

Cannabis Industry Impacts  
to the Environmental Health  
of the Illinois River Basin and  
Community Well-Being



Josephine County, Oregon  
Christopher Hall

# Illinois River Basin, Josephine County, Oregon Hydrologic Code 8-17100311

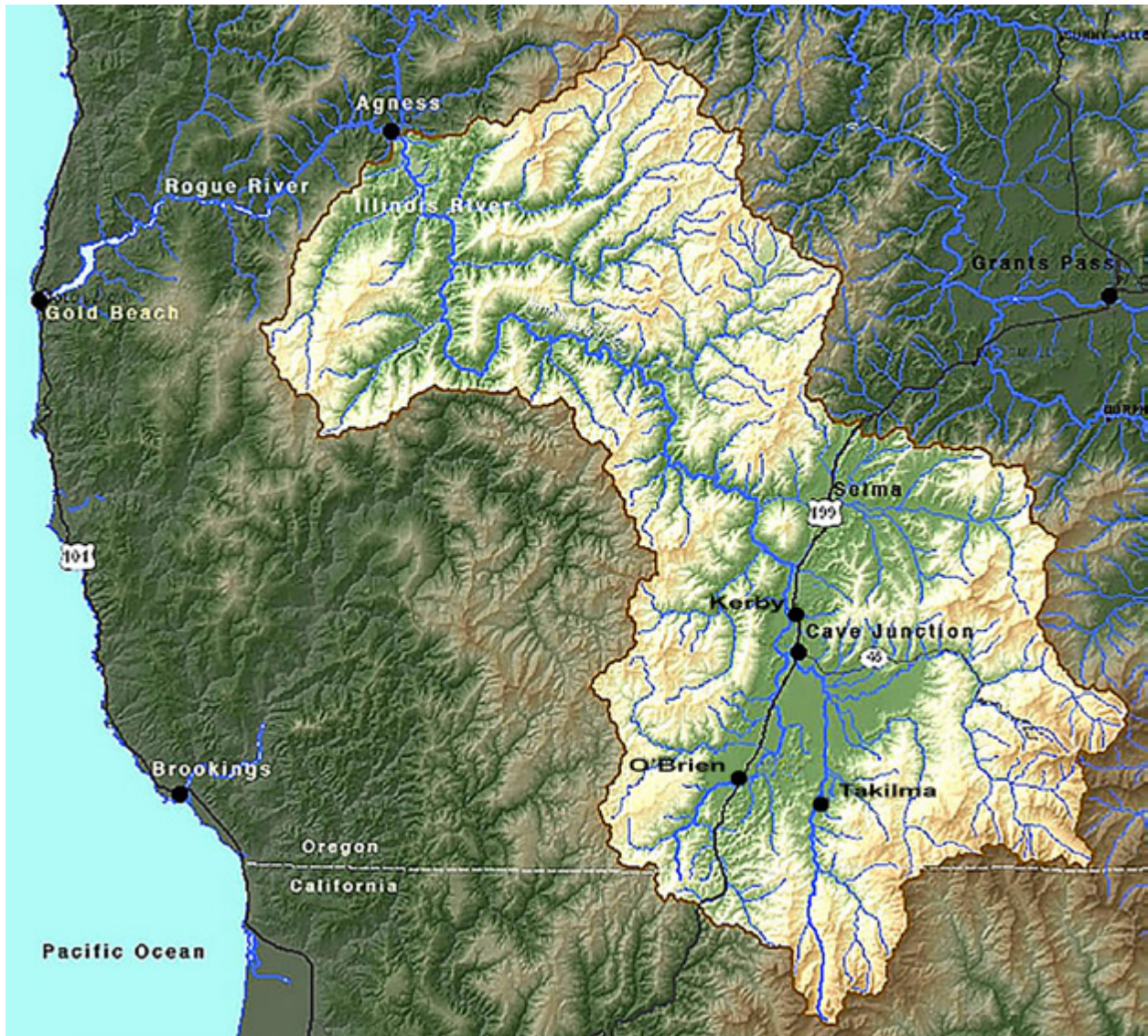


Image -- KalmiopsisWild -- <https://kalmiopsiswild.org/explore-kalmiopsis-wildlands/the-rivers/illinois-river-basin/>  
An excellent and detailed description of the Illinois River Basin can be found at this link.

The Illinois Valley Soil & Water Conservation District operates within the Illinois River Basin HUC 8-17100311 watershed boundary shown above. This report covers the southern half of the watershed where the human population of the watershed lives and conducts agricultural activities. Southern subwatersheds include the West Fork Illinois River HUC 10-1710031104, East Fork Illinois River HUC 10-1710031103, Deer Creek HUC 10-1710031105, Althouse Creek HUC 10-1710031101, Sucker Creek HUC 10-1710031102, and Josephine Creek-Illinois River HUC 10-1710031106.



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Period of Study: June – October 2021  
Christopher Hall, Cave Junction, OR

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[All files associated with this report can be found here](#)

[Contact the IVSWCD here](#)

## 1) Abstract:

The cannabis industry laid waste to the Illinois River Basin in 2021 in ways previously unseen. The signs of wanton destruction were evident in May as the community began an uproar about the negative impacts affecting the environmental health of the watershed and their own well-being. The Illinois Valley Soil & Water Conservation District (District) initially discussed ways to address the community's concerns about the negative impacts. Throughout May residents called the office with complaints about riparian clearing, water theft, and other impacts to sensitive habitats they witnessed. In June, the district publicized the Community Organizer job description to address the community's concerns. This is a report of that work. The fact that the community's concerns surfaced so early in the growing season speaks to the large scale of the problem.

This report provides an introduction to the topic, a brief history of "how we got here," an explanation of research methods (mapping and calculations of consumptive water use), a *By the Numbers* page in the style of *Harper's Index*, a discussion of the community's sentiment on the cannabis industry and their proposed solutions, a photo essay accompanied by quotes from the community, a discussion of the advocacy work building a bridge between residents and state officials, and a conclusion with next steps and further research needed. The appendices and links contain extensive data, tables, and pertinent detailed discussions.

While this report seeks to explain the circumstances as noted, the greater hope is that this report will inspire further research and that readers will envision the next steps they can take.



Westside & Holland Loop -- a 6 by 9 mile area of the Illinois Valley filled with 531 cannabis grow operations.



## 2) Introduction:

In 2021 the Illinois Valley community witnessed unauthorized water use on a large scale. The volume of such unauthorized water use is estimated to be 414 million gallons. The public repeatedly asked how such profligacy could continue unabated despite calls and complaints to state officials charged with addressing the issue. The unregulated cannabis industry took water it had no right to use and exacerbated drying up wells, creeks, ditches, and rivers during a period of a prolonged megadrought. High temperature is the leading cause of surface water pollution in the Illinois River Basin -- in a good year (Meyers, Tugaw. 2011). Widespread unauthorized water use by cannabis growers may have negatively impacted cold water fishes, including the ESA-protected coho salmon, and other threatened terrestrial species (Parker-Shames, et al. 2021). Overwhelming water extraction may have seriously degraded water quality due to increasing favorable conditions for cyanobacteria (Power, et al. 2015).

Water quality also plummeted due to riparian clearing, and growers dumping trash, sewage, and chemicals onto the lands and into riparian areas and waterways. (Baker. 2018)

The Illinois Valley Soil & Water Conservation District (District) embraced the public interest to protect, restore and maintain the ecological health of the lands and waters in the Illinois Valley by seeking their input about solutions to the water quality and water use concerns they directly experienced.

The District has sought to fulfill its mission to remedy the conditions that limit the health of fish and wildlife, their habitat, and

watershed functions by conducting educational and outreach activities with the public on the topics of agricultural water quality and beneficial use, protection of riparian areas, pollution to lands and waters, and conservation best practices.

Members of the public noted their lack of agency to directly protect and restore lands because they are not landowners or because the lands needing mitigation are owned by persons causing the negative impacts. Despite their lack of agency, they feel they have an obligation to protect, restore, and maintain the watershed and support its overall enhancement. These alienated and disaffected members of the public believe that they are stakeholders and have asserted themselves as such.

Most stakeholders believe an important way to secure long-term protection for lands and waters that provide critical habitat for native fish and wildlife is to enact the policies, regulations, and laws that were written explicitly to protect these resources. The public believes that a shovel in the creek, removing an unpermitted pump from the river, back-filling an illegal pond, and implementing water and pollution laws are equally the same when protecting and restoring the ecological health of the Illinois Valley. With this understanding, the public has been pressing state officials to enforce and revise existing laws and write new ones as the most effective form of remedy at their disposal.

The District answered the community's call for leadership to carry out resource assessment, planning, technical assistance, monitoring, and outreach activities necessary to address their concerns to protect and restore water quality and quantity of surface and

ground waters. The state of Oregon designates the Illinois River as a Scenic Waterway; therefore, the community and the state have specific concerns about the quality and quantity of waters that drain into the river. Calculations show that unauthorized water use in the Illinois Valley in 2021 may have exceeded the limit for groundwater extraction set by ORS 390.835 by several times.

For perspective, on August 5, 2019, the [Oregon Water Resources Department \(OWRD\) Groundwater Section found](#) that agricultural wells with water rights in the Illinois River Basin had already exceeded the state-designated limit for reducing streamflow in the Scenic Waterways. This finding began the process to slow and cease approval for groundwater applications for water rights; meanwhile, unauthorized water use blew through the ceiling unabated.

There's an adage that water thieves hold the most senior water rights. The public is aware of this dark irony and the scope of damage this dissonance causes to the Illinois River Scenic Waterway. According to public sentiment, the time for shovels and logs as the sole mechanisms to solve the problem has passed. The public has called for interdiction to protect, restore, and maintain the ecological health of the lands and waters in the Illinois River Basin, requesting state regulators take action. The time for decision-makers to step in has arrived (Carah, et al. 2015).

The public's concerns about water quality and quantity are paramount, as noted in the community sentiment research the author conducted during the summer and fall of 2021. A close second is the perceived indifference from state agencies that are charged with addressing the negative impacts caused

by illegal industrial cannabis grows. Many thought that if the scofflaws were permitted to get away with stealing and polluting water on such a large scale, as seen in 2021, then the activities were, for all intents and purposes, effectively legalized by indifference.

For example, the widespread outrage at municipal bulk water sales is not because the relatively small amount of water sales measurably reduced stream flows in the Scenic Waterway; rather, the [municipalities symbolize the indifference](#). The public knows that most municipal bulk water sales are used to irrigate illegal cannabis crops. This led the public to believe that local indifference epitomized the disregard they experienced from state agencies. As such, municipal bulk water sales served as an important and aggravating symbol of how illegal cannabis grows were permitted to operate as if they were legal: four out of five cannabis grows over 12 plants in the Illinois Valley were not licensed in 2021.

Credit is now due to Oregon officials for acknowledging these facts: state legislators are currently revising the laws regulating bulk water sales and other water law enforcement statutes during the 2022 legislative session.

Additionally, the state has appropriated \$5 million [to increase the Oregon Water Resources Department's \(OWRD\) capacity to enforce water law](#). This action is a response to complaints by the public in southwest Oregon – Josephine, Jackson, and Deschutes counties. Whether this increase is sufficient to manage the thousands of illegal industrial grows poised to steal water in 2022 remains to be seen because the funding is intended to assist legal farms who misuse their water rights.

No information collected in the course of this project is sufficient to allege violations of the law by anyone in particular; instead, the information is aggregated to assess the scope, scale, and impact of the cannabis industry. The District is non-regulatory and does not directly participate in enforcement actions. However, the District has a duty to alert partner agencies to egregious violations it has witnessed and help citizens contact these agencies upon their request for assistance. No information in this report is sufficient to alert any agency about any specific instance of law violations.

The District “supports actions to implement and enforce the laws in a manner that encourages water conservation while striving to make sure that all beneficial uses have access to sufficient supplies” (OACD 2019). Unauthorized (non-beneficial) water use, poor water quality, the subsequent negative impacts resulting from such water use and poor quality, and indifference to these problems frame the scope of this report. As such, this

report forwards the community’s concerns to state agencies and to elected and appointed officials statewide.

In this report, implementation and enforcement refer solely to water quality and quantity unless explicitly noted otherwise.

The job description for the work contained in this report states:

“The Community Organizer will engage with the community around their interests and concerns with local water quality and quantity as it relates to agricultural use. The Illinois Valley Soil and Water Conservation District (IVSWCD) has seen an increase in calls from the community voicing their concerns about the legality of some agricultural water use within the valley. The Community Organizer’s goal is to fully understand the nature of the concern and to initiate and carry forth creative, community-driven solutions that will have a material impact on local water quality and quantity.”



Photo courtesy of an anonymous community member -- water tanks and fertilizer pool -- 2021



The mission for the author's strategic plan guiding this work is:

...to assess and promote community-based concerns and solutions on agricultural water quality and implement conservation best practices, including use of Oregon's water statutes and rules to protect the Illinois River Basin for farming and non-farming residents, visitors, businesses, and the flora and fauna of the region.

