Economic Impact of Potter Valley Project (PVP) and Estimated Effects on Sonoma County Economy

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Executive Summary

This analysis considers the economic impacts of the Potter Valley Project (PVP) dams being removed. We consider potential scenarios of economic change for the current users of water from PVP. These dams have historically provided water supply balance and reliability for parts of Sonoma County's economy. Although the act of removing the dams will provide a positive economic benefit, the likely loss of agricultural and commercial output and incomes, as well as the enhanced cost of water for residential users, exceeds those gains in relatively short order. The water available from the dams represents approximately 7.2 percent of countywide use.

The economic effects of water scarcity will spread throughout Sonoma County's economy. Although concentrated initially in a small set of heavy water users as what we call direct effects in northern Sonoma County, most of the rest of the economy interacts with these heavy users and will also feel the effects indirectly. Any reduction in water from recent, average levels puts business incomes, jobs, and local tax revenues at risk. This is why drought is a large concern for any region. Without the dams, the regional economy is now more exposed to the effects of a drought. In this report, we consider scenarios based on specific percentage reductions in water available because the dams cannot help regulate a minimum amount of water reliability anymore. These scenarios include a 10, 20, and 30 percent reduction in available water due to the lack of water balancing that the dams have provided. A lack of water availability is assumed to affect all users of water countywide, as water use in one part of the county means a lack of availability in other parts, all based on shared water resources.

Agriculture in Sonoma County (as well as Mendocino County) is the prime water-using industry (approximately 65.8 percent of use). The shock of water reductions fall on farmers more than other businesses, though light and heavy manufacturing that is water-based feels these effects as well. The volume and levels of revenue are greater for manufacturing because of that industry's economic size versus farming in Sonoma County's economy. However, all water demand sectors are affected, including municipal or government users. Even when agricultural users are the primary source of economic losses, other industries, because of their interactions with agriculture, also lose incomes: wholesale, retail, hotel, and restaurant, and healthcare jobs are also affected.

	Sonoma County: 10% Loss of Water Availability, Annual Loss		
Sector	**Incomes Lost**	**Jobs Lost**	**Tax Revenues Lost**
Agriculture	$6,174,100	53.1	$32,600
Commercial	$50,912,500	242.2	$2,416,200
Residential	$75,200	0.3	$2,600
Municipal	$7,897,500	1.4	-
Total	**$65,059,300**	**297.0**	**$2,451,400**

The changes in the table are annual, based on a 10% loss of water supply. The dams' removal creates some positive economic impacts during demolition, but the water variability, if 10 percent below current availability on average over time, means the net impacts of the dams' removal are negative the year after the demolition is complete (year 5 after demolition begins). If declines in water supply exceed 10%, the exhaustion of benefits associated with demolition are felt even sooner.

Introduction

EFA has been asked to provide an economic impact report for the Sonoma County Farm Bureau based on the potential decommissioning of the Potter Valley Project (PVP) dams. We consider the benefits of dam removal (the actual demolition), relative to the loss in economic value from the elimination of water supplies that the dams provided. This report considers Sonoma County's economy overall in four main categories: agriculture, other commercial businesses, residential, and municipal. The economic impact arises from being more dependent on local annual rainfall. It is also possible to ship in water from other areas, but the feasibility of such efforts is beyond the scope of this report.

The issue arises largely because America's dams are aging and many are becoming an uneconomical source of power. As a result, dams are being decommissioned and sometimes removed. Recently, the PVP dams have fallen into this category. In 2021, PG&E ceased hydroelectric operations and has expressed a desire to decommission and remove the dams.

The Potter Valley Project was a hydroelectric facility in Northern California. The project includes a pair of dams:

- Cape Horn Dam at Van Arsdale Reservoir
- Scott Dam at Lake Pillsbury

The dams are currently owned by PG&E. However, PG&E has determined that continued operation of the dams is no longer financially viable; maintenance costs are growing and exceed the revenue obtained. Accordingly, PG&E has decided to discontinue the dams' operation and facilitate their removal.

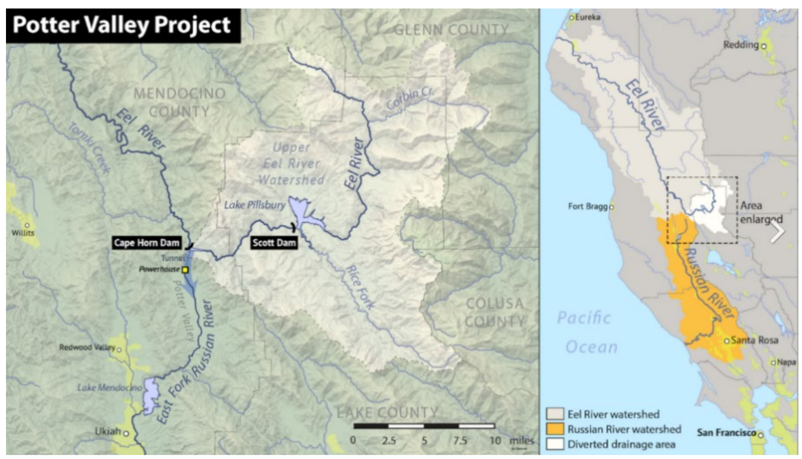


Figure 1: Map of Potter Valley Project Locations

For PG&E, these dams have been a source of revenue from the electricity that they generate. The electricity has historically been sufficient to provide the nearby town of Ukiah with a clean, renewable source of energy. As the dams ceased providing electricity in 2021, alternative sources have been found. The dams provide a variety of benefits in addition to electricity. In particular, the water provided was used for flood control, agriculture, residential use, and other commercial uses (including tourism).

