

**An investigation into the impact of cannabis production on viticulture
in Sonoma County**

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1.0 ABSTRACT

The study investigates the impact of cannabisⁱ production on viticulture in Sonoma County.

The paper reviews material relating to cannabis production in California and Oregon and identifies shared agricultural resource to develop the study's hypothesis that increased cannabis plantings will disrupt viticulture.

The paper tests the hypothesis by analyzing the current situation and extrapolating future impact. It examines the current situation in Oregon and the high-value grape growing regions of California and compares this to Sonoma County. It analyses Sonoma County's grape growers' perceptions of the impact of cannabis production on their viticulture.

ⁱ Cannabis sativa (cannabis) is a flowering plant, commonly referred to as marijuana, and is related to, but different from hemp. Both contain cannabidiol (CBD) but hemp is cultivated for industrial purposes and does not contain the high levels of tetrahydrocannabinol (THC) found in cannabis, the chemical compound responsible for the pharmaceutical effect, sought after for the recreational 'high'. For this research paper, the term 'cannabis' relates to marijuana only and does not include hemp.

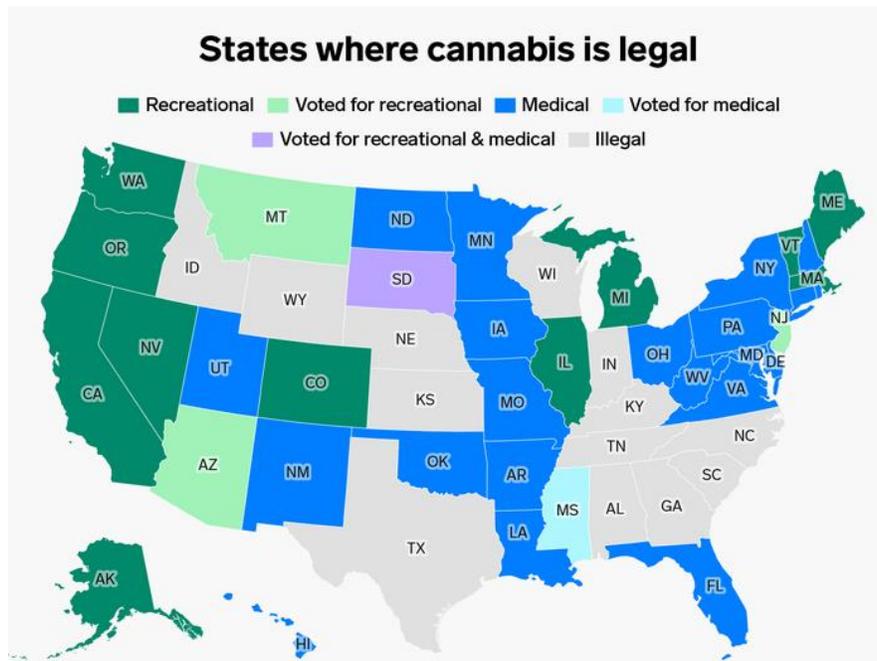
Eighteen interviews with wine and cannabis industry experts provide opinions and considerations used to give context and directional contrast to the situation in Sonoma County, as well as develop the questions for the study's survey. Focus interviews with eleven Sonoma grape growers supplement the fifty-seven survey responses.

The study concludes that increased cannabis cultivation has the potential to disrupt high-value viticulture. Industry recommendations include influencing legislation to control cultivation proximity, undertaking more research, protecting appellation distinction, and cooperating for mutual benefit.

2.0 INTRODUCTION

Vines and cannabis share history, land, and farming practices. The cultivation of outdoor cannabis shares a timeline with viticulture dating back to 4000 BC. Stonework on a Roman temple at Baalbek, Lebanon shows the plants side by side and Chateau Musar shared the Beqaa valley with cannabis for years before it was suppressed (Matthews 1999).

Cannabis is illegal at federal level in the United States of America (US), but individual states have passed legislation permitting exemptions (Map 1). 83% of the US population agree with some form of legalization, 64% believe cannabis to have medical benefits and 35% are cannabis consumers (BDS 2020).



Map 1 – Source Shayanne Gal/Business Insider November 2020

The US west coast climate, topology and agricultural infrastructure has long offered the ideal environment for viticulture and cannabis. Medical usage was legalized in California in 1996ⁱⁱ and Oregon in 1998ⁱⁱⁱ. Cultivation for recreational usage was legalized in Oregon in 2014^{iv} and then California in 2016^v. This made the US the first country to support its cultivation alongside its viticulture, thereby potentially challenging the distribution of shared resource. Federal prohibition encourages cannabis cultivation near usage as it cannot legally cross state lines, hence the increase in California, the world's largest legal cannabis market (McGreevy 2019). Federal restriction also means there is limited research funding available. The University of California (UC) would be in violation of federal law were it to engage in work that directly supports or enhances cannabis production or profitability (Wilson et al 2019). To date, there is no published academic research specifically relating to the impact of cannabis on viticulture.

There are generations of illegal cannabis growers in Sonoma County (SC) (EFA 2018) but only since legalization has SC adopted a regulatory framework for coexistence. This is comparable to the wine regions to its north and south but is at odds with its closest neighbor, Napa County, which continues to prohibit cannabis cultivation.

ⁱⁱ Compassionate Use Act 1996 Proposition 215 Legalized Medical Cannabis

ⁱⁱⁱ Oregon Medical Marijuana Act 1998 established in Ballot Measure 67

^{iv} Legalizing non-medical cultivation and use of Cannabis in Oregon 2014 Measure 91

^v Adult Use of Marijuana Act 2016 Proposition 64

This research provides an overview of the current situation in California and Oregon. It investigates the impact an increase in cannabis production might have on viticulture to highlight what challenges there may be to their continued coexistence. It analyses SC stakeholders' views to understand their perception of the situation.

Legalizing cannabis cultivation where grapes grow appears logical given their shared history. However, lack of research regarding their compatibility and how those involved perceive their coexistence, marks a missed opportunity to formulate best practice guidelines and share learning cross-industry. This paper is a first step towards providing the research needed by a wine region seeking to add value to its grapes and protect its resources, to live harmoniously with its cannabis neighbors.

3.0 CONTEXT AND LITERATURE REVIEW

3.1 Profitable farming

The history of Californian agriculture is one of transformation, driven by market demand. The state's 19th century ranching and grain-growing transitioned to intensive fruit cultivation including grapes and citrus. California's 'white gold' cotton peaked in the 1980s when rising water costs and pest problems made its production less lucrative and almonds, grapes and tomatoes were planted instead (Olmstead, Rhode 2017). Just as fruits took over from grain and cotton, so other forms of agriculture, under the right circumstances, will eventually displace current crops. Cannabis, an annual flowering plant, with its short maturation (5-7 months) and high market value, has the potential to transform the state's farming again.

3.2 The agricultural coexistence of vines and cannabis

Vines and cannabis use the same resources. The following areas of crossover were identified and ranked according to importance in the establishment of a viable business, following the model set out in published material (Creasy, Creasy 2009; Leafly 2017; Smart 2014). These include market consideration, land and climate, water, soil, habitat, cultivation, and labor. The effects of the use of pesticides, as well as taint from cultivation proximity was also researched.

3.2.1 Market consideration

California and Oregon's combined wine industry has an estimated retail value of \$41billion (CWI 2019; OWB). The reported US west coast cannabis wholesale value is over \$20billion (ERA 2017). California cannabis is forecast to surpass sales of \$6billion in 2025 (BDS 2020) and the black market in California is still thriving^{vi}. This means that wine and cannabis market values are already comparable.

The cost of establishing legal cannabis production is substantial (ERA 2017) yet the average revenue of operations on the US west coast has increased from \$1.29million in 2018 to \$3.73million in 2019 (CBT 2020). Cannabis yield/acre at over \$1million (Cannabislaw) is compared with crops including corn at \$644, soy at \$400 and wheat at \$232 (NFD 2016).

^{vi} “An estimated \$8.7billion is expected to be spent in the illegal cannabis market in 2019 — more than double the amount of legal sales” (McGreevy 2019).

A further comparison with wine grapes in SC estimated at \$13,000/acre (SCVA 2020), Santa Barbara County at just over \$7,000/acre (SBV 2020), and Oregon’s Willamette Valley at \$5,560/acre (OWB 2018) suggests how much more of an incentive cannabis offers farmers, even in premium wine grape regions (Chart 1).

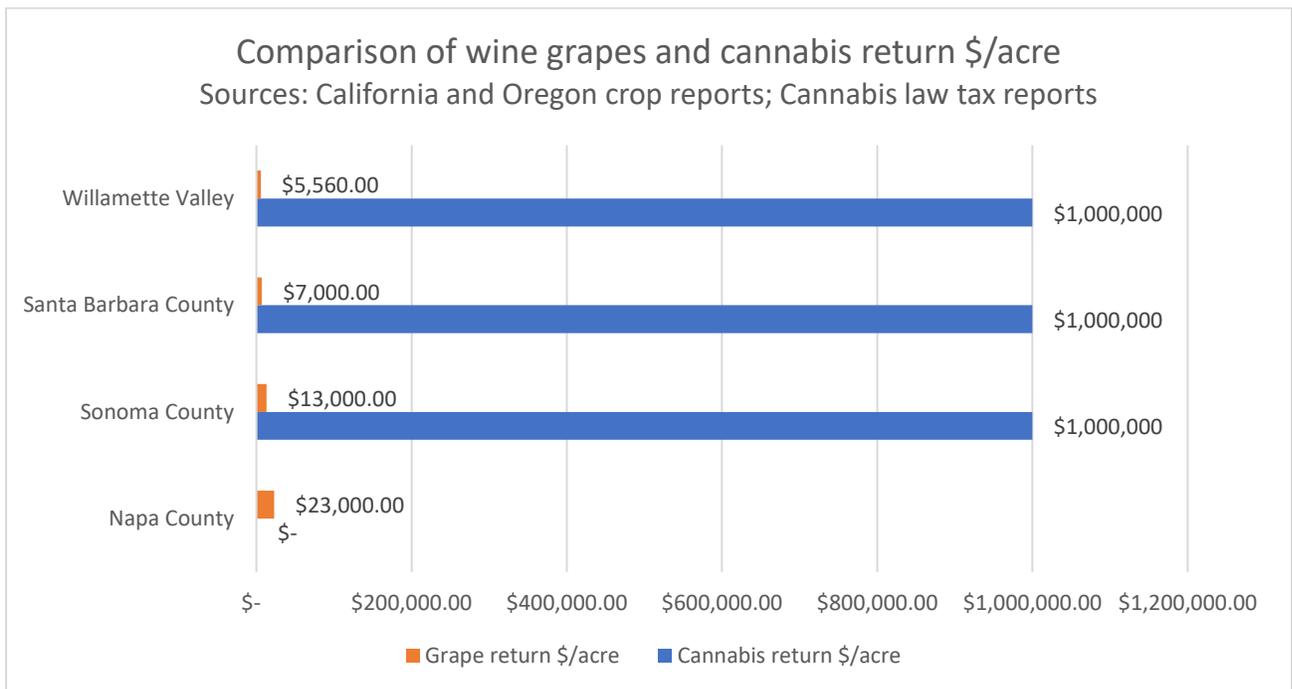
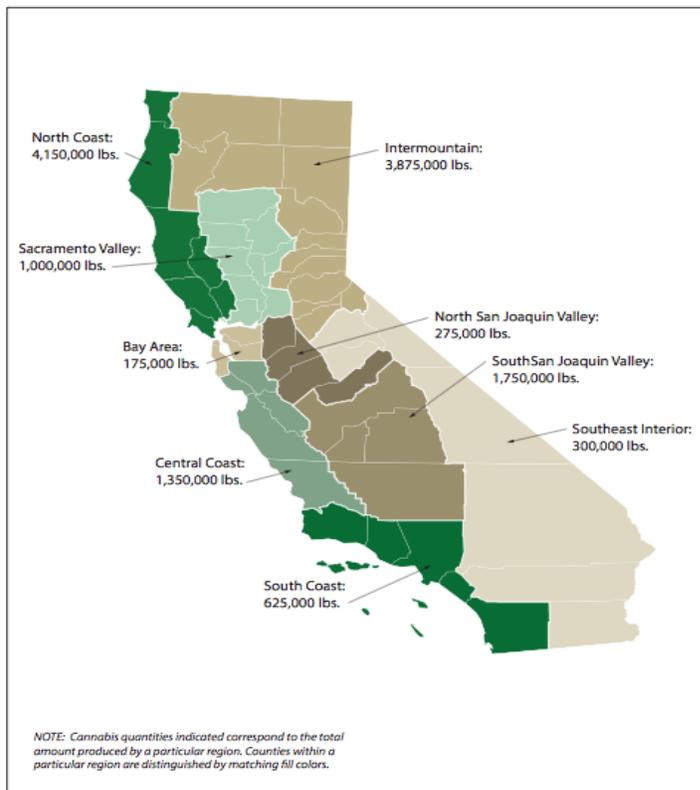


Chart 1

SC’s viticulture is valued at \$770million, but legal cannabis cultivation has already reached a value of \$233million, on a fraction of comparable acreage (Swindell 2019). Equally, SC’s Agricultural Commission is as incentivized as farmers to support an increase. Cannabis generates \$33million in state and local taxes, with every kg producing \$7800 of business revenue across hundreds of industries (EFA 2018).

