBUTION TO THE SUPPLY OF FRESH NUTS, FRUIT AND VEGETABLES

Westlands irrigated agriculture is a significant contributor to both the regional and national economies. Crops produced within Westlands' boundaries produced an estimated 28.1 percent of the crop-related agricultural production in Fresno County in 2019 (up from 23.4 percent in the prior study) and 13.1 percent of the crop-related agricultural production in Kings County in 2019 as shown in Figure 31 (up from 7.0 percent). Given that Fresno County ranked first in the state in 2019 for overall agricultural production and Kings County ranked eighth, this is a significant contribution. Figure 31 shows the overall shares of county, state and national crop production produced by farmers who are part of the Westlands Water District.

Farms in Westlands contribute almost 23 percent of fruit and nut production in Fresno County, and almost half of the vegetable and melon produced in the county. Similarly, for Kings County, the limited acreage that falls within Westlands Water District accounts for 13.4 percent of Kings County fruit and nut crops, and more than 36.3 percent of the vegetable and melon crops. Nationally, farms in Westlands provide 3.5 percent of the national production of fresh fruit and nuts and 5.4 percent of the national production of vegetables and melons—an impressive total given the small scale of the District relative to the total arable land in the United States. This 5.4 percent compares to 3.1 percent in the 2014 study, reflecting the fact that when the District receives more of its surface allocation (75 percent in 2019 versus 0 percent in 2014), it is able to contribute more to the national output in these healthy crops.

The overall importance of the impact that farms in Westlands Water District have on the national production of these key agricultural products is a testament to the unique character of this farming region and its ability to provide fresh fruits and vegetables to the nation year-round.

Figure 31—Westlands Water District Overall Share of Fresh Fruit and Vegetable Crops, Estimated Crop Values by Category, 2019
(thousands of dollars)

	Westlands Water District	Fresno County	Kings County	California	United States
Fruit and Nut Crops	1,009,528	4,246,673	644,224	21,419,425	29,026,988
Vegetables and Melons	768,193	1,429,003	180,649	8,237,276	14,157,279
All other	169,171	394,555	479,059	7,723,771	
Total	**$1,946,893**	**$6,070,231**	**$1,303,932**	**$37,380,472**	

Westlands Water District - Share of Overall Output				
Fruit and Nut Crops	22.9%[a]	13.4% [a]	4.7%	3.5%
Vegetables & Melons	44.7% [a]	36.3% [a]	9.3%	5.4%
All other	24.1% [a]	3.8% [a]	2.2%	
Total	**28.1%** [a]	**13.1%** [a]	**5.2%**	

SOURCE: Westlands Water District data; Fresno County Department of Agriculture, *2019 Fresno County Annual Crop & Livestock Report*; Kings County Department of Agriculture/Measurement Standards, *Kings County Agricultural Crop Report 2019*; California Department of Food and Agriculture, *California Agricultural Statistics Review 2020-21;* United States Department of Agriculture, *Agricultural Statistics 2020, Fruit and Tree Nut Yearbook.*

[a]-includes only the share of production of farms within the Westlands Water District that are within each respective county-imputed from 2019 data.

California's growing regions are the nation's primary source of fresh fruit, nuts, and vegetables as shown in Figure 32. California growers account for well over half the total U.S. production of nearly every category of fresh fruit and vegetables consumed in the United States—accounting for more than 85 percent of the production for 23 crops and more than 45 percent of the U.S. production of 36 crops.

