

## **The Economic Impacts of Water and Agricultural Industries: Inland Mendocino County**

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### **Sponsored by**

Mendocino County Inland Water and Power Commission  
Mendocino County Russian River Flood Control and Water Conservation Improvement District  
Mendocino County Agricultural Department  
Mendocino Winegrowers Inc.  
Mendocino County Farm Bureau

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## Highlights

**Total Economic Impact of Agriculture in the Study Area<sup>1</sup> =  
\$743,387,400**

By maintaining or expanding water capacity, the economic impacts of farmers are supported.

	<b>Wine Industry</b>	<b>Pears/Fruit</b>	<b>Tourism</b>	<b>Totals</b>
<b>Direct, Full-Time Equivalent Jobs</b>	1,610	92	1,334	3,036
<b>Direct Business Income</b>	\$384,739,100	\$8,995,800	\$94,768,900	\$488,503,800
<b>Number of Acres</b>	11,570 acres	1,256 acres		12,826 ac
<b>Indirect and Induced Impacts</b>	\$201,691,200	\$4,408,200	\$48,784,200	\$254,883,600
<b>Total Jobs</b>	3,156	139	1,713	5,008
<b>Local Tax Revenue</b>	\$6,944,500	\$167,752	\$8,954,400	\$16,066,652
<b>Total Economic Impact</b>	<b>\$586,430,300</b>	<b>\$13,404,000</b>	<b>\$143,553,100</b>	<b>\$743,387,400</b>

The economic impacts of losing water resources are based on farmers losing their ability to operate. Expanding water storage expands water security and reliability, and is direct agricultural support in lean rainfall years. If 100 acre feet were lost or gained to the Study Area's farmers, these estimates show what would be lost from the county economy.

<b>Per 100 Acre Feet of Water Lost</b>	<b>Wine Industry</b>	<b>Pears/Fruit</b>	<b>Tourism</b>	<b>Totals</b>
<b>Total Economic Impact</b>	\$6,758,000	\$462,000	\$1,653,000	<b>\$8,873,000</b>
<b>Total Jobs</b>	36.3	4.8	19.7	<b>60.8</b>
<b>Local Tax Revenue</b>	\$80,100	\$5,780	\$103,180	<b>\$189,060</b>

<sup>1</sup> The Study Area is the Russian River Flood Control and Water Conservation Improvement District (RRFC) and the Redwood Valley County Water District (RVCWD).

## Executive Summary

This study examines the value of water to agricultural businesses in the Russian River Flood Control and Water Conservation Improvement District (RRFC) and the Redwood Valley County Water District (RVCWD) (together the “Study Area”). Maintaining capacity in water resources makes Study Area farmers more resilient during years with less rain and supports a large portion of Mendocino County’s economy directly. Farmers generate or support:

- Over \$743 million dollars of business revenue of a county economy of just over \$3.5 billion;
- Over 5,000 jobs out of 32,600 county workers overall annually; and
- The Study Area’s farmers support approximately \$16.1 million of local tax revenue annually.

Lake Mendocino is the principal source of water for the Study Area. There are almost 13,300 acres of current agriculture land identified in the Study Area, 11,570 acres of grape vineyard alone. Restrictions on frost protection in wine grape growing or in pear orchards can impair harvest volumes, farmers’ ability to meet production contract terms, and also reduce agricultural land values. Further, a lack of storage capacity for water can have the same, basic effects as a water shortage regardless of rainfall level and groundwater available. Water resources must satiate demand from local farmers, residents and many other employers. Using groundwater as a source for additional agricultural purposes or to offset reduction in the availability of surface water is limited by water quality, volume and subsurface distribution. Water supply restrictions or capacity reductions affect the broader, county economy through the current level of agriculture.

Tourism is an allied industry to grape farmers and wineries and boosts the value of local agriculture as a result. As in many other wine-growing areas worldwide, Mendocino County draws in tourists for its local wineries, vineyards and natural beauty. Tourism may easily be affected by water shortages due to local wineries reducing what they can offer tourists in terms of services or products (based on reduced revenues and wine volumes), but water restrictions can also affect other aspects of a tourist’s freedom during vacation. While the majority of tourists to Mendocino County come for the coastal areas, the Study Area draws tourists that likely also access the coastal areas, tying inland tourism based on wine and agriculture to the countywide economy. Tourism’s tie to the Study Area’s farmers accounts for 19 percent of the business revenue impacts, over half (56 percent) of the local tax revenue augmented, and 34 percent of the new or supported jobs.

This study provides a set of algorithms for water reductions and economic losses per 100 acre feet based on the data presented. Also, as more water is stored and available, support for current farming is available, within land limits, to preserve the economic footprint of local farmers and ranchers. Whether restricting water use or deciding not to increase Lake Mendocino’s capacity, local agriculture is directly affected and those effects are felt by businesses, households and local governments throughout Mendocino County. One can also read these numbers as the return on investment per acre foot captured if Coyote Dam were raised, but additionally as how increasing water capacity leads to more safety and security for local farmers and how they affect the rest of the county economy.

## **The Economic Impacts of Water and Agricultural Industries: Inland Mendocino County**

### **Introduction**

This report provides an estimate of the economic value of water to agricultural businesses in the Study Area is the Russian River Flood Control and Water Conservation Improvement District (RRFC) and the Redwood Valley County Water District (RVCWD) of Mendocino County. Figure 1 shows a map of the Study Area. These areas combined are called the “Study Area” from here. The economic estimates also reflect how a water shortage affects local agriculture as businesses. Water shortages can be seen like a technological change for the negative or a reduction of goods and services supplied locally. Restrictions on frost protection for wine grapes and other fruit can reduce the amount of goods and services provided across many industries; if more water is available, these data also allow an estimate of how supporting agriculture impacts other parts of the local economy.

This study generates an algorithm by which a loss or gain of water will tell how many jobs, how much business income, and how much public revenue (taxes and fees) would be lost by Mendocino County. For example, raising Coyote Dam also raises water security and resilience for farmers in the Study Area. Such security increases the stability of local business incomes, jobs supported and tax revenue derived from agriculture. The Russian River Flood Control and Water Conservation Improvement District (RRFC) provided acreage data being used for farming in the Study Area. All of Mendocino County, due to economic connections between local agriculture and other industries, is affected by a water shortage.

The major agricultural industries in question are based on current land use estimates in 2015 from RRFC and from the Mendocino County Agricultural Commissioner’s Crop Reports from 2009 forward.<sup>2</sup> This report provides an estimate of the business income, employment, and tax benefits to Mendocino County and its incorporated cities and towns due to the Study Area’s agricultural sector.

The loss of water resources reduces farming and agricultural land resilience in Mendocino County. The economic impact analysis defines economic changes that would take place if the water supply increased or decreased. The logic is that each agricultural industry has a reaction, or “elasticity”, based on the change in acre feet available. Each farming industry experiences different, specific reactions to loss as a direct effect in terms of production levels. The direct effects give way to indirect and induced effects as changes ripple throughout Mendocino County.

This report concludes with algorithms that local policy advocates can use to quickly estimate the economic and fiscal effects of a loss of 100 acre feet of water availability to the local economy. Further, the algorithm provides a way to compare the cost of increasing water capacity against the gains of local tax revenue, business revenue and jobs supported by the additional water resources. From economic losses due to lost reliability of the local water supply, local businesses lose income, local workers lose their jobs and local governments lose tax revenues.

This project is structured as follows:

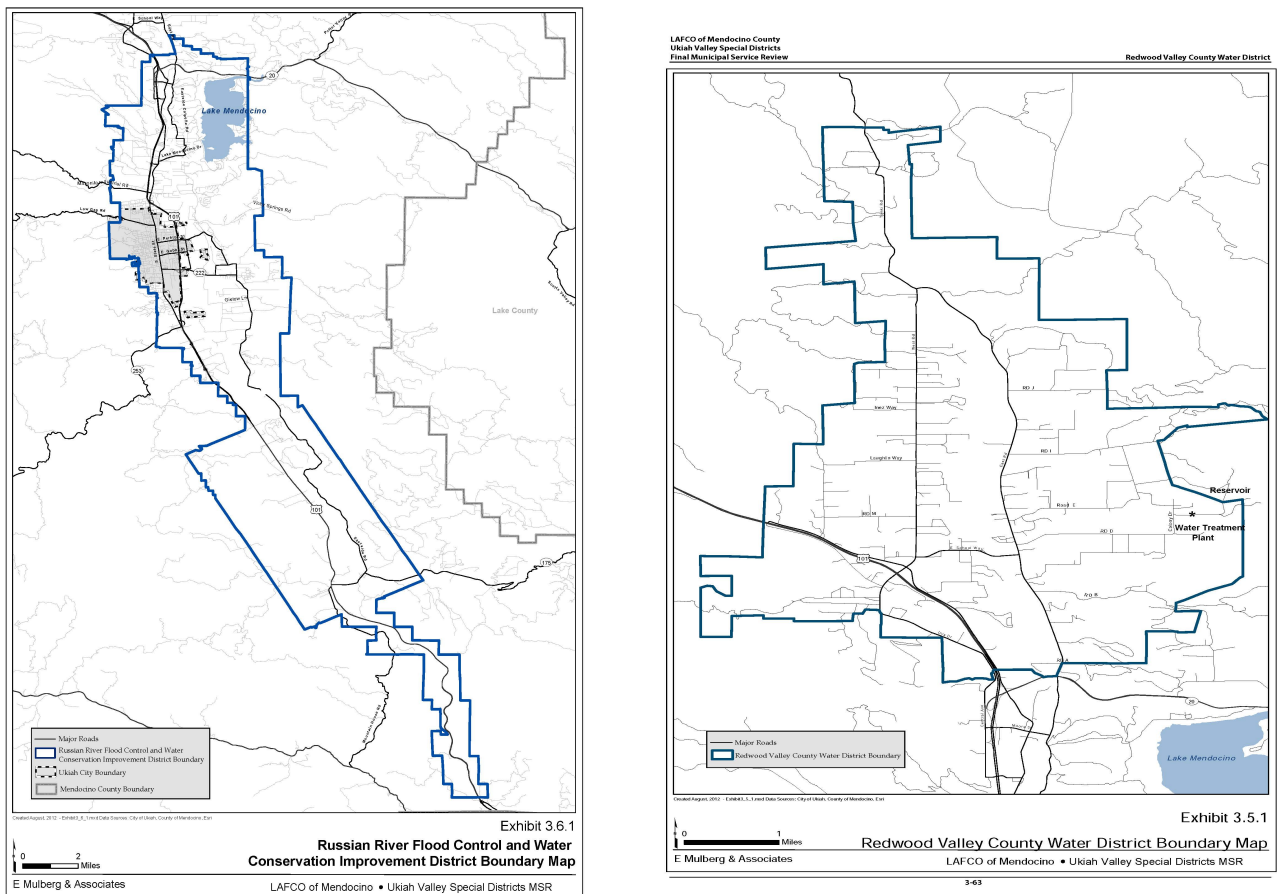
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<sup>2</sup> See <http://www.co.mendocino.ca.us/agriculture/cropStats.htm> for more. Data on land use was provided directly by RRFC staff.

