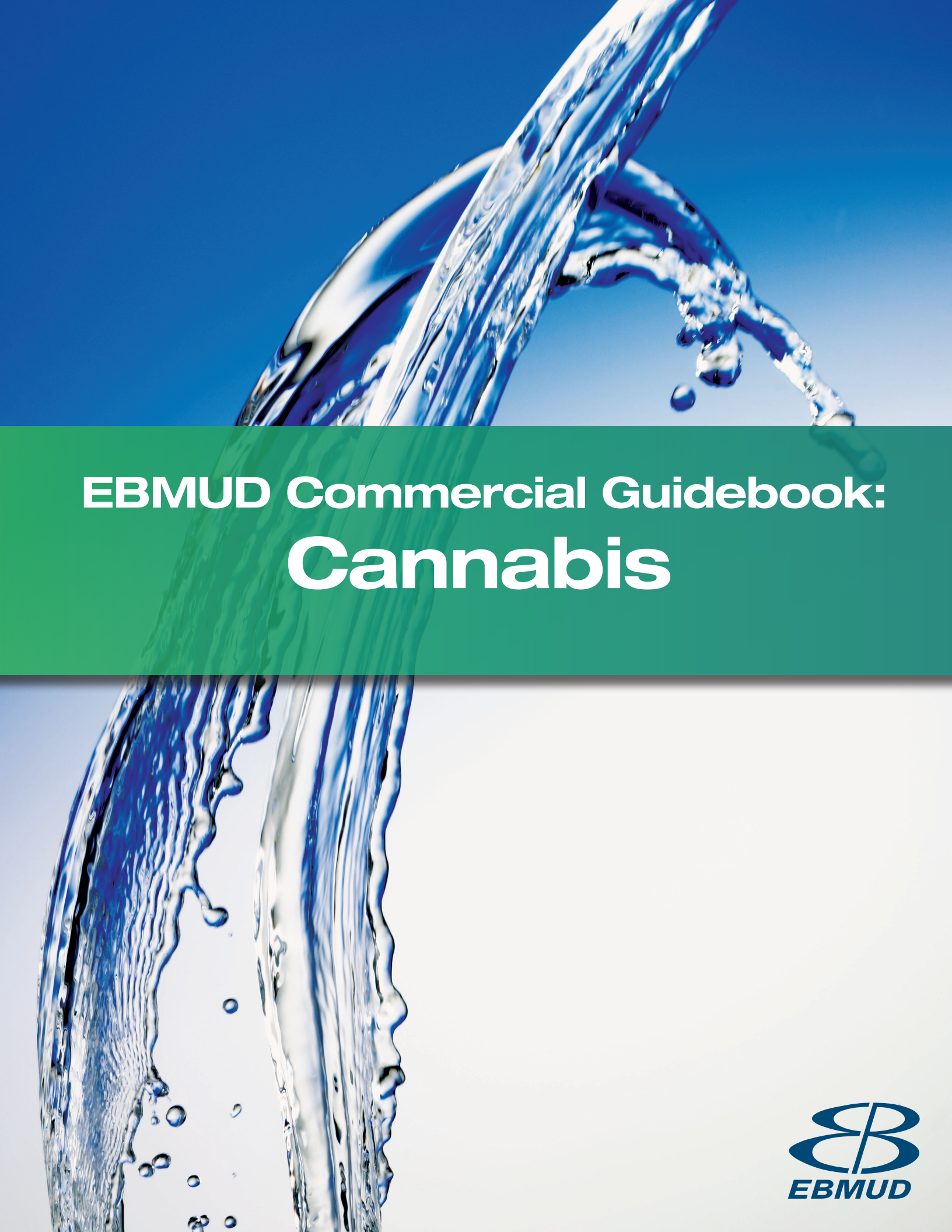

EBMUD Commercial Guidebook:
Cannabis

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CANNABIS PRODUCTION OPERATIONS

The medical and recreational cannabis market in the United States exceeds 20 billion dollars and is, "one of the fastest-growing industries, globally."[1] While cannabis is processed into multiple products, this section will focus on addressing equipment used in growing cannabis.

Additional areas that affect a cannabis business include cooling (HVAC), filtration systems, dehumidification, and cleaning. Be sure to check the chapters for those areas that affect your business.