In the absence of the dams, water not captured would flow through the region and into the Pacific Ocean just south of Eureka in Humboldt County. Dam removal can put a strain on those who have come to depend on their existence as a source of water. Dam removal is not a one-sided story, however. Although providing clean, renewable energy, environmental impacts that may be considered negative exist. With the dams, timing and size of water flows are disrupted, leading to diminished numbers of animals and trees along the river. In sum, removing a dam that has been in place for a long time comes with environmental benefits as well as costs.

Although dam removal may help the natural environment's conditions, it is damaging to the local economy. The damage comes from two key changes. The first is the removal of clean energy from the system. The second is the removal of a source of useful water. The energy is relatively easily replaced, either by other clean renewable sources or from traditional sources. The water is much harder to replace, especially in a part of the world such as Northern California, which is increasingly experiencing drought and water shortages.

This report endeavors to shed some light on the overall economic implications of removing the two dams. There are two phases of economic costs and benefits. The first includes the economic benefit from the removal of the dams. The Bay Area Council Economic Institute (2023) has estimated these benefits to be on the order of 1,223 to 1,637 full-time equivalent job-years, $252 to $345 million in economic output. These benefits are not inconsequential but are very short-term in nature.

The second involves the implications of a reduction in annual water supply by about 62,500 acre-feet. This is approximately 7.2% of countywide water use. This reduction has potentially negative implications for all of the categories mentioned above. Evidence has been generated on the implications for agriculture, recreation, and tourism, but to date, there is little evidence on the implications for local industry. As most businesses consume some water, a reduction in supply has implications for not only the number of people employed in the business, but whether or not the business continues to exist. Reduced water supply will lead inevitably to either water rationing, or more likely higher prices paid for water. Higher costs of doing business and less profitability may result for many businesses, even those that are light water users.

With a less competitive product comes reduced amounts produced and hence less in the way of local inputs purchased and local workers hired. Some businesses may find it in their best interest to close their local doors and move elsewhere, or simply cease to exist. Others will reduce their numbers of employees and purchases of local inputs. The latter outcome is clearly more desirable as it does not block businesses from recovering in time should water become less of a competitive issue. It is also possible that local businesses could change their production processes in ways that minimize the effects of higher water prices on their output. For some, there will be water-saving technologies available that mitigate the effects of the higher water costs.

Our approach takes on the following logic. We first identify water use connected to the value of goods and services production in Sonoma County, with Mendocino County included for contrast. We then categorize industries by major uses and types of goods and services: agriculture, manufacturing, services, and government. We then provide scenarios for lost acre-feet and estimated loss of economic value if water supply is reduced in Sonoma County. Rainfall plays a significant role, according to Sonoma Water (Sonoma County's main water utility). Rainfall can be captured in years of surplus (heavy rainfall) and used in years of deficit (light rainfall). The critical issue is that should the dams be removed, the reservoirs would not exist to provide a general balance to water supply regionally, with particular implications for heavier users such as farmers.

Background and Recent Studies

Negative economic impacts arise from the reduction in output from the affected industries. These declines in economic activity have implications for not only county residents and households, but also public works and services and result in the loss of some tourism. The lost economic value becomes the basis of the economic impacts in reverse; i.e., the damage done by the removal of the dams provides an indication of their contribution to the local economy. However, in the short term, these effects are offset by gains estimated from the positive impulse of workers hired to remove the dams. A recent study by Bay Area Council's Economic Institute provides those estimates over four years of time; water availability uncertainty and the risk exposure are seen as ongoing issues.[1] Our analysis considers 20 years of this risk for commercial and residential users of water when comparing to the gains from the dams' removal.

There is a small, but growing literature on the implications of water shortages for local economies. Sustained droughts have invigorated such research. Very little exists with regard to water shortages arising from discontinued use of dams, reservoirs or related infrastructure. Medellin-Azuara, et al. (2022)[2], provides some relevant analysis. This study is concerned with economic losses in California's Central Valley arising from multi-year drought conditions. In particular, the economic impact in years 2021 and 2022 are examined due to significantly-reduced water supplies. Their analysis estimates the lost value of land that was left fallow due to a lack of water, along with follow-on consequences for regional food processors. Their study estimates the gross revenue impact on crops in the two years combined at roughly $4 billion, with value-added impacts of $2 billion of lost economic activity in the defined counties. When including related food-processing industries, the losses amount to over $6 billion in lost revenue, and approximately another $1.4 billion in value added beyond the original $2 billion. The processing industries also likely experienced reduced employment of between 5,000 and 7,000 jobs in each year because of reduced production and revenue levels. The food processing results were obtained through the use of the IMPLAN© modeling system, just like our results as presented below. A variety of other studies use either the same IMPLAN© modeling system or an equivalent approach.