Figure 32—Crops for Which California Is the Leading US, 2019

Crops for Which California Produces More than 99 Percent of US Total
Almonds, Artichoke, Celery, Dates, Figs, Garlic, Grapes (Raisins), Honeydew Melons, Kiwifruit, Nectarines, Olives, Peaches (Clingstone), Pistachios, Plums, Prunes, Sweet Rice, Ladino Clover Seed, Walnuts
Crops for Which California Produces More than Any Other State
Apricots, Asparagus, Avocados, Dry Lima Beans, Broccoli, Brussel Sprouts, Fresh Cabbage, Fresh Carrots, Carrots (Processing), Cauliflower, Corn (Sweet), Cotton (American Pima), Daikon, Dates, Eggplant, Escarole/Endive, Flowers (Bulb and Cut), Grapes (Table and Wine), Alfalfa Hay, Jojoba, Kale, Kumquats, Lemons, Lettuce (Head, Leaf, and Romaine), Limes, Mandarins, Melons (Cantaloupe), Onions (Dry and Green), Parsley, Peaches (Freestone), Chili Peppers, Bell Peppers, Persimmons, Pluots, Pomegranates, Raspberries, Safflower, Fresh Spinach, Strawberries, Processing Tomatoes, Greenhouse Vegetables, Watercress

SOURCE: California Department of Food and Agriculture, *California Agricultural Statistics Review2014-15;* United States Department of Agriculture, *Agricultural Statistics 2019-2020.*

WESTLANDS WATER DISTRICT FARMERS CONTRIBUTE TO U.S. AND CALIFORNIA AGRICULTURAL EXPORTS

Agricultural exports totaled $21.7 billion for California in 2019, the most recent year for which data are available, and up 3 percent from the prior year. Figure 33 shows the exports for the top 15 products for California agricultural exports.

Figure 33—Top 15 Agricultural Exports, California, 2019

Rank	Commodity	Export Value *($millions)*
1	Almonds	4,901
2	Pistachios	2,010
3	Dairy and Products	1,805
4	Wine	1,253
5	Walnuts	1,250
6	Rice	765
7	Table Grapes	743
8	Processed Tomatoes	623
9	Oranges and Products	541
10	Cotton	438
11	Beef and Products	404
12	Strawberries	402
13	Hay	339
14	Seeds for Sowing	333
15	Lettuce	292

SOURCE: California Department of Food and Agriculture, *California Agricultural Exports, 2019-2020.*

Of these fifteen commodities, growers in the Westlands Water District contribute significantly to the state's supply of nine of these commodities, including almonds, wine (by providing wine grapes), pistachios, table grapes, processed tomatoes, raisins, cotton, lettuce, and seeds for sowing. Additionally, hay, grain, and feed production from farms within the District contribute to two others—dairy and beef products.

Replacing Lost Agricultural Production Introduces New Policy Challenges

Many of the critical points raised in the 2015 analysis about the importance of agricultural production to the Central Valley region and the state remain today. The economic ladder of opportunity continues to be critical for providing opportunity to the state's agricultural workers. The region's geography, climate, soil, economy, and regulatory environments continue to represent the premier place in the United States where agricultural can be successful on this scale, even as changes in the climate impact it. California's unique location on the Pacific Rim and the relative proximity of ocean transportation continue to contribute to its comparative advantages for trade.

Additionally, the major reasons discussed in the 2015 analysis continue to be important and true:

1. Reliable domestic production of key foodstuffs is essential to a robust national security strategy. Especially with the labor market supply chain disruptions around COVID-19 on the production of foodstuffs and the complexities of moving goods across international borders, it is even more critical to have a predictable and reliable food supply.
2. Domestic food production continues to be held to quality and safety higher standards than production in countries from which the U.S. imports agricultural products.
3. Domestic producers must meet stringent standards to protect the environment while foreign producers, especial in Central and South America are generally held to lower environmental standards.
4. Labor regulation in these same foreign markets is typically much more relaxed and workers often bear greater risks for significantly less pay and benefits.
5. Production outside of the United States is often less effective at stewarding the precious resources upon which agriculture depends, including water and soil quality.

