



# HUMBOLDT COUNTY GROWERS ALLIANCE

## **Planning for Drought Resilience in Humboldt Cannabis: A Proposal for Water Storage**

Humboldt County, along with most of California and much of the West, is currently facing severe drought conditions. While seasonal fluctuations in the availability of water are a normal feature of the climate, these conditions are being exacerbated by larger climatic changes, raising the possibility that current drought conditions may persist for years into the future.

Drought is not a new issue for the licensed cannabis industry. The passage of the first set of statewide cannabis regulations in 2015 coincided with, and were largely driven by, statewide drought conditions. As a result, protections for water resources were heavily embedded in the statewide regulatory framework established by the MMRSA and Proposition 64, and in subsequent county-level ordinances, with regulatory scrutiny on cannabis water usage that far exceeds other agricultural industries.

At the core of this framework is a requirement for cannabis cultivators to forbear from surface water diversions during low-flow summer months. All licensed cannabis cultivators in California are currently required to abide by these restrictions. The statewide forbearance requirement for cannabis has led many cannabis farmers to adopt water storage, including the use of ponds, rainwater catchment systems, bladders, and plastic or metal water storage tanks.

As drought conditions persist and intensify, we view additional and widespread adoption of decentralized water storage as the single most essential tool in promoting long-term sustainable water usage in cannabis agriculture, and an area of shared priority for cannabis farmers, environmental advocates, and the county.

Humboldt County currently enables farmers to apply for water storage grants through the county's Project Trellis program, derived from cannabis tax revenue, and has also stated support for water storage initiatives in its 2021 legislative platform.<sup>1</sup> As drought conditions intensify, however, we believe it is essential that these efforts intensify. This paper makes the case for water storage as the critical element of a forward-thinking strategy for drought resilience, environmental sustainability, and long-term economic resilience for Humboldt County and its nearly 1,000 small and independent permitted cannabis farmers.

Briefly, our conclusions are as follows:

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<sup>1</sup> From the platform: "Home and business water storage systems have become critically important as California, especially heavily forested land, is experiencing more natural disasters such as wildfire and drought. It is important to incentivize more construction of these systems on existing construction so that property owners may be better equipped to survive these events. Any such incentives and evaluation must take into account the effect that additional water storage may have on the environment, including water availability, vector impact, public health and invasive species. The county supports legislation that incentivizes responsible water storage systems for existing construction."

- 1. Overall water usage for Humboldt cannabis cultivation is extremely low compared with other agriculture.** Based on Water Board data and recent studies, we estimate total cumulative water use for permitted Humboldt cannabis farms at 884 acre-feet, 33 times less than the water usage for a *single* large almond farm in the Central Valley.
- 2. The marginal economic and environmental impact of a gallon of water storage in cannabis cultivation greatly exceeds other agricultural products.** At wholesale prices of \$1,000/pound, we estimate the marginal economic value of a gallon of water in outdoor cultivation at \$6.90/gallon. The marginal value of a gallon of water used in outdoor cannabis cultivation is 345 times greater than tomatoes, 690 times greater than lettuce, and 6,900 times greater than almonds.
- 3. Widespread adoption of decentralized water storage is attainable with a combination of public incentives and private investment.** We estimate total outlay for 100% adoption of water storage in Humboldt cannabis cultivation, given current permitting levels, at approximately \$100 million. For comparison, cannabis tax receipts in Humboldt County for 2020 alone totaled \$19 million. With expanded access to tax and grant incentives, streamlined permitting, continued investment by farmers, and existing baselines for adoption of water storage, we believe it is possible for cannabis farmers to rapidly adopt significant increases in water storage over the short and medium-term.
- 4. Expansion of existing financial incentive programs, streamlined water storage permitting, and other policies can greatly expand water storage and build unprecedented drought resilience for Humboldt cannabis.** There are a range of policy options and incentive programs available to the county to encourage widespread adoption of water storage. Existing resources, including Project Trellis allocations, Measure S incentives, and the recent allocation of \$18 million in funding from the state, could be prioritized for water storage, and a range of other policy actions could be taken to help streamline and incentivize water conservation practices in cannabis cultivation.