- Overview of Mendocino County's Economy and Recent Data;
- Local Agriculture in Mendocino County's Economy and Water as an Input;
- Economic Impact Modeling;
- Data and Results; and
- Summary and Algorithm.

We will start with a look at Mendocino County's economy overall. Figure 1 shows the areas affected by Lake Mendocino's water in Mendocino County that act as the Study Area. Lake Mendocino is seen in both maps as a point of reference.

**Figure 1: Map of the Study Area inside Mendocino County Overall**



**Sources: LAFCO of Mendocino County Russian River Flood Control District (RRFC)**

## Mendocino County: Recent Economic Data

Understanding the size of Mendocino County's economy provides context for the results below. The first is the economic size of Mendocino County in terms of personal income. Personal income is the amount that residents have to pay taxes, save and buy goods and services. The local labor market includes workers and employers. Mendocino County is a rural county in northern California, but its

industry mix of jobs is not that much different than California overall. The state economy is dominated by many suburban and urban areas that provide more personal and businesses services versus agricultural employers. Third is the group of sales tax, property tax and transient occupancy tax (TOT) revenues generated by Mendocino County. We will see that tourism, based on the wine industry, is an important element of local agriculture's economic footprint based on water resources. The final subsection is on the agricultural industries of focus in this report:

- Wine grapes and wineries;
- Pears and other fruit; and
- Tourism.

Like other wine-growing areas, Mendocino County attracts tourists because local wineries and vineyards act as a gateway for other tourism. While this report focuses on a specific study area, the entire county is affected by Study Area agriculture. Each of the following sections provides an overview of Mendocino County's economy, as is available from data for the entire county as of August 2015.

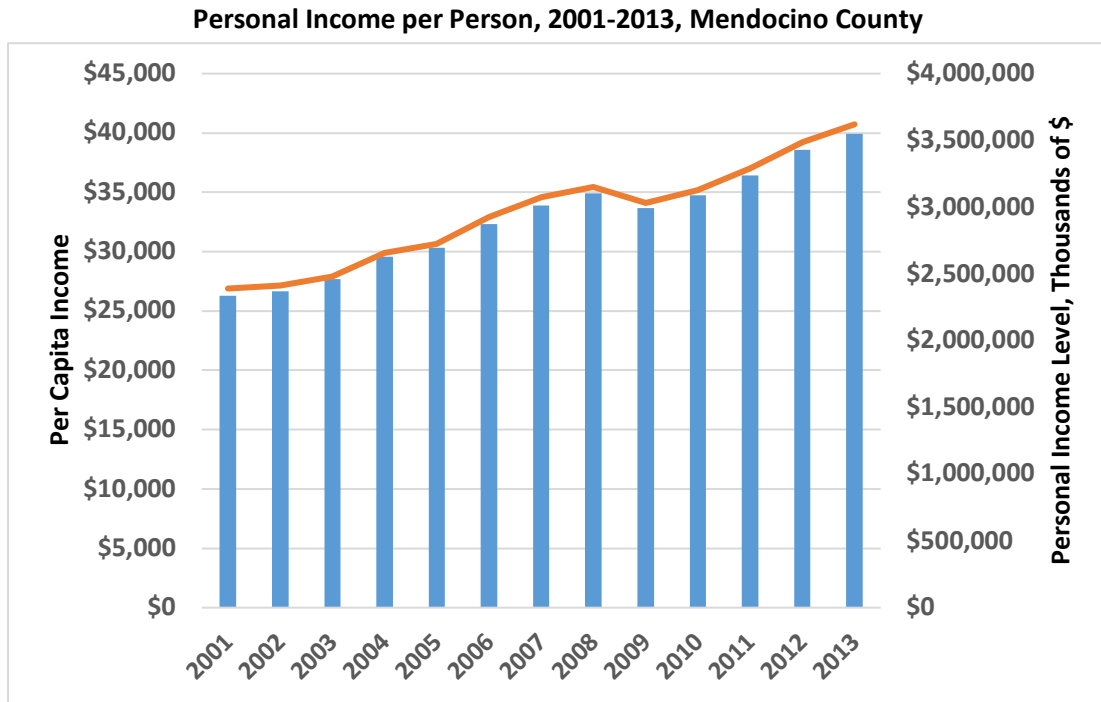
#### *Personal Income and Gross County Product*

Mendocino County has the following income measures for local business income. IMPLAN ([www.implan.com](http://www.implan.com)) does provide an estimate as of 2013, approximately equal to \$3.49 billion in 2013. Personal income in Mendocino County is reported by the Bureau of Economic Analysis as \$3.55 billion of 2013. We should think about these income measures as statements about the size of the county economy, and how much of the Study Area farmers and ranchers generate within the county as a percentage of the whole.

Personal income per capita and overall personal income are ways to compare one area to another in terms of economic size and ability to generate retail sales and also support local businesses. Figure 2's data on personal income growth suggests that the number of workers, residents and businesses potentially affected by local agriculture has been rising since 2009.

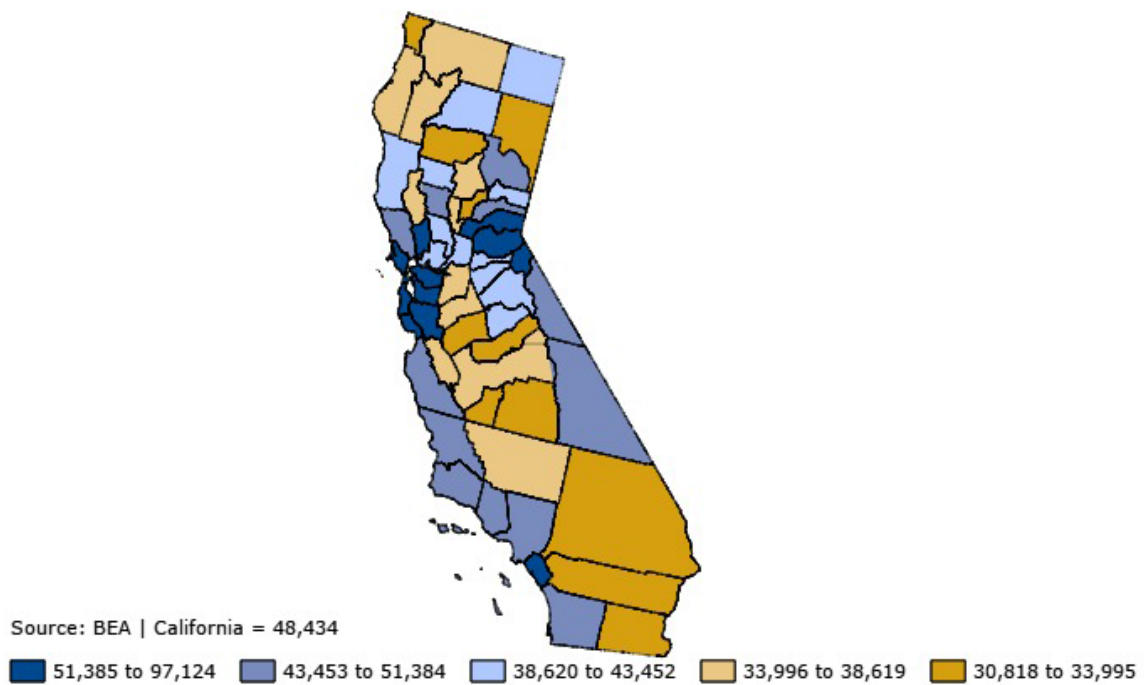
Figure 3 compares per capita personal income in Mendocino County with the other 57 California counties. This map provides a way to see how Mendocino County has income levels like its North Bay counterparts (Sonoma and Napa counties), but also has elements of its more northern neighbors (Humboldt, Trinity, etc.). Local agriculture relies on external markets to help augment generate local wages and salaries, land price support, and an expanding tax base. Figure 3 also shows that California had a per-capita income level of \$48,434 in 2013; Mendocino County had a per-capita income figure of \$40,727 in 2013, according to the Bureau of Economic Analysis in 2013.

**Figure 2: Personal Income, Nominal Levels, 2001-2013, Mendocino County**



Source: BEA ([www.bea.gov](http://www.bea.gov))

**Figure 3**  
California, Per capita personal income, 2013



*Why Does This Matter?*



Personal income levels act as a way to consider how much income is in Mendocino County from wages and salaries, investment income, and what can generate sales that support local businesses of all types. Local personal income is not the only source of business-to-business transactions or retail sales, as tourism can have some effects on other markets without any dependence on the local population. The Study Area farmers support \$743 million of business revenue through its direct and broader economic impacts just in the Study Area, supporting wages and salaries in Mendocino County as personal income. Personal income is a guide to the evolution of the local economy and the way in which jobs are compensated and the types of jobs that exist in Mendocino County. When water use is restricted or water supply is enhanced, people and businesses are both affected.

### *Employment and Labor Market Breadth*

As of July 2015, Mendocino County businesses employed at least 32,800 people; the county has about 39,000 residents who are currently employed. Commuting links Mendocino County to other labor markets. There are approximately another 22,200 people employed by “non-payroll” employers in Mendocino County as of 2014. Together, there may be as many as 55,000 people working in Mendocino County daily, split between the coastal and inland areas. Most of the employed residents live in the Ukiah/Redwood Valley/Willits areas, followed by Fort Bragg and the village of Mendocino.