This work is guided by the [Inland Rogue Agricultural Water Quality Management Area Plan](#) and promotes solutions that are demonstrably within the range of community sentiment in the Illinois Valley.

This project has three goals:

Goal #1: Conduct graphical and empirical research to estimate the scope of the cannabis industry, its impacts, and its water use;

Goal #2: Conduct research to identify community sentiment regarding agricultural water quality and water use as it pertains to the cannabis industry;

Goal #3: Build a bridge between Illinois Valley residents and their elected and appointed officials about the impacts the cannabis industry has on agricultural water quality and the quantity of water in aquifers and scenic waterways, on the overall environmental health of the watershed, and on the community's well-being.

This report is one part of the solution; advocacy in the form of a petition, a letter-writing campaign, public relations and marketing campaigns, and testimony to elected and appointed officials are others. Details about the advocacy work are in Section 7, Advocacy: Building a Bridge Between Residents and State Officials.



The Author's organic OMMP legacy grow from 2017 (These plants had a 1:1 ratio of CBD to THC)





Industrial hoop house grow from 2021



Industrial cannabis grow sacked by law enforcement -- 2021

### 3) Cannabis Industry History to the Present Day:

To understand the water quality and quantity problems faced by the community of flora, fauna, and humans who call the Illinois River Basin home and pass through the region on holiday or to spawn eggs in its many tributaries, it is helpful to understand some of the history related to cannabis cultivation.

The following is a brief description of how cannabis cultivation has changed in the Illinois Valley, from the legacy gardens of 1960 to 2016 to the recreational market and hemp growing from 2016 to 2020 to the hoop house cannabis production of 2021.

There is a long, proud history of small-scale, backyard cannabis gardening going back 60+ years in the Illinois Valley. Cannabis cultivation has been one of the major activities that define our cultural heritage (Polson, Bodwitch, 2021), along with mining, timber, homestead farming, hay, cattle, and grapes, rural isolation, our scenic rivers, and small communities nestled among the hills. Growing cannabis never posed an existential threat to our region until very recently. It is essential to distinguish the reasonable practice of backyard gardening from the industrialization of cannabis crops seen in 2021.

Historically, families grew cannabis on a small scale in this region because the climate, changing day-lengths from long to short, native soils, and water are ideal for high-quality micro-scale cultivation. Small backyard gardens could produce enough cannabis to support living expenses; sales were on the unregulated market. The concept of cannabis as a medicinal herb took hold commercially

as the Oregon Health Authority began to regulate cultivation in 1998 under the Oregon Medical Marijuana Program (OMMP). This opened up a pathway for increasing quality and discipline in the burgeoning industry. Cannabis went from \$4,000 per pound wholesale to \$2,000 in ten years following the establishment of the OMMP. Just before legalization, when Measure 91 passed in 2014, the wholesale price hovered around \$1,500.

Measure 91 was a ballot initiative driven by consumers wanting legal access. Legacy growers, on the other hand, viewed it with skepticism; many who spoke about it in the Illinois Valley said it would drop the wholesale price. The measure authorized the Oregon Liquor & Cannabis Commission (OLCC) to create a legal pathway for growers to enter a state-regulated market for recreational cannabis. The onerous regulations were hard for growers to comply with; meanwhile, consumers hoped they could buy cannabis as they did beer and wine. Adult-use regulation rolled out by the state of Oregon inadvertently “virtue-signaled” to former OMMP growers and those who never intended to enter the new commercial-legal market that they could stop hiding their operations and come out of the closet. In 2017, many people did just that. Green-rushers immigrated to the Illinois Valley, hoping to strike it rich on the dreamy consumer sentiment that cannabis was finally legal. That year, the price of cannabis dropped from \$1,200 per pound wholesale for high-quality hand-trimmed outdoor cannabis to \$800 or less. In 2018, the price dropped to \$500 – this hurt both the regulated and unregulated markets. The legacy growers were correct.

During this time, the Oregon state legisla-



ture passed HB 2198 and SB 1057. These bills ended interest in the OMMP program for growers who cultivated more than 12 plants because the mandated tracking and other regulations were too onerous. Medical dispensaries began to fade away after 2017 as OLCC recreational cannabis retail shops opened. This change inspired most OMMP growers who used to cultivate more than 12 plants to go back to growing without any licensing.

While there has not been much quantitative research into the interaction of the unregulated and regulated markets, it is widely known that a tight correlation exists (Lewis. 2021). An oversupply in the unregulated market slows sales in the limited state-regulated market because consumers easily move between the regulated and unregulated markets. For most consumers, their sole concern is finding the best price. Over the past several generations, consumers have purchased cannabis from friends and neighbors; these unregulated connections are robust and trusted. Because the legal, regulated market is costly for producers, and because they have a limited in-state customer base, they have difficulties competing with the illegal, unregulated market. The volume of unregulated cannabis grown within Oregon is enough to sell nationwide, leading to jokes about OLCC licensed producers who are left “selling sand to beachgoers.”

The oversupply of cannabis and the subsequent reduction in price per pound in 2018 drove many unregulated cannabis growers into the newly opened-up legal CBD hemp market regulated by the Oregon Department of Agriculture (ODA). The significant portion of growers who took this option indicates that many preferred a nationwide

legal opportunity if they perceived it would be profitable. Statewide hemp production increased from 7,800 acres in 2018 to 51,000 in 2019 (Cowee. 2019) because it was easy to comply with the ODA licensing, similar to how the OMMP had previously been easy to comply with. The hope was that CBD would be highly profitable.

In 2018 and 2019, the Illinois Valley saw grass hay fields put into hemp production that had not been plowed or irrigated in generations. Hemp growers used water rights that had been unused or under-used for decades. Wholesale hemp biomass prices were \$3.50 per CBD percent per pound in the winter and spring of 2019. For 10% CBD hemp, that was \$35/ pound. Across the U.S., oversupply drove down the price. In the winter and spring of 2020, the price dropped to \$1.50 per CBD percent per pound. In the winter and spring of 2021, the price was cheaper than carrots: some sellers and brokers stopped measuring CBD percentages, and buyers could purchase biomass for \$1 per pound or less nationwide. The price collapsed because the FDA never approved CBD for human consumption – there was no market for it.

While there is still some market for boutique hand-trimmed smokable hemp, the size of the market in 2021 is tiny compared to the short-lived hemp biomass market and existing THC cannabis market.

Enter Delta-8 THC. As the price for hemp biomass collapsed, the industry discovered that they could ape the THC cannabis market by processing CBD into Delta-8 THC. They found a way to make CBD profitable again. This process was not cheap, but it resulted in a distillate that had anywhere from

70% to 95% Delta-8 THC that could be sold in vape pens or sprayed onto boutique hand-trimmed hemp, turning hemp into an intoxicating smokeable commodity. As soon as states got wind of this work-around, some began to regulate Delta-8 THC, making it unprofitable to sell compared to the naturally occurring Delta-9 THC. Brokers of Delta-8 THC raced to sell their inventory during spring 2021 before the window closed on Delta-8 sales in Oregon and other states. Acres of hemp production declined in Oregon from 27,434 acres in 2020 to 3,800 acres in 2021 (Drotleff. 2020, 2021), and a significant percentage of 2021 licensed acreage was not planted legally; in fact, half of the “hemp” growers used the ODA licensing for cover to grow THC cannabis, as revealed by the [HB 3000 testing regime](#).

The loss of a viable, regulated hemp market incentivized growers to rush back into the unregulated THC cannabis market in 2021. These swings are reminiscent of the pork cycle described in economics 101 textbooks. Cannabis industry players knew the hemp market was a bust and that the only profitable cultivar was THC cannabis. They also knew they would oversupply the market – this author witnessed many such discussions on What’s App and spoke with locals on this topic. Growers thought they had better rush their harvests to market as early as possible to beat the glut and sell their cannabis in late summer. They rushed the green rush. (Dillis, Polson, et al. 2021) This explains the zeitgeist in 2021 to grow cannabis in hoop houses: many pulled tarps for “light dep” crops or grew auto-flower cannabis. Some tried to grow two successive crops. Crops grown under cover in hoop houses could start at least a month earlier in the year and finish a month early. Evidence of the early start to the grow-

ing season became known in May 2021. The community angst and concern caught the attention of the District, which quickly convened to address the issue. Usually, cannabis growers’ impacts are not felt until mid-summer.

The backstory to light deprivation crops: in the past ten years, there has been an increasing segment of the business where growers would harvest a small light-dep crop to front-load some income, enabling them to have cash on hand to cover the overhead expenses of growing cannabis and to pay their trimmers in the fall. This growing style became more prevalent since it was high-quality fresh cannabis hitting the market in August/September ahead of the main fall harvest. In 2019, growers produced more light-dep relative to previous years.

Growers erected hoop houses en masse in 2021 for several reasons: the need to blackout light, the mistaken fear hemp pollen would seed crops as it did in recent years, and a general belief that hoop houses create a veil of plausible deniability about growing unlicensed cannabis in the open. Growers cultivated regular season crops, light-dep crops, and auto-flower crops. Auto-flower cannabis is a cross with ruderalis hemp that is not photosensitive and matures without regard for day length. Auto-flower THC cannabis plants grow for ten weeks from seed to harvest; they grow about two feet tall and produce 1/4 to 1/2 pounds per plant. Growers can plant two successive crops in great density without breaking a sweat (no pruning, no clones, no drape-pulling, etc.) and get very productive harvests. [The map associated with this project shows about 1,000 grows](#), most of which are under hoop houses. Satellite maps from 2018 show only a few

hoop houses.

Because the state did not limit the size of hemp farms, the “scale-genie” was let out of the bottle, and growers got a taste for huge grows. Furthermore, in 2021, growers operated under the presumption that they could go big under hoop houses and harvest crops without concern for law enforcement. The only miscalculation in this racket was that they oversupplied the market early and drove the price down to \$300 per pound as of this writing (February 2022), with some OLCC producers claiming that they can’t afford to hand-trim their crop, which runs about \$150 per pound to trim.

This report argues that the green rush caused significant negative impacts to the environmental health of the watershed by negatively impacting the flora, fauna, and humans (Van Busic, et al. 2018) (Baker. 2018). Section 4 discusses the scope of the industry in the Illinois Valley in the summer of 2021 based on a precise mapping project conducted by the author. Such information is a necessary foundation to understand the community sentiment in Section 5.



Cartoon courtesy of the artist -- Jesse Springer, Springer Design & Illustration -- 2021



#### 4) Research Findings – Mapping and Irrigation Requirement Calculations:

To estimate the water use by the cannabis industry and to understand the scope of production and its impacts in the Illinois Valley, the author needed to view cannabis grows and accurately measure their size. The mapping project identified 950 cannabis grows larger than 12 plants in the Illinois Valley. [The map with background imagery is here](#); [the map on white is here](#). There are likely a few dozen more located east of the 7-mile marker along Caves Hwy 46 and the California border that the author did not map. New summer 2021 satellite imagery of the Illinois Valley is now available to confirm the number.

While a few dozen grows as small as 12 plants were mapped, the vast majority had scores, hundreds, and thousands of plants, requiring assessments to be made by the square foot. The Q Bar X Ranch that law enforcement raided had about 1.6 million square feet of unlicensed hoop house grows; another had about 1 million square feet.

##### **Methodology of the mapping project/ how to replicate:**

The author secured the use of a plane from a pilot who typically offers his services for free to causes he supports (the District paid for fuel). The aircraft was a “tail-dragger” with high wings above the fuselage and a large passenger window that opened fully. The plane flew out of the Grants Pass Airport at 7:00 AM on August 2, 2021, and returned around 11:30 AM.

This author rented a Sony 4K ultra high-definition video camera with an external recorder-screen device controller. Various tables and trigonometric calculations led to the conclusion that, based on the CMOS chip size (1”) and the field angle of the camera lens at a 16:9 ratio, the plane had to fly 4,500 feet above ground to obtain a 1-mile wide image along the width of the screen. Before the flight, the author conducted test shots from 1-mile away onto Hwy 5 to determine resolution, clarity, and measurements using tractor-trailers for scale.

The author mounted the camera onto a closed tripod, held it out the window, and braced the camera against 80-knot winds. The steady-shot technology in the camera kept the image clear. The author set the focus at infinity and the gain at zero; the camera automatically controlled the iris and aperture. The recorder-screen device spooled data onto an SSD at the rate of three gigabytes per minute. Over three and one-half hours of video footage equaled half a terabyte of uncompressed video data. The author stopped and started the camera record button about every three to four minutes to create discrete video files that would be manageable to work with (about nine to twelve gigabytes each). There were about 60 files in total.