### **1. Overall water usage for Humboldt cannabis cultivation is extremely low compared with other agriculture.**

The amount of water usage involved in cannabis cultivation has long been a subject of contention. Early studies conducted in 2015 estimated overall water usage based on an assumption that a single cannabis plant consumes six gallons of water, per plant, per day.<sup>2</sup> These estimates informed many early policy and regulatory schemes governing water usage for cannabis cultivation.

Cannabis cultivators, however, have long pushed back against this estimate given the enormous variability in plant size, cultivation method, climate, and other factors, and the lack of empirical research informing these estimates. More recent academic work, based on Water Board data, now concurs that the “six gallons per plant per day” estimate is not based on adequate research. For example, a 2020 study has found that:

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<sup>2</sup> Bauer, S., Olson, J., Cockrill, A., Van Hattem, M., Miller, L., Tauzer, M., & Leppig, G. (2015). Impacts of surface water diversions for marijuana cultivation on aquatic habitat in four northwestern California watersheds. *PloS one*, 10(3), e0120016.

*“Prior methods of estimating water demand of cannabis cultivation are incomplete...To date, estimates of water demand by cannabis farms have relied on scaling a single static approximation of an outdoor cannabis plant's expected daily use for the entirety of the traditional growing season (April–October; Cervantes, 2006; Bauer et al., 2015). However, this approach does not account for changing water demands over the course of the season or under different cultivation conditions... An even more significant shortcoming of previous plant-based estimates is that they do not account for the use of stored water.”*<sup>3</sup>

Two more recent studies, both of which are based on an analysis of North Coast Regional Water Quality Control Board data, have found that water usage for cannabis cultivation can more reasonably be estimated at 7-15 gallons per square foot.

- Data reported in Dillis (2020)<sup>4</sup> can be extrapolated to estimate average water usage for outdoor farmers at 7.4 gallons/square foot/year, and average water usage for mixed-light farmers at 10.1 gallons/square foot/year.<sup>5</sup>
- A joint publication from New Frontier Data, the Resource Innovation Institute, and Berkeley Cannabis Research Center estimates outdoor water usage at 11.3 gallons/square foot/year and mixed-light water usage at 14.9 gallons/square foot/year.<sup>6</sup>

These estimates are generally consistent with the experiences of HCGA members, with the caveat that water usage on any particular farm may vary significantly based on the range of factors. These estimates are also generally consistent with water usage estimates in projects submitted for hearing to the Planning Commission.<sup>7</sup>

On April 28, 2021, HCGA submitted a Public Records Act request to the California Department of Food and Agriculture for access to state cultivation permitting data in Humboldt County. According to the CDFA dataset, there are currently 1,584 state cannabis cultivation licenses in Humboldt County, distributed over 906 independent farms.

Overall state-permitted cultivation area in Humboldt is 435 acres, corresponding to approximately 19 million square feet. Of these 1,584 state licenses, 590 (37.2%) are outdoor, 881 (55.6%) are “mixed-light 1,” 100 (6.3%) are “mixed light 2,” and 13 (0.8%) are indoor. The average size of a Humboldt cannabis farm is just under 21,000 square feet, and the median size of a Humboldt cannabis farm is approximately 10,000 square feet.

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<sup>3</sup> Dillis, C., McIntee, C., Butsic, V., Le, L., Grady, K., & Grantham, T. (2020). Water storage and irrigation practices for cannabis drive seasonal patterns of water extraction and use in Northern California. *Journal of Environmental Management*, 272, 110955.

<sup>4</sup> See footnote 3.