3.2.2 Land and climate

66% of all US cannabis is grown in California (NDIC) (Map 2). Location is everything for outdoor cultivation which is dependent on a Mediterranean climate to promote volume and quality (Leafly 2017). Like vines, cannabis grows well on flat land, but gradient, altitude and sun exposure give quality flowers with higher terpene and cannabinoid content, the chemical compounds responsible for aroma and pharmaceutical effect or 'high' respectively.



Source: SRIA 2017



Figure 3-1. Map of Estimated California Production (Pounds) by Region

Map 2

It is outdoor cannabis cultivation, with its trio of labor requirement, land, and water usage, that most impacts viticulture. Cannabis production occurs throughout California but there is a proliferation of outdoor cultivation along California's coastline (Map 2 pg 9). Illegal cannabis cultivation requires secrecy and isolation, but this is set to change with legalization. Outdoor cannabis growers' dependence on a Mediterranean climate means the coastal regions are the prime areas for expansion. Significantly, these are the regions that are also home to the state's high-value viticulture.

3.2.3 Water

Drought is a serious issue on the US west coast meaning that water, essential for viticulture and cannabis cultivation, is the most important factor in the consideration of their coexistence. Farming is increasingly vulnerable to water shortages (PPIC 2020). California lost more than a thousand farms when the California Sustainable Groundwater Management Act 2014 took control of regulating groundwater away from landowners (Cagle 2020). Vineyards can be dry farmed, unlike cannabis (Dillis et al 2019), but during their establishment, and in some sites, they need irrigation. Furthermore, both extract most of their annual volume at the same time, from June through October (Bauer et al 2015). Illegal cannabis cultivation still poaches billions of gallons from public water (Gabriel 2018). More research is required to measure the full impact on viticulture (Megdal et al 2015).

3.2.4 Soil

Like vineyard soils, the ideal pH for cannabis is between 6.0 and 7.0 (Leafly 2017). Cannabis also requires nitrogen-rich soil (O'Hare et al 2013) and growers use more than 30 different soil amendments and foliar nutrient sprays (Wilson et al 2019). Nutrient enrichment, however, increases pests and pathogens (Matson et al 1997) and the use of fertilizers correlates with increases in infectious diseases (Johnson et al 2010) potentially negatively impacting neighboring properties. The movement of soil, common in the establishment of cannabis cultivation, is a similar threat (Butsic, Brenner 2016). Together with erosion, these are important factors to consider in creating an environment for coexistence.

3.2.5 Habitat

Illegal cannabis cultivation sites have seriously impacted waterways, natural habitats, and wildlife in remote areas (Carah et al 2015). Both the California and Oregon departments of Fish and Wildlife (Baker 2018) and Drug Trafficking (ODA 2018) list issues including pollutants, pesticides and rodenticides, fertilizers and imported soils, water impacts and site-specific impact of traffic, road use, noise, and artificial lighting. In view of legalization, academic reports suggest regulation is important (ERA 2017) as are siting decisions (Wilson et al 2019).

3.2.6 Cultivation; plant material, nurseries, techniques

There is no cross-over in plant material between grapes and cannabis, therefore no obvious impact, although both cultivators grow from clones and source from nurseries (MCCP). Cannabis nursery operating costs mirror those of a transplant nursery for conventional agriculture but have higher electricity bills given the need to ensure adequately high 18/6 light and dark time (MCCP). Like vines, cannabis seeds and clones vary in price by strain, reputation of nursery, genetic qualities, and purchase quantity^{vii}. However, unlike vine material, cannabis seeds cannot be sent across state lines given their illegal status at federal level (Findlaw). Purchase for production must be done in-state, thereby incentivizing local business in counties that support legal cannabis production.

Cultivation techniques of grapes and cannabis, however, are not only similar but highlight the challenge of coexistence. Most cannabis harvests produce a single crop and occur in October, thus coinciding with the grape harvest (Goggins 2019). The significance of this is threefold. Firstly, cannabis produces within its first year ensuring a faster return on investment, an advantage over vineyards that take years to reach maturity. Secondly, the

^{vii} Average price of a cannabis clone is \$20 whilst seeds are sold in packs of differing quantities; a pack of 10 seeds ranges from \$10 to \$105 (MCCP) dependent on strains (MCCP; Findlaw). This compares to vine cuttings and budsticks available at \$3.75-\$5 each (Wunderlich et al 2015; UCD FPS).

cannabis flowers are most pungent at harvest time increasing the risk of potential odor drift to neighboring properties. Thirdly, labor requirements for harvesting overlap.

The use of cover crops in vineyards to increase organic matter, nitrogen content, and reduce the use of herbicides (Creasy, Creasy 2009; Centinari 2016) is equally relevant to legal cannabis production with its need for nitrogen-rich soil and stringent rules on treatments. More research relating to regenerative farming techniques would benefit both industries.

While outdoor cannabis yields one annual crop, more than half of indoor growers report multiple crops (Wilson et al 2019). Outdoor yields average 2.51lb/plant whilst indoor averages only 0.2lb, however, due to the shorter growing cycle and higher planting density indoors, cultivators can get 3 to 4 harvests a year (ERA 2017). The significance for viticulture revolves around labor supply but also the 'aesthetics' of the land. Greenhouses in plain sight mean that indoor cultivation is to all intents and purposes, outdoor.

3.2.7 Labor

Viticulture and cannabis production require labor and research suggests there is a general shortage, meaning access to it, for both industries, is challenging. US west coast farm labor has experienced “a reoccurring pattern of turmoil” (Olmstead, Rhode 2017), dependent as it has been on migrant workers (Alba 2013) and evolving land usage. The decline in farm worker immigration caused by complex visa schemes between 2005-2015 (Bronars 2015) affected all agriculture and is expected to continue (Freeman 2016). Both grape growers and legal cannabis cultivators are now having difficulty securing contracted labor (Forer 2016; Wilson et al 2019).

Sources vary but there are somewhere between 400,000 and 829,300 agricultural jobs in California, 80% of which are in the fruit and nut industries which includes viticulture (EDD; Martin et al 2016). There is a lack of information on the numbers of workers employed in cannabis production^{viii}. Importantly however, regardless of the lack of clear data, an increase in cannabis production will exacerbate the existing shortage and disrupt viticulture.

^{viii} Cannabis employment figures are not reported in US government documentation because of its illegal status at federal level. Lack of clear evidence is further compounded by the continued prevalence of illegal cultivation.

Of further significance is the intrinsic competition between the labor requirements of viticulture and cannabis. Both need seasonal workers at the same time, as their harvests, which both involve hand trimming, coincide. Hourly rates of \$15-\$25 are comparable between the industries (Wilson et al 2019) but indoor cannabis cultivation with multiple crops provides year-round work, and more working hours. This has resulted in a growing number of workers moving from vineyards to cannabis employment (Washburn 2020). It is this transition of an already straitened work force that will have the most impact and may result in an increase in mechanization in vineyards as experienced in other fruit and vegetable crops (Calvin, Martin 2010).

3.2.8 Pesticide, herbicide, pests, diseases

Studies document a wide range of synthetic pesticide residues on illegal cannabis (Voelker, Holmes 2015). Legal cannabis, however, is required to test negative for over 60 residue compounds (SC 2020) meaning growers use biologically based inputs to control pests and disease (Wilson et al 2019). Significantly, it has led to conflict with farms with row crops and fruits subject to less stringent residue testing. Avocado farms and vineyards in proximity to cannabis grows have adjusted their spray regimes to avoid potential litigation (McGreevy 2019). Pests and diseases that affect both grapes and cannabis include powdery mildew, mold, and moth (Rosenthal 2012). Stagnant water can be a breeding ground for certain vineyard pests (Baker 2018) and to fulfil their water needs, cannabis cultivators construct ponds or other artificial water sources, thereby increasing risk to viticulture.

3.2.9 Odor contamination

The impact of possible odor contamination of grapes from nearby cannabis cultivation is well-documented in press articles but under-researched academically. There are more than two hundred identified terpenes in cannabis (McKeil 2019), some of which are pungent during flowering and the harvest trimming process, significant therefore because the cannabis and grape harvests coincide. However, drift factors are connected to topography, orientation of sites relative to each other as well as the prevailing winds. Two Santa Barbara County air quality studies concluded cannabis odors were below the detectable threshold (Borsage 2019; Serpe 2019). Furthermore, grapes and cannabis have some organic and chemical compounds in common. 3-methyl-2-butanethiol, present in skunk secretion, isolated in cannabis giving it a 'skunky' aroma, has been identified in wine but not yet linked to proximity to cannabis^{ix}. Cannabis terpenes, limonene and pinene, are shared by grapes as well as citrus and pine trees which are common near US vineyards (Young 2016; Marais 1983; Capone et al 2017). Another study (Vizueté 2019) focused on 1,8 cineole (eucalypt) in cannabis, a terpene documented by the Australian Wine Research Institute as being most associated with wine taint (Capone et al 2012). It concluded it would take 1000+ days for the 1,8 cineole to reach threshold levels, emitting at the highest level, therefore was of no significant concern.

^{ix} Schneider R, l'Institut Français de la Vigne et du Vin, Lallemand Sulphur Lecture Tour, June 2013

4.0 METHODOLOGY

4.1 Documenting shared agricultural resources

Academic papers, the California Department of Food and Agriculture (CDFA), grape growers' associations, cannabis growers' websites and published material were used to collate information relating to shared agricultural resource. Areas of potential impact were identified as being land, water, and labor. Other relevant factors such as environmental issues and financial incentive were explored. Relevant information came from interviews with industry experts.

4.2 Analysis of current situation

An analysis of the current situation was undertaken to provide context and comparison between regions, by collating data from the CDFA and Oregon Liquor Control Commission (OLCC). Supporting evidence was gathered from Agriculture Commissions, grape growers' associations, and cannabis industry websites as well as published articles.

4.3 Interviews with industry experts

Qualitative insights were gained via interviews with 29 wine and cannabis industry experts. The interviews took place between December 2019 and May 2020. See Appendix 9.1 (pg 74) for full list of names^x.

4.4 Survey of SC viticulture stakeholders

The views of SC viticulture stakeholders on the current impact as well as the potential impact of cannabis production on their viticulture, were gathered by survey.

Using the county grape growers' websites and professional contacts within the wine industry, a database of 362 email addresses was collated and survey requests were distributed by email via SurveyMonkey. Ultimately, 57 completed surveys were collected to give directional data, surpassing the target goal of 50.

^x In the body of the text, they are referred to as (I-xx) with the number corresponding to the number in the Appendix 9.1 (pg 74)

Responders were asked to identify where they grew grapes, managed vineyards, or made wine, to ensure feedback had been gathered from all appellations. They were asked to rate the current and potential level of impact of cannabis production on their viticulture as well as on a critical set of criteria relating to land, water and labor. They were asked to give a general opinion on impact to their overall business and encouraged to list the disadvantages and/or benefits.

There were 17 questions which included closed (Yes/No), multiple choice, rating, and open-ended questions. Applicable questions followed the scale response from Likert (1932). The questions and choice of answers from the survey appear in Appendix 9.2 (pg 77).

4.5 Interviews with SC viticulture stakeholders

In addition, qualitative insights were gained via interviews with eleven representatives from wineries and vineyards. Interviewees were selected from survey participants to represent different regions and different acreage to substantiate their responses and explore any differences in opinion relative to site and size.

5.0 RESEARCH QUESTIONS - Results

5.1 Current situation analysis

5.1.1. State analysis – California and Oregon

5.1.1.1 Legal production overview

Production comparison shows grape tonnage in California and Oregon is considerably greater than cannabis (Table 1) suggesting there is little impact.