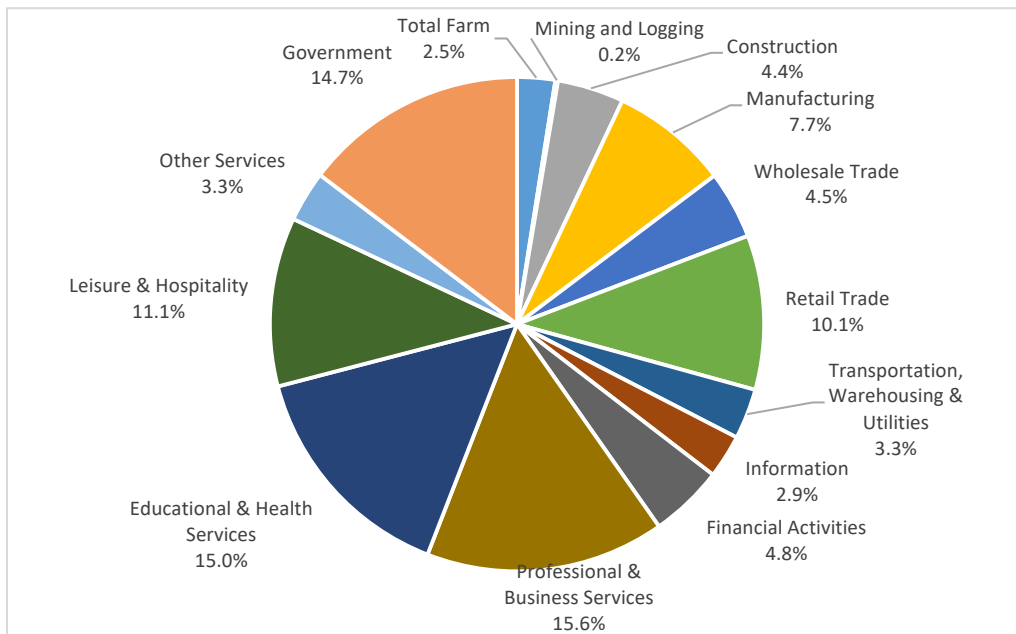
**Table 1: Labor Force and Employment Levels for Specific Cities and Towns, Mendocino County Working Residents, July 2015**

Area Name	Labor	
	Force	Employment
Covelo	480	450
Fort Bragg	3,640	3,480
Laytonville	500	410
Mendocino	480	470
Point Arena	250	240
Redwood Valley	2,000	<b>1,800</b>
Ukiah	6,980	<b>6,410</b>
Willits	2,260	2,160

**Source: EDD ([www.edd.ca.gov](http://www.edd.ca.gov))**

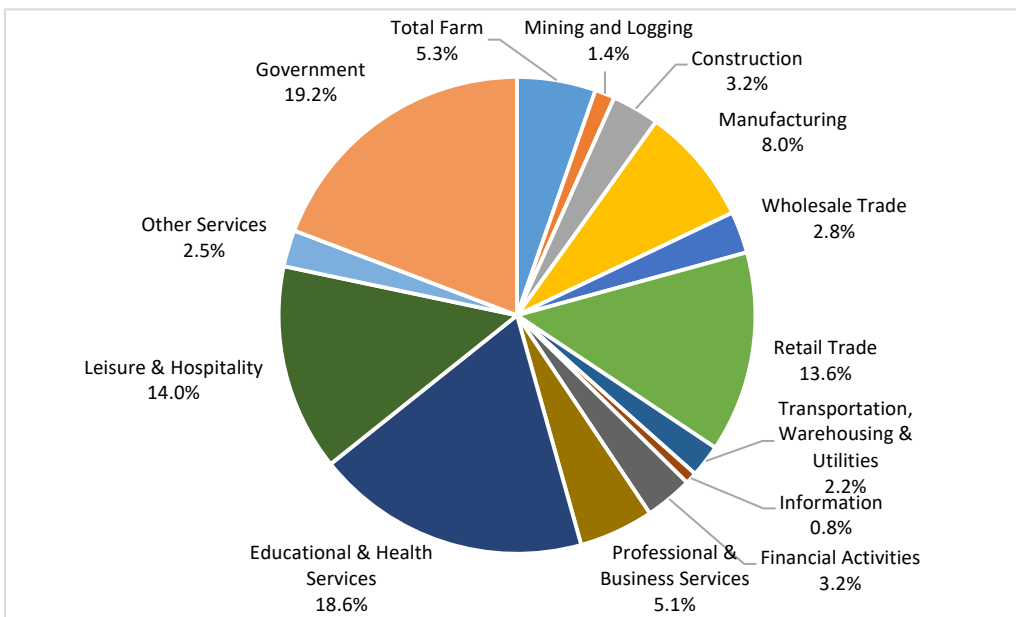
The local mix of industries is also an important aspect of the economic impact of any industry on its local communities. Below is a comparison to California of the proportions of employment in specific industries. Notice the mix for California is more skewed toward services, a reflection of California’s urban areas being both dominant jobs and population sites.

**Figure 4: California Industrial Mix, 2015**



Source: California Employment Development Department ([www.edd.ca.gov](http://www.edd.ca.gov))

**Figure 5: Mendocino Industrial Mix, 2015**



Source: California Employment Development Department ([www.edd.ca.gov](http://www.edd.ca.gov))

*Why is this important?*

The mix of industries in Mendocino County is different from the state of California in many ways, as local businesses serve local residents and their needs. Notice that retail trade (stores of all kinds) and leisure and hospitality (tourism support services, including restaurants and hotels/motels/B&Bs) are

all larger in Mendocino County than the state mix. Professional and business services industries are a much larger proportion for California due to larger, urban areas having a concentration of such businesses. When we see the economic impact results below, we should expect the industry mix of those businesses affected by a contraction or expansion of agricultural incomes to follow the industry mix above. Over 5,000 jobs are supported by the Study Area's farmers.

The mix of local industries tells how local agriculture may affect other businesses as it increases or decreases in size. For example, as more wine grapes are harvested, more workers spend more money on local businesses. The types of local businesses, and the ability of those incomes to be spent locally, capture the economic impacts and define leakage that the local area cannot capture. These "leakages" are important in determining the magnitude of an industry's impacts on a local area. For example, some wineries will grow grapes in the Study Area, move those grapes for processing to another place in Mendocino County, and then sell bottled wine in the Study Area in tasting rooms, local restaurants or grocery stores. The economic impact model below captures these leakages, especially those beyond Mendocino County. How local industries affect government revenue gained or lost by an industry's expansion or contraction is similar to the business income effects.

### *Sales and Property Taxes*

The levels of sales, property and transient occupancy tax revenues tell a story of how much is currently generated by businesses in Mendocino County. Property taxes are part of the economic impact story as all commercial properties pay this tax. In 2014, the assessed value of properties in Mendocino County was \$10.493 billion dollars; that valuation was estimated to provide over \$30 million in property tax revenue.<sup>3</sup>

The California Board of Equalization ([www.boe.ca.gov](http://www.boe.ca.gov)) provides taxable sales information for Mendocino County, as well as current and historic sales tax rates by city. BOE lags about six (6) quarters in its data; it reports that Mendocino County had about \$1.304 billion in taxable transactions in 2013. The number of taxable transactions that implies for the fiscal year, given what Mendocino County retains from sales taxes is approximately 1.2 percent higher than 2013, which is approximately \$1.32 billion for calendar year 2014. The sales tax revenue derived from these transactions depend on where the transactions happened, and are also spent on specific initiatives from the past. For Ukiah<sup>4</sup>, as an example, the following list adds to the base of 7.5 percent sales tax in Mendocino County, for a total of 8.125 percent:

- Mendocino Library Special Transactions and Use Tax (MLST) = 0.125 percent (April 2012); and
- Ukiah (City) City of Ukiah Transactions and Use Tax (UKGT) = 0.50 percent (October 2005).

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<sup>3</sup> See <http://www.co.mendocino.ca.us/administration/14-15FinalBudget.htm> for the most recent budget data for the 2014-15 fiscal year. These data are also available at OPEN BOE ([www.boe.ca.gov/DataPortal](http://www.boe.ca.gov/DataPortal)) at the CA State Board of Equalization. Additional assessments add specific expenditures from the base support, and are not discussed here in framing the base property tax revenues.

<sup>4</sup> See <http://www.boe.ca.gov/pdf/boe105.pdf> for more.

Transient occupancy tax (TOT) revenue is estimated by Dean Runyan Associates ([www.deanrunyan.com](http://www.deanrunyan.com)). For the calendar year 2014, Dean Runyan Associates estimates county TOT revenue was approximately \$6.733 million. Because Mendocino County is a mix of wine industry, coastal-area and outdoor activity tourism, it is difficult without more detail data to know why TOT is generated. Based on a recent travel study for Mendocino County, we will approximate TOT revenue as 26-percent related to the wine industry. There is also tourism to Mendocino County that is connected to agricultural businesses. This also generates TOT and sales tax revenue, which we will see come up in the IMPLAN results. Over \$16 million of local tax revenue is supported by Study Area farmers annually.

#### *Why is this Important?*

In the economic impact results below, there are estimates of both state-level and local-level taxes that are earned by the current level of agricultural activity in the Study Area. Any loss of water resources that affects local farmers affects sales tax, property tax and TOT revenues for all of Mendocino County. Sales tax and TOT revenue changes are relatively easy to understand, but property tax losses will come from a reduction in home building and renovation, a reduction in commercial property building and renovation (especially wine-industry commercial spaces that house both tasting facilities and winery operations), and also defer maintenance which can lead to more rapid downward reassessments during recession. The tax revenue supported by local agriculture completes the economic impacts of changes to the water supply in these areas. Let's look at some summary numbers for county agriculture in more detail.

#### *Specific Ag Industry Characteristics + Farm Income and Employment*

Our look at agriculture in the Study Area focuses on three major industries<sup>5</sup>:

- Wine grapes and wineries;
- Pears and Other Fruit; and
- Tourism related to agricultural products.

Farm revenues are estimated by the Mendocino County Agricultural Commissioner's office, and historic details are provided by the Bureau of Economic Analysis ([www.bea.gov](http://www.bea.gov)) for farmers in Mendocino County, as shown in Table 2. Table 2 shows the proportions of revenue made by farmers that is spent elsewhere in the economy and through farmer supply chains. When vineyard rootstock is purchased, other businesses are affected; when seed is purchased, other businesses are affected. As shown later, the economic impact results reflect each industry's supply chain and define how incomes made (or lost) by local farmers have broader impacts on the Study Area economies, as well as all of

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<sup>5</sup> Livestock was considered for coverage in this study, but due to uncertainty over the number of head of cattle and other livestock, and the relatively low value of farm income specific to the Study Area, we decided to leave livestock out to keep these numbers conservative and more certain based on available data.

Mendocino County.

**Table 2: Farm Income Categories and Levels, Thousands of \$**

Category	2009	2010	2011	2012	2013	2014 est.
<b>Ag Value of Mendocino County (less Forest Products)<sup>6</sup></b>	<b>118,150</b>	<b>116,191</b>	<b>115,407</b>	<b>144,963</b>	<b>156,621</b>	<b>139,295</b>
Production expenses	107,710	96,073	94,290	123,938	135,047	119,139
Seed purchased	1,550	2,508	2,710	3,015	2,765	2,284
Fertilizer and lime (incl. ag. chemicals 1978-fwd.)	4,959	6,221	6,584	7,839	7,641	6,972
Petroleum products purchased	4,864	2,482	2,558	3,344	4,255	4,946
Hired farm labor expenses <sup>7</sup>	39,105	44,458	44,842	56,503	61,325	51,847
All other production expenses <sup>8</sup>	57,232	40,404	37,596	53,237	59,061	53,090
Total farm labor and proprietors' income	10,440	20,118	21,117	21,025	21,574	20,156

Sources: Bureau of Economic Analysis ([www.bea.gov](http://www.bea.gov)) and Mendocino County Agricultural Commissioner

Mendocino County's Agricultural Commissioner estimated that the agricultural income in the county was \$139.3 million in 2014. Let's now look at the Study Area's agricultural mix, which does not comprise all of Mendocino County's agriculture. These areas do comprise a majority of grape vineyard acreage, approximately 66.8 percent of the county total as of 2014. Table 3 shows the breadth of agricultural land in the Study Area. Notice that wine grape vineyard is the dominant agriculture use, followed by orchards, primarily pears. Because county tourism has ties to the Mendocino County wine industry, driven by the local growers and wineries, we will see later how tourism adds economic value to local agriculture.