Ellis, et al., (2015) is another analysis that makes use of the IMPLAN© model to evaluate the effects of water supply variability.[3] This report was produced as a part of their regional water planning process. In the Ellis study, IMPLAN© is used to estimate the economic impact of not meeting the identified regional water needs. Berrittella, et al. (2007), takes a different approach using a model that ties the entire economy together to gauge reduced water supply effects.[4] Their analysis is insightful and is akin to the IMPLAN® model in providing results based on economic interlinkages. The analysis is also more sophisticated in that it allows an identification of winners and losers. Winners are loosely those with solid water rights or who

[1] http://www.bayareaeconomy.org/files/pdf/BACEI-PotterValley-Feb2023-FINAL.pdf
[2] https://wsm.ucmerced.edu/wp-content/uploads/2022/11/Economic_Impact_CA_Drought_V01.pdf
[3] https://www.twdb.texas.gov/waterplanning/data/analysis/doc/2016/FINAL-2016%20Socioeconomic%20Impact%20-%20Region%20K.pdf
[4] https://core.ac.uk/download/pdf/53221001.pdf

benefit from the resources freed up by the losing/contracting industries. IMPLAN® is a software as a service (SaaS) company that provide economic models for zip codes, counties and states across the United States. These models connect different industry spending, jobs supported and tax revenues generated to each other to measure economic interactions among industries within a defined area to know what incomes remain local from one industry's growth or contraction in the same area.

Butte County (2022) also looked at a drought impact study and is another useful guide for assessing dam removal impacts. Although that report assesses the economic impact of a drought rather than a supply reduction, there are many similarities. [5] A key difference is that while the PVP dams' removal is a permanent change for the Sonoma County economy, drought conditions may be temporary or last for years. The Butte County (2022) report provides useful background for thinking about the pathways to economic impact of reduced water supplies.

There are a variety of studies that provide a more global perspective on drought and its economic impacts. Ortuzara, et al. (2023), provide insights into global interlinkages between regions and countries with regard to water scarcity. Damania, et al. (2017) is another study that provides an important discussion of the importance of water availability and variability on economic growth.

Summary

Previous studies take a similar approach as we do below, where the reduction of water availability leads to outcomes that either increase the cost of water or reduce industry production based on a lack of water or both. The offset in terms of regional economic impacts with demolition projects is only addressed in the Bay Area Council Economic Institute (2023) study, but needs to be included below to understand the net impacts of such a policy choice. We now look at the Sonoma and Mendocino County economies.

Economic Background for Sonoma and Mendocino Counties

Table 1 provides an indication of the pattern of employment and the numbers of establishments across industries. The industries indicated are the 2-digit level North American Industrial Classification Codes (NAICS) and are a relatively standard level of aggregation. The first two columns provide the pattern of employment across industries, in Mendocino and Sonoma counties, respectively. The middle columns provide a "location quotient" relative to California and the final two columns provide a count of the number of business establishments in each industry, by county.

The location quotient columns provide an indication of how concentrated an industry is in each county, relative to the state as a whole. A value in excess of one means that the share of that industry's employment level for that county is greater than the state on average (more concentrated). Similarly, a value less than one indicates that there is a smaller share of employment in the county than in the state as a whole. For example, with location quotients of 1.58 and 1.24 in retail trade, both counties have relatively more employment in that industry than does the state as a whole. Mendocino County's share of

[5] https://www.buttecounty.net/DocumentCenter/View/5510/Butte-County-Drought-Impact-Analysis---June-2022-Final-PDF

employment in retail trade is 58% bigger than California's and Sonoma County's share of employment is 24% bigger. Conversely, in public administration, there is a relative concentration in Mendocino County (LQ = 1.84) while there is a relative dearth in Sonoma County (LQ = 0.75).

Table 1: Patterns of Employment in Mendocino and Sonoma Counties

	Employment		Location Quotient vs CA		Establishments	
Industry	**Mendocino**	**Sonoma**	**Mendocino**	**Sonoma**	**Mendocino**	**Sonoma**
Agriculture, Natural Resource and Ag Support	1,567	5,844	2.92	1.57	239	562
Construction	1,312	15,476	0.85	1.52	290	2,288
Manufacturing	2,482	22,477	1.07	1.47	146	1,079
Wholesale Trade	688	6,802	0.59	0.89	75	620
Retail Trade	4,417	22,841	1.58	1.24	391	1,568
Transportation and Warehousing	701	4,741	0.46	0.47	70	260
Information	246	2,755	0.24	0.40	36	178
Finance and Insurance	464	4,146	0.51	0.69	82	662
Real Estate and Rental and Leasing	478	3,524	0.90	1.01	136	700
Professional, Scientific, and Technical Services	605	9,686	0.24	0.59	187	1,718
Management of Companies and Enterprises	248	2,155	0.58	0.76	11	69
Administrative, Waste Management Services	1,047	12,713	0.53	0.98	114	892
Educational Services	3,258	15,286	1.24	0.88	24	216
Health Care and Social Assistance	5,738	32,926	1.18	1.03	1,702	6,603
Arts, Entertainment, and Recreation	582	6,088	0.90	1.43	46	304
Accommodation and Food Services	3,521	20,767	1.21	1.09	312	1,241
Other Services (except Public Administration)	648	7,086	0.67	1.12	195	1,304
Public Administration	2,737	7,358	1.84	0.75	202	473
Totals	**29,435**	**204,249**			**4,301**	**20,947**

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2023-Q1.

Overall, both counties have a heavy concentration of employment in utilities, manufacturing, retail trade, accommodations, and health care. Industries with a relative dearth of employment include wholesale trade, transportation, and professional and business services. Both also have strong concentrations in agriculture and natural resource and support industries for farmers. Water uses within the regional economy, however, are likely heavily concentrated. Agriculture, energy production and manufacturing are the heaviest users.