Wine Grape v. Cannabis Tonnage Comparison		
Sources: OWB; USDA; Ciatti		
	Wine Grape	Cannabis
	Tons	Tons
CALIFORNIA	3,890,253	6,750
OREGON	79,685	1,250

Table 1

Outdoor cannabis cultivation already shares regionality with viticulture (Map 2 pg 9). These production figures also illustrate therefore, that cannabis has the potential to expand should it move further into existing viticulture regions and replace current grape production.

While not the focus of this research paper, Oregon’s hemp production has increased to 62,000 acres in 2019, a 427% increase from 2018, and twice the acreage of Oregon’s vineyards (ODA). An Oregon industry expert (I-2) suggested in interview that hemp’s biproducts fit the Oregon wellness lifestyle profile, a lifestyle that is promoted nationally and globally. Hemp is a relative of cannabis and both produce CBD (see footnote 1 pg 1) but is federally legal, making it is easier to distribute. This increase suggests there is demand for the biproducts both plants contain and that if cannabis receives federal approval, it too could see considerable growth.

5.1.1.2 Expansion through licensing

The number of license applications indicate considerable appetite for legal cannabis production, especially in Oregon where applications already outnumber wineries five to one. California winery licenses outnumber licensed cannabis operations two to one but have been legal decades longer (Table 2).

	Wineries	Cannabis Licenses
CALIFORNIA	8700+	4532
OREGON	793+	3956
Sources: OLCC; CDFA		

Table 2

The licensing of cannabis production in both states is at the discretion of individual counties. Interviewees who supported cannabis legalization, stated licensing was fundamental to controlling growth and protecting existing viticulture (I-7, I-19, I-21). One wine industry expert also discussed their company's decision to engage with the cannabis market to diversify their offering, commenting on the extra security licensing had provided them: "Permitting has introduced an efficient and necessary vetting process" (I-1).

Interviewees from both states said that legalization had led to cannabis grows neighboring their vineyards (I-10, I-15, I-26). In all cases this had negative consequences including the threat of litigation. In Oregon, the vineyard owner detailed the negative effect of soil erosion from the cannabis producer moving three acres of soil and leaving it unprotected in a storm, causing significant seepage on to his land (I-15). In California, the winemaker discussed the closure of their tasting room due to cannabis odor (I-26). They linked their negative experiences to a lack of adequate monitoring by the authorities. The permitting process is meant to afford existing agriculture some protection. Experience to date suggests that if inadequately supported, viticulture is impacted.

5.1.1.3 Illegal cannabis cultivation

The focus of the paper is the impact of legal cannabis, but illegal cultivation has been established for decades, albeit in hiding. The US west coast grape and wine industries have developed successfully despite the negative environmental effects of illegal cannabis detailed previously (pg 11). This suggests viticulture is accustomed to its presence and has adapted accordingly, supported in interview by one expert saying: “California supplied 70% of the nation’s cannabis, mirroring its wine business, for years. This isn’t new.” (I-1).

However, illegal cultivators operated out of sight and away from viticulture, and this has been key to limiting physical impact. As one SC vineyard owner stated in interview: “They are not really that close, many are hidden still, so we haven’t been affected” (I-17). This suggests that controlling proximity of legal cannabis cultivation should be a priority for viticulture.

Despite legalization, illegal cannabis cultivation is still widespread. Only 26% of Oregon cannabis production is licensed and therefore legal (NDIC). In California, there could be as many as 68,000 cannabis farms but only 4,500+ license applications (CGA 2020; CDFA 2020) (Chart 2). In interview, grape growers across three counties acknowledged the scale and mentioned first-hand knowledge of illegal grows (I-9, I-12, I-17, I-21). One established cannabis grower in Mendocino interviewed suggested the high cost of cannabis licensing had encouraged a continuation of illegal production. They confirmed they faced permitting costs of \$150K+ when they chose to legitimize their business (I-11).

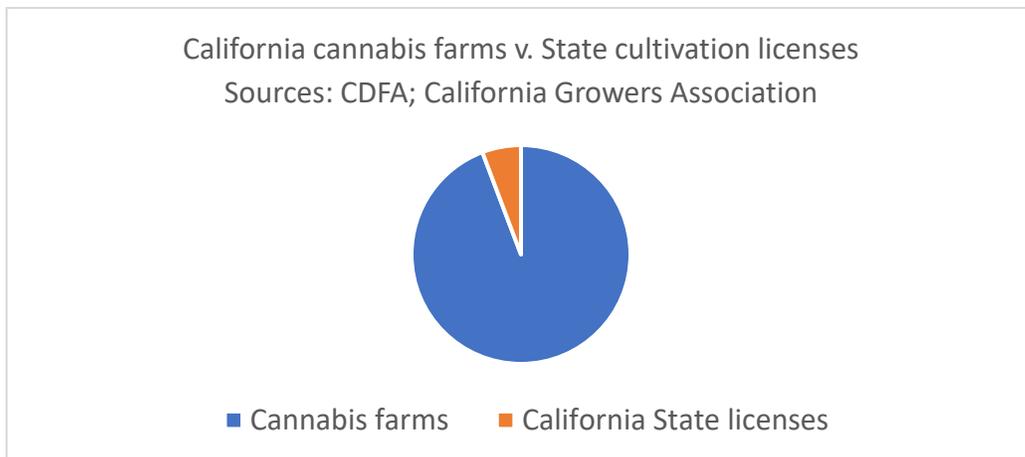


Chart 2

Without proper monitoring by licensing authorities, cannabis cultivation could expand in closer proximity, under the guise of legitimacy, but fail to be fully compliant, a concern that was raised twice in interview (I-15, I-16).

5.1.1.4 Current impact on viticulture

Legalization has given cannabis growers a legitimate claim to cultivate closer to other established agriculture, including viticulture. An analysis of interview material from both California and Oregon suggests the consequences of this mainly affect labor and water.

The impact on labor is due to the skilled and seasonal nature of the work which suggests that unless both industries limit their reliance on manual labor, competition will increase as cannabis cultivation increases. In interview, grape growers in both states confirmed this competition had impacted their viticulture, exacerbating an already difficult situation due to the general labor shortage. One stated: “Labor has been more difficult, supply, availability ... plus unemployment is currently low so many are going into construction. I don’t see it getting better” (I-17). This sentiment was shared by several interviewees confirming it as a widespread issue (I-9, I-12, I-15, I-26).

The impact on water also affects both states. Two Oregon wine industry experts (I-2, I-15) discussed the plight of grape growers during the dry weather in 2017-2018, when the water shortage was exacerbated by the illegal diversion of water to cannabis grows. Water theft was also discussed in interview by grape growers in three California counties (I-17, I-19, I-21) who found piping had been laid on their land syphoning water to illegal cannabis sites. As well as confirming water shortage as a widespread issue, it also illustrates the continued presence and impact of illegal cannabis.

5.1.2 High-value grape regions comparison and analysis – California

Legal cannabis acreage within Napa, SC and Santa Barbara is limited (Chart 3) but the financial incentive (Chart 1 pg 8) suggests it will increase.

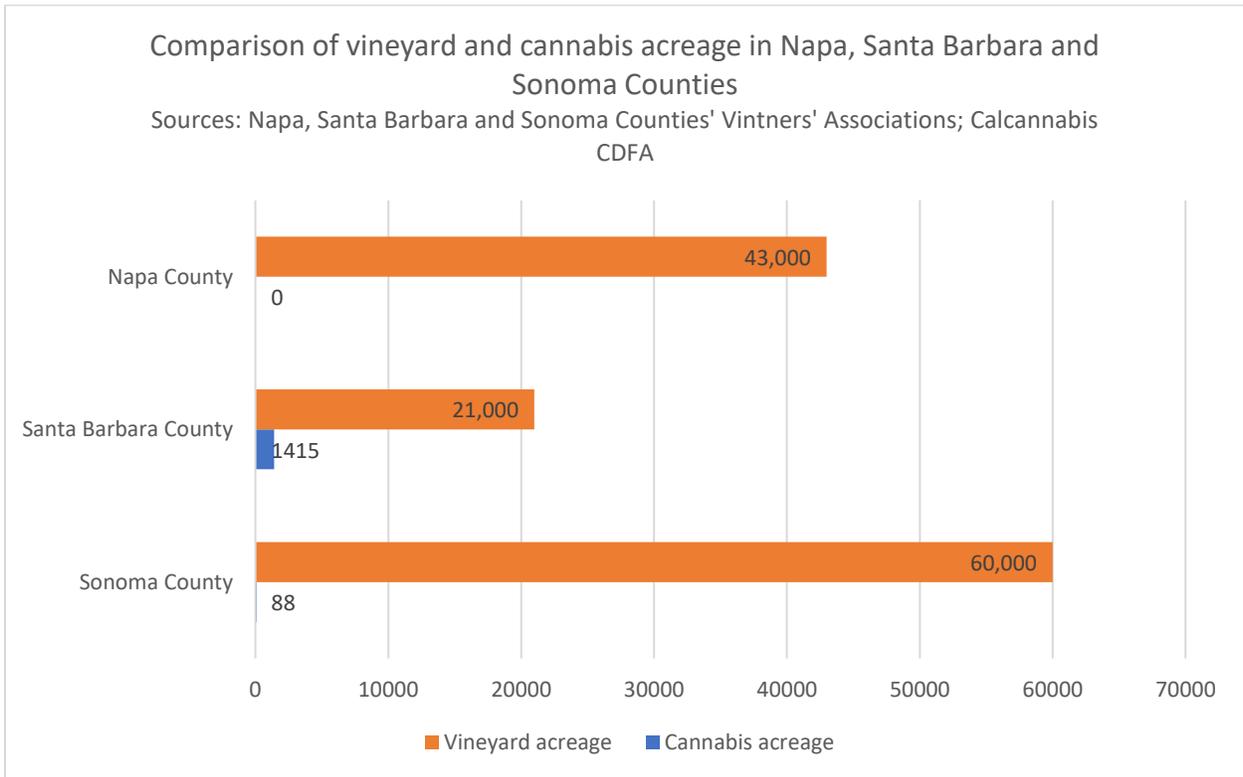


Chart 3

5.1.2.1 Napa County; least impacted

Napa County prohibits commercial cannabis cultivation meaning its viticulture is the least impacted (Chart 3 pg 26).

A county Supervisor stated there were more pressing community priorities than the legalization of cannabis, including housing and transportation (Eberling 2019). This suggests a timing issue. Napa County interviewees however, believed the county's innate conservatism and its fear that the stigma of cannabis might damage the region's reputation as a tourist destination, accounted for the continuing ban (I-19, I-23).

The moratorium is disputed within the agricultural community. In March 2020, Measure J in the county ballot, called for an end to the prohibition. A report compiled to analyze the fiscal, land use and other impacts of the initiative, listed odor issues as well as herbicide and pesticide drift from nearby vineyards as causes of potential conflict. It recommended 32-64 acres of commercial cannabis cultivation (Eberling 2019), much smaller than the 1000+ acres cultivated in Santa Barbara (Calcannabis). This approach is favored by a Napa grape grower, who also grows cannabis in Mendocino saying in interview: "We're proposing on a scale that is a rounding error compared to what Santa Barbara's done" (I-23). They described the coexistence as "net positive" to the wine industry, attracting as it would in their opinion, a younger generation to the county.

Measure J was withdrawn, the backers citing the “good faith” of the Supervisors in their efforts to work on a new cannabis ordinance. The current ordinance, however, supports the ban to protect the county’s “unique and sensitive environment” and preserve the community’s welfare (Municode 2020). This implies cannabis is indeed perceived as a threat, just as those interviewed had suggested (I-19, I-23).

5.1.2.2 Santa Barbara County; most impacted

Santa Barbara vineyard acreage is significantly higher than legal cannabis (Chart 3 pg 26). However, it is the region most impacted having experienced rapid expansion of large cannabis grows near vineyards.

The county supported legalization of cannabis and issued multiple licenses with no acreage restrictions. The comparison of \$/acre return shows how far cannabis outperforms grapes as a taxable commodity (Chart 1 pg 8). Financial gain may, therefore, have governed the initial decisions, and this was supported in interview with local wine industry experts (I-10, I-24, I-26), one saying: “Unfortunately, money talks”. Furthermore, they all felt there had been no consideration to its effects on viticulture.