<sup>5</sup> The study does not report these numbers directly, but instead reports that an average outdoor cannabis farm (size: 1,185 square meters) consumes an average of 358,854 liters of water per year, and that an average mixed-light cannabis farm (size: 1,301 square meters) consumes an average of 533,981 liters of water per year. Conversion of this data to gallons per square foot per year yields the above results.

<sup>6</sup> Resource Innovation Institute, Berkeley Cannabis Research Center, and New Frontier Data (2021). Cannabis H2O: Water Use and Sustainability in Cultivation <https://newfrontierdata.com/product/cannabis-h2o-water-use-and-sustainability-in-cultivation/>

<sup>7</sup> HCGA reviewed reported water usage per square foot in staff reports submitted for consideration at the June 3 and June 17 Planning Commission hearings. For outdoor and light-deprivation projects, reported water usage estimates per square foot per year were, for each project: 4, 7, 10, 13, 11, 8, 17, 9, 16, 8, 10, 20, and 25.

Based on this more recent data, we estimate total water usage for the 19,000,000 square feet of permitted cannabis cultivation in Humboldt County at approximately 288 million gallons, or 884 acre-feet.

For comparison:

- Overall water usage in California agriculture is currently estimated at 34 million acre-feet, or 11 trillion gallons.<sup>8</sup> Humboldt cannabis cultivation therefore accounts for approximately 0.0027% of total agricultural water usage in California.
- Humboldt County staff have estimated total non-cannabis agricultural groundwater usage in the Eel River Valley Groundwater Basin - stretching from Loleta to Scotia north to south, and the ocean to Carlotta west to east - at 13,600 acre-feet.<sup>9</sup> Total Humboldt cannabis water usage is about 6.5% of the total water usage by non-cannabis agriculture in this basin.
- A single large 10,000 acre almond farm in California utilizes 4.49 acre-feet of water per acre<sup>10</sup>, or approximately 45,000 acre-feet total - more than 50 times greater than for all Humboldt cannabis cultivation combined.

<b>Agricultural Product</b>	<b>Typical size of farm</b>	<b>Average water usage</b>	<b>Water usage for typical farm</b>
Cannabis (outdoor)	0.25 acres	435,600 gallons per acre	100,000 gallons
Almonds	100 acres	1,463,000 gallons per acre	146,300,000 gallons
Tomatoes	160 acres	675,000 gallons per acre <sup>11</sup>	108,000,000 gallons

The very low consumption of water in Humboldt cannabis in comparison with commodity-scale industrial agriculture does not change the importance of sustainable water usage in cannabis during low-flow summer months in sensitive watersheds. In context, however, it demonstrates that the overall consumption of water in Humboldt cannabis is low – and that comparatively moderate investments in water storage can make a substantial impact on farmers’ overall water consumption.

<sup>8</sup> California Department of Water Resources.

<https://water.ca.gov/Programs/Water-Use-And-Efficiency/Agricultural-Water-Use-Efficiency>

<sup>9</sup> Eel River Valley Groundwater Basin (Basin ID 1-010) – Comments on Draft 2018 Basin Prioritization.

<https://humboldt.gov/DocumentCenter/View/65123/Humboldt-County-Eel-River-Valley-GW-basin-comment-letter-8-20-2018>

<sup>10</sup> <https://www.pressdemocrat.com/article/specialsections/these-are-the-california-crops-that-use-the-most-water/>

<sup>11</sup>

[https://www.pge.com/includes/docs/pdfs/shared/edusafety/training/pec/water/blaine-hanson\\_water\\_forum\\_complete.pdf](https://www.pge.com/includes/docs/pdfs/shared/edusafety/training/pec/water/blaine-hanson_water_forum_complete.pdf)

**2. The marginal economic benefit of a gallon of water storage in cannabis cultivation greatly exceeds other agricultural products.**

Published research based on recent data estimates that, for outdoor cultivation, each gallon of water used produces 3.13 grams of final cannabis product.<sup>12</sup> This is equivalent to approximately 145 gallons of water per pound of cannabis produced. At \$1,000 per pound wholesale, then, each gallon of water utilized equates to \$6.90 of economic output.