Cannabis can be grown indoors, outdoors, and inside greenhouses. While outdoor operations have the lowest rates of water use per square foot,[2] indoor production tends to generate the highest yields per square foot due to a shorter growing cycle and higher planting density.[3] Indoor operations use significantly higher volumes of water per square foot of plant canopy, but less water per plant, as they are also able to produce more harvests per year.[4] The decision whether to cultivate indoors versus outdoors should take into account local regulations, facility rental or purchase costs, as well as water and energy costs.

Water sources used in the production of cannabis may include utility-supplied potable water, hauled (delivered) water, private well water, on-site reclaimed water, and natural sources such as rain or surface water.[5] Water is used for irrigation, humidification, cooling, cleaning, and to dissolve nutrients for application. The volume of water used in cannabis, as compared to other crops, is still an area ripe for research with conflicting studies frequently reporting that it is equal to, or less than, many major crops.[6]

More important than comparisons to the water use of other crops, however, is a focus on relative water efficiency of different production methods within the cannabis industry itself. Prior to irrigation, water should be tested to determine its suitability for the crop. Some water sources require additional filtration, and some water may be used for fertigation (combination of fertilizers and water prior to application).

Indoor Commercial Cannabis Operation

1 Lipson, Ross. Forbes. (2022, February 18). Where Is the Cannabis Industry Headed In 2022? Forbes. *https://www.forbes.com/sites/forbesbusinesscouncil/2022/02/18/where-is-the-cannabis-industry-headed-in-2022/?sh=49d5ffec72e2*

2 Long, Andrew. (2021, March 2) Marijuana cultivators should rethink how they measure water use, new report says. MJBizDaily. *https://mjbizdaily.com/rethinking-water-use-measurements-in-marijuana-cultivation/*

3 Wilson H, Bodwitch H, Carah J, Daane K, Getz C, Grantham T, Butsic V. (2019, September 12). First known survey of cannabis production practices in California. Calif Agr 73(3):119-127. *https://doi.org/10.3733/ca.2019a0015.*

4 Dillis, C., Grantham, T., Butsic, V., Carah, J., Parker-Shames, P. (2020) Water Use in Cannabis Agriculture. Cannabis Research Center. *https://crc.berkeley.edu/wp-content/uploads/2020/12/CRC_Brief_WaterUse_2020_1205.pdf*

5 New Frontier Data. (2021). Cannabis H2O: Water Use & Sustainability in Cultivation. *https://newfrontierdata.com/product/cannabis-h2o-water-use-and-sustainability-in-cultivation/*

6 Comprehensive Cannabis Consulting. (2018, January 12). Cannabis Cultivation: Water Efficiency and Regulations. *https://www.3ccannabis.com/2018/01/cannabis-cultivation-water-efficiency-regulations*

Table 15-1: Irrigation Methods for Indoor Cannabis Cultivation

IRRIGATION METHOD	BENEFITS	DRAWBACKS
HAND WATERING	• Eyes on all plants during watering • Gives grower "hands on" feel • No high-tech equipment required	• Inconsistency of volume per pot • Inconsistency between employees responsible for task • Labor-intensive
DRIP IRRIGATION	• Usually automated • Precise volume of water • Allows cultivator to water many plants at once	• Potential clogging of emitter • Manual inserting/removal of dripper when moving plants • Additional cost to install and maintain • More technical, with high learning curve
FLOOD TABLES	• Automated • Less chance of under-watering plants • Easy and inexpensive to build	• Large amounts of water used at once • Increased humidity if reservoirs do not have lids • Manual labor to clean and refill reservoirs

Table 15-1 includes the efficiency, benefits, and drawbacks for the most commonly used methods of indoor irrigation.[7]

Recommendations

Standard areas where the cannabis industry may benefit from best management practices for water efficiency include:

Leaks

- All plumbing systems are susceptible to leaks. Leaks not only waste water but may result in lost nutrients, health and safety violations (wet floors and surfaces) and create an environment for harmful algae growth. Perform the following checks:
  - Ensure pipes are correctly sized.
  - Ensure pressure is appropriate for the type of irrigation application used.
  - Regularly check fittings and emitters on irrigation systems and repair all leaks immediately.
  - Consider investing in a sub- or flow meter to better understand irrigation use and quickly detect costly leaks[8] (and take advantage of any available utility rebates).