Understanding The Uncertainties of Today's Economic Instability on these Estimates

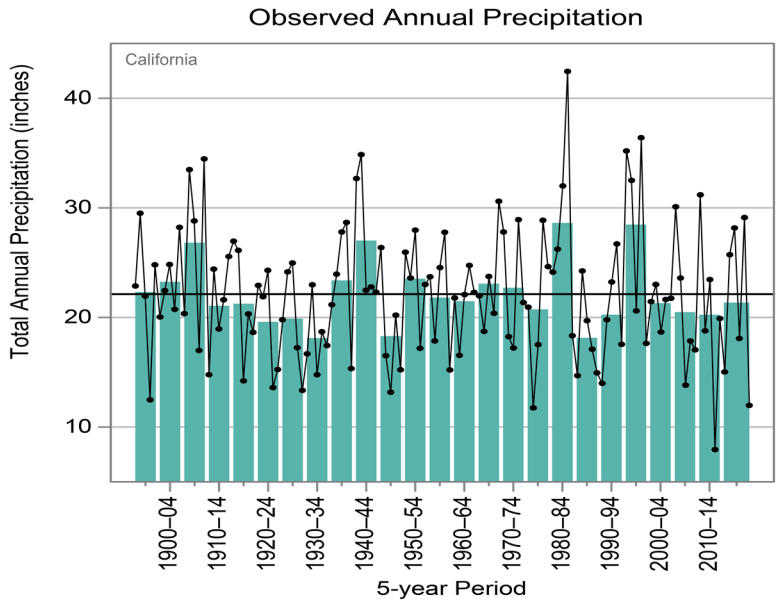
This analysis provides the best estimate possible of the economic impact of the Westlands Water District on local and national economies. This estimate is offered during a time of tremendous instability and uncertainty. There are many dimensions of the current demographic, economic, and public policy environments that could and will have significant impacts on how that impact varies in the future and, to a limited extent, how it has changed already. In this section, a few of these uncertainties will be briefly explored with a view toward describing their likely impacts on the analysis provided in this report. These areas of uncertainty include:

- Climate change and precipitation levels;
- Supply chain and support disruptions;
- Labor market shifts due to current immigration policies; and
- The COVID-19 pandemic.

CHANGING PRECIPITATION PATTERNS AND CLIMATE CHANGE

Recent political debates have centered on the question of whether recent precipitation cycles are precursors to or reflective of large, immutable shifts in the global climate. A detailed treatment of this issue, the attendant long-term climate trends, and some consideration of its potential impact on the economy of the region is presented in our 2017 report *The Implications of Agricultural Water for the Central Valley*.[11] The specific implications of disruptions to the region's water supply are addressed in that study. In the most recent history, however, there have been periodic windows of relatively normal precipitation. In the long-term, if current boom and bust periods persist in the water cycle, public policy will have to move toward creating and supporting greater storage and conservation to meet the needs of agricultural, industrial, and urban users.

Figure 34—Total Annual Precipitation, California, 1900 – 2020



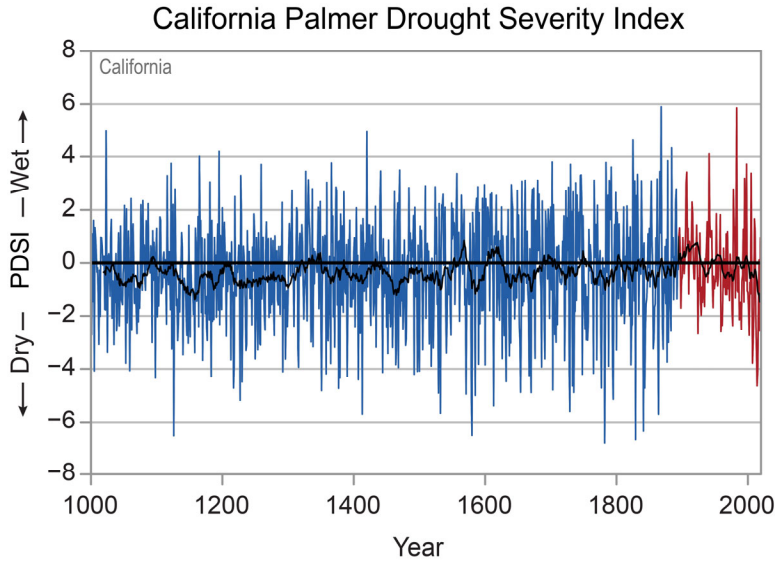
SOURCE AND NOTES: National Oceanic and Atmospheric Administration National Centers for Environmental Information, *State Climate Summaries 2022: California*. Dots show annual values. Bars show averages over five-year periods (last bar is a six-year average). Horizontal black line is the average for the entire period.