The pilot mounted an i-pad with GPS connectivity onto his steering column and maintained a north-south axis along which to fly. The first path was from Hays Hill along Hwy 199, heading south to O’Brien, shooting video out the passenger window pointed down and facing west. The following course headed north, facing east. The pilot flew nine paths at a constant speed and altitude. The final path was a clockwise circle from the southeastern edge of Selma-Dryden to Hol-

land Loop to Dick George Rd, down along Takilma, over to O'Brien, and up along the Illinois River, then east across Selma and out of the Illinois Valley back to the Grants Pass Airport in Merlin.

The next step was to make an initial 36-inch map of the Illinois Valley and plot each video file pathway. This enabled the author to visually locate each video file on a map and find footage quickly anywhere on the map in an orderly process.

The author used Google Earth and Adobe Illustrator to grid out the initial map of the Illinois Valley in 1-inch tall by 2-inch wide rectangles and construct a high-resolution based map in each block. Each small rectangle held an 8-inch tall by 16-inch wide satellite map at 300 dpi. The high resolution allowed for zooming to a 1-foot resolution on the ground. The purpose of such intense detail was to ensure that subsequent placement of cannabis grow images would be precisely placed and scaled. The map scale is 4,675 feet = 1 inch, determined by multiple measurements comparing ARC GIS and Google Earth mapping.

The next step was to view all the footage and select the timecode to extract screenshots. The 4K ultra-high-definition camera shot uncompressed video that allowed for the export of still images 9 inches tall by 16 inches wide at 240 dpi. The author used Adobe Premiere to extract 271 still images. Using Adobe Photoshop, the author resized and dehazed each file. Individual cannabis plots were cut out and made into their own layers. The author copied each cannabis grow from Photoshop to the high-resolution base map in Illustrator. The process for precisely scaling and locating the cannabis grow images was made possible

by comparing the original video footage to the base map.

After placing the 1,000 cannabis grow sites into the Illustrator file, the author printed large 36-inch posters [with](#) and [without](#) the base map background. This hard copy of the map of the Illinois Valley has been used for public relations and research purposes.

Then began the GIS portion of the project. The author coordinated with the GIS specialists at RVCOG and the Josephine County Information Technology Department to build a [GIS map](#). The author geotagged every cannabis grow over 12 plants in size = 950 grows. Geotagging is the process of labeling each cannabis grow image with a latitude and longitude number with precision to 12 places to the right of the decimal point. Geotagging was done by visually looking at the location placement of each grow on the base map and finding that exact location on the geotagging software map. Again, the precision of having built a high-resolution base map in Illustrator and comparing that with the original video footage and to the GPS map made continuity of location easy and exact. RVCOG and Josephine County received the geotagged files and the latter populated a GIS map.

### **Methodology of the Irrigation Requirement Calculations:**

The next step of this process was to build a spreadsheet to populate an interactive GIS map with attribute tables measuring the size of each grow to identify an accurate estimate of the volume of water used by the cannabis industry in the Illinois Valley from April through October 2021.

Gordon Lyford, CWRE #342, is a leading

expert on consumptive crop water use with a master's degree from UC Davis on the subject and 20 years experience in the field working for the Bureau of Reclamation. Gordon prepared a consumptive crop water use paper in Appendix A. The document discusses Evapotranspiration (ET), Irrigation Efficiencies (IE), and season-length Irrigation Requirements (IR). We concluded that there are six cannabis growing styles and that each has a distinct IR.

Each growing style is associated with a multiplier of crop water use ranging from 1.1 Acre Feet (AF) to 2.85 (AF) of water used per acre during the growing season. Image examples are in Appendix B.

A – wide-spaced outdoor – IR 1.85 AF;

A(x) very wide-spaced large plants outdoor – 2,000 Gal./ season each;

B – wide-spaced hoop house – IR 1.6 AF;

C – close-spaced sea-of-green outdoor – IR 2.85 AF;

D – close-spaced sea-of-green hoop house – IR 2.6 AF;

E – row crops typical of hemp fields – IR 1.1 AF.

[The spreadsheet](#) is 30 columns wide by over 1,000 rows deep and is too big to include in this report. It is fully available to review, including all calculations by clicking the above link.

To determine accurate plant-spacing estimates, the author followed up on another flight on November 23, 2021. The author

could peer inside and photograph plant density because many hoop houses were uncovered with plastic either ripped by the elements or set aside by workers. This flight revealed the number of plants per square foot. The number of plants per hoop house was greatly increased over previous years as the practice of growing cannabis went from maximizing the number of pounds per plant to pounds per square foot. Generally speaking, hoop houses incentivize optimizing the use of space in what is called a sea-of-green.

Appendix A discusses the selection of corn compared to hemp, noting a similar season length, rapid growth rate, canopy coverage, and irrigation efficiency. More research is required to study hemp and cannabis consumptive water use; notably there have been several studies so far (Bauer 2012, 2015. Dillis 2019, 2021. Parker-Shames 2021). Hopefully, hemp and cannabis will soon be included alongside corn in consumptive water use data sheets prepared by researchers. Appendix B discusses in greater detail the impact of the unusually hot and dry summer of 2021 and the likely strong Vapor Pressure Deficit (VPD) effect that is known to hang over part of southwest Oregon (RAO, et al. 2022).

To estimate the water use of each field, the author measured every plot to a 1-foot resolution. Similar work counting and measuring grows has been conducted in California (Parker-Shames, et al., 2021), (Bauer. 2013, 2015), (Van Busic, Brenner. 2016). Since 1 inch equals 4,675 feet on the map, and measurements in Adobe Illustrator resolve to 1/10,000th of an inch, then, for example, 0.0239" equals 112 feet. Every grow operation had between one and nine individual measurements in two dimensions (x and



y-axis) depending on how many different growing styles were present and the evenness of the layout. Some grows had hoop houses scattered around mixed among two or three types of growing styles requiring multiple measurements. Find every measurement and calculation in the [online spreadsheet](#).

Every measurement was multiplied by the specific growing style to calculate the Irrigation Requirement (IR). For example, a grow with close-spaced sea-of-green hoop houses (grow style D) that measured to be  $(0.0239 \times 4675) \times (0.0482 \times 4675) = 25,200$  sq. ft. was multiplied by 2.6 AF to calculate the total seasonal IR as 1.5 AF.

#### **Methodology of the Unauthorized Water Use Calculations on Unlicensed Cannabis Grows:**

The number of licensed grows above 12 plants in the Illinois Valley is estimated to be 170; the precise number is unknown because the OLCC does not publish production site locations. About half of the 220 OLCC grows in Josephine County are thought to be located in the Illinois Valley (will use 120 to err on the high side).

Only about 20 of the 80 ODA Hemp grows in Josephine County are located in the Illinois Valley, known from [a public records request in August 2021](#). The HB 3000 testing regime showed a 53% failure rate for the presence of THC for all hemp farms the state tested (not all sites were tested). Of the 13 farms tested in the Illinois Valley, seven failed for High THC (the author received this data from the ODA [through a public records request as well](#)).

Of the 971 OHA OMMP grows in Jose-

phine County, about 7%, or 70, were between 13 to 48 plants, a bit more than half of which were likely in the Illinois Valley = 40 (93% of OMMP grows are 12 plants or less).

Therefore, 120 OLCC grows, ten legitimate ODA Hemp grows, and about 40 OHA OMMP grows equal 170 licensed grows.

Based on the 950 mapped grows and 170 legal grows, the author concludes that 82% (780) of all cannabis production sites larger than 12 plants in the Illinois Valley were undocumented and lacked licensing. Knowledge of consumptive crop water use will lead to understanding the scope and scale of unauthorized water use by these unlicensed cannabis grows in the Illinois Valley. This report does not speculate on legal-licensed farms fumbling their water rights. The problem of not using water rights correctly by farmers growing legal crops was never a concern to the public relative to the vastly larger volume of water used to irrigate illegal crops with or without a water right. (The public views using a water right to irrigate unlicensed cannabis crops as a non-beneficial use -- water theft.)

To identify the scope of unauthorized water use in 2021 in the Illinois Valley, the author added up the consumptive crop water use estimates of each grow and multiplied the total by 0.82, the rate of unlicensed grows. The spreadsheet notes the estimated water use of every grow and totals numbers to the right and along across the bottom.

In Appendix B, the section titled Additional Research and Calculations discusses the process for estimating the number of pounds each grow site produced, which was also based

on the growing styles present. This information is helpful to understand how many gallons each growing style produced and the overall number of gallons it took to produce a pound of cannabis in the Illinois Valley: the estimate is 410 gallons per pound. This section also discusses ratios of water to square foot. From these calculations, the author determined which growing styles appeared to use space and water most efficiently, and which produced the most weight.

### **Results and Discussion on Mapping, Water Use, and Impacts:**

It is important to note that much of the cannabis industry has gone from maximizing pounds per plant to pounds per square foot. This change occurred over the past five years. The reason is due to a sea-change in the perception of profit maximization following the legalization of cannabis and hemp: previously, the state enforced plant limits under the OHA OMMP; now, square footage is the limit under the OLCC rules. As unlicensed cannabis growers came to realize they had little concern about law enforcement actions in the Illinois Valley due to systemic underfunding, they ignored the previous rules for plant count and began to follow the much more profitable standard set by OLCC grows.

Most cannabis production sites are believed to use groundwater from domestic wells (Dillis, et al., 2019 and 2021). Also, many wells are within one-quarter mile of perennial streams; this is a distance that would disqualify them from being considered for a water right. Further GIS mapping overlays of perennial streams and geotagged grow sites is needed.

The Oregon Water Resources Department (OWRD) found during [a 2020 hemp water audit](#) that some hemp growers had water rights violations that included using groundwater from wells without water rights instead of using the surface waters (creeks, streams, rivers) for which they did have water rights.

From the OWRD audit: “Surprisingly, of the sites that were in violation of Oregon Water Law, 44 percent had water rights. The common violation found in these cases was that a well was being used to irrigate a commercial crop on the property without a valid groundwater right, while the surface water rights for the property were not being used.”

Groundwater is easier to use and maintain than surface water, especially when many creeks and small streams dry up mid-summer. The over-extraction of groundwater in 2021 led to a boon for municipalities that sold bulk water to cannabis grows. Sales increased as wells dried up from overuse, nearby well-interference, and unauthorized commercial agricultural water needs that exceeded domestic well capacities. Ongoing drought conditions certainly caused groundwater levels to drop; it is not known by how much. Unauthorized water use to irrigate unlicensed cannabis crops during this time outraged residents whose wells produced limited flows or ran dry. Appendix C has a table on municipal bulk water sales in 2021 and discusses the water volumes and current efforts by Oregon lawmakers to address those issues under HB 4061.

On August 5, 2019, the [Groundwater Section of the OWRD made a finding](#) that the 1 CFS limit set by ORS 390.835 had been reached whereby the cumulative volume of water from agricultural wells with water

rights had measurably reduced the surface water flows necessary to maintain the free-flowing character of the state-designated Scenic Waterways of the Illinois River and Rogue River. (Also see Bauer, et al. 2015.)

In their letter to the Groundwater Section, Joe Kemper, GIT, and Michael Thoma, Ph.D., RG noted: “The hydrogeologic regime described by this conceptual model and supported by basin-specific observations indicates that groundwater throughout the Rogue River Basin is connected to surface water and that groundwater pumping from wells will impact surface water within relatively short timescales.”

The OWRD has not processed applications for water rights to agricultural wells the way it did before discovering the limit set by ORS 390.835 had been surpassed; indeed, acquiring such a right is now on par with getting a surface water right which is almost impossible. Appendix D is the OWRD “Assessment of Groundwater Pumping Impacts on the Rogue and Illinois State Scenic Waterways.”

The estimated volume of water used to irrigate cannabis crops in 2021 in the Illinois Valley is 1,548 AF – 505 million gallons. The estimated number of unlicensed cannabis grows, 82%, would have used 1,269 AF – 414 million gallons. During the five-month growing season, 1 CFS equals 291 AF, the limit over five months not to be exceeded per

ORS 390.835.

Since groundwater and surface waters are connected in the Illinois River Basin, research is needed to understand how 414 million gallons of unauthorized water use on unlicensed cannabis crops would impact surface water flows of the state-designated Illinois River Scenic Waterway. For perspective, 1,269 AF of unauthorized water use is 4.36 times the limit set by ORS 390.835. Despite the efforts by the OWRD staff to slow and cease applications for water rights to agricultural wells in the Illinois River Basin, growers of unlicensed cannabis extracted water without authorization unabated in 2021. Such unauthorized use of water puts a fine point on the old adage that water thieves possess the most senior water rights in the state of Oregon. As shown in Section 5, Community Sentiment, the public wants state officials to prioritize stopping unauthorized water use by unlicensed cannabis grows. As one pithy OLCC licensed cannabis farmer said:

“Oddly, in the event of an enforcement of the seniority of legitimate water rights caused by a shortage, those that are legal will lose first. I have several water rights ranging from 4 years old to 150 years old and could very well have my use restricted on the recent rights because of entirely unrecorded, unmetred, illegal use. Weird, huh?” -- D.D.