Similar data is available for other common agricultural products, illustrating that a gallon used in cannabis cultivation results in vastly more economic output than a gallon used in other agricultural contexts.

<b>Agricultural Product</b>	<b>Wholesale Price per Pound</b>	<b>Gallons of Water Usage per Pound of Output</b>	<b>Economic Value per Gallon of Water Used</b>	<b>Comparative Value of Water Usage for Cannabis v. other Agricultural Products</b>
Cannabis (outdoor)	\$1,000	145	\$6.90	1:1
Tomatoes	\$0.60	26 <sup>13</sup>	\$.02	345:1
Lettuce	\$0.35	28 <sup>14</sup>	\$.01	690:1
Almonds	\$1.40	1,900 <sup>15</sup>	\$.0001 (one-tenth of one cent)	6,900:1

Compared with other agricultural uses, it is clear that cannabis is an extremely beneficial use of water, and the significance of a gallon of water (or water storage) is hundreds or thousands times greater than it might be in another agricultural context. In this sense, cannabis is, by far, the most water-efficient crop in California.

**3. Widespread adoption of decentralized water storage is attainable with a combination of public incentives and private investment.**

Based on our estimate for total water usage in Humboldt cannabis cultivation at 884 acre-feet, it's possible to further estimate the total cumulative cost to achieve 100% water storage for Humboldt cannabis.

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<sup>12</sup> Resource Innovation Institute, Berkeley Cannabis Research Center, and New Frontier Data (2021). Cannabis H2O: Water Use and Sustainability in Cultivation

<sup>13</sup> [https://www.huffpost.com/entry/food-water-footprint\\_n\\_5952862](https://www.huffpost.com/entry/food-water-footprint_n_5952862)

<sup>14</sup> [https://www.huffpost.com/entry/food-water-footprint\\_n\\_5952862](https://www.huffpost.com/entry/food-water-footprint_n_5952862)

<sup>15</sup>

<https://www.paesta.psu.edu/podcast/how-much-water-does-it-really-take-grow-almonds-paesta-podcast-series-episode-43>

We estimate approximately one-third of cannabis in Humboldt is currently grown via stored water from ponds, tanks, or rainwater catchment.<sup>16</sup> This suggests that, of the 288,000,000 gallons of total water usage for cannabis cultivation, 192,000,000 gallons of water utilized cultivation are currently not being stored.

Current prices for plastic or metal water storage are at 60-80 cents per gallon. The total cost for 192,000,000 gallons of additional water storage, assuming prices hold stable, would therefore be approximately \$134 million.

Water bladders are a more cost-effective form of water storage, although they're currently subject to more significant restrictions. At current prices of 20 cents per gallon, 192,000,000 gallons of water storage could be obtained for \$38 million.

While \$100 million is not a small sum, it is proportionate in the context of the overall economic output of licensed cannabis cultivation in Humboldt County. For example, 2020 charges on Humboldt cannabis farmers for the Measure S cultivation tax alone totaled \$19.1 million.

These numbers suggest that widespread adoption of water storage is an achievable goal over the short-to-medium term, and that a moderate investment of resources can significantly increase the proportion of irrigation water sourced from storage.

#### **4. Expansion of existing financial incentive programs, streamlined water storage permitting, and other policies can greatly expand water storage and build unprecedented drought resilience for Humboldt cannabis.**

In June, HCGA members completed a survey on barriers to the adoption of water storage. 96% of farmers surveyed have currently adopted at least some level of water storage, and nearly all indicated an interest in adopting additional storage. 55% of farmers indicated a preference to store water via plastic or metal storage tanks, while 41% preferred to store water in ponds.

In response to a question on what key barriers preventing members from adopting additional water storage:

- 59% cited the cost of water storage tanks.
- 57% cited the cost of building a pond.
- 30% cited the cost of water storage installation.
- 41% cited barriers to permitting a pond.
- 41% cited barriers to permitting water storage.