In the premium appellation of Santa Rita Hills there is a licensed 147-acre outdoor cannabis grow, the largest recorded site to share regionality with high-value vines (MBD 2019). The region is known for its windy and humid conditions. In interview, a Santa Rita Hills vineyard owner explained: “We were obliged to change our fungicide spray regime to avoid potential litigation over potential residue drift onto newly planted cannabis grows bordering our property”(I-10). They could only use chemicals on the approved cannabis list, that were: “not yet proven effective for grapes”. This suggests viticulture has been compromised, potentially to long-lasting effect.

According to county grape growers and industry experts interviewed (I-12, I-24, I-25), there is community discussion in the form of symposiums and Town Hall meetings, and a willingness to collaborate. Nevertheless, the Executive Director of Santa Barbara Vintners is quoted as saying that had they known what a disaster it would become, they would have fought cannabis every step of the way (Blake Gray 2020) suggesting a community still divided. The County Board of Supervisors has agreed a cap of ~1500 acres on outdoor cannabis production (Welsh 2019) suggesting efforts are being made to control expansion.

5.1.2.3 Sonoma County; limited impact

SC has 88 acres of licensed outdoor commercial cannabis (CDFA ; Johnson 2019). This is tiny in comparison to its vineyard acreage (Chart 3 pg 26) suggesting limited impact. Furthermore, outdoor SC cultivation is capped at one acre per permit (SCCP 2020) suggesting its viticulture is protected from the negative impact caused by the rapid expansion of unlimited licensed cannabis acreage experienced in Santa Barbara County.

Like Napa County, SC's viticulture is an important financial agricultural asset (pg 8) suggesting it should enjoy a similar level of protection. Yet unlike Napa, SC has legalized and supported cannabis cultivation implying longer term agricultural diversity is considered more important than current financial dominance.

Furthermore, if the Santa Barbara County approval of a rapid increase in cannabis licensing was promoted by financial gain, as suggested by those interviewed, the same motivation could equally govern SC, putting its viticulture at risk of similar negative impact. The significant financial incentive to the SC Agricultural Commission and its landowners (pg 8) was recognized by one SC vineyard owner in interview: "Some people explained to us that we could make much more money growing even a few acres of cannabis than growing grapes. They are probably right" (I-13).

5.1.3 Conclusions

The research shows that where large-scale cannabis cultivation has been sanctioned in proximity to vineyards, there has been a greater, negative impact on viticulture. Where cannabis production is more limited, both legally and physically, so is the impact on viticulture. The level of impact of cannabis production on viticulture is defined therefore, by two things: the implementation of legislation and the proximity of cultivation. Both are at the discretion of individual counties which has led to significant differences in the approach taken and consequences experienced. While this allows comparisons it also suggests there is an opportunity for a collective approach to benefit legislators and stakeholders in the formulation of best practices.

Even counties with high-value viticulture have adopted different strategies towards legalization of cannabis; Napa County prohibits, Santa Barbara County supports, Sonoma County limits. This suggests an acknowledgement that their coexistence is challenging, but equally suggests there is no agreement on how great an impact cannabis has on viticulture. This ultimately indicates a lack of scientific evidence which is essential in assessing the risk factors and defining their magnitude and suggests the need for further research.

The research indicates that counties' decisions regarding how much to support legal cannabis production and how to monitor it once underway, is influenced by financial

consideration. It concludes therefore, that to guarantee legislative protection, viticulture must firstly retain its position as a leading agricultural asset within its county and secondly leverage its current financial advantage. Achieving the first means not just maintaining high quality, but also ensuring volume production and protecting premium market selling price. The second involves lobbying for influence over legislative decisions at county level.

5.2 Potential increase impact analysis - Sonoma County

Land, water, and labor are the three main agricultural resources shared by viticulture and cannabis cultivation, discussed in the literature review. California and Oregon experts in interview, ranked labor as the area most impacted, followed by water, then land. The following analysis is provided, therefore, in that order of ranking.

5.2.1 Labor

Labor shortages discussed in interview by grape growers in Oregon and Santa Barbara (pg 25) are similar in SC, given the general situation on the US West Coast (pg 14-15). There are more vineyards in SC (Chart 3 pg 26), however, requiring more labor but also suggesting a more established vineyard work force. Better pay from elsewhere is the biggest risk to viticulture, substantiated in interview by two SC grape growers. One stated: “(cannabis) trimmers were being paid more than in the vineyards – so we did lose access to labor” (I-13) and another said: “Up on Rockpile, we are having a difficult time accessing vineyard management, largely due to Administration policies but also due to a better economic climate in Mexico” (I-3).

5.2.2 Water

The water theft and shortage experienced in other regions also concerns SC viticulture. Water usage guidelines (SCWA 2009) show how indoor and outdoor cannabis cultivation combined, uses ten times more acre-feet^{xi} volume per year than SC irrigated vineyards (Chart 4).

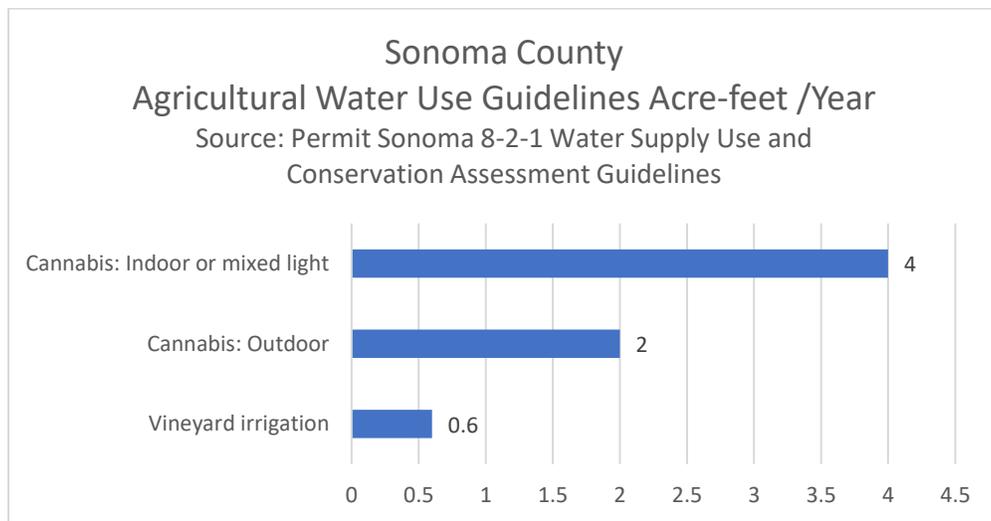


Chart 4

A significant increase in cannabis acreage would seriously impact water availability in SC, a region already prone to drought. Permits regulate but cannot make up for natural

^{xi} An acre-foot is a unit of volume equal to the volume of a sheet of water one acre in area and one foot in depth. It is the equivalent of 43,560 cubic feet, or 325,872 US liquid gallons.

shortage. Theoretically, for SC to conserve water and not increase its use in viticulture, every new acre of outdoor cannabis planted, would replace 3.3 acres of irrigated vineyards. Extrapolated further, to maintain the status quo, an increase of SC's cannabis outdoor acreage to 1500 in line with Santa Barbara, would lead to the need to eradicate the equivalent of nearly 5,000 acres of irrigated viticulture, over 8% of SC's current vineyard acreage.

5.2.3 Land

Licensed cannabis acreage is tiny compared to SC's main agricultural crops, suggesting other forms of agriculture in the County could have more impact on viticulture than cannabis (Chart 5).

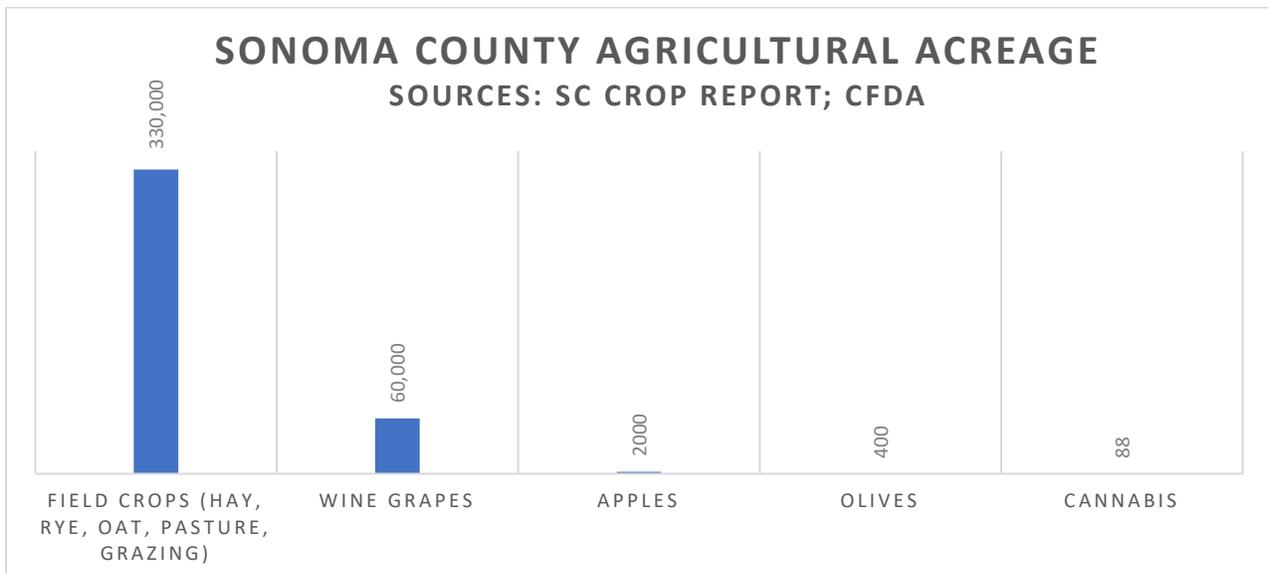


Chart 5

Furthermore, one industry leader (I-1) said in interview: “Only 6% of the county is grown to grapes – you don’t have to tear up huge areas to plant, there’s plenty of land available” suggesting SC could comfortably support both vineyard and cannabis expansion.

However, SC vineyard acreage in 2018 increased by only 0.2% in 2018 (USDA NASS 2019) and SC farmers are more consistently applying to replant land than to acquire new (Chart 6) suggesting there is in fact a lack of suitable, or affordable land in the county.

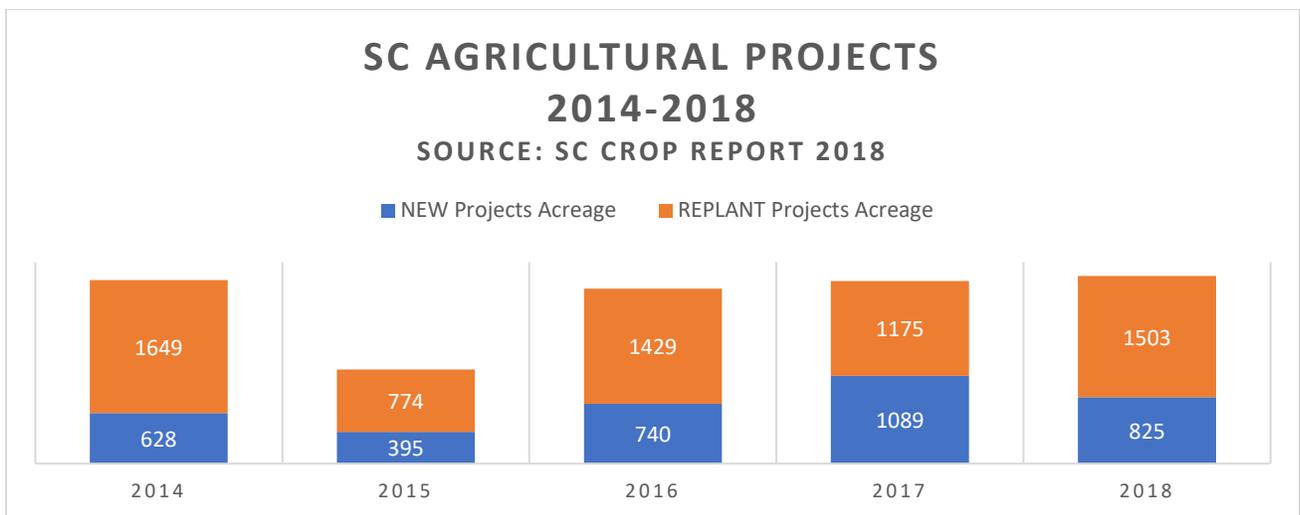


Chart 6

In interview, a Santa Barbara vineyard owner (I-4) explained they faced the withdrawal of a bank loan on their new winery due to there being a licensed cannabis plantation on the same parcel of land. This is significant because SC grape growers wanting to diversify and repurpose a portion of their land to cannabis production would face the same constraints and complications.