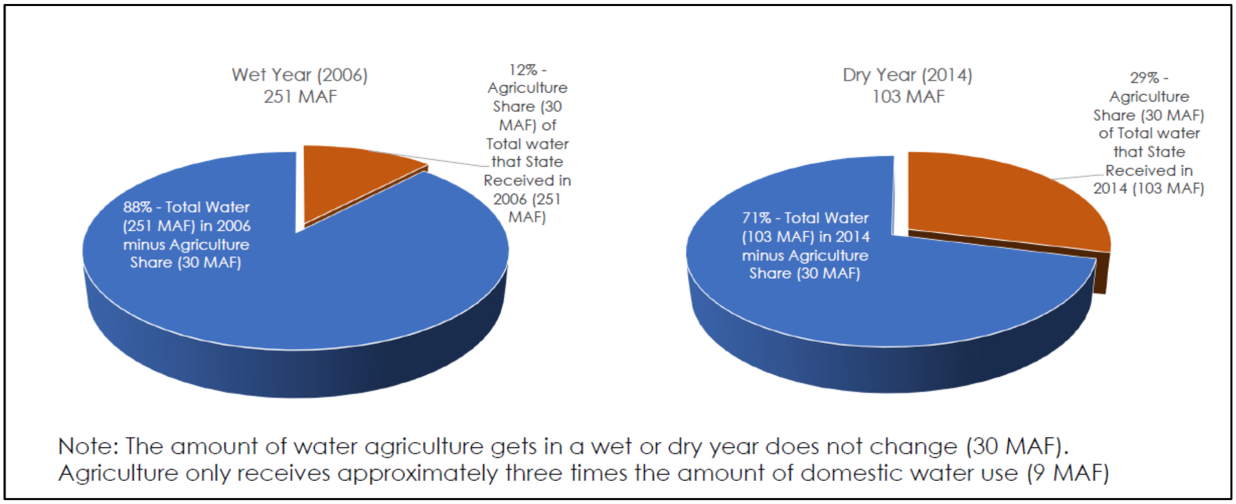


Figure 2: Agricultural Use, 2006 and 2014, California Bountiful (2023)

A study by California Bountiful in 2023 estimated that California agriculture uses approximately 21.5 percent of California's total water supply, where captured water volumes changed based on dry and wet years. What Figure 2 suggests is the risk associated with rainfall when adequate, captured water is not available for farmers; the available water can fluctuate greatly.[6] This does suggest that the primary impact of reduced water supplies from the Cape Horn and Scott Dam removals will affect agriculture more than other categories of water users.

The data behind Figure 2 are for 2010. The pattern of agricultural production has likely changed since then. Accordingly, we present data in Figure 3 on patterns of agricultural production in Mendocino and Sonoma Counties, specifically. There are many industries that require significant water use or rely heavily on its availability. According to that same study, many other important parts of the U.S. economy are exposed to significant water risks (Figure 4). The estimated value for Mendocino County is shown in Figure 3 as a point of contrast for Sonoma County agriculture.

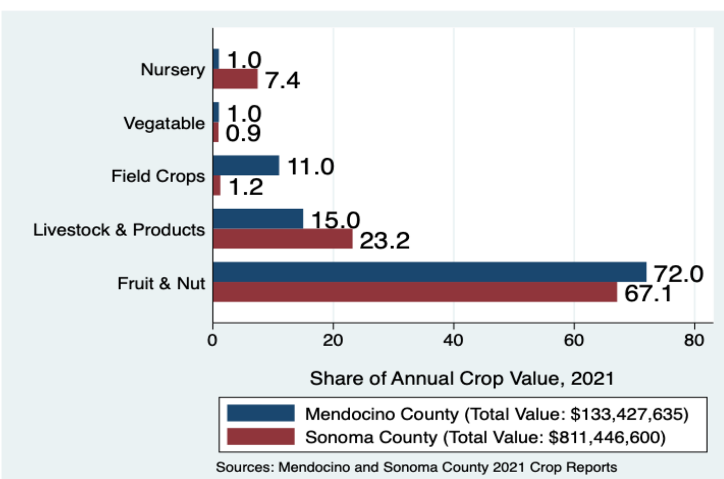


Figure 3: Distribution of Agricultural Production by Value

6 https://www.cfbf.com/ag-news/press-releases/new-research-offers-clarity-on-actual-water-use-by-agriculture1

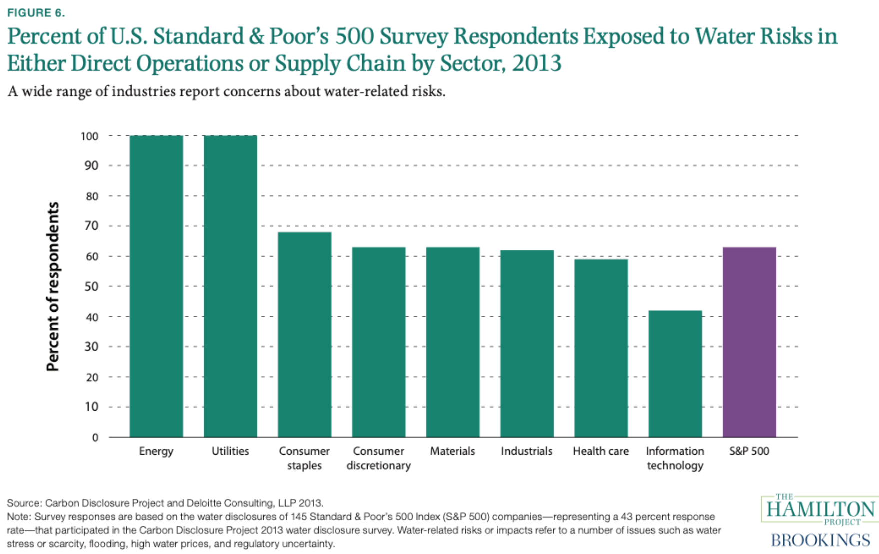


Figure 4: Water Risks by Major Industry Categories, Self-Identified by Survey (More Likely to Face a Water Risk than No Risk)

The study further reports that domestic water usage in California ranks very high among states in the United States. Though it is below states such as Nevada, Idaho, and Utah, it is in the top 10 states for water usage on a per-capita basis. In the next section, we review the way economists think about water markets and how drought or changing supply conditions can affect the local economy.