# *Illinois Valley Water Evaporation Project*

## *By The Numbers...*



Total number of mapped grows over 12 plants  
946

Unlicensed cannabis grows  
82%

Total number of acres under cultivation for  
cannabaceae family plants  
753

Total Number of Acre Feet of water used to  
irrigate cannabis & hemp  
1,548

Total Number of gallons of water used to  
irrigate cannabis & hemp  
505 million

Total number of acres under cultivation for un-  
licensed cannabis crops  
625

Total Number of Acre Feet of unauthorized  
water use applied to unlicensed cannabis crops  
1,269

Total Number of gallons of unauthorized water  
use applied to unlicensed cannabis crops  
414 million

Number of traditional large legacy plants mapped  
7,011

Acres those plants took up  
42

Average square feet per plant  
260 (about 16' by 16')

Square Feet of Hoop Houses  
25 million

Acres of Hoop Houses  
*(Includes grows where plastic was removed but PVC ribs remain.)*  
573 acres

Ratio of Acres of Hoop Houses to Acres of Legacy Plant Grows  
14 to 1

Pounds of trimmed Cannabis "A" buds  
*(Adding in "B" buds and trim will increase this number by at least 30%.)*  
1.2 million

Gallons to grow 1 pound of trimmed cannabis  
410

Average gallons of water per square foot over the entire growing season  
17

*(Equals a 20 oz. water bottle per sq. ft. to drench 12 to 24 inches deep soil daily.)*



Cannabis grows along the Illinois River flowing through Kerby

## 5) Research Findings – Community Sentiment

The District conducted community sentiment research on Agricultural Water Quality which included water use, pollution, riparian area damage, and all the attendant problems that came from the negative impacts of the large-scale illegal cannabis industry. The District partnered with Beyond Boom & Bust, a local community arts organization run by Eliot Feenstra and Sophie Traub, to assist with meeting facilitation and outreach.

From the start, it was clear that one had only to “follow the water” and see where it flows to understand the community sentiment.

### **Introduction:**

In May 2021, many Illinois Valley community members became vocal about their concerns that the cannabis industry was having a serious negative impact on the environmental health of the watershed and their well-being. While for years residents have complained about fences, truck traffic on gravel roads, smell, and rampant code violations, never before had water quality and water use been the cause célèbre, and never before had concerns welled up so early in the year.

The author collected aggregated anecdotal evidence from residents of the Illinois Valley. This listening tour collected, counted, and noted qualitative data at four town hall events, twice at the farmers market, and on several popular Illinois Valley-based Facebook groups (a few groups had hundreds of members; two groups had thousands). The participants at in-person events and those online spoke in similar terms and tones

regarding their experiences. Grave concerns, sentimentality, and invective were equally present on both platforms.

The District is not a social/ political research firm. It was not the intent of the Community Organizer and the position itself to produce randomized controlled trials or cross-sectional studies of randomly selected participants as would be done in peer-reviewed sociological studies and by polling firms. Rather, the District promoted public outreach activities, and participants self-selected for attendance, contributing input based on their self-interest and witnessed experiences. This work aimed not to produce quantitative proof for statistically reliable, representative, and repeatable evidence. However, residents who voiced their concerns had their statements tabulated, and by all accounts, they did not change their views except in the direction of strengthening their existing positions.

### **Reaching Out:**

The author conducted an ongoing public relations and marketing campaign to reach out to community members from July through December 2021. This included:

- Repeated color ads in the Illinois Valley News and press coverage therein;
- Constant (daily) communication on several local Facebook pages;
- Comprehensive email campaigns using Mailchimp and the widely read Takilma email;
- Use of the District website and Facebook page to carry messages and events;
- PSAs on the local radio station;
- Color flyers placed on bulletin boards



throughout the Illinois Valley; and

- A large, full-color mail card delivered by the post office to every mailbox and PO box in the Illinois Valley (5,800) during the last week of 2021, highlighted the work of the District, titled “*Repairing the Riparian Areas Since 1949.*” This card had a large picture of a cannabis grow operation desecrating a riparian area on the front and a lovely image of the vision the District holds for the future on the flip side (the same logo is shown on the cover of this report).

### Listening to the Community Sentiment:

One of the differences between community input on social media compared to the comments from members present at town halls and the farmers market is that social media participants put their names behind their comments, statements, and concerns; whereas at the town halls and the farmers market, participants openly discussed their fears that they would be recognized for having shown up and attended the events or face danger if they were overheard expressing their opinions. This circumstance alone requires more research.

Most of the in-person participants requested anonymity and declined to fill out the sign-in sheets, though some did. Often, participants at town halls would say that their neighbors and acquaintances were as upset as they were, in what is believed to have been an effort by the participants to express the shared extent of the concerns as they saw them. Given how other divisive political issues drive people into the closet or to form a “silent majority,” the author believes there are many more concerned residents than those who had the courage to show up.

Unsurprisingly, operators of illicit cannabis grow operations did not contribute to this research because it is likely the case that they were aware of the negative community sentiment against them – yes, a great deal of “othering” has taken place. As a minority, illicit growers did not wish to contribute their point of view on the impacts their cannabis operations had on the environmental health of the watershed and overall community well-being. As stated earlier, however, legacy growers never really threatened the watershed and community well-being; as a class, they are distinct from the operators of large-scale illegal grows and organized crime syndicates. Still, they did not show up to have their voices counted.

More research is needed to assess the legacy growers’ views. One-on-one private conversations with legacy-style growers have been well-documented (Polson, Bodwitch, 2021), and the author has known many legacy growers over the past 15 years. Generally, they resent the disruption to the unregulated cannabis market that existed before legalization; most think the changes benefit the consumers at the expense of the growers. The author hypothesizes that legacy growers are as upset about the recent large-scale industrialization of the unregulated cannabis industry as the non-growing residents are because of the negative environmental impacts and precipitous drop in wholesale prices.

Migrant workers who experienced slavery and extremely poor working conditions were also left out of this research work. They are the most silent (silenced) class; they experienced “othering” far more than the owners of cannabis grow operations. Those seeking to hear their voices and tell their stories are

migrant worker organizations (Unete in Medford), investigative journalists, and social scientists. This is critically important work to pursue, given the human rights violations seen in 2021.

### **Methodology Researching the Community Sentiment:**

The town hall in-person events began with an introduction about the work of the District followed by a brief discussion of the topics of water quality, quantity, and related concerns about riparian areas, agricultural lands, and watershed characteristics. The Illinois Valley Watershed Council shared its work to restore habitat.

Participants were asked the following questions during break-out sessions:

- 1) What have you seen or heard of that concerns you about how water has been used/abused in the Illinois Valley? List both concrete specifics and general abstract concerns.
- 2) What uses of water in the Illinois Valley do you think are most important and least important?
- 3) How have you seen Agricultural Water Quality issues impact other environmental/ social/ political/ daily-life concerns?
- 4) If you could click your heels three times, what would you like to see happen in relation to agricultural water quality in our valley? What do you want to make sure policymakers know?
- 5) Any other topics, interests, vision, or ideas you'd like to share?

The participants had pens and pads to write down their own answers, thoughts, concerns, and solutions, and each break-out group had a facilitator. Participants had lengthy discussions, and all notes were collected and used to enter into a spreadsheet format. This structure allowed the participants to express their thoughts openly. For perspective: often at structured events with break-out sessions, organizers will define strict boxes in which commentary may be permitted; however, the author explicitly avoided this limiting factor. As a result, there were 55 different concerns the author organized into seven major headings and 20 different solutions to those concerns. The author considered the interplay and tension between guiding themes that many people voiced and those that were uniquely important to getting a full picture of the participants' experiences. The irony of the exclusion of those working in the cannabis industry from this research is not lost on the author; again, this project focused on the residents' concerns about negative impacts they witnessed and experienced.

On the social media side, similar questions were asked of the public on several popular public Facebook pages. These questions inspired a great deal of discussion among the answers people gave. The input from the community on social media was far more prolific than from in-person town halls and farmers market tabling, possibly due to the convenience of responding to research questions in one's own time over a couple of weeks compared to attending an event at a specific place and time. Four town hall events were held in mid-August, mid-September, and early November. The first and last events were well-attended, whereas the middle two were not.

While in-person attendance may have dipped in part due to concerns about the pandemic (the local Delta surge raged from the end of July through the first week of October 2021), a greater impact of Covid-19 was the increased familiarity and comfort people had communicating online. Social media was a convenient tool to collect aggregate anecdotal evidence: the pages and conversation threads have been saved, and the community input is easy to assess and tabulate as if the people were in-person.

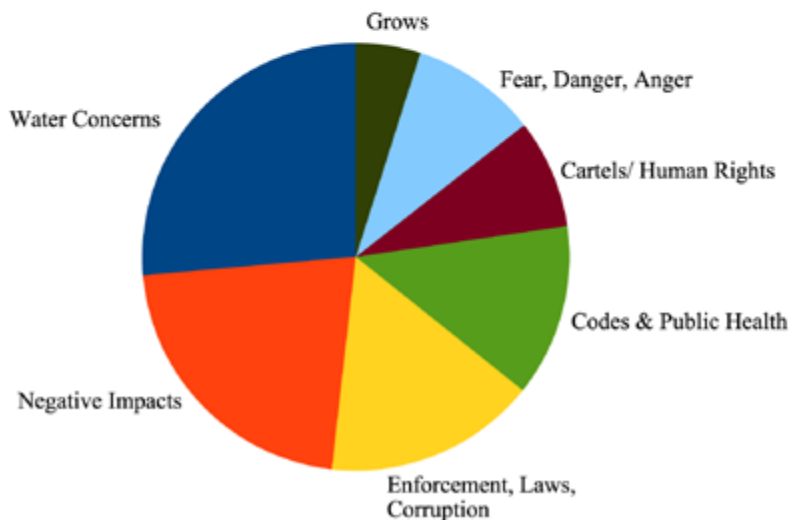
### Community Sentiment Results:

There are 941 instances where the public responded to concerns they articulated about negative impacts to the environmental health of the watershed and community well-being. The author tabulated the responses under several dozen specific issues and organized them into seven main headings, shown in Appendix E and the summary table and pie chart below.

Illinois Valley Community Sentiment on Cannabis Industrialization

February, 2022

Main Concerns – Headings	Complaints	Percentage	Top sub-concerns
Water Concerns	243	26.4%	Water theft/ drought/ pumping from stream & well/ city don't sell water to illegal grows
Negative Impacts	201	21.8%	Water quality/ way of life/ environment/ greed
Enforcement, Laws, Corruption	148	16.1%	No enforcement/ officials ignore us/ laws are insufficient
Codes & Public Health	120	13.0%	Pesticides/ trash/ sewage
Cartels/ Human Rights	76	8.3%	Human rights violations/ Cartels
Fear, Danger, Anger	88	9.6%	Gunshots, fear of complaining, wildlife shot
Grows	45	4.9%	Grow next door is huge/ Owner next door leasing to Cartel
<b>Total Concerns</b>	<b>921</b>	<b>100.00%</b>	





An additional question asked of the community on social media bears emphasis:

When asked on Facebook: “Would you support or protest the enforcement of Oregon Water Law (in the IV) using county, state, and/ or federal police?” 84% said support (of 66 respondents, five said protest, and four were unsure).

Among respondents at town halls and tabling at the farmers market, the general trend prioritizing water use was: 1 – Residential/ Commercial (homes & businesses); 2 – In-Stream (fish, recreation & fire); 3 – Agriculture (legal crops only)

The results from the two above queries are likely influenced by the fact that most Illinois Valley residents do not engage in water theft (“so, yes, please enforce”) and because most respondents do not work in agriculture but do live in homes and enjoy the rivers.

### **Discussion of Community Sentiment Concerns:**

Generally speaking, the community responded to their concerns as if there was an existential threat in their midst. The comments below by community members (set among the photographs) are only a small selection of the majority views. These comments are from local Facebook pages, not in-person town halls. They do not represent a statistical cross-section of the Illinois Valley. Rather, these comments exemplify the various feelings and views of those concerned about the nega-

tive impacts of the unregulated cannabis industry.

No one on social media or in town halls responded in favor of large-scale illegal cannabis grows, water theft, riparian clearing, dumping of trash, sewage and chemicals; no one stood up for organized crime, “cartels,” leasing or selling land to illegal grows, or the general negative impacts to the community well-being. A few did not support law enforcement as a cure for the problems they were concerned about, though, notably, they were against most laws.

The project and work of the Community Organizer were explicitly directed to assess and address the community’s concerns as typified by their comments below.