5.2.4 Conclusions

SC viticulture will continue to face the challenges of a general labor shortage. In suitable sites therefore, it should consider mechanization to alleviate the need for manual labor. However, more generally, grape growers must offer competitive remuneration or risk loss of labor resource to cannabis cultivation.

The impact is more serious when it comes to water. With a limited water supply, SC viticulture already competes with other agriculture and is under pressure to conserve and regulate its water usage. The inherent risk to SC viticulture of an increase in indoor and outdoor cannabis cultivation is that it would be scaled back or forced to impose greater restrictions to maintain the status quo. Furthermore, the establishment of new vineyards would be seriously impacted.

In contrast to the water shortage, an analysis of the land situation implies availability. However, the likelihood of a potential conflict is just as high. SC's agricultural footprint is large, and by licensing cannabis production it is encouraging diversification. This in turn stabilizes the work force and provides a financial safety net to farmers in times of market fluctuation. However, grape growers looking to diversify will find it difficult while cannabis remains federally illegal and may, instead, substitute one for the other thereby seriously impacting SC viticulture.

5.3 Sonoma County grape growers' perception of impact

The evidence of the long-standing presence of cannabis in SC (EFA 2018) would suggest grape growers are used to it. Furthermore, the limiting one acre per license (SCCP 2020) suggests the impact of legal cannabis cultivation is controlled. This was validated by most survey participants (75%) choosing 'Neutral' when rating the general current impact and corroborated in interviews with SC grape growers (I-1, I-9, I-20).

However, legalization not only brings a potential increase in cannabis cultivation but encourages expansion in closer proximity to existing vineyards. Grape growers' perception of this impact was measured through their response. There was a significant swing to 58% rating the future impact as 'Negative' and 76% of participants perceived an increase in cannabis to be disadvantageous to their business (Chart 7). This indicates a significant level of concern, despite the unknown variables.

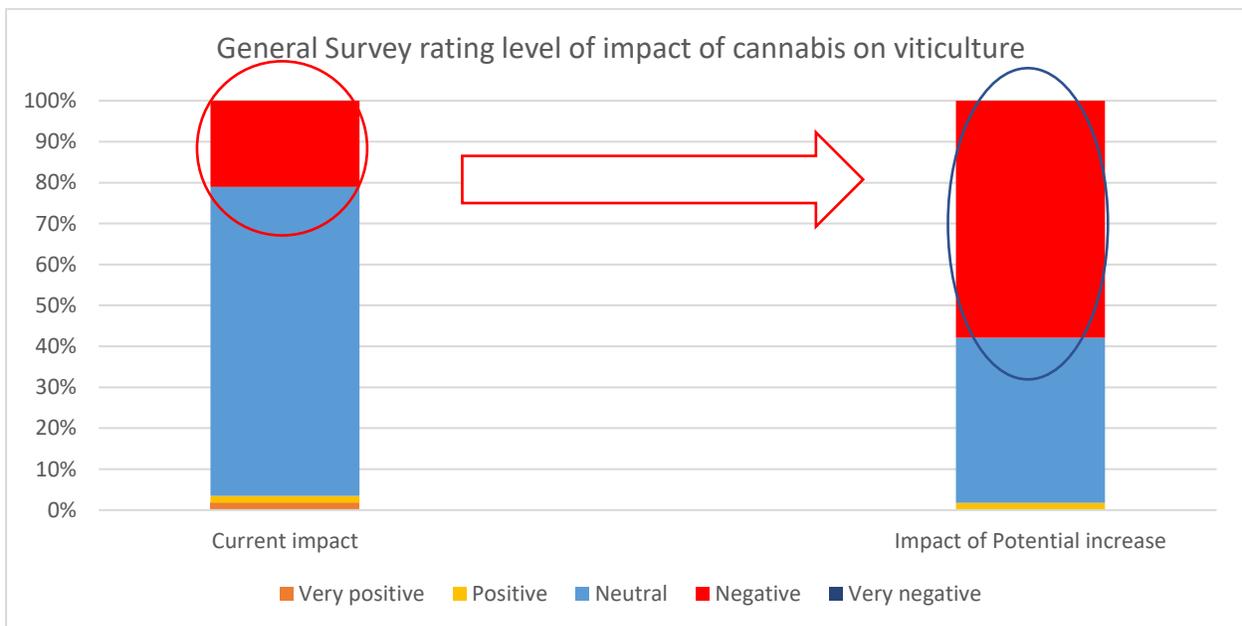


Chart 7

5.3.1 Labor

5.3.1.1 Current impact

Of the three areas covered (land, water, labor), survey participants gave the highest ‘Negative’ ratings to issues relating to labor. This implies labor is a front-of-mind issue and confirms SC viticulture’s reliance on manual labor.

LABOR – Survey Results			
In relation to LABOR, rate the level of impact current cannabis production in SC has on your viticulture			
	Very Negative/Negative	Neutral	Positive/Very Positive
Cost of labor (higher costs = negative impact)	78%	22%	0%
Availability of vineyard workers at harvest (less availability = negative impact)	75%	25%	0%
Access to skilled vineyard workers (less access = negative impact)	75%	25%	0%
Availability of vineyard workers year-round (less availability = negative impact)	65%	35%	0%
Flexibility of working hours / days (less flexibility = negative impact)	48%	52%	0%

Table 3

Table 3 shows the breakdown of response rates. There were no ‘Positive’/ ‘Very Positive’ ratings indicating no perceived benefits to labor issues from current cannabis production.

According to 78% of the participants, cannabis has negatively impacted viticulture by leading to higher costs. This was detailed in open comment as having come from greater competition:

- “The main issue is decreased access to an already dwindling labor supply struggling with high costs of living.”
- “higher wages for the same labor pool”

There is a local hiring preference clause in SC’s cannabis permitting which could contribute to a local shortage (DPR 2020). Two interviewees had to pay more to compete for workers incentivized by cash payments from cannabis growers (I-13, I-17)^{xii}.

According to 75% of the participants, cannabis has impacted access to harvest workers and skilled labor. This can be explained by the overlap in grape and cannabis harvest requirements.

One grape grower stated the continued illegal cannabis production was the main problem, confirming illegal grows are still active:

- “Currently, many operate without permits, without paying workers comp, without paying payroll taxes. If that continues at an increased level, it is difficult to compete with.”

^{xii} Cannabis is historically a cash business, due in part to federal restrictions on banking as well as its continued illegal activity (ERA 2017).

In interview, participants representing a range of small to larger scale operations across several different appellations, (I-3, I-9, I-13, I-17, I-27) all stated their preference for flexible, part-time labor to manage costs and work around seasonal weather conditions, and that all had experienced a shortage. This substantiates the survey results (Table 3 pg 39) and implies this is an issue regardless of size and location. This suggests a collective approach to seeking solutions, supported by the county's viticulture associations, would benefit a wide cross-section of the county's viticulture, and is discussed in the industry recommendations (pg 61).

5.3.1.2 Future impact

An increase in cannabis will be disruptive to labor according to participants who increased their ‘Negative/Very Negative’ ratings on all sections (Table 4).

LABOR – Survey Results			
In relation to LABOR, what impact do you think the potential increase in cannabis production will have on your viticulture?			
	Very Negative/Negative	Neutral	Positive/Very Positive
Cost of labor (higher costs = negative impact)	89%	11%	0%
Availability of vineyard workers at harvest (less availability = negative impact)	85%	15%	0%
Access to skilled vineyard workers (less access = negative impact)	84%	16%	0%
Availability of vineyard workers year-round (less availability = negative impact)	78%	22%	0%
Flexibility of working hours / days (less flexibility = negative impact)	71%	29%	0%

Table 4

Thirty-seven participants stated labor issues when asked to comment on the greatest disadvantage of an increase in cannabis to their overall business. Given the complexity of the California labor situation and general shortage, it would be wrong to suggest that an increase in cannabis will be the **only** reason viticulture labor will be impacted. But it is clear from the survey that it is of concern to those involved, substantiated by the fact that everyone interviewed mentioned it.

5.3.2 Water

5.3.2.1 Current impact

The small legal SC cannabis acreage (Chart 3 pg 26), coupled with the strict permitting guidelines, suggests current cannabis production has limited impact on viticulture water supply. This was mainly supported by the survey response relating to access, quality, cost, and availability of water with 69% or more of SC grape growers rating the current impact as 'Neutral' (Table 5).

However, 20%-31% of survey participants did rate water issues as being impacted negatively and no one rated the current impact as 'Positive'/'Very Positive'. This implies there is already an element of disruption to viticulture. It also confirms there are no perceived benefits of cannabis cultivation to viticulture water usage.

WATER			
In relation to WATER, rate the level of impact current cannabis production in SC has on your viticulture			
	Very Negative/Negative	Neutral	Positive/Very Positive
Access to Water	27%	73%	0%
Quality of Water	20%	80%	0%
Cost of Water	27%	73%	0%
Availability of Water	31%	69%	0%

Table 5

5.3.2.2 Future impact

The analysis (pgs 34-35) suggests an increase in cannabis cultivation in SC would negatively impact viticulture by putting pressure on an already unpredictable water supply. The survey results suggest participants are aware of this potential threat. Their combined ‘Negative’/ ‘Very Negative’ ratings increased across all sections (Table 6).

WATER			
In relation to WATER, what impact do you think the potential increase in cannabis production will have on your			
	Very Negative/Negative	Neutral	Positive/Very Positive
Access to Water	56%	44%	0%
Quality of Water	49%	51%	0%
Cost of Water	56%	44%	0%
Availability of Water	61%	39%	0%

Table 6

Two grape growers elaborated in interview on water’s increasing importance “as climate change proceeds” and their personal concern about shortage caused by continued illegal and legal grows (I-3, I-29). Understandably, those with irrigated vineyards expressed greater concern than those dry farming. All those interviewed however, agreed water was a shared concern for those planting new vines and the expansion of viticulture, making it a general priority for the county.

5.3.3 Land

5.3.3.1 Current impact

Cannabis' \$/acre return advantage over other crops (Chart 1 pg 8) suggests acreage will increase, possibly in addition to rather than instead of existing illegal cultivation. For now, however, licensed cannabis cultivation is small compared to SC's viticulture (Chart 3 pg 26) suggesting impact is limited. This was confirmed in part by survey participants, the majority choosing 'Neutral' when rating the current impact of cannabis on all land related issues (Table 7) and suggests the licensing limitations are effective.

LAND			
In relation to LAND, rate the level of impact current cannabis production in Sonoma County has on your viticulture			
	Very Negative / Negative	Neutral	Positive / Very Positive
Pesticide usage (where enforced changes to regime = negative impact)	26%	74%	0%
Herbicide usage (where enforced changes to regime = negative impact)	28%	72%	0%
Soil erosion	28%	70%	2%
Cannabis Odor ingress (during cannabis flowering; cannabis processing)	30%	70%	0%
Land availability (where difficulties acquiring/accessing new land = negative impact)	32%	68%	0%
Land value (where increase to your land value = positive impact)	29%	67%	0%

Table 7

However, nearly a third of participants rated the current impact as negative across all categories. This could suggest the addition of licensed cannabis to existing illegal cultivation in the county is affecting viticulture.

One winemaker (I-27) suggested SC should only permit indoor cannabis to mitigate the environmental issues relating to odor, pesticide, herbicide, and soil erosion: “Perhaps it should all be done indoors in Sonoma, and Mendocino and Humboldt do the outside operations.” Indoor cultivation will not resolve the water or labor issues however, which limits this solution.

5.3.3.2 Future impact

Survey participants increased their ‘Negative’/ ‘Very Negative’ ratings (Table 8) across all categories, possibly indicating their awareness of the environmental issues experienced in other regions.

LAND			
In relation to LAND, what impact do you think the potential increase in cannabis production will have on your viticulture?			
	Very Negative / Negative	Neutral	Positive / Very Positive
Land availability (where difficulties acquiring/accessing new land = negative impact)	58%	40%	2%
Cannabis Odor ingress (during cannabis flowering; cannabis processing)	54%	46%	0%
Pesticide usage (where enforced changes to regime = negative impact)	51%	49%	0%
Herbicide usage (where enforced changes to regime = negative impact)	51%	49%	0%
Soil erosion	51%	49%	0%
Land value (where increase to your land value = positive impact)	33%	51%	17%

Table 8

Land availability

58% rated the future impact 'Very Negative/Negative'. This level of concern is legitimized by the analysis regarding the trend to repurpose land as well as the complexities involved (pg 36).