While the Study Area is not the complete agricultural picture of this county, it is naive to believe that other parts of the county economy will not be affected by a water shortage that reduces Mendocino County's agricultural economy.

**Table 3: Acreage in the Study Area, by Agricultural Use, 2015**

Ag Type	Totals
Orchard	1,256
Pasture	255
Potential AG	187
Row Crops	28
Unknown	2
Vineyard	11,570
<b>Total</b>	<b>13,298</b>

Source: RRFC, Mendocino County Ag Commissioner

## Summary

<sup>6</sup> The 2014 data is a preliminary estimate made by the author based on Bureau of Economic Analysis data. The final findings of the Agricultural Commissioner may differ.

<sup>7</sup> These payments include workers' pay and benefits, employers' contributions for Social Security and Medicare, and payments for contract labor, machine hire, and custom work. See [www.bea.gov](http://www.bea.gov) for more

<sup>8</sup> These payments include of repair and operation of machinery; depreciation, interest, rent and taxes; and other miscellaneous expenses

This section sets the stage for the economic impact results below. Mendocino County has approximately \$3.5 billion in annual personal income as a measure of economic potential as of 2013. This has likely grown toward 2015 based on continued economic recovery. Many local workers have jobs in Ukiah, Redwood Valley, and other parts of the Highway 101 corridor, including jobs outside the county in Sonoma and Napa counties. The mix of jobs and industries that employ workers in Mendocino County is diverse, and somewhat similar to the state overall, though more skewed toward agriculture in Mendocino County and away from professional and business services. This mix defines how agriculture can affect the rest of the county economy.

Tax revenue levels also provide some context for how much agriculture, just in these two areas of Mendocino County, may support public programs. Because tourism is a fundamental part of the wine industry's economic effects on an area, sales taxes and transient occupancy taxes (TOT) provide local government with a boost that is similar to exporting services.

The key here is to understand how the economic impacts of local agriculture are affected when water capacity and security is reduced. The Study Area's agriculture types help define what may be lost in income, jobs and tax revenues. The next section looks at water as an input more directly and also how supply chains work to set up the broader economic analysis.

### **Water and Agricultural Supply Chains**

Lake Mendocino is the primary source of water for residents, businesses and farms in the Study Area. Like any shared resource, competition over water makes for a complicated set of political and economic decisions if a resource shortage takes place. Choices over irrigation, frost protection and other water choices depend on the long-term availability and security of water.

The capacity of Lake Mendocino, in terms of acre feet (the unit of measure here, approximately 325,851.5 gallons), provides the supply conditions for these areas to demand water. The demand conditions depend on many aspects of decisions made to date and also those to come:

- The number of housing units;
- The number and size of commercial real estate;
- The water-saving decisions of current and future residential and commercial owners in terms of infrastructure;
- The agricultural decisions of farmers and ranchers; and
- The amount of tourism that comes to the Study Area as temporary "residents" of Ukiah and Redwood Valley.

Water is an input to agriculture, as if water was gasoline to fuel a tractor. Without water, farmers will be limited on harvest volumes, and such a shortage may also imply both additional costs and lost revenue. This is because water has a unique role in agriculture as it does in our everyday lives; water cannot be easily substituted. Farmers and ranchers are in competition with each other, but also with the other "residents" above.

Water resources provide a rate of return to farmers with each gallon used. There is a cost for water, and farmers may face rising costs conditions when water resources are low. Rising water costs should be considered a reflection of reduced water availability. When there is an additional cost to water, farmers are forced to make a choice between more expensive water and other inputs; a farmer may purchase fewer hours of work from outside the farm, be more of a direct laborer as a ranch hand, and subsidize the larger cost of water for harvest cycles.

When such tradeoffs take place, the local economy is adversely affected. A worker who was employed in May as a farm worker and is fired in June because of a change in the cost of water may struggle to find more work locally and either exist on unemployment insurance or move away from Mendocino County altogether. Because the "supply chain" for each agricultural good involves labor, materials, machines, water, and many other inputs, once one of these inputs faces reduced demand, a ripple effect begins through these supply chains that may have widespread impacts on seemingly unrelated industries. Some may point to ground water as an offset for local farmers.

### *A Brief Note on Ground Water*

A major debate item concerning water used in agricultural production is the use of ground water. Using groundwater as a source for additional agricultural purposes or to offset reduction in the availability of surface water is limited by water quality, volume and subsurface distribution. There are three aspects of ground water to consider in this study. First, some farmers will have licensed water rights over well water deemed an underflow of the Russian River. Second, we can assume that farmers that have ground water are likely using Lake Mendocino water either as part of the watershed that naturally feeds the individual water rights or as supplements beyond direct rainwater. There is a boron level in groundwater captured from local rainfall that may force many farmers to use water derived from Lake Mendocino directly simply because the boron levels are too high to trust in any agricultural setting, specifically wine grapes and pears. Finally, with the creation of additional regulations on the use of groundwater in the Ukiah Valley groundwater basin, the development of new groundwater wells may be reduced. We will assume, therefore, that decision making by Study Area farmers depends directly on Lake Mendocino water levels.

### *Study Area Water Resources*

Raising Coyote Dam improves water resilience and capacity benefitting local agriculture through enhanced water resources. Using the economic data above, the next step is to find how water is used in the Study Area as best as possible. The water use data in Table 4 below is a way to estimate the proportion of water used in local agriculture. Table 4 illustrates an example of residential and agricultural competition over water; this "marketplace" becomes especially tricky to navigate when there are drought conditions. While Table 4 illustrates the demand for water from the 8,000 acre feet water rights of RWCWD from 2001 to 2013, this study is focused on water resilience and availability to protect current agriculture. Data from RRFC from 2015 is also in Table 4.

Although reliability for domestic water supply has two features not available to reliability for agricultural water, these features do not completely eliminate the likelihood of reduction of supply to

agriculture during times of shortage. The first of these features is that available supply is more likely to be increased through expanded use of groundwater for domestic than for agriculture. This is largely due to the ability of public water systems to distribute water from a point source to a larger area than a single farm or ranch. It is also due in part to the ability of public drinking water systems to accept the cost of improving impaired chemical water quality of source waters. The second is the statutory right of drinking water to take priority over irrigation water during times of shortage (CA Water Code § 106). In order to eliminate any potential competition over available water supplies the most reliable method is to increase supplies.

Table 5 shows basic forecasts for population inside of Mendocino County through 2030. With recent water usage data and population data, we can say that assuming water per person used will not rise over time (due to general conservation efforts and water-efficiency technologies becoming more the norm), the major reason why demand for water will rise would be due to population growth, water-intensive business growth, including agriculture, or unforeseen needs otherwise.

**Table 4: Acre Feet of Demand, Various Uses, Study Area**

<b>RRFC</b>	
Municipal*	2,992
Agricultural	3,861
Industrial	347
Surplus**	800
<b>RWCWD***</b>	
Agricultural	1,131
Domestic	543

Source: RRFC/RWCWD Annexation/Dissolution, LAFCO Application Plan for Services April 2015, and Redwood Valley County Water District

\* Includes some agricultural service not in the Ukiah Valley

\*\* RRFC surplus water bound by a judgement to sell all surplus to RVCWD.

\*\*\*Average Use For 2001-2013 from RWCWD, RRFC is data for 2015.

**Table 5: Recent Data and Projections on Mendocino Population and Housing Demand, 2010-30**

Mendocino County	2010	2015	2020	2025	2030
<b>Total Population</b>	87,841	89,024	90,551	92,340	93,707
<b>Household Population</b>	85,797	87,014	88,561	90,292	91,604
<b>Group Quarters</b>	2,044	2,010	1,990	2,048	2,103
<b>Total Households</b>	34,945	35,904	36,764	37,494	37,900
<b>People Per Household</b>	2.46	2.42	2.41	2.41	2.42

Source: California Department of Finance, P-4 Report ([www.dof.ca.gov](http://www.dof.ca.gov))

Residential growth will continue, as will the need for more housing units and other demands on water resources; such growth affects agricultural supply chains. The next section looks at the Study Area's major agricultural sectors using historic data on the size of employment, income and other economic variables to set up the main part of this study which is the economic impacts of a water



shortage on the Study Area and Mendocino County overall.

### *Agricultural Supply Chains*

Before we look at the broader economic impacts from changes in agricultural output for these areas, it is important to understand the supply chains in two agricultural industries: wine grapes and pears. Tourism's supply chain issues will be discussed in the economic impact results section.

A supply chain is what links all the parts of a production process to each other. These can be as simple as a farmer who sells at a farmer's market, where the farmer is basically the entire supply chain; it can also be very complex in that the parts of the supply chain are made up of multiple parts for each step (production, distribution and retail) and every part is a different company providing that input or that service.

The supply chain description of each industry will be part of the economic impact descriptions below. The wine grape supply chain is dominated by regulatory stops for each step in the chain: production of wine, the distribution of the final product, and then retail. Each step in the wine industry has a tax imposition (which means more government revenue is affected when water resources are reduced in availability). Pears and other fruit face a similar supply chain, but not the same regulatory and taxation stops, short of food safety.

In the wine industry, there has been a combination of industries that represent the "direct" impacts of the industry on the greater economy under a philosophy that specific industries unique serve the production step in the wine industry's supply chain, and without that industry, the supplier would not have a market.

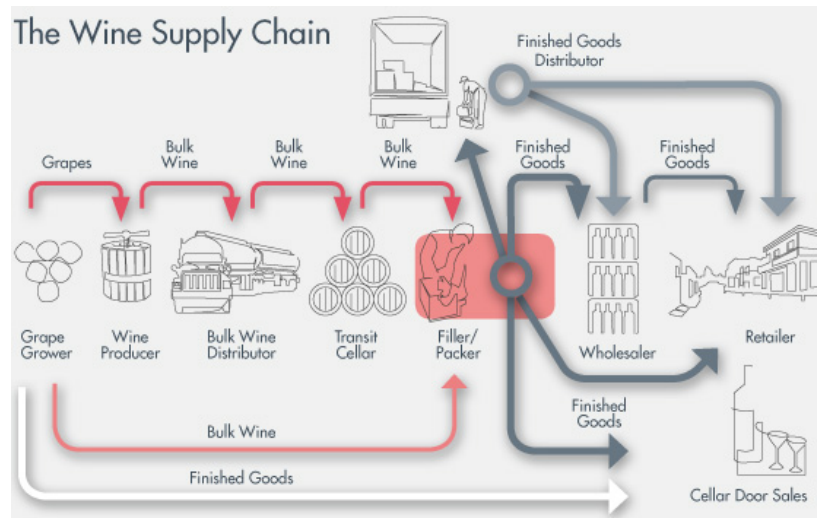
### *Wine grapes to glass*

The wine industry has a long history in Mendocino County; county vintners have many connections within and beyond the county borders. There have also been many analyses of the economic impacts of the wine industry on various states in the United States.<sup>9</sup> The basic flow and outline of these studies act as beginning points for this analysis. Figure 6 describes the basic process, which is a three-tier system: production, wholesale/distribution and retail sales. We will assume that Mendocino winery sales through restaurants are approximately three (3) percent of overall restaurant revenues, as shown in the summary impacts and tables of the Appendix. This is an important part of the supply chain as one of four "retailer" centers: tasting rooms; direct-to-consumer (e.g. wine clubs); grocery and wine stores; and restaurants.