Economic Impacts of Reduced Water Supply

Water is a vital input for all parts of a regional economy, affecting all agents, be they private businesses, individuals, or government agencies. Variability in its supply, therefore, can significantly affect regional economic outcomes. We start with data on water use by industry sectors, residential structures and local government activity at all levels of government.[7] We will assume that demand and supply are basically the same on an annual basis; to date, reservoirs like the Potter Valley Project (PVP) dams would store excess rainfall beyond what was provided in the market to satisfy demand beyond other water sources.

This study assumes that a reduction in water supply, or an increase in the price of water, leads to less water used as an input in production like a negative "technology" shock: running a business is more costly, especially the more water dependent the business may be. Such a shock increases prices for consumers and vendors that purchase products such as harvested goods from local and regional farmers. Businesses across the region hire fewer people, creating broader, negative effects across the county economy.

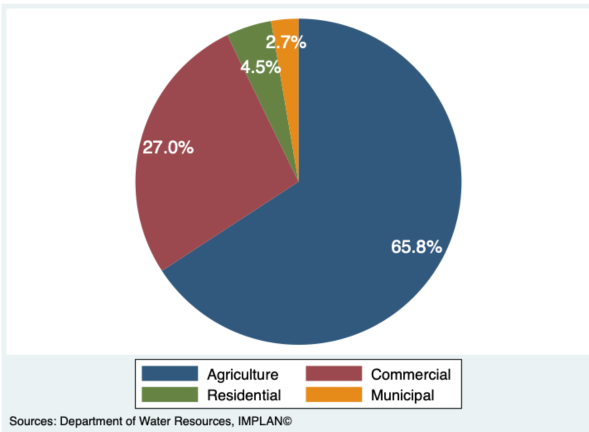
Removal of the PVP dams and the resulting increased uncertainty over water availability may well negatively shock the Sonoma economy permanently. Over time, such shocks can lead to positive outcomes, such as new technologies being adopted to reduce water use. But this comes at a cost of the new technology today for cost savings tomorrow. The loss of water availability can also lead to a loss of local businesses or establishments leaving the area due to increased capital or operational costs from reduced

[7] Residential use was estimated by combining data provided by California Department of Water Resources (DWR) on per capita water use in gallons and California Department of Finance population data. Commercial and municipal use, including agricultural use, was estimated by IMPLAN®.

water availability. The water supplied by the PVP acted as a reserve and served to stabilize water supplies. In the absence of the PVP supplies, the local economy will depend on rainfall and will be heavily influenced by its volatility and any resulting drought condition.

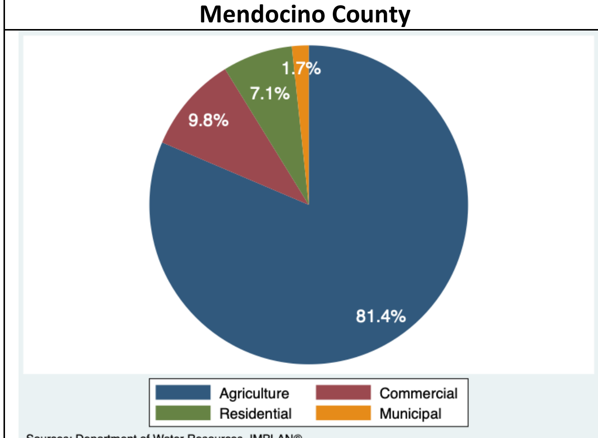
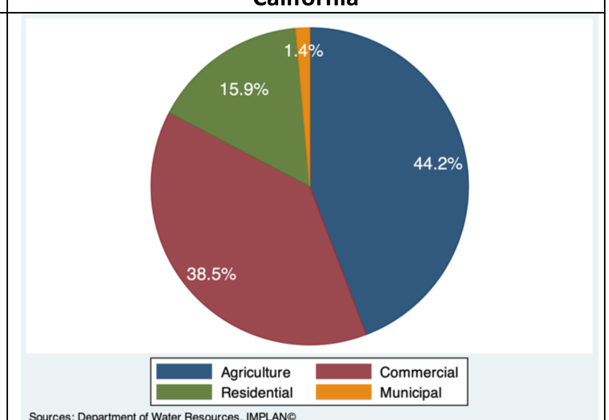
The industry mix also dictates risk exposure to lost water sources. The more agricultural the user mix, the more exposure; we saw this in the economic background section above. Also, “municipal” use of water is only governmental agency use; water utilities are included in the category, but only to the extent that they are final users of water.

Figure 5: Sonoma County Water Use by Industry Sector, 2022, % of Total



What these three figures show is how important agricultural use is in Sonoma and Mendocino counties relative to the state as a whole. The state has larger, more urban areas with concentrated residential housing and hence greater residential use of water relative to commercial or agricultural users. Let’s now look at more details on both water use and value of water in terms of business revenues derived from using water as an input for a good or service.