[11] Shires, Michael A. *The Implications of Agricultural Water to the Central Valley*, research report complied under contract with the Westlands Water District, September 2017, 35 pp. https://wwd.ca.gov/wp-content/uploads/2017/08/implications-of-agricultural-water.pdf.

Figure 34 provides a snapshot of the last 120 years of precipitation data for the state, reproduced from the state summary from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information 2022 *State Climate Summary* for California. Within just this period is considerable volatility.

Looking at the broader and longer trend, as seen in Figure 35, the volatility is even more striking, with many periods of significant drought. To quote that analysis, "The extended record indicates periodic prolonged wet and dry periods. In the modern era, the wet period of the 1900s and the recent dry period of the 2000s are clearly evident."

Figure 35—California Palmer Drought Severity Index, 1000 – 2020



SOURCE AND NOTES: National Oceanic and Atmospheric Administration National Centers for Environmental Information, *State Climate Summaries 2022: California*. Values for 1895-2020 (red) are based on measured temperature and precipitation. Values prior to 1895 (blue) are estimated from indirect measures such as tree rings. The fluctuating black line is a running 20-year average.

Public policies around this issue, such as the Sustainable Groundwater Management Act, also have important long-term implications to the future scale of the economic profile of the Westlands Water District. The District serves as the Groundwater Sustainability Agency (GSA) for the Westside Groundwater Subbasin (the subbasin that is below the District).

As the GSA, the District has identified groundwater reductions and restrictions that will go into effect beginning in 2022. There is an eight-year

transition period during which the amount of groundwater pumped will be reduced from 1.3 acre-feet/acre in 2022 to 0.6 acre-foot/acre in 2030.[12]

The District's *Water Management Plan* incorporates the assumptions of this Act and other responses to the impacts of environmental regulations that spin out of the state's planning for the possible consequences of climate change. For purposes of this analysis, which looks at the District's current economic footprint, the impacts caused by these policy initiatives are just beginning to be seen in the crop and production profiles and choices made by its customers.

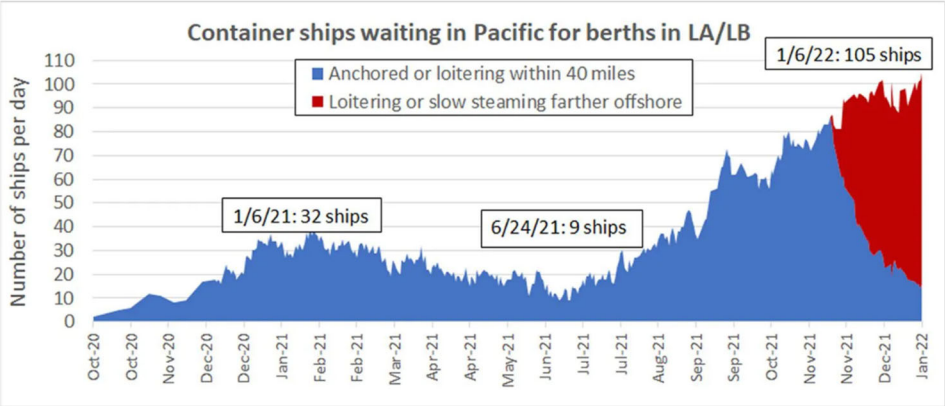
SUPPLY CHAIN AND LOGISTICAL SUPPORT DISRUPTIONS

The intersection between the COVID-19 pandemic (discussed in more detail below) and the state's regulatory environment has led to disruptions in the supply chain and logistical infrastructure that could eventually affect the economic footprint of the Westlands Water District. Agriculture is an integral part of the nation's infrastructure and increased dependence on ships, rail, and trucks to move goods around. As these key transportation arteries have become seriously blocked during the pandemic, it has a direct impact on growers' ability to move their goods to market.