The pictures accompanying these comments depict images that were commonplace throughout the Illinois Valley. Note that surrounding lands two to four times the size of the immediate footprint of the irrigated areas are negatively impacted; they are strewn with trash, chemicals, detritus, graded soils silting up during rains, and cleared vegetation posing fire risks. Photo captions describe pertinent concerns the community raised regarding negative impacts to agricultural lands, riparian areas, forests, and surface waters.

It is important to recognize that the use of imagery to illustrate findings throughout this report does not imply that every cannabis grow operation is like the imag-

ery, nor does it imply that the imagery is unique and not representative of a larger circumstance. The use of imagery does not imply that the cannabis industry in the Illinois Valley is undifferentiated and monolithic; however, the imagery provides an accurate view of the many issues

that pose a significant problem and define the overall circumstance this report reveals.

Participants' names have been anonymized in reference to the quotes.



Photo courtesy of Carol Valentine -- 2021 -- Jack Dwyer looking for water in Deer Creek in which he has a water right.

While no summation can be accurate due to its inherent facile nature, it appears that the community generally expressed their concern about too many growers seeking to use cannabis as a catalyst in an alchemical process engineered to turn the value of the land and water into dollars while externalizing the costs of production onto the watershed community -- the flora, fauna, and humans living in the Illinois River Basin.



C.R.: “Even when water is trucked in, it still comes out of our river. So the water issue could save families wells but still is taxing on water ways.”



Water trucks waiting to fill at a municipal bulk water station -- 2021



Water truck filling up at an unpermitted acre-foot sized hole -- 2021





Cannabis Grows along the East Fork of the Illinois River -- 2021

C..G.: “I have a neighbor that filled a springs drainage with sticks and dirt then diverted the flow to another tax lot he owns. It no longer flows across my property as it used to. I asked the water master to correct this and he, with his assistant, looked at it and quoted the neighbors description about it being a natural occurrence. He told me that I was lucky a little still flowed.”



A.E.: “Surprisingly I’m for water law enforcement. Water diversion is a huge issue in the valley currently. Wise management of waterways plays a part in being a good steward of the land we are blessed with.”





Photo by an anonymous resident of black sludge in a pool located on an abandoned grow site on top of a mountain that had been deforested and graded months earlier. -- 2021



East Fork of the Illinois River with the riparian area denuded of vegetation. -- 2021



A.M. : “I called the police 2 times now because our house and many more are 50 to 100 ft away from them ...bullets just flying God knows where....and I have lots of children...so freaking annoying...not to mention the stupid criminal behavior...shooting...yelling...breaking things...traffic at 1...2...3...4 am...my husband is about to go postal. I’m hoping they are forced out soon...between my husband coming unhinged and the entire neighborhood...I don’t know what’s going to happen.”

M.C.: “Complete disregard for the land and water. Dumping huge amounts of poison and fertilizer that leeches into our water. Killing wildlife. Trash and toxic burning that our children breathe. Large amounts of people living in horrible conditions on illegal farms, dumping their own contaminated human waste into our environment.”

T.K.: “We have laws in place to stop the illegal activity that is happening in our communities. However, one sheriff in our county cannot take on the organized crime culture...Do I feel threatened? Yes. Do I feel unrepresented? Yes. I am paying taxes for police protection that I am not getting. The rule of law is not being adhered to. I don’t see any consequences or convictions for people committing the crimes that are so blatant in our community.”



Photo by an anonymos resident -- 2021.  
Dead bear that roamed in an area with a high concentration of cannabis grows.  
The resident who took this picture had seen it all summer until it showed up dead.  
The Oregon State Police trooper could not find any wounds; the assumption was that the bear was poisoned.



N.L.: “Plastic, water theft, trash, noise, odors, increased traffic and accidents, deforestation, negative effects on legal growers and businesses (depressed prices).”

T.H.: “I have water rights. I doubt all the hoop properties sucking the water table down during the day, and sucking river water at night have rights.”



M.M.: “Stop the rape of our lands and water because when its gone so will be those who don’t care about our lives here. These folks are sponges (They take all they can and give nothing in return except trouble).”

J.T.: “There are people stealing water all over the Valley and using wells to irrigate large acreage. By the end of the Summer, there will be a huge crisis.”

M.L.: “Awful! If this goes on next year, I’ll ask for the National Guard for help.”

L.R.: “We are surrounded by three grows and it’s not very comfortable. These are not cartel either and they grow all year long.”







A child's chair in a migrant workers' camp -- 2021

K.N.: “How about real wages for local work forces? With farms relying on homeless and immigrant labor to keep their profit margins at peak capacity by paying poverty wages shows that legal or not, many of these farms give no shits about this community.”



L.M.: “I wish it were just locals growing here that cared about our community and our environment especially our water.”





Photo by Josephine County Sheriff Department

J.C.: “Uncaring greedy, selfish criminals.”

J.C.: “Greed will weed them out. Selfish bastardized pigs are trashing and stealing vs. attempting to get ahead and pay forward. They will imprison themselves. Tread on my family anymore and they will pray law enforcers are near. We can take this community and it’s culture back!”

C.G.: “Take a drive down 8 dollar and Illinois river road and look at all the black poly/ drip line floating in the river caught on rocks. It’s up on top of the water just waving around.”



Cut-up PVC water pipe being delivered by a grow operation to the dump in Kerby



K.L.: “Clear cutting trees before owning them; trashing properties without owning them; leaving their messes behind; allowing their untrained guard dogs to roam free; gun fire competitions; water theft; bringing the brown russet mites to the Illinois Valley; multiple 1/2 year camps with no facilities; polluting the water with no regard for the animals who need clean water.”



T.K.: “In 1995, my husband started a creek restoration project in Selma. ... Over the years we have spent thousands of dollars replanting native trees and shrubs. ... The replanted trees have reached a height of 40’ but are dying due to water diversion. We no longer see fry in the salmon stream, the water dried up before the fish had a chance.”



C.C.: “Last weekend we floated the Illinois River and were appalled, but sadly not surprised, at the amount of trash. So, yesterday, we went back to pick it up. What appalled me last weekend, shocked me further yesterday. There is SO MUCH TRASH. We were able to get a good chunk of it, but we just ran out of time and space to carry it in the boats.”

Photo by Nicole Smedegaard -- Sean Bowen cleaning up the Illinois River -- 2022



L.O.: “There’s more garbage in the woods this year, not just the normal household garbage and stolen cars... But piles and piles of irrigation, scrog netting, nutrient jugs, pesticides. It’s BAD this year compared to other years.”



D.H.: “The list is long, but the first things that come to my mind are: habitat destruction, watershed destruction, water level reduction, water pollution, waste left by irresponsible growers, crime, human trafficking, increase in traffic accidents and hazards for wildlife, etc.etc.etc.”

J.S.: “We have decided to get out of the [legal] industry for many reasons. The market is saturated as it has been from the beginning. We are treated as criminals as legal growers. Both by the county and OLCC. Rather than hiring people who know anything about growing these plants they hired law enforcement types to police the growers. They totally ignored the illegal growers with their police powers stance.”

C.A.: “I’m so angry that our government let this get so out of control. I’ve been distressed by it for years —the writing was on the wall that this was going to happen... all the math pointed to it. I guess that’s the problem with a complaint-driven code enforcement system... they are always ten steps behind. Now the problem seems uncontainable.”





Listing water truck without license plate on its way out of town -- 2021

S.M.: “Water levels -- the amount of water being illegally pumped out of the river is insane and then how much they are selling to Water trucks too. Then there is all the chemicals/products being put on crops polluting the water and the ground.  
Soo much more as well.”

M.R.: “Human trafficking, unlicensed, uninsured drivers wrecking their vehicles and fleeing the scene, rat infestations, chemicals and raw sewage dumped in the rivers and streams, air and soil pollution from toxic burn piles, overtaking local, state and federal resources, passing the expense on to the taxpayers. Overladen trucks damaging the pavement on city and county roadways... oh, and water theft... did I miss anything?”



J.W.: “I moved to this valley a decade ago for many reasons, but at the top of that list was the environmental conscientiousness of the people living here. Unfortunately I have watched a group of outsiders trash our soil with chemicals, denude huge tracts of forest and drain our water dry. If something is not done immediately, this valley will be destroyed for years to come.”



K.S.: “Water loss, plastic trash. Destruction of community by outsiders wanting to get rich. Got growers all around our place and now we have well issues. Thieves, shootings and bs.”



Q.S.: “I would like to see big illegal operations stomped out so the people who are reputable don’t continue to get shit on.”

C.C.: “If you were in REAL farm country and you stole water You would be arrested, jailed AND fined thousands of \$\$\$\$\$. But here, where we have recreational farming, there is NO ONE who enforces any water laws in Josephine county.”

J.W.: “Murder, assault, human traffickers, water theft, and the list goes on.”

S.C.: “...isn’t doing anything about the abuse of non legal use of water. Changing existing water ditches and putting in huge water ponds, sucking from already drought troubled protected waterways with no water rights and unwilling to obey the general laws of water use. Using water ways as employee restrooms and dumping garbage on a once beautiful area. Excuses are given that there are not enough dollars and not enough people to do the job. Something has to give soon. Our natural resources are paying the price now and soon our wells too.”





L.M.: “I hope that our locals do not lease their land to illegal pot growers who do not care about our water supply, soil or economy but tempt them with a bag of cash. Less greed and more caring about our environment.”





A.C.: “Much more regulation for anything close to a commercial sized grow. Which is the opposite of what people might expect me to say, but I’ve seen Cannabis cultivation in Oregon since the mid 90’s and what’s going on right now is going to tax and ultimately obliterate the water table.”



R.N.: “Need to limit size of grows get rid of illegal grows when we are out of water was it worth all the greed going on out here.”

T.K.: “Across the street and up the hill from my home, the bulldozers came, day after day, month after month, our ‘neighbor’ proceeded to tear down a watershed mountain and convert the land into a massive pot grow. Endless truckloads of dirt came out of their driveway forever altering the creek that used to fill a pond on our property.

R.B.: “Many people commented, based on their memory and experiences with Forks Park, that flow of water through Forks Park has significantly diminished both this year and last year and this has raised concerns about contamination and health issues. I think there were many families who stopped taking their kids to the park because of this...”

B.D.: “My neighbor has two water trucks that he loads with from his place next door and drives to an unknown location. I have seen the the truck leaving multiple time as late as 9pm. The trucks are clearly loaded down and the water spills out leaving a clear indication that it’s water. My concern is that we live on 10 acres and are dependant on water. Short story... this effects my family’s well being not to mention my property value.”



C.C.: “I absolutely cannot believe the audacity of humans who trash their world like this. I imagine if we are friends and you follow me, you most likely don’t exhibit this behavior, and my rant will do no good. If I am wrong, then you can kindly fuck off. We are now at war.”



Photo by the Illinois Valley Fire Department -- 2021  
Burning PVC, Plastic Sheetting and other detritus from a large grow

S.C.: “Use of unlawful chemicals and often human fecal matter  
in creeks ways, rivers and on land.. Nasty!”

J.W.: “I’ll say it! Illegal grows consume massive amounts of water...it is the primary reason there are  
people without water in both counties.”

J.D.: “Water, chemicals that contaminate our soils. So much garbage along side of our roads, human  
trafficking. So much to speak about. Thank you law enforcement for what you have done so far.”

S.C.: “Nasty smoke billowed into our place this evening.. When I went to see where it was, I  
found at (location) huge fires and the fire crew were there and the sheriff as well. I hope they do  
something.”

## 6) Solutions the Community Seeks:

At the town hall events and tabling at the farmers market, conversations were free-flowing and lightly moderated. Participants shifted to discussing solutions naturally after a period of time when, during break-out sessions, it appeared they had finished voicing their concerns.

The leading solution is to legalize cannabis federally. Proponents of this idea argue that other states would produce so much cannabis that the Illinois Valley could go back to producing small amounts of high-quality boutique cannabis as was done in the past. The consensus in discussions was that the financial incentive would be relocated geographically to states with large agriculture infrastructure and that the local industry would shrink to a sustainable size the watershed could support.

Two other popular solutions are to require a period of residency of three to five years to avoid short-term profiteers from wrecking the region as they perpetrate the boom and bust volatility of the regional economy, and require growers possess the water rights on the properties where they grow cannabis. The participants believe the spirit of water law is met by growing at the Place of Use where water rights are located, not trucking it in.

A fourth solution is to identify 1) a water use baseline, 2) the holding capacity of the watershed, and 3) to limit the acreage of grow operations accordingly. Participants spoke of wanting to know what the limit is on water extraction for agriculture. Significant research could take years. The author [developed a strategic plan](#) that the Water Resources Committee of the IV Watershed Council reviewed over several meetings. The District and Council boards adopted this plan by vote in late 2021. Click the above link to view this document.



A 2020 voter's pamphlet found on the site of a grow that law enforcement raided in 2021. Many residents believe political action is necessary.