Automation

- Automated irrigation systems can improve accuracy and efficiency of water application.
  - Smart controllers and associated online software can manage irrigation remotely and save money on water use, adjusting based on local weather and site conditions.

7 City of Denver, Public Health and Environment. (2021, October). Cannabis Environmental BMP Guide. *https://www.denvergov.org/files/assets/public/climate-action/documents/2021_cannabis-bmp-guide_rev-11-23.pdf*

8 East Bay Municipal Utility District. Best Management Practices for Cannabis Facilities. *https://www.ebmud.com/download_file/force/7615/668?bmps_for_cannabis_facilities.pdf=*

- Smart controllers automatically shut off irrigation prior to or during rain events (for outdoor cultivators).
- Automated irrigation and flow metering systems can measure irrigation applied during each phase of growth and establish a baseline for runoff.
- Some software systems integrate additional data including fertigation.
- Take advantage of any available utility rebates for smart controllers and/or flow sensors.

Irrigation schedules

- The frequency and duration of irrigation greatly depends on the growing medium, environment, and season.
  - When programmed correctly, automatic irrigation systems can streamline operations, saving water and money.
  - Thoroughly research the desired production approach and take the plant's growth phase into consideration to determine the ideal schedule.
  - Watch for signs of an over-watered plant, especially in indoor environments where the humidity can remain high.[9]

Filtration

- "Water can be purified using several different methods including carbon filtration, UV sterilization, and reverse osmosis. When considering environmental inputs, water treatment using carbon filtration has emerged as the most efficient method to reduce contaminants and minimize water loss."

Reverse osmosis for wastewater purification is expensive, creates significant waste, and is not recommended.

- "For example, a typical point-of-use RO system will generate five gallons or more of reject water for every gallon of permeate produced."[10]
  - Additionally, in water utility service areas such as EBMUD with low Total Dissolved Solids (TDS), additional purification is often not necessary. Check with your local water utility for more information.

Onsite water reuse (runoff, condensate)

- Water in an agricultural setting is frequently wasted through missed opportunities in water use efficiency. In cannabis growing operations this can include the ability to capture, filter, and reuse water that would otherwise be lost to runoff, evaporation, disposal of unused irrigation, or ventilation water.
- For outdoor applications, consider using mulch and raised beds to minimize or eliminate this waste.
- For indoor applications, installation of HVAC systems designed to collect and treat condensate can be reused to minimize waste.[11] For more information on condensate reuse, see Chapter 7, Alternate Onsite Water Sources.

Green cleaning products and practices

- Growing media is a contributing factor to the frequency and level of cleaning necessary in the work environment.
- Soil may require more frequent cleaning of an indoor grow area than rockwool due to the likelihood of getting soil on the floor.
- Be sure to properly dilute all cleaning solvents as higher concentrations do not necessarily work better and make it harder to process the water.
- Use environmentally friendly cleaners such as those rated by Green Seal, Eco Logo or Safer Choice.[12]

Maintenance

- Performing regular and routine maintenance can reduce leaks and equipment failure that result in water waste.
- By choosing lower maintenance systems, you can minimize your water use and maintenance costs.
- Regular HVAC system maintenance is crucial to system sustainability.

Water savings will vary with each business dependent on the size and type of the operation, the environment, and the need for water filtration.

9 Cannabis Training University. Overwatered Marijuana Plants: Comprehensive Guide to Spotting and Avoid Overwatering Cannabis Plants. *https://cannabistrainginguniversity.com/growing/overwatered-marijuana-plants-how-to-spot-and-avoid-overwatering-cannabis-plants/*

10 Environmental Protection Agency. Point-of-Use Reverse Osmosis Systems. EPA.gov. *https://www.epa.gov/watersense/point-use-reverse-osmosis-systems*

11 *https://growersnetwork.org/cultivation/condensate-reclamation-practical-concerns/*

12 City of Denver, Public Health and Environment. (2021, October). Cannabis Environmental BMP Guide. *https://www.denvergov.org/files/assets/public/climate-action/documents/2021_cannabis-bmp-guide_rev-11-23.pdf*

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    https://thecannabisindustry.org/wp-content/uploads/2020/11/NCIA-Environmental-Policy-BMP-October-17-final.pdf
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    https://resourceinnovation.org/wp-content/uploads/2019/12/18-CEO-MJ32-Energy-Cannabis-Report_FINALWEB.pdf

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