Land value

Cannabis offers significant returns (Chart 1 pg 8). This was recognized by 17% of the grape growers surveyed who rated the impact as 'Positive'/ 'Very Positive' and reinforced by a vineyard owner in interview (I-13 pg 30) and one survey participant who stated: "I would possibly change my operation to cannabis with potential increase in profitability of my acreage".

Nevertheless, when asked if they would consider planting cannabis as well as grapes on their land, 75% answered 'No', and only 25% answered 'Yes'. This suggests awareness of the legal complications and implies satisfaction with their current situation. However, when asked to elaborate in interview why they would not, one responded: "Not yet, only because it's a specific skill set" (I-1) implying a timing issue, dependent on experience, rather than an outright negation of possibility.

One grape grower interviewed (I-17) commented they would not consider cannabis if they were commanding good prices for their grapes. This is pertinent given that the bulk market value of the four main SC grape varieties, Chardonnay, Zinfandel, Pinot Noir and Cabernet Sauvignon, declined steeply in 2019 (Chart 8).

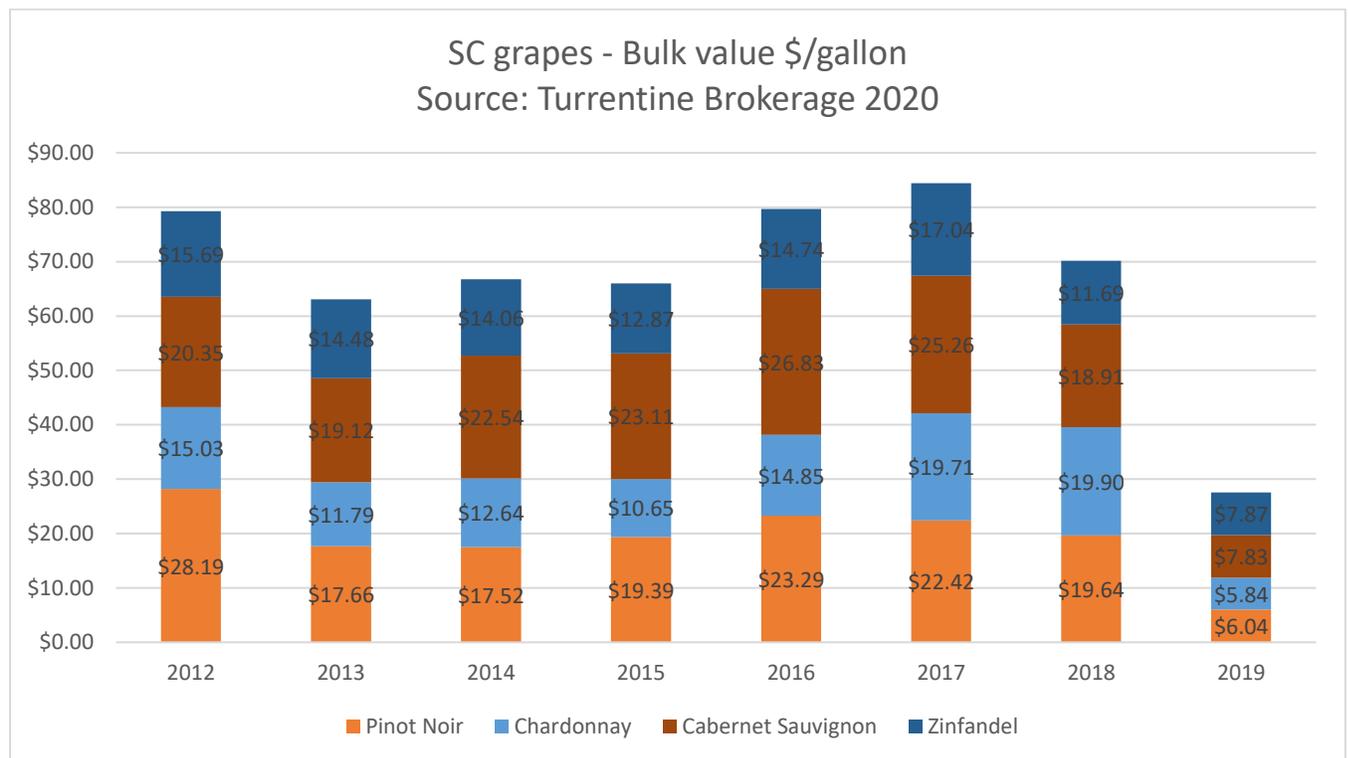


Chart 8

The bulk market is cyclical and the decline in value is linked to availability and market trends, thus not intrinsically connected to cannabis. But it is possible to extrapolate that grape growers, faced with decreasing grape monetary value, may consider alternatives and that now includes cannabis.

Odor ingress

54% of those surveyed considered odor and taint to be a serious issue and it was mentioned three times in the survey's open section. The experience from other regions validates this level of concern. However, one winemaker stated: "SC is quite used to odor of cannabis/skunk, it's been a part of the air/agricultural diversity for so many years, long before legalization" (I-9). Two more SC grape growers (I-1, I-17) believed vineyards would not be impacted by odor and erosion since cannabis would not be planted close to them. This is somewhat supported by the setback requirements in cannabis permitting^{xiii}, but not entirely. The licensing does not address the potential issue of odor drift from outdoor grows, with odor filtration systems a requisite only for indoor/mixed cannabis sites. This suggests further research specific to SC and cannabis terpenes would benefit the SC viticulture community.

Pesticide/herbicide

51% rated the potential enforcement of new pesticide and herbicide regimes as 'Very Negative/Negative'. Their usage is particularly relevant to vineyards in SC according to two vineyard managers interviewed (I-9, I-14) as an increasing number are certified

^{xiii} Pre-operational measures in cannabis permitting include specified setbacks of 100ft from property lines and 300ft from businesses. Vegetation and fencing are required for screening, affording some protection to vineyards, and no tree removal to mitigate erosion.

Organic or Biodynamic. Cannabis may be setting a new standard within agriculture by its strict residue testing and move towards organic certification^{xiv} but it is a standard which disrupts viticulture. The onus is on neighboring properties to manage their spraying regimes to avoid litigation as illustrated in the interview with the Santa Rita Hills vineyard owner (I-10 pg 29).

Stricter compliance was considered an advantage by one survey responder: “Regulation could be an overall benefit for sustainability and health”, but a disadvantage by another: “I do see some potential for more strict regulation regarding runoff and erosion that may make compliance more difficult”. This highlights the contentious nature of what is a complex issue.

Soil erosion

51% of survey participants considered soil erosion would be a problem from increased cannabis cultivation. This would depend on proximity and is a concern justified by one Oregon vineyard owner’s experience (I-15, pg 22).

^{xiv} Draft regulations for an organic certification for California-grown cannabis, the OCal Program, comparable to the National Organic Program, were released by the CDFA in May 2020.

5.3.4 Terroir and brand ‘Sonoma’

The “world’s best cannabis” is grown in California, according to three interviewees (I-7, I-11, I-23). If so, it stands to reason there will be connoisseurs seeking California’s best cannabis; terroir-driven cannabis. This has considerable potential to disrupt the value of premium grapes according to one expert interviewed: “If cannabis culture ever really develops a sense of terroir (buzzoir?), then the wine biz will be in real trouble” (I-8). Market value of SC viticulture has been defined by its 18 American Viticultural Areas (AVAs) which have allowed it to differentiate itself from other regions. They have enabled SC to charge more for its grapes by conceptualizing and marketing a quality hierarchy as well as by nurturing a reputation for being unique. Competition arises when another product markets itself in the same way, in the same place, to a similar audience. The question then becomes whether both products can retain their exclusivity as a premium product.

Cannabis experts (I-5, I-11, I-23) discussed terroir in interview, speaking of the importance of the effects of the terpenes and the differences arising from unique practice and place. The concept is supported by Francis Ford Coppola quoted as saying: “I want to make appellation-specific cannabis” and already marketed by his Sonoma-based wine company^{xv}. One cannabis tour operator (I-7) confirmed in interview that he had

^{xv} Coppola’s cannabis product ‘The Grower’s Series’ marketed as “an ancient and bounteous gift of mother nature, linked by great care, terroir, and temperateness.”

established himself specifically to promote the singularity of the plant grown in SC. An appellation project for cannabis, modelled on the wine industry appellations system, is underway by the CDFA, suggesting location will govern future cultivation sites.

The notion that cannabis could claim similar rights to terroir as viticulture was disputed by two winemakers interviewed (I-21, I-26) who believed the chemical and its effects were its attraction not the “sense of place”. One could argue however, that many believe the same to be true of wine.

There are problems for viticulture, both physical and reputational, when cannabis becomes its neighbor. High-value grape growing regions are particularly implicated, being areas marketed as the premium terroir for grapes and the perfect environment for wine tourism. Interviewees shared firsthand experience of theft (I-19, I-21), noise and odor pollution (I-16), and of threatening criminal activity (I-15), all related to neighboring cannabis cultivation. One survey participant stated concerns over the possibility of a loss of business linked to a loss of the county’s reputation. Other wine industry experts interviewed, however, viewed cannabis entering premium grape regions as advantageous, especially in Napa (I-23 pg 27). This was supported by a SC estate manager (I-20) who championed Sonoma’s inclusivity saying: “Cannabis is an important part of the cultural fabric of the region and a marker of the region’s ability to produce quality crops.”

5.3.5 Conclusions

5.3.5.1 Current impact

The majority perceived the current impact of cannabis on viticulture to be limited. While this suggests SC grape growers are accustomed to its presence, it also suggests that the limited, controlled expansion via permitting has mitigated impact. Equally, however, most agreed nothing positive had come of its legal presence which indicates wariness rather than full acceptance. The current impact is most acutely felt in terms of issues relating to labor, more so than water and land, mirroring experiences elsewhere and underlining the US west coast's general labor shortage.

5.3.5.2 Future impact

There is a higher level of concern amongst SC grape growers about the future impact of cannabis, across a wider number of issues relating to all three categories, reinforcing the suggestion that its legal presence is not entirely welcomed. Labor, again, is considered the area most likely to be impacted negatively. However, the extrapolation of potential impact on water supply suggests this should be at the forefront of stakeholders' minds and of greater concern than labor, given water's naturally inconsistent availability. Nevertheless, SC viticulture's configuration and concentration of vineyards, water usage, orientation, wind direction as well as labor requirements are all unique to site. This

suggests the specific conditions under which cannabis may expand in relation to viticulture in SC needs its own detailed modelling to confirm or allay the concerns expressed in this study.

The cannabis industry is looking to emulate wine's appellation system and seeks value in premium production. If handled with proper consideration for the premium nature of both, the 'halo effect' sought by those marketing a new cannabis product from a high-value viticultural region could also benefit those concentrating solely on selling their grapes and wine. However, there is the risk of a negative impact from competition if one is set against the other within the wider market. This suggests grape growers should continue to protect their unique selling point, which is often defined by their AVA. One way to ensure this is to protect the language of their appellation system from appropriation by cannabis cultivators.

6.0 STUDY LIMITATIONS

These findings are subject to limitations, the most relevant being the continued presence of illegal cannabis cultivation.

The negative impact of illegal cannabis cultivation is discussed in the literature review (pg 11) and its continued presence is substantiated by anecdotal evidence from interviews. Nevertheless, the direct and quantifiable impact of the illegal portion of US west coast cannabis cultivation on viticulture is near impossible to verify. Given its potential scale, however, it is important that any further research attempts to cover illegal cultivation to gauge its impact.

Further limitations include the short time since licensed cannabis went into production meaning there is little accumulated data for analysis.

Nevertheless, the research hypothesis has not been studied before. The results do show aspects of viticulture are impacted and that there is concern among stakeholders, suggesting that even the inevitable directional nature of this research has relevance.

7.0 CONCLUSIONS AND INDUSTRY RECOMMENDATIONS

The study concluded that increased cannabis cultivation has the potential to disrupt high-value viticulture. In response, the following industry recommendations are offered.

7.1 Influence legislation and control proximity

The study found the level of impact of cannabis production on viticulture was defined by the implementation of legislation and the proximity of cultivation (pg 31).