Figure 6: Mendocino County and California Water Use by End-User Category, 2022, % of Total

Mendocino County	California
	

Sonoma County Water Market Overview

The focus of this study now shifts to Sonoma County. The following data show the Sonoma County industry-sector breakdown with details provided for agriculture and then major industrial users of water, compared to residential users (occupied housing units). Municipal users include local, state and federal government agencies, including public schools and universities. Table 2 provides evidence on water risk across the County; industries with a higher percentage use are at greater risk than those with a lower level of use. The higher the level of use and hence risk, the larger the potential for an industry to incur output value and job loss locally.

Table 2: Sonoma County Water Use and Value, Agricultural and Commercial Users, 2022

Industry	% of County Water Use
Fruit farming	50.6%
Light Manufacturing	8.2%
Miscellaneous crop farming	6.7%
Natural Resource Extraction	6.1%
Heavy Manufacturing	3.5%
Dairy cattle and milk production	3.2%
Municipal Users	3.2%
Vegetable and melon farming	2.6%
Animal production, except cattle and poultry and eggs	2.3%
Real Estate	1.6%
Event Centers	1.5%
Advanced Manu	1.4%
Beef cattle ranching and farming	1.2%
Tree nut farming	1.1%
All Other Industries	6.8%

Sources: Department of Water Resources and IMPLAN®

Each of the major industrial sectors generates business revenues at home that depend on the availability of water. Table 3 provides an overview of the estimated output or costs of water in each of the four categories of Sonoma County water users. These figures are derived from estimates of pricing Sonoma Water's current pricing and the California Department of Water Resources (DWR) estimates of water use by residential, commercial and municipal users.

For Sonoma County, total business revenues pay for wages, salaries, and tax revenues from business activity. That revenue does not all remain in the local economy (due to hiring workers and purchasing inputs from outside of the County), but it shows how value can change; for agricultural businesses, these outputs are similar to "farm gate" values, as the dollars received as output or business revenues is what farmers are paid for harvests or animal products otherwise directly from the farm. The estimated water demand in Sonoma County is 864,889 acre-feet per year from all sources in 2022.

Table 3: Output and Average Output per Estimated Acre Foot Used, 2023

Water Demand Sector	Output Value/Cost of Estimated Water Used (residential) (Millions)	% of Water Supply Used, Sonoma County	Acre Feet Used
Agricultural	$854.2	65.8%	569,097
Commercial	$48,114.6	27.0%	233,520
Residential	$161.8	4.5%	38,920
Municipal	$3,987.4	2.7%	23,352

Sources: DWR, IMPLAN®, Sonoma Water, EFA Calculations

Table 3 provides an indication of the maximum risk based on lost spending by households shifted to water costs or lost output by county businesses. Variability in water supply will invoke different responses from each of the different categories of water users. That response depends on how important water is as a cost to the sector. All users face water as a cost in some ways, but there is variability within each category; some agricultural and commercial users are more water intensive than others. Municipal governments are relatively small versus other employers. The response to water shortfalls will vary not only across, but within industries and use categories. Because of data limitations, we are limited to assessing an average response in each industry.

Water Supply Shock and Subsequent Economic Effects

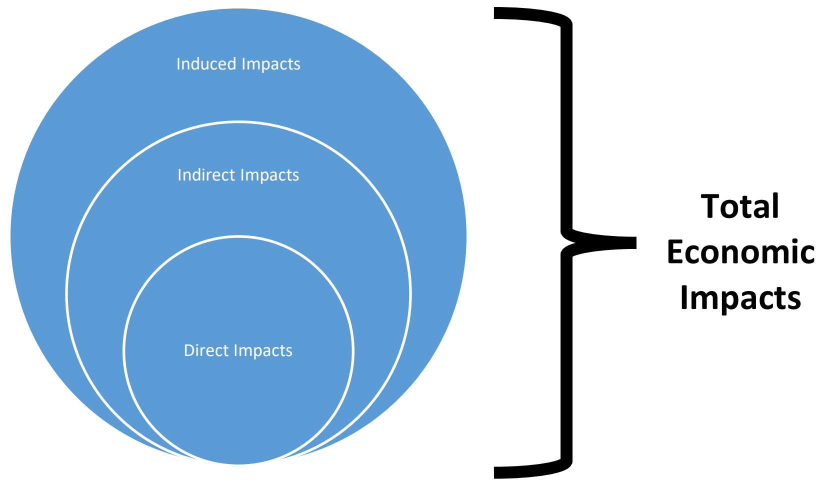
Facing a future without the PVP reservoirs to balance water demand and supply means some economic impacts of water supply shortfalls that would have been maintained had the dams remained. Under specific assumptions about the response to a water supply change, we can estimate the resulting loss of output value or increase in residential spending on water. Those assumptions are as follows:

- For agricultural, commercial and municipal users, the lost supply of water under different scenarios reduces available production based on the estimated percentage of the market for industry sectors on average, creating lower business revenues to support jobs, wages and taxes;
- For residential users, the reduced quantity available of water will lead to some rationing or rising prices or a combination such that an additional cost of water reduces spending on other goods and services in Sonoma County to support jobs, wages and taxes.

Economic Impacts Basics

Economic impacts come in three “categories” to describe the industries involved in lost incomes and jobs, starting with the same way ripples come from throwing a rock into a still pond; for example, the rock illustrates a reduction of agricultural goods available due to a lack of water availability, which ripples out as additional economic impacts countywide. The broader effects from those direct impacts are illustrated by Figure 7.