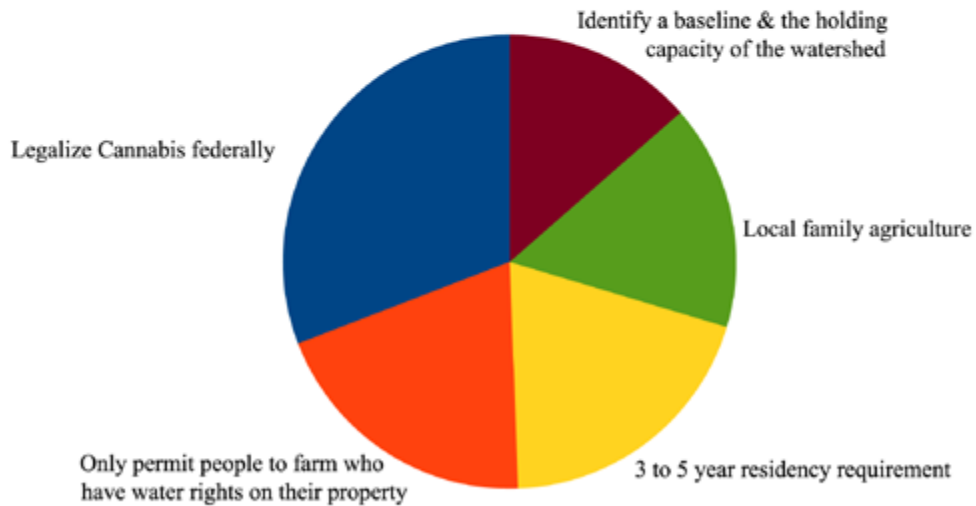
# Summary of Solutions

Full data at the end of Appendix E

Illinois Valley Community Sentiment on Cannabis Industrialization

February, 2022

Top Suggested Solutions	Support	Percentage
Legalize Cannabis federally	50	35.7%
Only permit people to farm who have water rights on their property	32	22.9%
3 to 5 year residency requirement	32	22.9%
Local family agriculture	26	18.6%
Identify a baseline & the holding capacity of the watershed (availability vs. use)	22	15.7%
<b>Total Solutions (out of 245)</b>	<b>140</b>	<b>100.00%</b>



*The overall community sentiment on finding a solution is to spread cannabis cultivation out nationally to prevent a concentration of growers, many from outside the region, from hurting the local watershed community – the flora, fauna, and humans.*



Below are some answers from members of the community who responded to the two following questions on local Facebook groups:

“If you could click your heels three times together, what would you keep and/ or change about the CBD and THC industry?”

“With hindsight, what are the negative impacts cannabis industrialization has had on the IV that must not be repeated next year?” *[Many responses to this question came in the form of proposed solutions.]*



E.B.: “Less plastic. Less fertilizer. Less improper use of water. More polyculture and sustainable, regenerative cycling of the plant.”

J.C.: “Get rid of the cartels.”

W.N.: “Three years residency prior to growing permits. Organic only!!!”

V.T.: “Make it federally legal so that people in the industry can invest and deposit their money in real banks. It might make it easier for them to contribute to our local economy?”

D.L.: “Legalize so price per pound is less than \$200. Most herbs are about \$25-40/ lb.”

C.C.: “Have SOME enforcement.”

L.B.: “80% of taxes and fees to county products grown.”

M.E.: “Take it off the federal schedule list and make it legal to grow anywhere in the USA, like tomatoes or rose bushes. It’s a plant!”

M.C.: “Legalize federally, firm restrictions on water rights with stiff penalties for harm caused to water tributaries and neighboring property, stiff penalties for poisons entering the ecosystem and residency requirements for permits to grow.”



A cannabis grow raided by law enforcement -- 2021

Z.B.: “Regulation is the problem. Deregulate and decriminalize...problem solved overnight.”



M.P.: “If I could click my Ruby shooed heels together three times and make a wish about the marijuana medicine world I wish they would have done it in another state because of that world coming here and such a grand way they’ve changed so much...I think we should go back down to like the four plants per property and just enough for the people that need it to use it...”

J.M.: “You can only grow what water your site can produce. All Permits in place and environmental destruction to land and wildlife stopped.”

R.M.: “Either start hiring more locals or provide adequate living spaces for migrate workers. Too many people living on BLM land with no idea how take care of their waste.”

B.S.: “Local growers only. No more criminal cartel grows. Hire local labor.”

C.B.: “Remove cartel which will be hard.”

B.J.: “I like to imagine that any use of the land would benefit the whole, maintaining delicate balance of topsoil life, respecting the water as a valuable resource that we all must share.”



A residential home in O'Brien surrounded by grows -- 2021

K.A.: “Each grow would only be permitted for the amount their land water supply can handle. No trucks of water, no siphoning.”



A.N.: “More oversight of water usage and sources. Regulations on clearing of property (and enforcement). Residency requirements.”

J.T.: “Limit OLCC Licensing to permanent residents of 5 years or more, heavily crack down on water rights violators.”

J.H.: “Dial it down and put regulations on it so there aren’t 2000 plant grows so on and so forth.”

J.F.: “How about just stopping the major grows. LE has been doing it for decades! Before the legalization. They didn’t have a problem finding patches.”

J.B.: “Make it easier for the small gardener to get legal and permitted, no gardens over an acre.”





J.B.: “Ban use of plastics and regulate water usage. Magically raise consciousness and consideration for the land and virtues of the human spirit.”

L.G.: “Make the growers bring in their own water instead of depleting our water table.”

J.L.: “Typically i would always say no to any more government regulation but with this insane drought i think it would be acceptable to regulate water being pulled out of the creeks or rivers . But that’s it.”

D.B.: “They just need to hire a water master that walks the waterways again. No police needed. When I was a kid there was one that checked flow rates and to make sure there were fish screens, and to look for illegal pumping.”

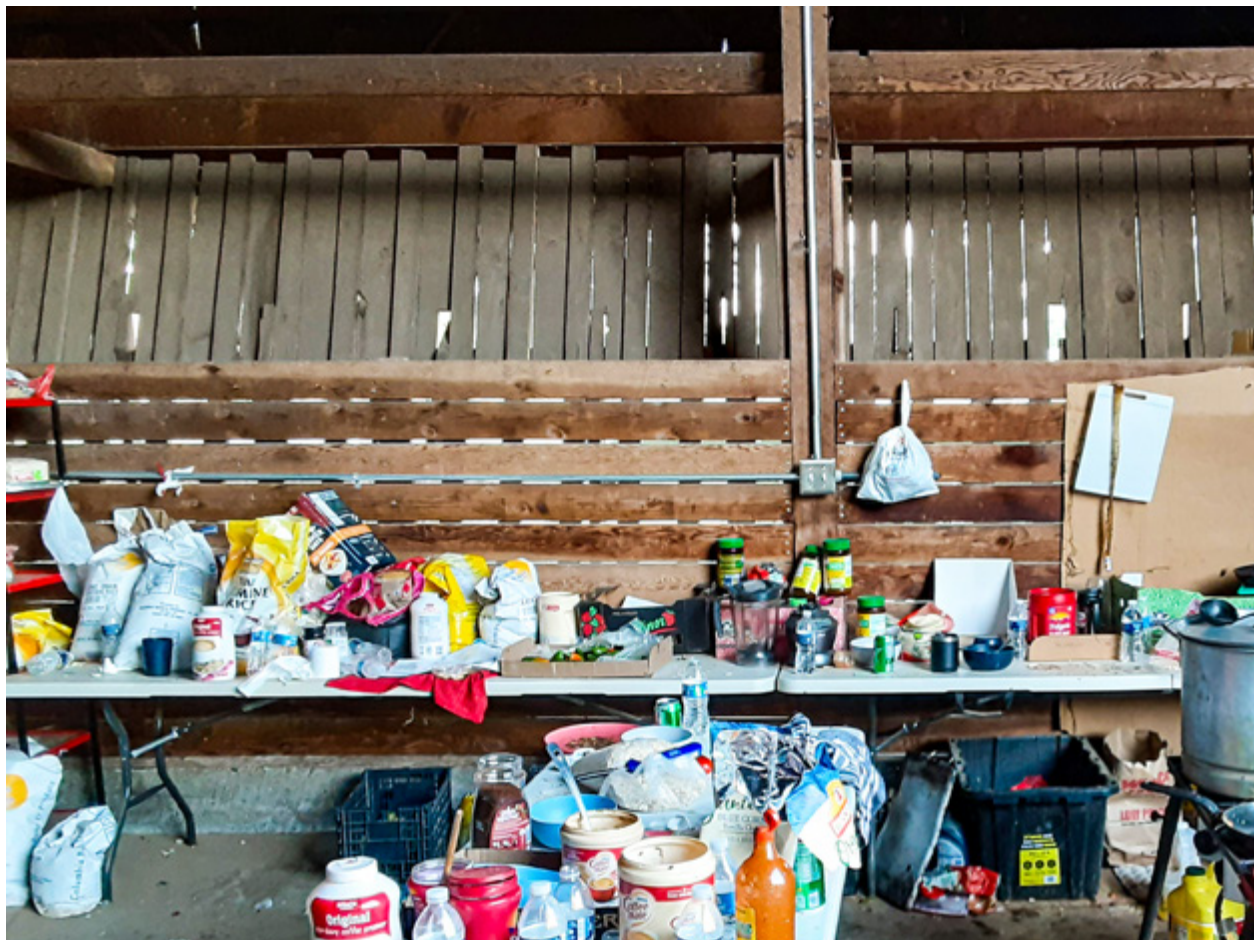
M.T.: “That THC/CBD carried the same disinterest and lack of controversy as growing and selling zucchini has.”

C.A.: “A more serious awareness of the damage done to the adolescent brain when they engage in daily use of Marijuana. But it might be too much to ask that industry to take anything besides their own profit “seriously”.”





E.L.: “Give first rights, highest profit, and reparations to the mostly Black and Latinx people who have been mostly highly impacted by the criminalization of cannabis. Decolonize. No resource over-extraction. No unchecked water access, sucking up wetlands, clearcutting. No one buying up land who isn’t concerned about their great great grandchildren’s water access in that same place.”





## 7) Advocacy and Outreach – A Bridge Connecting the Community With Their Elected & Appointed Leaders and the Greater National Audience:

The importance of assessing the community sentiment and researching the scale of the impacts the cannabis industry had in 2021 in the Illinois Valley would be wasted if the decision-makers and wider audience beyond the rurally isolated region never heard of nor were engaged with the concerns detailed in this report (Carah, et al. 2015). Two forms of advocacy and outreach are 1) communication with state elected leaders and agency staff and 2) communication with the press at the local, state, and national levels.

### Outreach:

The story of the cannabis industry's growth and how it overwhelmed the Illinois Valley made national headlines. This attention paid to the Illinois Valley is unprecedented, particularly in the short period of a few months. Reporters from the [Associated Press](#), [Politico](#), and [The Guardian](#) reached out to the author. They produced feature headline stories read by millions on water theft and its negative impacts, organized crime syndicates referred to as “cartels,” and the impacts these two factors had on the local community. The IV News ran two articles on this project and the town hall events, plus large front-page aerial photos seen in this report. The Grants Pass Courier covered the advocacy work regarding the region-wide petition that collected 1,000+ signatures by residents calling on state officials to enforce water law.

The LA Times assigned a Pulitzer Prize-winning journalist to conduct a year-long investigation on the entire cannabis industry. This reporter has visited the Illinois Valley repeatedly since November 2021, twice with a staff photographer. The paper will run a series of articles in mid-2022 that will comprise the most in-depth view of the cannabis industry to date: the Illinois Valley will be among other regions that are featured. Lastly, ABC News Nightline will produce a full investigation for its show; their producer came to the Illinois Valley to scout for the production that will air mid-2022. Following the completion of this report, the author will continue to assist and guide journalists seeking to understand our region.

The author spent a great deal of time with these journalists, sharing backstories, Illinois Valley history, current circumstances, imagery, data, and maps. The author scheduled many interviews with local residents and brought these reporters to the kitchen tables and backyards of those who lived right up against criminal syndicate operations. The author also guided photographers in their quest to understand the visual scenes that tell the story of just what happened in the Illinois Valley in 2021. One reporter said something to the effect that everything they have seen elsewhere can all be found at once in the Illinois Valley.

The press, an institution that helped found this nation, preserves our most cherished values and recognizes the dire need to tell the state of Oregon and the rest of the nation about how the cannabis industry impacts the regions of southwest Oregon. Precedent for this concern has existed for years in California's Emerald Triangle, and now southwest Oregon has become besieged as well. The au-

thor's work as Community Organizer was to assess the community's concerns and the facts underpinning those concerns and focus them into a series of coherent messages that both state and national decision-makers can come to understand so they may take necessary actions to resolve the problems. The press has garnered the awareness of millions of people state and nationwide about the concerns of those who live in southwest Oregon and the rurally isolated region of the Illinois Valley.