**Figure 6: An Illustration of the Wine Supply Chain**

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<sup>9</sup> See Full Glass Research (2015) for a recent study on the Oregon Wine Industry. The Wine Institute (2015) also has highlights from the most recent state-level look at California (see <http://www.wineinstitute.org/resources/pressroom/120720060>).



Source: Google Images

Figure 6 also describes many beverage supply chains and defines how the economic impact process works. The wine industry captures many of these supply chain links locally or derives “export” income at many different points (selling outside of Mendocino County). The farming and production (bulk wine) tasks, from grapes to distribution and shipping finished bottles somewhere (in some cases, directly to the consumer through tasting rooms or what the wine industry calls “Direct to Consumer” programs), represent what is normally seen as the wine industry’s direct impacts. The sum of these tasks brings grapes to the marketplace as packaged wine after a production process. Some of the bulk wine (wine before packaged) is imported, and some is exported.

The next two stops of the three-tier system are wholesale/distribution and retail sales. Some of the wine will be sold in wholesale export markets as bulk; some will be sold to beverage distributors to go to retailers and some will be sold direct to consumers (DTC) and also sold out of a tasting room or both. The supply chain includes retailers from restaurants that carry Mendocino wines (and may by direct sales from wineries that have wholesale licenses) to tasting rooms to capsule manufacturers and printers for labeling. The direct effects pick up the retail channels for wine as indirect and induced effects. In the Appendix, direct income and employment data for wholesale and restaurant outlets are based on revenue proportions to total winery sales. For example, we assume that a percentage of wholesale jobs in Mendocino County represent winery interests and restaurants employ workers to service wine sales as well as food sales.<sup>10</sup>

The acreage data below defines the current amount of planted acreage within Mendocino County; Table 3 is specific acreage in the Study Area. Some of the summary data that come from both the Mendocino County Agricultural Commissioner’s report and from the National Agricultural Statistics Service (NASS) provide baseline data for the value of grapes.

<sup>10</sup> See <http://oregon-wine.com/wp-content/uploads/2015/02/full-glass-wine-economic-impact-oregon-1-2015.pdf> for a recent study that provides a simple way to consider the supply chain connections of wineries to the distribution and retail tiers.

Acres of vineyards in Mendocino County<sup>11</sup>:

- Bearing = 16,429;
- 904 non-bearing;
- 17,333 overall in wine grapes as of 2014, 11,570 of which are in the Study Area.

We assume 66.8 percent of bearing acres are in the Study Area. The tonnage of grapes processed provide a value of what was actually turned into wine for the year in question, and there is also a value of purchased wine that is essentially the value of bulk wine produced **and** purchased. Some of the processed grapes may not be sold. The following data provide a summary for the 2014 harvest:<sup>12</sup>

- Number of tons of grapes processed (2014): 61,960, Table 2, Grape Crush report;
- Average Grower returns per ton of grapes (2014): \$1,493.10, Table 6, Grape Crush report; and
- Total economic value of grapes to Mendocino County wineries = \$92,512,476 (Tons processed x Average Grower Return).

The value of grapes begins the economic process. From there, the other supply chain stops begin to move. The evolution of the value of wine grapes processed since 2011 is in Table 6:

**Table 6: Recent Data on Processed Wine Grapes, 2011 – 2014, Mendocino County**

Year	2011	2012	2013	2014
Value/ton (\$)	\$1,236.81	\$1,427.07	\$1,441.53	\$1,493.10
Tons Processed	57,383	71,095	77,921	61,960
Value Processed	<b>\$70,971,868</b>	<b>\$101,457,399</b>	<b>\$112,325,027</b>	<b>\$92,512,476</b>

Source: Grape Crush Report, NASS, <http://www.tinyurl.com/grapecrush>

The employment levels of major subindustries for vineyards and wineries also help provide context for how the economic impacts ripple out from vineyard operations. Table 7 provides recent data on specific industries such as vineyard management, rootstock nursery, wholesale businesses specific to wine, equipment wholesale specific to the wine industry, and the most recent winery and vineyard employment data available for Mendocino County.

What the data in Table 7 provide are beginning points for estimating the economic impacts of the wine industry located in the Study Area.<sup>13</sup>

**Table 7: Employment by Major Industry Component, Wine Industry, Mendocino County, 2015**

		Vineyard			Wine	Equip
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<sup>11</sup> Table 10 Grape Acreage Report, NASS,

[http://www.nass.usda.gov/Statistics\\_by\\_State/California/Publications/Grape\\_Acreage/](http://www.nass.usda.gov/Statistics_by_State/California/Publications/Grape_Acreage/)

<sup>12</sup> See Grape Crush Report, Tables 2 and 6, <http://www.tinyurl.com/grapecrush>

<sup>13</sup> See Mendocino Wine and Wine Grapes Commission (2014) Market Analysis for detail on varietals, plantings, and other details about the county's wine industry from a grape grower viewpoint. See <http://www.mendowine.com/files/MWIMarketAnalysis2014.pdf> for more.

	Vineyards	Management	Nurseries	Wineries	Wholesale	Wholesale
<b>2009</b>	767	107	17	773	67	15
<b>2010</b>	694	105	15	669	74	12
<b>2011</b>	721	101	13	671	73	13
<b>2012</b>	700	98	11	726	82	15
<b>2013</b>	733	95	11	771	86	32
<b>2014</b>	792	89	11	806	93	97

Source: California Employment Development Department ([www.edd.ca.gov](http://www.edd.ca.gov))

Another aspect of wine grapes and their agricultural value is the net exports for grapes and bulk wine that happens during harvest. According to Mendocino Winegrowers Inc., there are generally net imports for harvested grapes or bulk wine annually.<sup>14</sup> This does not mean the local wine industry sends out more income than it brings in; in fact, the use of bulk wine with recognized branding can help enhance a winery's business through brand recognition and expansion of wine volume in order to remain competitive. The wine industry in Mendocino County then uses that bulk wine to export for use in bottled wine elsewhere (estimated by Bureau of Economic Analysis and IMPLAN at approximately \$35,000,000 in 2013, almost 10 times what is sold within Mendocino County). Also, capsules or the seal on the top of wine bottles (more than other parts of the winery's supply chain) have local providers that are preferred over imported providers. Mendocino County does have some supply chain leakages, which are discussed in more detail below. The next industry we look at is the supply chain for pears and other fruit using orchards.

#### *Pears and Other Fruit*

The pear industry has an annual cycle for farm workers and other spending on inputs by farmers, with a surge during the harvest season. While there may be other fruit in the Study Area and farmed in orchards, Table 7 provides a specific look at the number of bearing acres of pears, tons harvested, overall production and, value of annual crops. Like grapes, pears are a non-citrus fruit and are harvested by hand, placed in bins and transported to a sorting house. From there, pears are graded, sorted by size and packed for fresh food markets (as in a grocery store produce setting), or for processing. Figure 7 shows the figures as of 2014 for the pears industry.

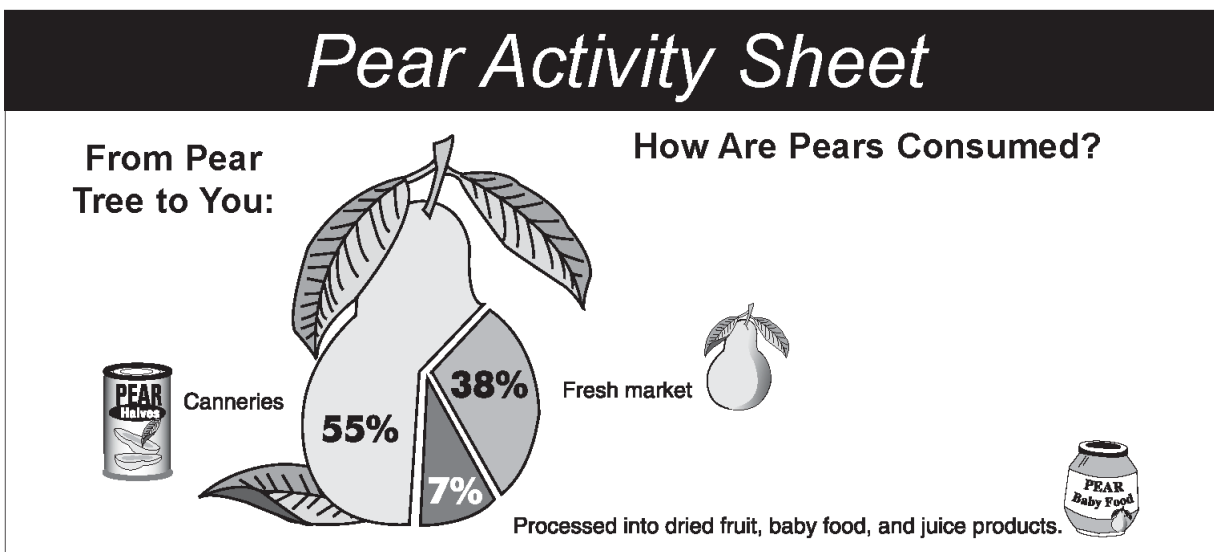
The supply chain for pears may not exist completely in Mendocino County. For example, there may be pear processors in Mendocino County that use local pears to process, but not all pears are processed locally. There may be many export sales of pears in raw form also. California EDD reports the number of employees in pear farming for Mendocino County is 135 workers as of the end of 2014. This is slightly up from 131 and 126 in 2013 and 2012 respectively.<sup>15</sup> There are no other supply chain

<sup>14</sup> Husch Winery was gracious enough to provide some winery-specific information to help understand the bulk grape market and also some recent examples of their purchasing behavior.

<sup>15</sup> It is likely there is a surge of workers that come in for harvest, and that this number is a blend of pear farming labor that comes in throughout the year. Because some of that labor is hired outside Mendocino County and comes in as contract labor, the number here is conservative as it reflects more of the permanent, local labor rather than every worker that comes to Mendocino County for orchard harvest annually.

data for pears in Mendocino County, so we will rely on the IMPLAN model to provide the rest of the economic estimates.