One critical dimension of this impact has been in the flow of containers through the state's ports—a key issue in both the sector's ability to move exports of agricultural products to their clients overseas and in the ability of growers to obtain needed equipment and chemicals to produce their crops. Figure 36 shows a table prepared by American Shopper showing the number of container ships waiting for berths in the Ports of Los Angeles and Long Beach.

[12] More information about these plans can be found at https://wwd.ca.gov/water-management/groundwater-management-program/sustainable-groundwater-management-act/.

Figure 36—Container Ships Waiting in Pacific for Berths in the Ports of Los Angeles and Long Beach, October 2020 – January 2022



SOURCE AND NOTES: Analysis by American Shipper based on data from the Marine Exchange of California. Miller, Greg. "New year brings new all-time high for shipping's epic traffic jam." American Shipper. January 7, 2022. https://www.freightwaves.com/news/new-year-brings-new-all-time-high-for-shippings-epic-traffic-jam.

Complicating the situation in the ports, but also more directly affecting the agricultural economy overall, is the impact that COVID-19 has had on trucking capacity across the state and nation. Some of the direct impacts on truckers have included access to rest areas and travel sites, testing requirements, and vaccine mandates (both through Occupational Safety and Health Administration and through requirements imposed on government contractors). These restrictions have unfolded in a sector that had already identified significant shortages of drivers. Even before COVID-19 arrived, the American Trucking Association identified a shortfall of 60,800 truck drivers.[13] By October of 2021, they had modified that estimate up to 80,000 drivers.[14] The imposition of vaccine mandates on large U.S. employers and federal contractors by the U.S. government likely exacerbated the situation.

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[13] There has been an on-going debate about the full magnitude of this shortfall, but even critics of this estimate recognize that this was a very tight labor market prior to COVID-19. For example, a March 2019 analysis by the U.S. Bureau of Labor Statistics, in its *Monthly Labor* Review, found that the labor market was "tight" but was allowing for good movement into and out of the market. (see the U.S. Bureau of Labor Statistics. "Is the U.S. labor market for truck drivers broken?" *Monthly Labor Review*, https://www.bls.gov/opub/mlr/2019/article/is-the-us-labor-market-for-truck-drivers-broken.htm).

[14] Economics Department, American Trucking Associations, Inc. "Driver Shortage Update, 2021," October 25, 2021 press release, https://www.trucking.org/sites/default/files/2021-10/ATA%20Driver%20Shortage%20Report%202021%20Executive%20Summary.FINAL_.pdf.

Additionally, the announcement by the United States requiring vaccination by foreign visitors at the Canadian and Mexican land border crossings has also generated considerable concern about how it may reduce the flow of goods internationally.

While some of these mandates have been reversed, or are in litigation, their impact on the number of truckers is being felt. Layered on top of this shifting landscape are more permanent changes to California's regulatory and legal frameworks. Rising fuel costs and regulatory fees are taking their tools as are the disruptions caused by the state's adoption in 2020 of AB 5 which would functionally eliminate the independent owner/operator model for truckers in California. While the legislation is not binding on California trucking companies pending a final resolution by the U.S. Supreme Court, it and new air "quality" regulations, requiring electric trucks by 2045, launched a shift in the trucking landscape in the state. Between driver scarcity and rising fuel costs, the volume of cargo capacity has declined while shipping costs have risen.