Figure 7: Economic Impacts



Direct effects come from farmers contracting harvest levels because water is not available. This reduction means less revenue and spending on labor and vendors. **Indirect** effects, which come from farm workers and vendors to farmers (including vineyard management business), estimate a second round of reduced revenues and spending. For example, a farmer may purchase less alfalfa because she has fewer cows or less fencing because the costs of water have changed. This spending shock reduces what vendors and its workers receive, reducing incomes further. These lost incomes create further impacts or **induced** effects on the broader economy. Employees of a vineyard manager that lose a job because their former employer reduces staffing due to a lack of farmer demand for those services spend less on groceries, medical visits, restaurant meals, and various other industries. Such a change further spreads the effects of reduced water availability throughout Sonoma County.

The economic impact data in Tables 4 to 8 can be seen as algorithms for changing levels of water availability. Table 4 summarizes the estimate reduction in business revenues (or the value of goods and services produced by the major water demand sectors) identified in Table 3 above. We consider three scenarios of water supply changes (where we assume water supply equals demand, thus the loss of water supply is simply a distribution of lost water among those that use water), 10 percent, 20 percent or 30 percent as an annual average of the 7.2% water supply lost. Due to the simple linear structure of these estimates, multiples or fractions of a 10% change in supply can help run any scenario.

Using a combination of data from Figure 5 above, Table 4 provides estimates of lost business revenues based on the three water loss scenarios, where the water availability shock is 7.2% of the total based on the acre feet lost by the dams' removal.

Table 4: Business Revenue or Output Loss Scenario, Year 1 of Loss

	Water Loss Scenario		
Water Demand Sector	**10%**	**20%**	**30%**
Ag	$6,174,100	$12,348,100	$18,522,200
Commercial	$50,912,500	$101,824,900	$152,737,400
Residential	$75,200	$150,400	$225,600
Municipal	$7,897,500	$15,795,000	$23,692,500
Total	**$65,059,300**	**$130,118,400**	**$195,177,700**

From these changes come a reduction of jobs and tax revenues. Table 5 shows those potential losses for the 30 percent scenario as a baseline measure of what might happen to jobs and tax receipts based on an output or spending shock to residents.

Table 5: Jobs and Tax Revenues Lost, Water Loss Scenario, 30%

Water Demand Sector	Jobs Lost	Tax Revenues Lost	Reduced Output
Ag	159.3	$97,800	$18,522,200
Commercial	726.5	$7,248,600	$152,737,400
Residential	0.8	$7,900	$225,600
Municipal	4.2	-	$23,692,500
Total	**890.8**	**$7,354,300**	**$195,177,700**

Tables 4 and 5 show the potential shock of losing water, if that loss is generalized across the county based on the loss of these dams. The shock affects jobs and tax revenues associated with the lost revenues. The next section looks specifically at the shock if focused on Sonoma County's agricultural industry.

Sonoma County's Agricultural Economy, Water Use and Broader Impacts

This section provides a brief overview of how a water shock may be centered on a specific set of industries. A reduction in water availability ("shock") has broad effects on business revenues, , hiring and tax revenues. These broad-based effects result from the economic relationships in a specific area (Sonoma County) when there is a contraction of one industry's economic outcomes **annually**, it spills over onto other parts of the local economy. We will look at the agricultural water demand sectors as a group; the output levels are skewed toward fruit farming, primarily wine grapes in terms of value of output. The supply-chain partners of both the farmers and their employees are affected by the change in output due to a 10-percent water reduction (per our examples above) that then affect other industries and Sonoma County overall due to lost output in these industries. The tables below provide estimates of how a reduction in agricultural output, resulting from a reduction in water availability, affects business revenues or output; jobs supported by the revenues through wage and salary payments contracting, and state and local tax revenues lost by lost taxable transactions.

Table 6: Business Revenues Lost, 10% Scenario, Industry Detail

Industry	Direct	Indirect	Induced	Totals
Agriculture	$6,174,100	$300,800	$7,200	$6,482,100
Real Estate and Rental and Leasing	$0	$160,100	$349,500	$509,600
Wholesale Trade	$0	$335,400	$80,600	$416,100
Health Care	$0	$0	$253,300	$253,300
Retail Trade	$0	$10,900	$182,300	$193,200
Finance and Insurance	$0	$51,800	$135,300	$187,100
Hotels and Restaurants	$0	$7,400	$112,900	$120,300
Professional, Scientific, and Technical Services	$0	$47,100	$72,300	$119,400
Other Services (except Public Administration)	$0	$8,400	$94,700	$103,000
All Others	$0	$253,400	$311,000	$564,400
Totals	**$6,174,100**	**$1,175,400**	**$1,599,000**	**$8,948,500**

Table 7: Jobs Supported Lost, 10% Scenario, Industry Detail

Industry	Direct	Indirect	Induced	Totals
Agriculture	51.6	2.5	0.1	54.2
Health Care	-	-	2.1	2.1
Retail Trade	-	0.1	1.4	1.4
Hotels and Restaurants	-	0.1	1.1	1.1
Other Services (except Public Administration)	-	0.1	1.0	1.1
Real Estate and Rental and Leasing	-	0.3	0.7	1.0
Wholesale Trade	-	0.8	0.2	1.0
Administrative and Waste Management Services	-	0.3	0.5	0.8
Professional, Scientific, and Technical Services	-	0.3	0.4	0.7
All Others	-	1.0	1.8	2.8
Totals	**51.6**	**5.5**	**9.2**	**66.3**

Table 8: Tax Revenues Lost, State and Local Levels,
10% Loss of Water to Sonoma County Farmers

Tax Category	Amount
Corporate Income Tax	$36,400
Personal Income Tax	$134,500
Sales Taxes	$113,300
Property Taxes	$122,900
Social Insurance Tax: Employee	$6,300
Social Insurance Tax: Employer	$7,400
Other Taxes	$31,200
Totals	**$452,000**

Summary

These tables show how local farmers are economically connected and affect other industries when there is an expansion or contraction. Overall, the potential economic implications of increased water variability are significant. In extreme years, with water supplies 30% below normal, output declines could exceed $190 million, with additional losses of tax revenues for local governments. The employment implications are also important, with more than 890 jobs being at risk. In sum, the economic impacts of losing the dams and their water reserves can be significant across the Sonoma County economy.