**Figure 7: Pear Use in Agriculture by Proportions of Users of Raw Pears**



Source: California Pear Advisory Board

**Table 8: Acres, Production Levels, Returns and Value, Pears and Other Fruit 2008-2013**

	Pears					Other Fruit	
	Bearing Acres	Tons/Acre	Production	\$/ton	Value	Bearing Acres	Value
2009	1,236	18	22,742	\$391	\$8,892,278	89	\$456,754
2010	1,199	15	17,985	478	8,589,636	71	446,895
2011	1,198	20	23,960	415	9,945,796	69	343,175
2012	1,184	19	22,614	470	10,628,768	71	304,754
2013	1,184	21	24,509	\$467	\$11,445,610	72	\$280,769

Source: Mendocino County Ag Commissioner, NASS ([www.nass.usda.gov](http://www.nass.usda.gov)), 2014 is forthcoming

#### *A Note on Land Values*

Before we look at tourism data, we should reflect on land values given local agricultural use above. One effect of a water shortage that is not estimated here is a change in land values. Because water is an asset that is essential to owning a home, running a business, or owning and operating a farm operation, if water resources are in question, land values may suffer. The valuation of such a change depends on the amount of water a potential land owner intends to consume. For an agricultural user of water, this can be an immediate issue for return on investment. If the water cost or availability is considered to be questionable in terms of negatively affecting the farmer's profits, potential farmers looking to purchase land may want a discount on the land cost to offset the lack of water or the expectation of rising water costs (for example, a need to truck in water).

An easy analog exists in home purchases. When inspecting a home while purchasing it, a potential owner is going to want to know if the gas lines, water lines, electricity wiring, etc., are in good shape and that an immediate investment will not be needed to offset an inability to use a necessary resource. If such an investment is deemed necessary, the buyer of a property may negotiate prices down to compensate for that cost. This example can be generalized to farm land with reduced water availability to restricted usage (for example, frost protection restrictions); a farmer may have some restrictions on the most beneficial use of the property, which reduces what a farmer is willing to pay as a purchase price. Hence, a reduced availability of water or an increase in cost can lead to lower land values. Vineyards and the county's aesthetics are a long-term draw for visitors due to the use of land.

### *Tourism: The Added Component in Local Agriculture*

Wine tasting and touring California's wine-growing areas is a big business. Wines and Vines Magazine<sup>16</sup> publishes an annual "buyer's guide" that identifies the number of wineries in the United States and the supply chain for wineries on a business-by-business basis. For Mendocino County, Wines and Vines identified 106 wineries in 2015, which is corroborated by the number published by governmental sources for the number of winery employers (46 payroll, 60 non-employer or self-employed). Tourism is normally seen as an "allied" industry to wineries and grape growing because of tasting room facilities.

Of those 106 wineries, Wines and Vines Buyer's Guide identified 55 percent with tasting facilities. The reason why this is important is that the tasting room is the portal to winery-related tourism. The challenge is to find a logical way to tie tourism spending to winery tasting rooms, and how that may lead to more tourism spending throughout the county. If Mendocino County was geographically landlocked like Napa County, it may be easy to say that the dominant tourism factor in Mendocino County is the wine industry. Because of the coastal tourism opportunities available in Mendocino County, visitors likely make a mix of both wine-industry and coastal stops.

A recent strategic plan by Visit Mendocino County in 2013 suggested that about 26 percent of tourism is non-coastal.<sup>17</sup> To remain conservative, we will use 26 percent of tourism revenue to be winery-related; it is likely that some tourists identified as coming to the coastal areas will stop at wineries on HWY 128, in Hopland or in Redwood Valley on their way to HWY 20 in Willits, and that some identified as remaining in Anderson Valley or in the "inland" portion of Mendocino County will be there for non-wine reasons. We assume that 26 percent represents the amount of spending specific to the wine industry in Mendocino County and the Study Area. Because the city of Ukiah is in the Study Area, we will also remain conservative by using 26 percent as many of the overnight stays in Mendocino County are likely to be in Ukiah.

Dean Runyan Associates ([www.deanrunyan.com](http://www.deanrunyan.com)) provides tourism data and economic impacts for every county in California. A brief overview of the Mendocino County data is in the Appendix to this report. In other reports on the economic impacts of the California wine industry, or for specific

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<sup>16</sup> Please see [www.winesandvines.com](http://www.winesandvines.com) for more.

<sup>17</sup> See <http://www.mcla.info/wp/wp-content/uploads/2013/10/VMC-strategic-plan-Final-august-2013.pdf> for more.

counties, the following bullets define the standard logic of tying tasting room activity to greater tourism spending:

- 26 percent of tourism revenue is generated by wine-related travel to Mendocino County;
- Using an acres count in the Study Area as a way to gauge the magnitude of the Mendocino County wine industry that generates the “direct” reason for travel, we will use 66.8 percent (vineyard acreage) of the 26 percent (tourism) to focus on the Study Area’s portion;
- The income, taxation and jobs supported are as follows, from Dean Runyan Associates:
  - \$325.68 million on average annually between 2010-14 in traveler spending;
  - 5,402 people employed and supported by tourism spending on average annually; and
  - \$31.8 million in local and state taxes generated on average annually;
- Applying the percentages above allows an additional level of impacts to come into our analysis based on the  $0.668 \times 0.26 \times$  impacts; and
- These additional revenues and jobs are added to the totals for the wine industry due to the assumed, **direct** relationship.

In summary, the tourism data provide a final layer to the wine industry impacts in the direct sense. We can assume that other agricultural industries do not draw many tourists that are measurable. However, due to winery tasting rooms, there are employees at wineries focused solely on retail sales of an array of goods (including bottled wine) and acting like a tourist retail stop.

The tourism industry in Mendocino County also generates “surplus” versus leakage, as people come from all over the world to spend money, stay overnight, and tour the county’s interior and coastal areas. Recent data suggest that Mendocino County generated an average of \$342.8 million in tourism spending from 2010-14.<sup>18</sup>

Because Mendocino County has other tourism assets, tourists likely visit multiple areas when here; if the wine industry were to see a reduction in wineries or a reduction in harvest volume, hence selling less wine, tourism would likely suffer that was directly related to the local wine industry and then spillover into non-wine industry travel. For this reason, water resources affect wine-related tourism and other agricultural industries in these areas and the economic impacts.

### **Economic Impact Analysis**

The economic impacts of the wine grape industry have been studied at length, and provide a way to approach this report. An economic impact summary is the sum of three major economic effects of an industry being local. Here is how the typical economic impact of an industry works.

#### *Overview of economic impact analysis*

**The direct impacts** are a mix of all the ways that the industry in question (grapes, pears, etc.) has direct supply-chain connections that may be located in Mendocino County. For example, if there are

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<sup>18</sup> See Dean Runyan Associations ([www.deanrunyan.com](http://www.deanrunyan.com)) for more.

wineries in Mendocino County (which there are), wine grapes simply begin the direct analysis. The grapes are processed into wine and each step from dirt to bottle that adds to the direct impacts, due to its direct relationship to grapes; without local vineyards, Mendocino County's wine industry would have to mostly import grapes to be processed or bulk wine, which would affect Mendocino County wineries' niche, tasting rooms, and purchases of inputs to process, distribute and sell wine. The direct impacts are from dirt to retail for the farmers.

**The indirect impacts** are effects directly tied to the direct impacts above, or how vendors and employees of agricultural businesses spend their revenue and wages made from vineyards, wineries, cattle ranchers, pear and apple farmers, and those that own pasture. This is where the direct effects ripple out into the broader economy. In both the supply chain and farm employee spending, there will be some leakages out of Mendocino County becoming lost income to outside vendors. An important part of these calculations is to use this mix of vendors as a way to define and describe economic impacts; there are business-to-business transactions in these impacts, which become even broader spending.

**The induced impacts** are the broadest effects, and include all the secondary rounds of spending and employment that come from the direct and indirect impacts. This is where retail and personal services industries, including rental income and medical care, are mainly counted in these impacts. This is because continued ripple effects of local businesses are on workers; when more and more workers are affected, workers spend on an array of personal and retail services. Such spending drives more employment and revenue, and those impacts continue on through many industries.

The sum is the total impact. Land values, their changes due to changing water conditions, will be seen as wealth and not income and are not captured by the economic impacts directly. The value of water as an input for these businesses is also not directly measured in the impact numbers.

## *Results*

Summary data tables for the economic impacts are found in the Appendix. What this section will do is provide a concise summary for each of the major industries involved, jobs and incomes annually supported, as well as the local tax levels. Each subsection has the same structure. Two major themes exist:

- The industries affected include those upon which industry workers spend their incomes, which then becomes incomes throughout other industries in the county economy; and
- These industries support health services, schools and other community assets because they exist.

## Wine

The industries affected are slightly different in terms of jobs and income, a theme which is prevalent in any economic impact analysis. In terms of business incomes and jobs, the following lists provide a summary of the most affected industries:



**Business Income Impacts, Wine Industry**

- Real estate
- Maintenance of residential homes
- Management Consulting
- Lessors of nonfinancial intangible assets
- Banks and Credit Unions
- Hospitals
- Winery/Vineyard Management
- Other local government enterprises
- Truck transportation
- Maintenance/repair, commercial
- Insurance agencies
- Offices of physicians
- Legal services
- Automotive repair and maintenance

**Jobs Supported, Wine Industry**

- Vineyard management
- Real estate
- Management Consulting
- Individual and family services
- Hospitals
- Truck transportation
- Accounting and payroll services
- Investment Banking
- Banks and Credit Unions
- Retail – Department Stores
- Retail – Grocery Stores
- Services to buildings
- Maintenance/repair, commercial
- Automotive repair and maintenance

Notice the spread of industries, in many cases, has nothing to do with the wine industry directly. This includes items such as real estate agencies, home repair and maintenance, hospitals, insurance, medical offices, and auto repair. In terms of jobs, accounting and payroll services see more supported jobs, as do retailers. In many instances, these industries are reflective of the wine industry, including many of the major supply chain items (vineyard management, truck transportation, banks and credit unions, services to buildings, maintenance and repair construction for commercial properties). These data suggest how widespread the effects and potential damage are from expansions and contractions of the wine industry.

Tax receipts are for sales taxes and property taxes mainly for this industry. This is different than other industries because of tasting room activity, representing local, taxable sales. However, tourism is not counted in these numbers unless it is directly related to the business aspects of wineries and vineyards. The estimated amount of business travel for the wine industry versus tourism for pleasure is assumed to be low.

**Pears and Other Fruit**

As identified in the Agricultural Commissioner reports, the number of bearing acres of pears and other fruit in Mendocino County is almost exclusively in the Study Area. For these industries, the following lists show the major industries affected by the existence of pears and other fruit.