The combination of port congestion and trucking limitations has affected farmers' ability to purchase herbicides, insecticides, fertilizers, and farm equipment. A January 2022 study by the Purdue Center for Commercial Agriculture[15] found that farmers had significant difficulty purchasing needed inputs from their suppliers. Some 28 percent reported difficulty in purchasing herbicides, 17 percent reported difficulty purchasing insecticides, 31 percent had difficulty purchasing fertilizers, and 24 percent had difficulty purchasing farm machinery in December of 2021.

The shipping congestion in our nation's ports, and the attendant container chaos, has also directly affected growers' ability to export their product abroad as the ability to secure space in outgoing containers is constrained. While this increases global prices, it also disproportionately affects transportation costs resulting in lower revenues for growers.

But most importantly, it creates problems for American consumers. As California growers face more obstacles—both natural and manmade—to

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[15] Mintert, James and Michael Langemeier. "Farmer Sentiment Rises on Strengthening Current Financial Position." *Ag Economy Barometer.* Purdue Center for Commercial Agriculture, January 2, 2022, https://ag.purdue.edu/commercialag/ageconomybarometer/wp-content/uploads/2022/01/December-2021-Ag-Economy-Barometer-1.pdf.

produce fresh fruits and produce, our ability to import replacement fruit and produce from abroad is hampered by the nation's supply chain bottlenecks. According to USDA estimates for the 2021 federal fiscal year, the U.S. is expected to import 12.9 million metric tons of fresh fruits and 8.9 million metric tons of fresh vegetables worth more than $26 billion.[16] It is also expected to import nearly 13 million more metric tons of processed fruit and vegetables worth more than $6.8 billion. These are significant volumes of fruit and produce with limited shelf lives that are already moving through our ports, rails, and trucking networks. Delays and delivery problems significantly increase the risks and costs of bringing these perishable goods to market.

A recent survey of grocers[17] by the National Grocers Association (NGA) pointed to the supply chain and especially trucking issues as an important cost driver and cause of empty store shelves. *The Packer*, in its coverage of this and several other NGA surveys, spoke in detail not only about the uncertainties and costs created by supply chain issues, but to its increasing vulnerability. Even as fresh fruit and produce are currently an area of relative strength vis-à-vis the supply chain (in part because of the local nature of the networks), shortages are starting to appear in some regions and the ongoing stability of the system requires a stable supply.[18]

The bottom line is that fresh fruit and produce continue to be available in the United States because farms in California, including those in Westlands, continue to provide some 80 percent of the nation's supply. Additionally, as discussed earlier in this Report, if water supplies continue to be uncertain and volatile, the acreage available to continue growing this produce will be significantly constrained. If this domestic production is curtailed, it will make

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[16] U.S. Department of Agriculture Economic Research Service. *Outlook for U.S. Agricultural Trade: February 2022*. Published February 24, 2022. https://www.ers.usda.gov/webdocs/outlooks/103379/aes-119.pdf?v=2745.6. Accessed February 27, 2022.

[17] National Grocers Association, *2021 Independent Grocers Financial Survey*, 2021. A summary and highlights can be found at https://www.nationalgrocers.org/wp-content/uploads/2021/11/FMSSurvey_Web.pdf.

[18] Kresin, Janice M. "Survey" Retailers reveal expectations on prices, supply chain issues in 2022." *The Packer,* December 14, 2021, https://www.thepacker.com/news/retail/survey-retailers-reveal-expectations-prices-supply-chain-issues-2022. Accessed February 27, 2022.

the nation dependent on foreign sources which are, in turn, much more subject to supply chain and transportation problems.

Finally, if current supply chain bottlenecks persist for too much longer, key equipment and technologies needed to grow agricultural products will begin to impact production levels. As agriculture has gotten increasingly sophisticated and farmers have incorporated innovative technologies and information systems into their business models, they have become increasingly dependent on technology to operate. Things like tractors, pumps, and drones rely on microprocessors and chips to function. The current supply chain crisis has adversely affected the national supply of these tools. Even goods manufactured domestically sit unfinished in many instances for want of a single input that is waiting to come ashore at a local port.