### **Advocacy to elected and appointed leaders:**

The broadest support from the community for the District was the work carrying their experiences and concerns to decision-makers who possess the power to address the mayhem of organized crime in the Illinois Valley. The term *cartel* has been used widely by residents and the national press. However, there is no evidence that large-scale illegal cannabis growers are colluding to fix prices and control the cannabis market, which is the definition of a cartel; according to local growers, the unregulated market is a mess. Rather, there is evidence of organized crime. The connections between various operations appear to form *syndicates*: migrant labor is traded between cannabis grow operations, multiple lands are leased or purchased by individual operations, and similar growing signatures between operations are obvious (exact replicas of hoop house construction and layout). The author has visited many such operations and stared at maps for hundreds of hours while constructing them from video, geotagging them, and measuring them to a 1-foot resolution.

All of this illegal activity hinges on one resource: water. From water flows all the other attendant evils that the Illinois Valley

community members denounced. This is the basis for the message to the elected and appointed officials: *Enforce water law. Shut off water to large-scale illegal cannabis operations in 2022.*

The District is the second Soil & Water Conservation District in the state of Oregon to adopt the Oregon Association of Conservation Districts (OACD) model policy on advocacy, its set of policy position statements, and its policy on designating staff and board members to conduct advocacy in the name of the District (Jackson SWCD is the first). The District worked with the OACD, Oregon Department of Agriculture (ODA), and the Oregon Watershed Enhancement Board (OWEB) to address how to fund such activity; as such, new guidance is forthcoming in 2022.

The District designated the author as one of those approved to advocate for the organization. The author made two formal submissions of testimony to legislators, one before the Special Session on December 13, 2021, and another to the House Interim Committee on Agriculture, Land Use, and Water during the Short Session of 2022. The first was in support of appropriating \$5 million for water law enforcement; the second supported of HB 4061 to reform the laws governing water use, including municipal bulk water sales and penalties.

On November 7, 2021, the author hosted the [District's fourth and final town hall](#), sharing the results of the mapping project, the aggregate assessment of community sentiment, and ways the community can take action. This was both in-person and on Zoom; the method was a visual presentation with a narrative.



The core message of the advocacy portion of this project is guided by the OACD policy position [*in italics*]: to advocate for our elected and appointed officials statewide *to implement and enforce the laws in a manner that encourages water conservation while striving to make sure that all beneficial uses have access to sufficient supplies*. The core belief is that if we “follow the water,” we will encounter the subsequent problems and concerns that antagonize the community and watershed ecology.

The author used the words and results of the community sentiment assessment to formulate a petition that garnered over 1,000 signatures (some in hardcopy, the majority online) and five letters, each tailored to the specific recipients: the governor, nine state legislators, the OWRD, the ODA, and the Department of Environmental Quality (DEQ). These letters and the petition [are available on the District’s website](#) and in hardcopy. Local residents signed scores of these letters and brought them to the District to mail to the recipients; others mailed them directly, and some wrote their own letters.

The text of the petition is:

*Enforce Oregon Water Law! Dry Out Large-Scale Illegal Cannabis Grows in 2022!*

“This summer was absolutely out of control,” he said. “We’re anticipating next year being just as bad, if not worse.” (Josephine County Sheriff, Dave Daniel, 11/4/2021, Associated Press).

We, the undersigned, support the historical tradition of local family cannabis farming in southern Oregon; however...

- The negative impacts of illegal cannabis industrialization cannot be overstated. The environmental health of our watershed and our community well-being are suffering!
- Water quality and quantity have been seriously degraded by water theft and wanton pollution at a time of severe drought.
- We demand enforcement of water law to shut off water to the large-scale illegal grows and demand increased funding appropriations directed at enforcement agencies to make this possible.
- Narco-slavery and human rights violations are legion in our community. The wanton killing of wildlife, the constant gunshots, the drying of creek beds and residential wells, the rampant building code violations, the recklessness on the streets, and our fear of living among cartels who operate with impunity pose a significant existential threat.
- Think of the fish!
- Shut off the water to large-scale illegal cannabis grows in 2022!

Ways to take action to achieve the community’s concerns on water quality and its beneficial use included asking county and state officials to strengthen the agencies that implement statutes and rules, such as:

- The OWRD to implement water law, focusing on beneficial use;
- The ODA to implement agricultural water quality and hemp growing oversight;
- The ODFW and OSP who collaborate to protect stream habitat from illicit cannabis grows to improve water quality;
- Josephine County Sheriff, OSP & their law enforcement partners to reduce illegal activity resulting in improved water quality;

- Josephine County Code Enforcement citation authority resulting in improved water quality;
- The DSL to enforce removal-fill laws near surface waters resulting in improved water quality;
- The DEQ to implement solid waste and other pollution actions resulting in improved water quality;
- Governor Brown to order state agencies to act and direct funds to improve water quality;
- Josephine County County Commission-

ers and county legal counsel, Wally Hicks, declared a State of Emergency and sought support from the state resulting in improved water quality.

The community agreed with the adage: “For problems to persist, it is only necessary for people to ignore them.”

The rallying cry of the moment: *Let’s be the Valley That Roared!*



Photo courtesy of an anonymous resident -- 2021 -- A lovely spring day in the Illinois Valley



## 8) Next Steps/ Further Research Needed:

This report documents some of the negative impacts the cannabis industry had on the watershed and the community of the Illinois Valley in 2021. The author conducted empirical research to provide a realistic estimate of the extent of the water extraction by the cannabis industry, which could previously only be speculated on. The impacts of this changing industry on the local community have been documented through numerous interviews and outreach events and presented to appointed and elected officials among the highest levels of state leadership.

The author hopes that this work may inspire further investigation into addressing the problem of sustainability in the cannabis industry, not just in the Illinois Valley but across southwest Oregon and northern California, where many communities are facing similar threats. The magnitude of the problem is so overwhelming that it needs to be addressed by forces greater than the community of the Illinois Valley and the local Soil and Water Conservation District office. The District has contributed by providing evidence of the tragic impacts on the environment and the flora, fauna, and humans who make their homes here. The District has also noted the crowd-sourced solutions from the local community who were directly impacted: theirs are place-based solutions. We hope that the call is heard and that 2022 and beyond do not prove to continue the downward trajectory of negative impacts by the unregulated cannabis industry.

When asked why cannabis inspires such chaos, given the roots of the plant as a moth-

er-earth medicine with peace, love, and happiness as its 1960s brand, the answer lies in the rapacious rush to monetize those spiritual effects at all costs. The irony of the green rush is an incomprehensible misalignment between the inherent spiritual values of cannabis and the competition to use the plant to strike it rich. The watershed community – flora, fauna, humans – paid dearly for this incongruity. Speculators wanted it cheap, fast, and good, a logical impossibility, so goes the old adage. In their desire to have it all, green-rushers externalized the costs onto the land, water, plants, animals, and people. Some paid more than others, and their story lies in this report.

Even though the federal government will legalize cannabis in the future (some speculate sooner than later), political leaders and their charges at state agencies have a moral and legal duty to protect the people and the environment from this unregulated activity. None of the malefactors should be eligible for forthcoming licenses under state and federal authority; rather, they should be prevented from ever again desecrating southwest Oregon. The green rush – the gold fever as it has been called – infected secondary businesses who supplied the industry its materials and services. It even infected those who calculated that such growing pains are necessary collateral damage in the eventual roll-out of a mega-industry ready to stone the nation. There is not, nor will there ever be, enough pot to smoke to chill out over this circumstance.

To this end, the author suggests these actions as the next steps to abate the impacts and drive solutions rooted in reason, compassion for the community, and justice for the environment and the people. The time of passing

on the true costs of the extractive cannabis industry to the rural communities and the environment must end.

- Map all of southwest Oregon in 2022 and identify the impacts to the entire region;
- Follow up on how \$5 million of increased funding for OWRD water masters' enforcement succeeded in abating the unauthorized use of water;
- Follow up on how \$25 million in new grants to law enforcement impacted cannabis enforcement effectiveness;
- Follow up on how new statutes and rules affected a change for the better;
- Engage landowners where serious negative impacts are evident in an educational community-driven campaign;
- Advocate for increased funding and staff for OSP, County Sheriffs, DEQ, OWRD, ODA, & OLCC;
- Monitor the water quality of the Illinois River and its tributaries (monitor the surface waters of the Rogue River Basin);
- Maintain and expand contact with local communities across southwest Oregon in 2022 and listen to their concerns;
- Advocate for continued action by elected and appointed officials to prevent water theft, pollution of lands and rivers, clearing of riparian areas and sensitive habitats, desecration of Class I and Class II soils, and the flagrant human rights violations that are among the vilest crimes.

### **More research is needed to:**

- Identify consumptive crop water use by cannabis and hemp. This includes crop water calculations based on different growing regions, the various ways it is cultivated, as shown in this report, and how cannabis and hemp use water in different years based on weather conditions.
- Calculate the carrying capacity of the watersheds where cannabis is grown, particularly in Mediterranean climates west of the Cascades. For example, the Illinois River Basin has a limited amount of water that must flow for domestic and commercial uses, for in-stream habitat and recreation uses, and for agricultural irrigation uses. If too much water is used for agricultural purposes, residential and habitat concerns will suffer.
- Understand the negative impacts discussed in this report, especially those against ESA-listed species – much research is currently underway now that legality has made it possible to study cannabis.
- Assess the human rights violations and the experiences of the migrant workforce, including human trafficking routes and systems.
- Assess the extent of the damage and the resources required to restore critical watershed habitats, agricultural lands, and forested areas after the green rush destruction.





A 55-gallon drum full of isopropyl alcohol atop a pile of fertilizer at a grow site -- 2021.



60,000 yards of gravel were removed to prepare an OLCC site a mile away -- 2021.

## Appendix A -- Estimated Cannabis Irrigation Use in the Illinois Valley, Josephine County, Oregon During 2021:

Irrigation demand is a function of crop water use. Crop water use is the combination of surface evaporation from leaves and soil, and plant transpiration. The combination is referred to as evapotranspiration (ET) or consumptive use (CU). Net ET or net CU is total ET minus effective precipitation. Effective precipitation in 2021 was minimal and is not considered in this analysis. Irrigation requirement (IR) or demand is a function of net ET divided by irrigation efficiency (IE).

ET has been carefully studied for decades and is based on measurements and calculations. Many theoretical and empirical equations have been developed to estimate crop ET. The methods to estimate crop ET are important for project level planning and field level management. Crop ET is a function of weather, crop type, and crop growth geometry. Weather factors include solar radiation, wind, temperature, and humidity. Crop curves are the relation between crop ET and reference ET (alfalfa or pasture) and is related to the stage of canopy development. Generally, crop ET exceeds crop cover by 20%, ie at 50% canopy - crop ET is 70% of reference ET, and at 80% canopy - crop ET is near 100% reference ET.

For this study “[Oregon Crop Water Use and Irrigation Requirements, Extension Miscellaneous 8530, March 1999](https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em8530.pdf)” was relied on. See:

<https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em8530.pdf>

The table on page 66 for sweet corn in the Lake Creek-Little Butte Creek area is used as an ET model for cannabis. The Illinois Valley in 2021 had a hot and dry spring, hot summer, and a wet fall.

Legal cannabis includes medical (Med), recreational (Rec), and hemp crops. Illegal cannabis is in its own category. Each have different regulations and cultivation techniques. In Oregon medical was legalized in 1999, recreational was legalized in 2015, and hemp was legalized in 2018 on a national level. Medical and recreational are generally grown on a small scale while hemp can be grown on a large scale. The issue in 2021 in the Illinois Valley is that the majority (80%) of the grow sites were illegal. Irrigating the illegal crops is not a beneficial use of water and the water used that way depletes surface water and groundwater causing various injuries.

This review has classified cannabis by various field schemes and assigned estimated IR for each of those classifications. This will allow a Geographic Information System to use the August 2, 2021 aerial photography survey of the Illinois Valley to assign IR values to each cannabis polygon. Based on those classifications an estimated total IR for cannabis crops



grown in the Illinois Valley in 2021 can be determined. For ease of calculation all polygons will be considered as gross field areas inside the perimeters so that individual plants or rows are not considered, like a grape vineyard with rows in a field. A(x) is an exception because the plants are large and very widely spaced.

The specific field level classifications are based on combinations of:

Legal vs illegal

Outside vs greenhouse (plastic houses or hoop houses)

Spaced vs full cover (sea of green)

Irrigation efficiencies

Cultivation techniques can vary from early and late plantings with starts, multiple crops, early to late harvest, drip irrigation and hand watering, greenhouses always covered or plastic rolled back at various times. There are however some useful general IR factors.