Those involved in viticulture must seek to influence their county agriculture commissions who govern legislation, to ensure their interests are protected and to control the proximity of cannabis cultivation. All grape growers in counties where legal cannabis cultivation is underway are implicated. However, since this study found county decisions were heavily influenced by financial consideration, it is recommended that businesses which currently generate the highest turnovers and employ the most people, leverage their financial advantage to lead the discussion.

Lobbying is recommended in private consultation with county authorities and at public Town Hall meetings. Of immediate concern is the amendment of treatment regimens to conform with legal cannabis regulation (pg 29). Vineyard owners must engage with their

county agricultural commissions to ratify the CDFA rulings on acceptable pesticides and herbicides to create a sustainable, comparable working environment and avoid drift issues. To control proximity, lobbying is recommended to lower cannabis license fees in more secluded locations, thereby incentivizing cultivation at distance, and conversely, to raise them in proximity to high-value vineyards.

7.2 Undertake scientific research

The study identified a lack of scientific data relating to the impact of cannabis cultivation on viticulture (pg 31).

The grape growing industry needs this data for four reasons. Firstly, to ensure the legislation pertaining to setbacks, size, location, strains selected, and orientation of cannabis grows in relation to existing vineyards, is sufficient. Secondly, to seek a collective approach to legislation, currently lacking between individual counties. Thirdly, to manage the consequences of coexistence, efficiently. Finally, but of equal importance, to confirm or allay the concerns expressed in this study by those involved in SC.

Once federal restrictions are lifted, certified academic, scientific, and agricultural institutions such as UCs and others, should seek government funding to undertake the research. In the meantime, funding should come from grape growers' and cannabis

associations, row crop farmers and landowners in regions where cannabis expansion is underway as well as regions considering legalization. It should also be sought from agencies who market the wines from these regions.

This study showed the most important areas for further research include terpene transmission and water distribution. The former requires modelling based on annual weather patterns, proximity, and site orientation which can be done at any time and should be undertaken immediately by advanced students of terpene transmission, geography, and meteorology. Site specific research, like the air quality analyses in Santa Barbara and grape tissue taint (pg 16), should be replicated in all regions where grapes and cannabis coexist. These must take place August – October to capture flowering and harvest conditions when cannabis terpenes are at their most pungent. It is equally important to record the annual cycle of odor drift to give comparisons, track uptake and measure accumulation. Companies such as international yeast specialists Lallemand Inc., who fund similar projects designed to find technological solutions to potential taint, could be approached for support.

SC viticulture will vie with cannabis cultivation for adequate water resource (pg 37). County viticulture associations already encourage their members to conserve water using cover crops, pruning techniques, drought-resistant rootstocks and clones, green harvesting as well as monitoring devices such as evaporation and sap sensors, and pressure bombs. The potential increase in cannabis, however, requires coalitions

between grape and cannabis growers, in partnership with academic institutions, government agencies and the technology industry to find even more solutions. Limiting the expansion of both vineyards and cannabis cultivation is recommended. Specific to viticulture, conversion to dry farming with its potential row re-orientation and yield reduction is a drastic measure but a necessary consideration.

7.3 Protect AVA distinction

The study found the cannabis industry is looking to emulate wine's appellation system and pursues premium production in areas already known for high-value viticulture (pg 54).

Protecting their AVA system is important to grape growers for two reasons. Firstly, it allows them to market themselves as unique by setting them apart not only from each other, but also from other premium wine regions and other products such as cannabis. Secondly, its exclusivity gives them greater control over their market value.

Grape growers, wine estates, vintners' associations as well as global wine agencies who market specific provenance, should protect this point of difference.

Maintaining appellation distinction starts in the vineyards with owners funding specific site development. This includes commissioning soil, water, and climate studies, selecting appropriate clones and managing quality fruit production through labor and harvesting decisions. Promoting appellation differentiation, however, relies on vintners and their associations continuing to champion their differences through educational seminars, published material, tutored tastings, and ambassador programs. Other measures might include blocking any attempt by the cannabis industry to assume the same AVA monikers. The threat of litigation, mirroring France's Champagne CIVC's campaign to protect the use of the word 'Champagne', is costly. Open dialogue between the two industries is recommended as a more measured first step.

7.4 Cooperate over labor and land usage

The research concluded that viticulture needs collective solutions to the general labor shortage (pg 41), and that diversification could benefit their business (pg 37).

Cooperation is important because cannabis is not going away. As old as viticulture and related in its power to harness plant life to offer the consumer a natural recreational high, its mainstream acceptance is underway. Farmers now have the option to cultivate legal cannabis. Better for viticulture, therefore, to look for mutual benefit in the crossover areas.

Labor issues are faced by all in SC, regardless of size or location. A collective approach to manage seasonal cost inflation and shortages is recommended, sponsored by the county's grower associations. The general labor shortage is exacerbated by both industries relying on similar types of labor, at the same time. It is recommended, therefore, that vineyard management companies, best placed as they are to create flexible work forces, diversify to cannabis and train their teams in the overlapping skills required, thereby mitigating the competition between the two industries.

Cannabis is a viable, if complicated, consideration for grape growers looking to diversify. Grape growers, however, need specialist cannabis consultants to establish new cultivation. A longer-term recommendation is that mentorship be encouraged through industry coalitions. However, an immediate pilot program with a small number of participating vineyards developed specifically to address the issues of coexistence, would provide learnings to be shared with interested farmers.

Finally, dialogue between the two industries is essential given the expansion of legal cannabis cultivation and its growing market share. Seminars, like the annual Wine and Weed Symposium, should be emulated by industry associations and institutes to stimulate debate. Furthermore, the formation of a dedicated cross-industry task force would guarantee commitment to the exploration of areas of mutual benefit and is therefore strongly recommended.

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9.0 APPENDICES

9.1 List of interviewees

1. **Beck, Corey** - President Francis Ford Coppola; wine grape grower and life-long SC resident
2. **Boskov MW, Bree** - Oregon based Master of Wine; Independent Wine Industry Management consultant; Education Manager for Oregon Wine Board
3. **Davenport, Margaret** - Davenport & Company; The Art and Craft of Fine Winemaking, Geyserville, SC
4. **Dore, Richard** - Owner/winemaker Foxen Vineyards, Santa Rita Hills, Santa Barbara County
5. **Evans, Jamie** - Founder HerbSomm (Cannabis food & wine pairing)
6. **Forer, David MW** - Master of Wine; expert in Sonoma/Napa labor situation
7. **Giammona, Jared** - Founder of The Sonoma Experience; Cannabis and Wine Tour operator, SC
8. **Grahm, Randall** – Winemaker, Vineyard owner (Popelouchum), San Benito County
9. **Higgins, Jennifer** - Head Winemaker Lambert Bridge Estate, Dry Creek Valley, Sonoma; Life-long SC resident
10. **Joseph, Kathy** – Winemaker and Founder of Fiddlestix vineyard, Fiddlehead Cellars, Santa Barbara County
11. **Lastreto, Nikki** - Co-founder and owner of Swami Select; cannabis growers in Mendocino County

12. **Lindquist, Bob** - Founder of Qupe winery; grape grower, winemaker, Santa Barbara County
13. **Lurton, Gonzague** - Acabo/Trinity Estate owner, Chalk Hill, SC
14. **Maloney, Brian** - Winemaker Buena Vista and DeLoach, SC
15. **Momtazi, Moe** - Owner of Momtazi vineyards, Willamette Valley, Oregon
16. **Morgan, Shirley** - Volunteer Citizens Advocate, Oregon; Marijuana News Periodical
17. **Pedroncelli, Jim** - Owner Pedroncelli Winery, Dry Creek Valley, SC
18. **Putnam, Stephanie** – Director of Winemaking, Boisset Estates (Raymond Estate, Buena Vista, DeLoach)
19. **Rodeno, Michaela** - Owner of Villa Ragazzo, Napa Valley; ex CEO Saint Supery, Napa Valley, Napa County
20. **Ruddick, Devin** - Vice President National Sales Manager Hook & Ladder Winery, Russian River and Chalk Hill, SC
21. **Scommegna, Roger** – Signal Ridge Vineyard owner, Mendocino County
22. **Shakked, Oded** - Longboard Vineyards owner, SC
23. **Sklar, Eric** - Founder of Fume - Cannabis cultivation and distribution company; Founder Alpha Omega, Napa Valley, Napa County
24. **Sparks-Gillis Brandon** - Winemaker Dragonette Cellars, Santa Barbara County
25. **Steinfeld, Amy** - Attorney at Brownstein Hyatt Farber Schreck, Santa Barbara; co-chair of the firm’s Cannabis and Industrial Hemp industry group; co-author of article ‘Demystifying Cannabis Regulations in Santa Barbara’

26. **Thomas, Tyler** – Winemaker Dierberg Vineyard, Santa Rita Hills, Santa Barbara County

27. **Ullom, Randy** – Winemaster for Kendall Jackson Winery, Jackson Family Wines, SC

28. **Washburn, Kaitlyn** - Journalist, Central Valley Agriculture; author of 'Wine to Weed: Wine Grape growers lose labor to cannabis farms'

29. **Yarak, Bill** - Hawk Hill vineyard owner, SC

9.2 Survey Content

The impact of cannabis production on viticulture in SC

The term 'cannabis' relates to marijuana only and does not include hemp

1. Do you grow grapes, manage vineyards, or make wine in SC?

YES

NO

2. Please check all applicable AVAs where you grow grapes, manage vineyards, or make wine

Alexander Valley

Bennett Valley

Carneros

Chalk Hill

Dry Creek Valley

Fort Ross – Seaview

Fountaingrove District

Green Valley

Knights Valley

Moon Mountain

Northern Sonoma

Petaluma Gap

Pine Mountain – Cloverdale Peak

Rockpile

Russian River Valley

Sonoma Coast

Sonoma Mountain

Sonoma Valley

3. Would you be prepared to talk to me in more detail about this topic off-line?

YES

NO

4. Rate the level of impact current cannabis production in SC has on your viticulture.

Very Positive

Positive

Neutral

Negative

Very Negative

5. What level of impact do you think the potential increase in cannabis production will have on your viticulture?

Very Positive

Positive

Neutral

Negative

Very Negative

6. In relation to LAND, rate the level of impact current cannabis production in SC has on your viticulture w

	Very Negative	Negative	Neutral	Positive	Very Positive
Herbicide usage (where enforced changes to regime = negative impact)					
Pesticide usage (where enforced changes to regime = negative impact)					
Cannabis Odor ingress (during cannabis flowering; cannabis processing)					
Soil erosion					
Land availability (where difficulties acquiring/accessing new land = negative impact)					
Land value (where increase to your land value = positive impact)					

7. In relation to LAND, what impact do you think the potential increase in cannabis production will have on your viticulture?

	Very Negative	Negative	Neutral	Positive	Very Positive
Herbicide usage (where enforced changes to regime = negative impact)					
Pesticide usage (where enforced changes to regime = negative impact)					
Cannabis Odor ingress (during cannabis flowering; cannabis processing)					
Soil erosion					
Land availability (where difficulties acquiring/accessing new land = negative impact)					
Land value (where increase to your land value = positive impact)					

8. In relation to WATER, rate the level of impact current cannabis production in SC has on your viticulture.

	Very Negative	Negative	Neutral	Positive	Very Positive
Access to Water					
Quality of Water					
Cost of Water					
Availability of Water					

9. In relation to WATER, what impact do you think the potential increase in cannabis production will have on your viticulture?

	Very Negative	Negative	Neutral	Positive	Very Positive
Access to Water					
Quality of Water					
Cost of Water					
Availability of Water					

10. In relation to LABOR, rate the level of impact current cannabis production in SC has on your viticulture.

	Very Negative	Negative	Neutral	Positive	Very Positive
Access to skilled vineyard workers (less access = negative impact)					
Availability of vineyard workers year-round (less availability = negative impact)					
Availability of vineyard workers at harvest (less availability = negative impact)					
Flexibility of working hours / days (less flexibility = negative impact)					
Cost of labor (higher costs = negative impact)					

11. In relation to LABOR, what impact do you think the potential increase in cannabis production will have on your viticulture?

	Very Negative	Negative	Neutral	Positive	Very Positive
Access to skilled vineyard workers (less access = negative impact)					
Availability of vineyard workers year-round (less availability = negative impact)					
Availability of vineyard workers at harvest (less availability = negative impact)					
Flexibility of working hours / days (less flexibility = negative impact)					
Cost of labor (higher costs = negative impact)					

12. Do you see there being any DISADVANTAGES to your overall business of the potential increase in cannabis production in the County?

