Berkeley UNIVERSITY OF CALIFORNIA Cannabis Research Center

Water Use in Cannabis Agriculture

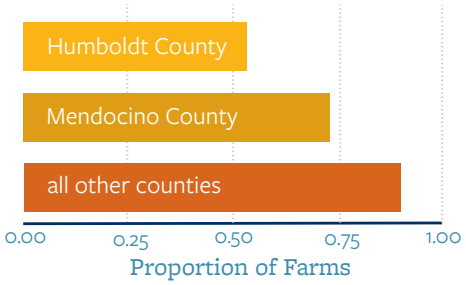
December 2020

Members of the Cannabis Research Center have been studying water use on cannabis farms since 2017. Studies have primarily relied on water use reports from farmers enrolled in the State's cannabis cultivation program, but also on anonymous farmer surveys. While data on water use remains limited for unpermitted farms, our research on permitted farms is improving understanding of cannabis water use practices and their associated environmental impacts.

Where do cannabis farmers source their water?

Cannabis farms rely on a variety of water sources for irrigation, including rivers and streams, springs, wells, municipal water, and captured rainwater. Most permitted cannabis farms rely on groundwater wells to meet their water demands.

Prevalence of Wells as a Water Source



More than half of permitted farms in Humboldt and Mendocino County use wells. In other important cannabis producing counties (Lake, Nevada, Monterey, San Luis Obispo, Santa Barbara, Santa Cruz, Sonoma, Trinity, and Yolo), the prevalence of well use is even higher.

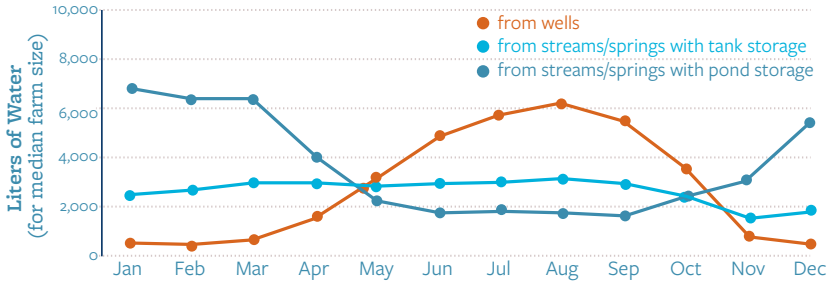
How much water do outdoor cannabis farms use?

Cannabis uses a similar amount of water per acre as other agricultural crops in California, but it accounts for a tiny fraction of the state's agricultural water use because crop area is so low. Cannabis water use also varies by cultivation type. Typically, cultivation in greenhouses uses less water per plant than cannabis grown outdoors, but because plants are smaller and densely arranged, greenhouse cultivation can use more water per square foot. Applying best management practices can limit water use for any cultivation method.

How do farm characteristics affect water extraction timing?

The amount of storage available and water source influence when water is extracted from the environment.

Monthly Water Extraction



Although crop water use peaks in July and August, water extraction volumes can be lower in these months if water is applied from storage in ponds or tanks. Ponds filled in the wet season may be large enough to meet farm water demands. However, farms with water tanks typically do not have the capacity to store all the water they need, so extraction also often occurs in the dry season. Farms that use wells typically do not store water, so extraction timing closely matches irrigation demand, peaking in the dry season.

Berkeley UNIVERSITY OF CALIFORNIA Cannabis Research Center

Water Use in Cannabis Agriculture

How do regulations influence water extraction by cannabis farms?

To comply with state regulations, farms that rely on streams or springs must store enough water to meet water demands for the entire growing season. State and county regulations prohibit the extraction of water from streams and most springs from April through October, referred to as a "forbearance period." At the time regulations were adopted, most farms using these sources did not have sufficient storage. Therefore, to become permitted, many farmers have had to expand their storage, reduce demand (e.g. reduce crop size), or seek alternative sources, such as well water.

How does cannabis farming threaten streams?

Farms can deplete streamflow. While water use by cannabis farms is low relative to other crops, many farms are located in remote upper watersheds, where water is naturally limited. In Northern California, these watersheds support sensitive species, including coho salmon and steelhead trout. Because peak water demand for cannabis occurs in the dry season, when streamflow is at its lowest levels, even small diversions can dry streams and harm aquatic plants and animals. Wells located along streams can have similar impacts as direct water withdrawals.

Because cannabis farms are often clustered on the landscape, there is the potential for significant cumulative effects from multiple farms diverting water at the same time. Nevertheless, it has been difficult to directly measure the impacts of cannabis on streamflow and to distinguish the effects of cannabis versus other water uses (e.g. residential, other forms of agriculture). An expanded streamflow monitoring network and direct measurements of cannabis water use would improve our ability to quantify (and mitigate) impacts to streamflow and sensitive species.

Farms can impair water quality. Cannabis farming sometimes involves the use of pesticides, fertilizers, and soil amendments. The development or expansion of cannabis farms can also involve land grading and road construction, often in rugged terrain. Permitted farms are subject to strict regulations to protect water quality, but the majority of farms in the state are not permitted and often fail to properly use agricultural chemicals, manage fuels, and control sources of fine sediment that pollute streams.

Pesticides known to be highly toxic to fish and wildlife have been found on unpermitted farms and are especially common at trespass grow sites on public lands. Despite these risks, detection of water quality impacts has proven difficult owing to challenges of site access, the relatively small size of cannabis farms, and uncertainty about cultivation practices. Understanding how, when, and where cannabis cultivation can degrade water quality, as well as management strategies for avoiding impacts, is an important area of future research.

For more information, visit: crc.berkeley.edu or contact tgrantham@berkeley.edu

Suggested Citation: Dillis, C., Grantham, T., Butsic, V., Carah, J., Parker-Shames, P. 2020. *Water Use in Cannabis Agriculture.* Cannabis Research Center, University of California, Berkeley, CA.