**Business Income, Pear and Other Fruit**

- Orchard Management
- Maintenance of residential homes
- Real estate
- Hospitals

**Jobs Supported, Pear and Other Fruit**

- Support activities for agriculture and forestry
- Bars and Restaurants
- Real estate
- Individual and family services

- Banks and Credit Unions
- Other local government enterprises
- Maintenance and repair construction
- Limited-service restaurants
- Offices of physicians
- Retail – Grocery Stores
- Retail – Department Stores
- Retail - Motor Vehicle and Auto Parts
- Outpatient care centers
- Offices of dentists
- Hospitals
- Wholesale trade
- Retail – Grocery Stores
- Retail – Department Stores
- Banks and Credit Unions
- Nursing and community care facilities
- Offices of physicians
- Personal care services
- Maintenance and repair construction
- Elementary and secondary schools

In contrast to the wine industry, pear and other fruit farming activities touch more industries that are less connected to the farming and more connected to the workers and their choices as local residents and households. Notice that both the business income and jobs supported are chiefly personal services and retail, including restaurants, medical offices, and an array of different categories of shopping. Also, construction jobs and incomes are important, as workers look to purchase and repair homes as they work, which support the trades locally as well as farmers. Sales and property taxes are more even in their effects as there are taxable sales do not include fresh or processed fruit. Hence, most of the taxable sales are indirectly related to pear and other fruit farming.

#### Tourism (26% of total for Mendocino as Direct Impacts)

Because tourism industries have so many direct impacts (from restaurants to hotels to gasoline purchases to the Skunk Train), there are fewer industries included in the Appendix tables. However, the lists are similar and focused almost completely on personal services and maintenance for buildings, such as hotels and restaurants. Hospitals and health care are in both lists also; this is a reminder that when workers have incomes, they are able to visit health care more and this helps relieve local government of providing more services.

#### **Business Income, Tourism**

- Real estate
- Maintenance to residential homes
- Wholesale trade
- Hospitals
- Other local government enterprises
- Management Consulting
- Banks and Credit Unions
- Maintenance/repair construction, commercial

#### **Jobs Supported, Tourism**

- Real estate
- Individual and family services
- Services to buildings
- Hospitals
- Wholesale trade
- Management Consulting
- Maintenance/repair construction, commercial
- Banks and Credit Unions

#### *Summary:*

Table 9 is a summary table of the business income and jobs supported by these industries in the Study Area ; Table 9 also shows a summary of the local tax revenue generated.

**Table 9: Summary of Economic Impacts, Annual, 2015 \$ and Full-Time Equivalent Jobs**

	Business Income	Total Income	Jobs	Total Jobs	S/L Taxes	Local Taxes
Wine	\$384,739,100	\$586,430,300	1,610	3,156	\$45,851,400	\$6,944,500
Pears/Fruit	8,995,800	13,404,000	92	139	633,252	167,752
Tourism	94,768,900	143,553,100	1,334	1,713	15,557,400	8,954,400
Totals	\$488,503,800	\$743,387,400	3,036	5,008	\$62,042,052	\$16,066,652

### Algorithms to connect Water Use to Agricultural Value

The importance of water use in agriculture is to determine the economic value of water. This section combines the data above into a way to consider the distribution of water in these areas. It is not as easy as simply taking the sum of the entire economic value above and the total acre feet of water used in these areas and taking a basic average. Since we have the total acre feet and the total acreage, we can solve part of the algorithm but not all. We need to make some assumptions about how much an acre of pear orchard and an acre of grape vineyard need to in terms of water.

The assumptions are as follows:

- One acre of vineyard uses approximately 0.75 acre feet of water per year<sup>19</sup>
  - This implies 8,677.5 acre feet was used in the Study Area per year in 2015
- One acre of pear and apple orchard uses 2.31 acre feet of water per year<sup>20</sup>
  - This implies 2,901.4 acre feet was used in the Study Area per year in 2015
- For tourism
  - Since tourists are “transitional households” locally when staying here, hotels and B&Bs are like apartment houses for water use;
  - We will estimate that the effects of tourism will follow the effects of the wine industry in terms of the value of a water change on the tourism impacts.

### Summary

Combining the data from the Appendix and Table 9 with the data in this section, we can find an algorithm for each of the Study Area’s focal industries when there is a gain or loss of 100 acre feet of water. Obviously, these results depend on the relative size of the industry in terms of income and jobs, as well as our assumptions on the water consumption per acre. Table 10 provides a way for policy makers and advocates to consider the economic impact of restricting water (as in limiting frost

<sup>19</sup> Please see University of California Cooperative Extension, Mendocino County (2008) for more and for these data.

<sup>20</sup> Ibid.

protection use) or expanding water infrastructure (as in raising Coyote Dam to increase Lake Mendocino's capacity).

What these data also allow is for to compare the cost of increasing water capacity in Lake Mendocino for the Study Area's use by 100 acre feet to the potential benefits in the local economy.

**Table 10: Summary of Per 100 Acre Foot Impacts, Study Area, 2015**

<b>Per 100 Ac Ft Lost</b>	<b>Vineyards/ Wineries</b>	<b>Pears</b>	<b>Tourism</b>	<b>Total</b>
<b>Business Income</b>	\$6,758,000	\$462,000	\$1,653,000	<b>\$8,873,000</b>
<b>Jobs</b>	36.3	4.8	19.7	<b>60.8</b>
<b>Local Taxes</b>	\$80,100	\$5,780	\$103,180	<b>\$189,060</b>

## Conclusions

This report estimated the value of water security and capacity to local farmers and the county economy. The estimates show the value of water in specific areas of Mendocino County to agricultural businesses. The loss of water resources due to drought, water-use restrictions such as limiting frost protection, and a lack of water capacity maintenance or expansion can all be detrimental to the county economy. Agriculture in the Study Area consists primarily of wine grapes, but there are also pears and other fruit grown. Tourism is a major allied industry in Mendocino County alongside the wine industry, expanding the economic reach of Study Area farmers into many facets of the county economy.

A loss of water security begins a domino or ripple effect starting in the agricultural communities and moving through the entire regional economy. This is through agricultural supply chains. The wine grape industry has wineries, vineyard managers, tasting rooms, tank and equipment wholesale, beverage wholesale and retail, and tourism all in its supply chain. The wine grape industry, including Study Area businesses and farmers, is a set of interconnections that tie the Study Areas to the rest of Mendocino County and beyond. In the Study Area alone, over \$743 million in business income is supported annually, approximately 5,008 jobs are supported, and \$16.1 million in local tax revenue is annually generated through farmers' economic impacts. A broad set of industries are affected, from construction to non-profit organizations. The flow of tourists adds more retail sales, more support for local businesses, and more tax revenue in the form of transient occupancy tax (TOT) to local cities. Tourism related to the wine industry feeds other areas in Mendocino County that are dependent on visitors to support their local residents and businesses. While pears and other fruit do not have the same economic connections as the wine industry does, fruit farming otherwise plays a role in these areas and also need water resources. The pear industry is the dominant player here using orchards as a way to grow fruit.

Tying these industries to water resources takes some assumptions about how each industry uses water and competes over the resources. It is important to recognize that Lake Mendocino is considered the main source of water for agricultural use in the Study Area, as groundwater is not a direct substitute for water coming directly from Lake Mendocino. As a result, water restrictions or a lack of supply due to an inability to capture more water in Lake Mendocino, will have a detrimental impact on agriculture and its economic effects on the local and regional economies.

The wine industry, based on its use of water and its dominance in the Study Area geography is heavily affected by a loss of water. This includes wine-related tourism that may slow down in proportion to a reduction of vineyard and winery output. These losses are felt throughout the county economy based on the supply chains that tie together the local wine industry to other businesses. A loss of water also affects all farming. Ultimately, a lack of water security threatens farmer incomes and wealth through reduced land values; the threat spreads through many other industries, workers and residents in Mendocino County.

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Data on agricultural values and water use provided by:

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(<https://www.co.mendocino.ca.us/agriculture/cropStats.htm>).
- Mendocino County Farm Bureau;
- The Mendocino County Russian River Flood Control and Water Conservation Improvement District ([www.rrfc.net](http://www.rrfc.net));
- Mendocino WineGrowers, Inc; and
- Redwood Valley County Water District ([www.rvcwd.org](http://www.rvcwd.org)).

## Appendix

**Table A-1: Tourism Data, 2010-2014, Dean Runyan Associates**

	2010	2011	2012	2013	2014	Average
<b>Destination Spending (Millions \$)</b>	307.3	319.8	332.1	329.7	339.5	325.7
Other Travel	15.2	17.6	17.1	16.4	15.3	16.3
Total Direct Spending	322.5	337.4	349.2	346.1	354.9	342.0
<b>Visitor Spending by Type of Traveler Accommodation (\$Million)</b>						
Hotel, Motel and B&B	166.1	173.2	182.6	181.4	188.8	178.4
Private Home	45.3	47.2	47.4	46.0	46.7	46.5
Campground	36.9	38.2	39.5	40.3	41.4	39.3
Vacation Home	14.4	14.7	14.7	14.5	14.8	14.6
Day Travel	44.7	46.5	48.0	47.4	48.0	46.9
Destination Spending Totals	307.3	319.8	332.1	329.7	339.5	325.7
<b>Visitor Spending by Commodity Purchased (\$Million)</b>						
Accommodations	70.4	72.7	77.0	78.8	84.8	76.7
Food Service	90.2	92.2	96.1	94.7	97.2	94.1
Food Stores	19.1	20.1	20.0	20.1	21.0	20.1
Local Tran. & Gas	37.2	42.5	43.7	42.1	40.3	41.2
Arts, Entertainment & Recreation	46.7	48.0	49.8	49.2	50.5	48.8
Retail Sales	43.7	44.3	45.5	44.8	45.7	44.8
Destination Spending	307.3	319.8	332.1	329.7	339.5	325.7
<b>Industry Earnings Generated by Travel Spending (\$Million)</b>						
Accommodations & Food Services	81.9	83.5	88.5	102.5	108.9	93.1
Arts, Ent. & Rec.	23.2	23.8	25.5	31.5	33.4	27.5
Retail	9.1	9.2	9.7	9.7	10.0	9.5
Ground Tran.	3.2	3.4	3.8	3.8	4.0	3.6
Other Travel	1.1	1.0	0.7	0.8	0.8	0.9
Total Direct Earnings	118.5	120.8	128.3	148.3	157.1	134.6
<b>Industry Employment Generated by Travel Spending (Jobs)</b>						
Accommodations & Food Services	3,150	3,290	2,800	2,780	2,850	3,200
Arts, Ent. & Rec.	2,170	2,170	1,800	1,680	1,740	2,280
Retail	380	350	300	300	310	300
Ground Tran.	110	110	100	100	100	100
Other Travel	40	30	40	30	30	20
Total Direct Employment	5,840	5,950	5,030	4,890	5,020	5,910
<b>Government Revenue Generated by Travel Spending (\$Million)</b>						
Local Tax Receipts	11.7	11.9	12.6	13.4	14.0	12.7
State Tax Receipts	16.8	16.8	16.4	17.4	17.8	17.0
Total Local & State	28.6	28.7	29.1	30.8	31.8	29.8