To address these barriers, we propose the county adopt the following policies:

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<sup>16</sup> This estimate is based on surveys of HCGA membership and Planning Commission staff reports. We are currently working to obtain more precise information based on Water Board data.

**1. Urgently prioritize existing resources to incentivize and support the widespread adoption of water storage.**

- Prioritize \$18 million in recently-allocated state funds for water storage projects, including providing direct grants to licensees.
- Increase Measure S allocations to Project Trellis to 25%, with the balance of the increase allocated to water storage and water conservation projects.
- Seek additional state and federal resources to support water storage projects.

**2. Provide additional tax incentives for water storage adoption.**

- Provide a 15% Measure S tax credit for farms with more than 50% storage, and a 30% tax credit for farms with more than 90% storage.
- Provide property tax relief from the assessed value of the improvements associated with cannabis water storage.

**3. Streamline water storage permitting.**

- Work with the Water Board to reduce restrictions on water bladders as a bridge to other forms of water storage. Water bladders are a significantly more cost-efficient form of water storage than alternative options. Current regulations, however, require expensive engineered berms in order to utilize bladders. On a short-term emergency basis, these engineering requirements should be reduced while farmers transition to other water storage options.
- Evaluate the potential for streamlined pond permitting. Ponds are the most cost-effective form of water storage, and also serve important functions for wildfire protection. However, many farmers face permitting barriers to install ponds. We support exploring collaboration between cannabis farmers, the county, and state regulators to determine if barriers to pond storage can be reduced.
- Prioritize permitting of legacy water storage. Some farmers report being required to remove existing water storage, in the midst of a drought, due to permitting barriers.
- Evaluate options to reduce other barriers to water storage permitting.

**4. Increase fire resilience by streamlining tree clearing for purposes of defensible space.**

- Following last year's fires, HCGA spoke with CalFire and learned that fire crews spent considerable emergency resources clearing defensible space around rural homes and commercial cannabis operations in Humboldt. California law mandates defensible space around all structures and ancillary buildings. While we support the prohibition on timberland conversion for purposes of cannabis cultivation, this should be clearly distinguished from forest clearing for purposes of fire safety.

**5. Support the success of small-scale, craft farms.**

- Policies that incentivize farmers to either utilize less cultivation area, or to adopt less intensive cultivation practices, will help to advance water conservation goals.

- Barriers to on-farm trimming are currently one of the most substantial impediments to a workable business model for craft farms. Meeting commercial building code requirements is expensive to the point of being impractical for most small farmers. Cottage exemptions for farms that meet certain conditions, or other efforts to reduce the cost of commercial permitting, would substantially boost craft cultivation in Humboldt.
- Support for appellations and countywide cannabis marketing will incentivize farmers to stay small and adopt more sustainable and water efficient cultivation practices.

During California's last major drought in 2011-2017, cannabis was often portrayed as an unusually thirsty crop that posed an extreme and unique threat to water resources. Today, cannabis farmers follow California's most stringent water-use regulations, and newly-published research now echoes farmers' long-standing knowledge that cannabis is a low-water usage - but extremely water-efficient - crop.

As we enter what may be another period of sustained drought, it is essential that policy conversations are informed by these facts, and contextualized in terms of overall water usage. Cannabis farmers share a common responsibility to reduce and conserve water, particularly in sensitive watersheds during low flow conditions - but this discussion must be contextualized by the actual water usage and conservation/storage practices of cannabis farmers, not by the legacy of Drug War-era conjecture and stigma.

With support from the county, we see a unique opportunity for Humboldt cannabis cultivators to set a model for agricultural water conservation. As a small-farm industry, with low overall usage of water and substantial existing investment in water storage infrastructure, Humboldt is perfectly positioned to build unprecedented climate and drought resilience through the widespread adoption of water storage - with major long-term benefits for the cannabis industry, the environment, and the county as a whole.

Thank you for your consideration,

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