YES

NO

13. What do you think the biggest disadvantage would be to your overall business of the potential increase in cannabis production in the County?

14. Do you see there being any BENEFITS to your overall business of the potential increase in cannabis production in the County?

YES

NO

15. What do you think the biggest benefit would be to your overall business of the potential increase in cannabis production in the County?

16. Would you consider planting cannabis as well as grapes on your land?

YES

NO

17. In your opinion, does SC have the capacity to sustain the coexistence of the production of high-quality wine grapes and cannabis?

YES

NO

9.3 Research Paper Proposal

IMW Research Paper Proposal Submission Form			
Student ID	15760	Date of submission	9 th January 2020
RPP Version No	7	Name of Advisor	Jennifer Simonetti-Bryan MW
<i>Note: RPPs must be submitted via your Advisor to the IMW</i>			
Proposed Title			
An investigation into the impact of cannabis production on viticulture in Sonoma County.			
Research Questions: Define the subject of your Research Paper and specify the specific research questions you plan to pursue. (No more than 200 words)			
<p>The US is the first country to have legalized the possession and cultivation of recreational cannabis alongside its highest value wine grapes, specifically in California and Oregon. Cannabis cultivation in California is set to increase since the passing of Proposition 64*. As an agricultural crop it vies with others for resources. For landowners looking for ROI, cannabis appears to offer the opportunity to bolster \$/acre return**. However, should grape growers and farmers turn their land over even in part to cannabis, the impact on both the resources and the environment for viticulture could be considerable.</p> <p>The Paper will provide an overview of the current situation vis a vis cannabis and grape growing in high value wine regions of California and Oregon and investigate more fully the situation in Sonoma County in order to test the hypothesis that increased cannabis plantings will be disruptive.</p> <p><u>Research Questions</u></p> <ol style="list-style-type: none"> 1. What is the current situation regarding cannabis production in high value grape growing regions of California (Santa Barbara, Napa) and Oregon and how does that compare to Sonoma County? 2. What impact will the potential increase in cannabis cultivation have on viticulture in Sonoma County? 3. What are Sonoma County's grape-growers' views on potential increases in cannabis cultivation? <p>*Following legalization in 1996 for medical use, Proposition 64, passed on 11/8/2016, permits adults 21 years of age and over to possess and grow specified amounts of marijuana for recreational use</p> <p>** https://www.pressdemocrat.com/business/9933561-181/sonoma-county-surpasses-1-billion</p>			

Background and Context: Explain what is currently known about the topic and address why this topic requires/offers opportunities for further research. (No more than 200 words)

There are no academic studies on the impact of cannabis production on high value wine grape regions.

Since 1996 nearly 9500 cannabis cultivators have temporary licenses to grow statewide but the number of cannabis farms in California could be as high as 68,000 according to the California Growers Association.

Vines and cannabis share certain characteristics in relation to agricultural resources. They both grow strongly on the flat, but hill slopes give lower yields and higher quality. Both are labor intensive, and both require regular access to water. California regulators are also developing an appellation of origin system for cannabis*. Just as the Central Coast appears the ideal place to cultivate cannabis given its mild weather, topography and proximity to LA's huge cannabis market, Sonoma County's varied microclimates and existing agriculture infrastructure could offer the same appellation diversity and quality hierarchy for cannabis as it does for wine.

Whilst legalized cannabis acreage in Sonoma County is small compared to grapes, its estimated \$95.8million gross value already represents a 10th of the County's \$1billion agricultural industry**. As a valuable taxable product for the County, an increase in acreage seems inevitable.

Proposition 64 did not legalize cannabis cultivation throughout the State but rather, gave cities and counties in California the opportunity to regulate operations. Cannabis cultivation therefore remains disputed in parts of grape-growing north America; Sonoma County has adopted a regulatory framework for them to grow in tandem while the Napa Valley continues to prohibit their coexistence***. Opposing viewpoints together with continued increase in cannabis production in premium wine regions to the north and south of them, provide a good opportunity for analysis of what is a complex situation.

*discussed at Wine & Weed Symposium 2019 (Santa Rosa)

** <https://www.pressdemocrat.com/business/9933561-181/sonoma-county-surpasses-1-billion>

*** <https://www.northbaybusinessjournal.com/northbay/napacounty/10175715-181/napa-cannabis-regulation-supervisors-ban>

Sources: Identify the nature of your source materials (official documents, books, articles, other studies, etc.) and give principle sources if appropriate. (No more than 150 words)

Primary Source:

Industry experts including (confirmed):

- Corey Beck, CEO The Family Coppola – Sonoma County grape grower as well as actively marketing cannabis products
- David Forer MW – expert on Labor issues in wine regions
- Randall Graham - Californian wine grape expert
- Moe Momtazi – Oregon grape grower currently in legal dispute with neighboring Cannabis growers

Members of Sonoma County grape growers

Secondary Source including:

Wine Trade publications/articles eg. Drinks Business, The Press Democrat, Shanken News Daily (both Wine and Cannabis editions)

- <https://www.winespectator.com/articles/can-cannabis-and-wine-coexist>
- <https://www.pressdemocrat.com/news/local/9956251-181/california-counties-maintain-tradition-of?sba=AAS>
- <https://www.pressdemocrat.com/business/9933561-181/sonoma-county-surpasses-1-billion>
- <https://www.thedrinksbusiness.com/2019/10/first-cannabis-growing-permit-granted-in-sonoma/>
- <https://www.petaluma360.com/news/8835355-181/annual-cannabis-harvest-underway-in>
- <https://www.shankennewsdaily.com/index.php/2019/01/29/22327/cannabis-news-briefs-for-january-29-2019/>
- <https://www.cannalawblog.com/california-cannabis-napa-county-headed-for-a-cultivation-compromise/>

Other publications eg. The Economist, High Times

- <https://www.economist.com/united-states/2018/10/11/cannabis-v-wine-in-california>

Sonoma Agricultural Commissions and Grape Associations websites

Other Californian and Oregon grape growing association websites

California Cannabis Industry Association (CCIA) website

Oregon Cannabis Association website

Academic Papers including:

California Agriculture:

- https://s.giannini.ucop.edu/uploads/giannini_public/19/41/194166a6-cfde-4013-ae55-3e8df86d44d0/a_history_of_california_agriculture.pdf - A History of California Agriculture
- <https://search.proquest.com/openview/92e3c89dc5845bab7e35f82624d793b2/1?pq-origsite=gscholar&cbl=18750&diss=y> - The Legal Green Rush: New California Agricultural Geographies in Commercial Cannabis Cultivation

Land:

- <https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1634> - Cannabis, an emerging agricultural crop, leads to deforestation and fragmentation

Labor:

- <http://calag.ucanr.edu/archive/?article=ca.2019a0018> - Growers say cannabis legalization excludes small growers, supports illicit markets, undermines local economies

Water:

- <http://calag.ucanr.edu/Archive/?article=ca.2019a0011> - Watering the Emerald Triangle: Irrigation sources used by cannabis cultivators in Northern California

Threats and Opportunities to agricultural stakeholders in California:

- <http://calag.ucanr.edu/archive/?article=ca.2019a0016> - "We can't just be a county that supports inebriants": Voices of the non-cannabis agricultural community

Books including:

Textbooks – Sunlight into Wine, Dr R Smart; Authentic Wine, Dr J Goode & Sam Harrop MW

Non-fiction - Cannabis Culture, Patrick Matthews

Research Methodology: Please detail how you will identify and gather the material or information necessary to answer the research question(s) and discuss what techniques you will use to analyze this information. (No more than 500 words)

1. Literature review of material relating to cannabis production in California and Oregon, pre and post legalization, as well as agricultural resource for grapes and cannabis (and other crops if necessary) to:
 - a. Summarize and evaluate what is already known about the impact and issues relating to their agricultural coexistence
 - b. Provide a set of parameters to define the scope and language of the Research Paper
 - c. Create the Survey and Interview questions

2. Investigate the current situation with regard to cannabis production in premium wine producing regions of California and Oregon by consulting Napa, SC, Santa Barbara, Willamette Valley County Agriculture Commissions, grape growers and cannabis websites, public records and published articles, in order to answer first research question:
 - a. Produce a summary of the current situation
 - b. Draw comparisons between the regions
 - c. Consider the implications of different experiences across the regions and analyze what that might mean for SC

3. Interview 5-10 additional grape growers, cannabis growers and industry experts with specific experience of Napa, Santa Barbara, and the Willamette Valley to answer first research question:
 - a. Solicit their perceptions, opinions and considerations then analyze them to provide directional contrast to the situation in SC

4. Collate information on agricultural resources shared by wine grapes and cannabis to answer second research question relating to the impact of any potential increase in cannabis planting on viticulture in SC:
 - a. Land
 - a. Current acreage licensed for grape growing
 1. Land Census - <https://www.nass.usda.gov/AgCensus/index.php>
 - b. Details of current cannabis plantation permits
 1. SC Agriculture Commission - <https://sonomacounty.ca.gov/Agriculture-Weights-and-Measures/>
 - b. Labor
 - a. SC Grape Growers, consult website and interview individual growers (see below) <https://sonomawinegrape.org/>
 - c. Water management
 - a. Access and regulation
 - d. Plant Material / Nurseries
 - a. Consult Vineyard management companies
 - e. Pest control and Environmental issues
 - a. Consult Academic Papers on pesticide and herbicide usage, residue, odor & terpene management
 - f. Finance
 - a. Establish as far as possible the value and remunerative advantage of cannabis production vis a vis grape growing and other agricultural crops (if necessary) to gain perspective on the size of the potential impact on grape growing

5. Survey SC grape growers to answer third research question relating to their views on the impact of the potential increase in cannabis production in their County:

- a. Online survey using a platform such as SurveyMonkey with questions mostly in the form of multiple choice
 - b. Looking for a minimum of 50 responses to give directional data from a total population of 1800
 - c. Qualitative topics will include but are not limited to:
 - a. Agricultural resources (eg Land, labor, water): what actual/perceived threats and/or opportunities exist
 - b. Environment: what actual/perceived threats and/or opportunities exist
 - d. Answers will be collated and analyzed, and an assessment made of both perceived and real impact and the importance Growers attach to them
6. Focus interviews with grape growers
- a. 10-15 Interviewees will be selected from Survey participants to represent different regions and different acreage. Questions will be scripted as well as open ended with the aim of:
 - a. Substantiating their survey responses
 - b. Exploring their experience and perception of the impact to their business vis a vis agricultural resource
 - b. Interviews will be analyzed to:
 - a. Identify the current as well as future perceived and real threats and opportunities and assess the importance the Growers attach to them
 - b. Identify consistent themes and experience between the growers
 - c. Identify any differences in relation to place and size
7. Evaluate the information gathered from the investigation, interviews, and Survey to reach conclusions relative to the hypothesis that increased cannabis plantings will be disruptive
8. Highlight the main issues and areas of opportunity and concern to provide industry recommendations

Potential to Contribute to the Body of Knowledge on Wine: Explain how this Research Paper will add to the current body of knowledge on this subject. (No more than 150 words)

The paper will be amongst the first of its kind to study the impact and provide industry recommendations. Cannabis has the potential to be a potent disruptor to the US wine industry. Marketed just like wine as a lifestyle product, but with added health benefits, revenues from legal production are predicted to reach \$43.7billion in the US by 2027*. Global beverage businesses including wine industry leaders Constellation and Coppola are investing in cannabis distribution, signifying their belief in its potential as a partner or possible alternative to wine. A wine region seeking to add value to its grapes and protect its resources needs to live in harmony with its agricultural neighbors. Current prohibition of commercial cannabis in Napa County, next door to SC where permitting continues, signals a region already divided. *Ciatti Report

Proposed Time Schedule/Program: This section should layout the time schedule for the research, analysis and write-up of the Research Paper and should indicate approximate dates with key deliverables. *Dates of submission to both Advisors and the IMW must be those specified by the IMW.*

- October 2019: RPP submission to Advisor (deadline 25th October 2019)
- November – mid-January: Literature review; collation of statistical evidence; interviews of industry experts
- Mid-January – mid February: Conduct a Survey of SC grape growers
- Mid-February – mid March: Interview individual SC grape growers
- End March: review and collate survey/interview answers and prepare analysis
- April: Complete first draft of RP; meet deadline 13th April 2020; confirm submission of final RP
- May: Review and meet deadline of 13th May 2020 for submission to Advisor
- June: Complete and submit to Institute to meet deadline of 25th June 2020