**Table A-2: Business Income Impacts of the Study Area Wine Industry, 2015 Dollars**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Ac Ft</b>
Wineries	\$297,461,000	\$3,411,200	\$51,700	\$300,923,900	\$3,467,900
Fruit farming	62,737,600	17,527,300	108,900	80,373,800	926,200
Wholesale trade	18,079,100	17,254,300	3,692,200	39,025,600	449,700
Real estate	-	10,427,600	8,161,400	18,589,000	214,200
Owner-occupied dwellings	-	-	14,467,700	14,467,700	166,700
Management Consulting	-	9,794,800	427,100	10,221,900	117,800
Lessors of nonfinancial intangible assets	-	7,945,100	219,800	8,164,900	94,100
Banks and Credit Unions	-	6,585,900	18,900	6,604,800	76,100
Winery Management	-	-	5,583,300	5,583,300	64,300
Other local government enterprises	-	4,782,700	788,000	5,570,700	64,200
Bars and Restaurants	4,272,800	1,193,700	7,400	5,473,900	63,100
Truck transportation	-	2,868,200	2,400,600	5,268,800	60,700
Maintenance and repair construction	-	2,828,600	764,300	3,592,900	41,400
Insurance agencies	-	545,800	2,641,100	3,186,900	36,700
Hospitals	-	-	3,131,200	3,131,200	36,100
Offices of physicians	-	544,000	2,518,300	3,062,300	35,300
Legal services	-	2,280,100	593,000	2,873,100	33,100
Automotive repair and maintenance	-	-	2,426,400	2,426,400	28,000
All Others (Including Nurseries)	2,188,600	31,337,900	34,362,700	67,889,200	782,400
<b>Totals</b>	<b>\$384,739,100</b>	<b>\$119,327,200</b>	<b>\$82,364,000</b>	<b>\$586,430,300</b>	<b>\$6,758,000</b>

**Table A-3: Employment Impacts of the Study Area Wine Industry, 2015**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Ac Ft</b>
Vineyards	645	180	1	826	9.5
Wineries	788	9	0	798	9.2
Wholesale trade	87	83	18	187	2.2
Vineyard management	0	163	0	164	1.9
Real estate	0	58	45	103	1.2
Bars and Restaurants	82	2	7	91	1.0
Management Consulting	0	52	2	54	0.6
Individual and family services	0	0	40	40	0.5
Hospitals	0	0	38	38	0.4
Truck transportation	0	32	5	37	0.4
Accounting and payroll services	0	24	5	29	0.3
Investment Banking	0	15	14	28	0.3
Banks and Credit Unions	0	0	25	25	0.3
Retail – Department Stores	0	15	10	25	0.3
Retail – Grocery Stores	0	15	9	24	0.3
Services to buildings	0	4	20	24	0.3
Maintenance and repair construction	0	17	5	22	0.3
Automotive repair and maintenance	0	6	15	21	0.2
All Others, Including Nurseries	8	233	379	621	7.2
<b>Totals</b>	<b>1,610</b>	<b>908</b>	<b>638</b>	<b>3,157</b>	<b>36.3</b>

**Table A-4: State and Local Level Tax Revenues Supported Annually, Wine Industry, 2015 Dollars**

<b>Tax Revenue</b>	<b>Amount</b>	<b>Per 100 Acre Feet</b>
Employment Taxes	\$733,400	\$8,500
Sales taxes – State	14,866,400	171,300
Sales taxes - Local	2,573,000	29,700
Property taxes	4,371,500	50,400
Personal Income	15,755,800	181,600
Other Taxes and Fees	7,551,300	87,000
<b>Total State and Local taxes</b>	<b>\$45,851,400</b>	<b>\$528,500</b>

**Table A-5: Business Income Impacts of the Study Area, Pears and Other Fruit, 2015**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Acre Ft</b>
Pear and Other Fruit farming	\$8,995,800	\$43,000	\$3,600	\$9,042,400	\$311,700
Orchard Management		732,200	700	732,900	25,300
Owner-occupied dwellings			486,000	486,000	16,800
Real estate		37,400	262,500	299,900	10,300
Hospitals			183,300	183,300	6,300
Banks and Credit Unions		39,400	104,700	144,100	5,000
Other local government enterprises		38,500	79,700	118,200	4,100
Maintenance and repair construction		66,000	25,300	91,300	3,100
Limited-service restaurants		70,000	161,100	231,100	8,000
Offices of physicians			79,700	79,700	2,700
Retail – Grocery Stores		200	62,800	63,000	2,200
Retail – Department Stores		900	49,700	50,600	1,700
Retail - Motor Vehicle and Auto Parts		500	47,700	48,200	1,700
Outpatient care centers			46,400	46,400	1,600
Offices of dentists			44,300	44,300	1,500
Retail - Internet retailers		4,800	39,300	44,100	1,500
Legal services		8,600	35,300	43,900	1,500
All Others		244,500	1,410,100	1,654,600	57,000
<b>Totals</b>	<b>\$8,995,800</b>	<b>\$1,286,000</b>	<b>\$3,122,200</b>	<b>\$13,404,000</b>	<b>\$462,000</b>

**Table A-6: Employment Impacts, Study Area, Pears and Other Fruit, 2015**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Acre Ft</b>
Pear and Other Fruit farming	92.1	0.5	0.1	92.7	3.20
Support activities for agriculture and forestry	-	18.1	-	18.1	0.62
Bars and Restaurants	-	0.1	3.7	3.8	0.13
Real estate	-	0.2	1.4	1.6	0.06
Individual and family services	-	-	1.3	1.3	0.04
Hospitals	-	-	1.2	1.2	0.04
Wholesale trade	-	0.4	0.6	1.0	0.03
Retail – Grocery Stores	-	-	0.9	0.9	0.03
Retail – Department Stores	-	-	0.7	0.7	0.02
Banks and Credit Unions	-	0.2	0.5	0.7	0.02
Nursing and community care facilities	-	-	0.7	0.7	0.02
Offices of physicians	-	-	0.6	0.6	0.02
Personal care services	-	-	0.6	0.6	0.02
Maintenance and repair construction	-	0.4	0.1	0.5	0.02
Elementary and secondary schools	-	-	0.5	0.5	0.02
All Others	-	1.9	11.8	13.7	0.47
<b>Totals</b>	<b>92.1</b>	<b>21.8</b>	<b>24.7</b>	<b>138.6</b>	<b>4.76</b>

**Table A-7: State and Local Level Tax Revenues  
Supported by Pears and Other Fruit Industry, 2015**

<b>Tax Revenue</b>	<b>Amount</b>	<b>Per 100 Acre Foot</b>
Employment Taxes	\$11,400	\$390
Sales taxes – State	137,500	4,740
Sales taxes - Local	23,752	820
Property taxes	144,000	4,960
Personal Income	235,400	8,110
Other Taxes and Fees	81,200	2,800
<b>Total State and Local taxes</b>	<b>\$633,252</b>	<b>\$21,820</b>

**Table A-8: Business Income Impacts of the Study Area Wine Industry Tourism, 2015**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Acre Feet</b>
Restaurants	\$28,151,500	\$702,300	\$1,820,700	\$30,674,500	\$353,000
Hotels and motels, including casino hotels	22,713,800	63,900	23,400	22,801,100	263,000
Retail – Department Stores	13,405,500	284,600	410,400	14,100,500	162,000
Retail - Gasoline Stores	11,418,600	81,700	152,000	11,652,300	135,000
Real estate	-	6,265,000	2,272,100	8,537,100	98,000
Museums, historical sites, zoos, and parks	7,375,500	-	35,300	7,410,800	85,000
Retail - Grocery Stores	6,002,600	55,800	518,400	6,576,800	76,000
Owner-occupied dwellings	-	-	3,995,800	3,995,800	46,000
Independent artists, writers, and performers	2,645,200	233,200	55,600	2,934,000	34,000
Wholesale trade	-	968,300	1,020,600	1,988,900	23,000
Hospitals	-	-	1,548,500	1,548,500	18,000
Other local government enterprises	-	876,500	664,500	1,541,000	18,000
Management of companies and enterprises	-	1,345,900	118,100	1,464,000	17,000
Other amusement and recreation industries	1,380,800	6,600	17,600	1,405,000	16,000
Banks and Credit Unions	-	539,100	865,600	1,404,700	16,000
Maintenance and repair construction	-	877,100	211,800	1,088,900	12,000
Transit and ground passenger transportation	897,700	13,200	24,400	935,300	10,000
All Others	777,700	11,858,300	10,857,800	23,493,800	271,000
<b>Totals</b>	<b>\$94,768,900</b>	<b>\$24,171,600</b>	<b>\$24,612,600</b>	<b>\$143,553,100</b>	<b>\$1,653,000</b>

**Table A-9: Employment Impacts Study Area Wine Industry Tourism, 2015**

<b>Industry</b>	<b>Direct</b>	<b>Indirect</b>	<b>Induced</b>	<b>Total</b>	<b>Per 100 Acre Ft</b>
Full-service restaurants	592.5	10.8	30.8	634.1	7.30
Hotels and motels, including casino hotels	253.4	0.6	0.3	254.3	2.93
Retail – Department Stores	177.7	3.9	5.4	187.0	2.15
Museums, historical sites, zoos, and parks	96.9	-	0.6	97.5	1.13
Retail - Grocery Stores	79.9	0.6	6.9	87.4	1.01
Retail - Gasoline stores	70.3	0.6	0.9	71.8	0.83
Real estate	-	34.4	12.5	46.9	0.54
Other amusement and recreation industries	23.9	-	0.3	24.2	0.28
Independent artists, writers, and performers	16.8	1.5	0.3	18.6	0.21
Transit and ground passenger transportation	15.3	0.3	0.3	15.9	0.18
Individual and family services	-	-	11.0	11.0	0.13
Services to buildings	-	8.1	2.6	10.7	0.12
Hospitals	-	-	10.5	10.5	0.12
Wholesale trade	-	4.5	4.8	9.3	0.11
Management of companies and enterprises	-	7.1	0.6	7.7	0.09
Fruit farming	6.6	-	0.3	6.9	0.08
Maintenance and repair construction	-	5.4	1.2	6.6	0.07
All Others	0.6	97.2	114.6	212.4	2.45
<b>Totals</b>	<b>1,333.9</b>	<b>175.0</b>	<b>203.9</b>	<b>1,712.8</b>	<b>19.73</b>

**Table A-10: State and Local Level Tax Revenues  
Supported by Wine Industry Tourism, 2015**

<b>Tax Revenue</b>	<b>Amount</b>	<b>Per 100 Acre Feet</b>
Employment Taxes	205,900	\$2,370
Sales taxes – State	3,270,500	37,690
Sales Taxes - Local	566,100	6,520
TOT	3,893,900	44,870
Property taxes	4,494,400	51,790
Personal Income	1,804,600	20,800
Other Taxes and Fees	1,322,000	15,230
<b>Total State and Local taxes</b>	<b>\$15,557,400</b>	<b>\$179,280</b>