For perishable agricultural products, this diminished capacity coupled with higher costs represent new pressures on both profitability and the ability to deliver their agricultural products to market. Because of the imbalances in the flow of containers through West Coast ports, for example, agricultural exporters are having difficulty finding containers as foreign shippers collect them rather than allowing them to collect American loads for export.[19]

If these pressures persist in the medium term, it may force farmers to choose between harvesting crops for delivery or leaving them in the field. In the medium term, if enough production is not brought to market, it could create a whole new supply chain crisis in the markets for fresh foods and produce.

LABOR MARKET SHIFTS AND PUBLIC POLICY

Agriculture has historically employed thousands of unskilled workers. State, and now federal, policies and laws have driven up wages for these workers. Although it is more complicated for agriculture, and especially difficult in the case of fresh fruit and vegetables, it is conceivable that new technologies and methods will be developed that will be decreasingly reliant on workers and labor. Technology has supplanted labor in many sectors where it was not believed possible.

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[19] American Farm Bureau, "Market Issues to Track for 2022." *Market Intel*. January 28, 2022, https://www.fb.org/market-intel/market-issues-to-track-for-2022.

Simultaneously, U.S. immigration policies have allowed for a surge of new workers who are largely unskilled. Current accounts estimate the new pool of potentially low-skilled workers in the hundreds of thousands. While this would normally drive wages downward for these workers, current minimum wage laws will likely force the competition for these low-skilled jobs into other forms and venues. To the extent these new workers relocate to the region, this could have significant impacts on the poverty and employment data listed in this study.

COVID-19 AND ITS IMPACTS ON DEMAND, LOGISTICS AND LABOR

Finally, there is the significant impact that COVID-19 has had on the economy and the workforce. While people still need to eat and thus much of the impact on demand for agricultural products has remained stable, declines in households' income due to employment disruptions has affected their ability to purchase goods—including agricultural goods. The USDA has even projected a modest increase in US agricultural exports in 2021.[20] Preliminary data showed little impact of this factor on the acreage planted in the Westlands service area in 2020, as documented in Figure 23 in this study.

At the same time, the pandemic has significantly impacted the local economy. Protecting workers from exposure and infection has been an ongoing challenge. Lost productivity due to illness, disruptions of logistics and transportation, unstable markets and prices, burgeoning inflation, dramatically escalating fuel costs, increased medical costs, and a plethora of other related impacts have increased the costs that agricultural producers face while a volatile marketplace has left them scrambling to plan and grow their products. Remember that agricultural production is measured in weeks and months while the instabilities introduced by COVID-19 and its mutating variants are measured in days and weeks.

Inflation is also another aspect of the COVID-19 economy that will impact the results presented in this analysis. These impacts will mostly be seen in data and analyses capturing economic activity in the years from 2021

[20] U.S. Department of Agriculture, "America's Farmers: Resilient throughout the COVID Pandemic," post by USDA Chief Economist Robert Johansson, July 29, 2021, accessed October 31, 2021. https://www.usda.gov/media/blog/2020/09/24/americas-farmers-resilient-throughout-covid-pandemic

onward. 2020 still saw relatively stable prices, including in the critical energy sector as reduced supplies were offset by suppressed demand.

For purposes of this analysis, however, sensitivity studies have shown that the relative impacts documented here are reasonably good estimates for the short and medium term. Labor markets and inflation are the two biggest drivers of uncertainty in this analysis and the impacts of these two variables will likely lag the pace of the current instability.

CONCLUSION

The footprint of the Westlands Water District on the Fresno region, the Central Valley, the state of California, and the nation is undeniable. Farms in Westlands are a significant supplier to the nation and the world of fresh produce and agricultural products. In the production of that supply, it directly and indirectly employs and supports tens of thousands of household and creates billions of dollars of economic value. While there are a range of modern policy and economic crises that may influence the level of that production, there are no real domestic alternatives to the region for production of these critical agricultural products.

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