The Longer Term: Net Effects of Removing the Dams

Like any other project, there is an economic benefit that a community derives when infrastructure is removed. Accordingly, the act of removing the Potter Valley Project dams will provide some offset of the negative economic impacts estimated above. Dam removal is estimated to take four years, concurrent with a reduced availability of stored water. After these four years, local water users have full exposure to the risk of reduced water supply resulting from the absence of the reservoirs.

The Bay Area Council Economic Institute (BACEI) in February 2023 provided a study estimating the economic impacts of the PVP dams' removal. These data are used as mitigation from removing the dams, but these benefits only exist in the short-term.

Figure 8: Summary of Findings from BACEI February 2023 Study of Dams Removal

California Statewide Economic Impacts of Potter Valley Dam Removals

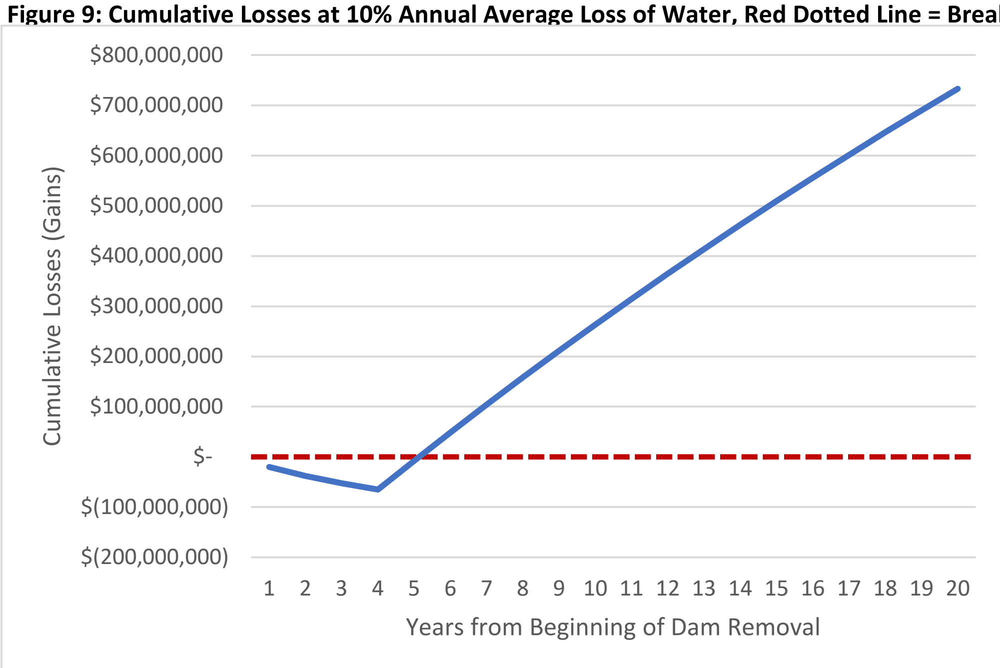
Project Component	Total Spending (millions in 2021 dollars)		Economic Output (millions)		Employment (Full-time equivalent job-years)	
	Low Bound	High Bound	Low Bound	High Bound	Low Bound	High Bound
Scott Dam	$105.97	$118.13	$199.81	$219.56	977	1,062
Cape Horn Dam	$27.51	$66.50	$51.90	$125.51	246	575
TOTAL IMPACT	$133.48	$184.63	$251.71	$345.07	1,223	1,637

Analysis: Bay Area Council Economic Institute using IMPLAN

The high bound estimate of $345.07 million helps offset some of the estimated costs shown above. By using a 3-percent inflation rate and a 5-percent discount rate of the losses from a 10% reduction in water availability, it is best to consider the net effects. In short, Figure 9 provides a way to see the present value of losses over time, as there could be annual losses with a 10-percent average reduction of water, with the removal of the dams. The breakeven point is approximately 0.92% water reduction on an annual average, meaning that if water shortfalls on average exceed 0.92%, there is economic hardship as a result of the removal of the dams and the stability to water supplies that they provide.

This report provides evidence that there are significant potential net economic costs to dam removal. As discussed above, there are also significant benefits to the natural environment. A complete benefit-cost analysis of dam removal is beyond the scope if this paper, but the results presented here certainly suggest that the answer is not clear. In low rainfall years, the economic costs are significant. Over a 10-year period, the net costs are as high as $250 to $300 million **annually**. In an era where water scarcity, throughout California, is likely to grow as a policy issue, the elimination of these dams as a source of water supply must be very carefully contemplated.

Figure 9: Cumulative Losses at 10% Annual Average Loss of Water, Red Dotted Line = Breakeven



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Data sources included California Department of Water Resources, California Employment Development Department, Bureau of Labor Statistics, Sonoma County Agricultural Commissioner, IMPLAN®, and Sonoma Water.