Greenhouses reduce ET by about 20% by reflecting solar radiation. Wide spacing to facilitate cultivation and improve crop quality reduces ET by about 30%. Close spacing, ie full cover (sea of green) maximizes ET but crops can be more vulnerable to diseases and insects. The crop season is generally May through September. Multiple crops tend to stretch out ET over time. Legal crops have higher irrigation efficiencies than illegal grows due to license requirements such as water meters, and better management care and concern. Limited water sources from wells and city bulk water purchases encourages wider spacings and higher irrigation efficiencies, while abundant surface water supplies encourage the opposite. Starts could be brought in from other valley locations but still have used water, probably during April. True legal hemp is only grown outside at a few sites, is short seasoned planted in mid-June, and is widely spaced.

Sweet corn ET is about 2.2 feet for a warmer than normal year. The monthly ET is about: May – 3”, April – 5”, July – 8”, August – 7”, September – 3” for a total of 26 inches or 2.2 feet. This is the model for cannabis ET in this analysis.

At 50% spacing gross ET is about 1.5 feet (0.7 x 2.2') outside and 1.2 feet (0.8 x 1.5') in a greenhouse. At full canopy gross ET is about 2.2 feet (1.0 x 2.2') outside and 1.8 feet (0.8 x 2.2') in a greenhouse.

Some Med grow sites have extra wide spacing, basically scattered individual plants. Therefore, IR water per plant times the number of plants is utilized to estimate the total IR for the site. The individual plants are large ranging from 10 feet to 12 feet in diameter. That is about 100 square feet per plant. An ET of 2.2 feet is about 16.5 gallons per square foot (2.2 acre-feet per acre \* 325851 gallons per acre foot / 43560 square feet per acre). Therefore, the ET of one plant is about 1650 gallons per season. At 90% IE that is about 1833 gallons per season. However isolated plants are subject to advection (aka the edge effect or the clothes line effect)

which increases ET. Some data and anecdotal reports suggest that large individual plants use about 2000 gallons per season. So, 2000 gallons per plant is used to make IR estimates for the extra wide spacing grow sites.

Two sites were used to calibrate or test the ET and IR model. One is a legal outside recreational grow. The second site is an illegal greenhouse cannabis grow.

The recreational legal grow is fully registered, permitted, and reported. The net area is 1.8 acres of plant canopy spaced in even rows across 3.6 gross acres. The grow is carefully managed and water from two permitted wells is metered and applied through a drip irrigation system to 1200 plants in raised beds. Irrigation was applied May through September (150 days) totaling 6.16 acre-feet. A small amount of water (0.04 acre-feet) was used to grow the starts inside during April before out planting in May. Therefore, gross ET is 1.5 acre-feet per acre and gross irrigation is 1.7 acre-feet per acre at an irrigation efficiency of 90%. Some crop stress was noted during the heat waves which confirms the thrifty irrigation practice.

The illegal cannabis grow was irrigated from two wells without water rights during May through September. The gross area of the greenhouses is about 3.1 acres. The plants were spaced apart in plastic soil mix bags in rows and columns. Total well output is about 2 acre-feet per month. Water was also stolen from the wells and trucked to other sites during June, July, and August at a rate of about 0.9 acre-feet per month (10,000 gallons per day) or 2.7 acre-feet during 2021. It is therefore estimated that 5.3 acre-feet were applied to the illegal greenhouse cannabis plants. Gross crop ET is about 1.2 acre-feet per acre or 3.7 acre-feet on the 3.1 gross acres and the gross IR is 1.7 acre-feet per acre or 5.3 acre-feet. The irrigation efficiency is estimated to be 70%. Total groundwater pumped was about 8 acre-feet.

There are 9 field level classifications and IRs. Some are more common than others.

- 1 – Legal Med & Rec wide spacing outside. 50% cover, gross ET = 1.5 F, IE = 90%.  
IR = 1.7 F
- 2 – Legal Med & Rec wide spacing in greenhouse. 50% cover, gross ET = 1.2 F, IE = 80%.  
IR = 1.5 F
- 3 – Legal Med & Rec close spacing outside. Full cover, gross ET = 2.2 F, IE = 80%.  
IR = 2.8 F
- 4 – Legal Med & Rec close spacing in greenhouse. Full cover, gross ET = 1.8 F, IE = 75%.  
IR = 2.4 F
- 5 – Legal Hemp widely spaced outside. Short season, 33% cover, gross ET = 0.8 F, IE = 75%.  
IR = 1.1 F
- 6 – Illegal cannabis wide spacing outside. 50% cover, gross ET = 1.5 F, IE = 75%.  
IR = 2.0 F
- 7 – Illegal cannabis wide spacing in greenhouse. 50% cover, gross ET = 1.2 F, IE = 70%.



IR = 1.7 F

8 – Illegal cannabis close spacing outside. Full cover, gross ET = 2.2 F, IE = 75%.

IR = 2.9 F

9 – Illegal cannabis close spacing in greenhouse. Full cover, gross ET = 1.8 F, IE = 65%.

IR = 2.8 F

While the above classifications could be used for individual field IR estimates they are not useful for valley wide IR estimates because the legality of specific sites are not always know and other cultivation details are hard to determine from aerial photographs. Therefore, the following 6 general groupings are used for valley wide IR values based on the averages of the above field level estimates.

A - Cannabis wide spacing outside.

IR = 1.85 F

Ax - Cannabis extra wide spacing outside.

IR = 2000 gal per plant

B - Cannabis wide spacing in greenhouse.

IR = 1.6 F

C - Cannabis close spacing outside.

IR = 2.85 F

D - Cannabis close spacing in greenhouse.

IR = 2.6 F

E - Hemp widely spaced outside.

IR = 1.1 F

It is instructive to note that Water Resource Department permits issued in the Rogue Basin generally specify irrigation diversion and appropriation rates of 1/80 cfs per acre (5.6 gpm per acre) for newer water rights and 1/50 cfs per acre (9.0 gpm per acre) for older water rights. The lower rates are for more efficient pipe distribution systems while the higher rates are for less efficient ditch distribution systems. These rates will satisfy peak irrigation demands during July and August. In addition, water right permits may set annual duties of 2.5 acre-feet per acre, 3.5 acre-feet per acre, or 4.5 acre-feet per acre. The newer permits usually specify 2.5 acre-feet per acre and older permits 4.5 acre-feet per acre. The permit duties seem to be in relation to the type of irrigation systems typical at the time the permits were issued such as drip and sprinkler versus flood irrigation.

Note: 1 acre-foot per acre = 1 F = 1 foot

Prepared by Gordon R. Lyford, CWRE#342, for the IVSWCD during January 2022.


## Appendix B – Spreadsheet on Measurements of Grows and their Irrigation Requirements:

A megadrought has lasted 22 years in the region and is now believed to be a one in 1,200-year event (Williams et al., 2022). The Vapor Pressure Deficit in southwest Oregon during the summer of 2021 impacted vegetation, sucking water from plant and soil surfaces, possibly increasing evapotranspiration more than normal (Rao, et al., 2022), requiring higher irrigation rates for cannabis plants to thrive.

While there is never a good time for water theft, hot, dry summers are a particularly bad time for the unauthorized use of water to irrigate unlicensed cannabis crops. The ideal vapor pressure deficit should range from .56 kPa to 1.18 kPa; however, during the summer, the temperature and relative humidity ranges exceeded the numbers on the following chart (PerfectGrower):

**Perfect Grower Vapor Pressure Deficit Recommendations (kPa)**

TEMPERATURE		Relative Humidity													
°C	°F	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
15	59	1.11	1.02	0.94	0.85	0.77	0.68	0.60	0.51	0.43	0.34	0.26	0.17	0.09	0
16	61	1.18	1.09	1.00	0.91	0.82	0.73	0.64	0.55	0.45	0.36	0.27	0.18	0.09	0
17	63	1.26	1.16	1.06	0.97	0.87	0.77	0.68	0.58	0.48	0.39	0.29	0.19	0.10	0
18	64	1.34	1.24	1.13	1.03	0.93	0.83	0.72	0.62	0.52	0.41	0.31	0.21	0.10	0
19	66	1.43	1.32	1.21	1.10	0.99	0.88	0.77	0.66	0.55	0.44	0.33	0.22	0.11	0
20	68	1.52	1.40	1.29	1.17	1.05	0.93	0.82	0.70	0.58	0.47	0.35	0.23	0.12	0
21	70	1.62	1.49	1.37	1.24	1.12	0.99	0.87	0.75	0.62	0.50	0.37	0.25	0.12	0
22	72	1.72	1.59	1.45	1.32	1.19	1.06	0.92	0.79	0.66	0.53	0.40	0.26	0.13	0
23	73	1.82	1.68	1.54	1.40	1.26	1.12	0.98	0.84	0.70	0.56	0.42	0.28	0.14	0
24	75	1.94	1.79	1.64	1.49	1.34	1.19	1.04	0.89	0.75	0.60	0.45	0.30	0.15	0
25	77	2.06	1.90	1.74	1.58	1.42	1.27	1.11	0.95	0.79	0.63	0.47	0.32	0.16	0
26	79	2.18	2.02	1.85	1.68	1.51	1.34	1.18	1.01	0.84	0.67	0.50	0.34	0.17	0
27	81	2.32	2.14	1.96	1.78	1.60	1.43	1.25	1.07	0.89	0.71	0.53	0.36	0.18	0
28	82	2.46	2.27	2.08	1.89	1.70	1.51	1.32	1.13	0.94	0.76	0.57	0.38	0.19	0
29	84	2.60	2.40	2.20	2.00	1.80	1.60	1.40	1.20	1.00	0.80	0.60	0.40	0.20	0
30	86	2.76	2.54	2.33	2.12	1.91	1.70	1.48	1.27	1.06	0.85	0.64	0.42	0.21	0
31	88	2.92	2.69	2.47	2.24	2.02	1.80	1.57	1.35	1.12	0.90	0.67	0.45	0.22	0
32	90	3.09	2.85	2.61	2.38	2.14	1.90	1.66	1.43	1.19	0.95	0.71	0.48	0.24	0
33	91	3.27	3.02	2.76	2.51	2.26	2.01	1.76	1.51	1.26	1.01	0.75	0.50	0.25	0
34	93	3.46	3.19	2.92	2.66	2.39	2.13	1.86	1.59	1.33	1.06	0.80	0.53	0.27	0
35	95	3.65	3.37	3.09	2.81	2.53	2.25	1.97	1.69	1.40	1.12	0.84	0.56	0.28	0



- Green - Optimal
- Yellow - Borderline
- Red - Too high / too low

Source: <https://www.perfectgrower.com/knowledge/knowledge-base/vpd-chart-vapor-pressure-deficit/>

This chart shows the ideal range for growing cannabis and the regions outside the ideal range. Typically, the growing season falls to the bottom left of this chart for cannabis grown outdoors, and to the bottom right for cannabis grown inside hoop houses. Typical RH in the summer dips to the teens and twenties during the daytime; in hoop houses, the RH can be in the 90s due to high heat and excessive watering to keep roots cool and moist.

During 2021, almost half the days in June, July, and August had highs above 95 F and relative humidity in the teens or low 20s (Weather Underground, 2021). These figures fall off the bottom left of the chart. Another fifth of the days was between 90 F and 95 F. For cannabis plants outside, growers would need to irrigate at higher rates than normal to meet the



evapotranspiration rates the plants would have required. For cannabis plants in hoop houses, temperatures can be 20 degrees F hotter than the outside temperature, and the only way to keep plants alive at such high temperatures (120+ F) is by keeping the roots cool and moist. This circumstance, too, would require growers to irrigate at higher rates than normal; however, this would cause the humidity to rise to very high levels in the hoop houses, creating a sauna effect. These figures would fall off the bottom right side of the chart.

It is beyond the scope of this project and this report to calculate the precise values the hot and dry 2021 summer had on the unauthorized water use irrigating unlicensed cannabis crops beyond the calculations prepared for the Irrigation Requirement figures in the spreadsheet link below. Given the high rate of financial risk growers would have faced in start-up, operating, and potential crop-loss costs, it is believed no amount of water would have been spared to keep plants alive during the most heat-stressed days. A quick review of the municipal bulk water sales by the City of Cave Junction shows a substantial increase earlier in the growing season that continued through October, compared to the previous years. There is reason to believe this relatively small amount of water use is indicative of the two orders of magnitude larger extraction from wells and surface waters by unlicensed growers in the Illinois Valley.

The spreadsheet contains the six different cannabis growing styles used by growers in the Illinois Valley in 2021. The spreadsheet is 30 columns wide by over 1,000 rows deep and is too big to include in this report. It is fully available to review, including all calculations at:

<https://drive.google.com/file/d/199wpy9pnuqXpMipD7YTZIfIPoUUt8CnF/view?usp=sharing>

Each style has a different Irrigation Requirement (IR) based on plant spacing and cover. Some cannabis grows comprised of just one style, some two styles, and some had three. Every outdoor plot and hoop house (or grouping of hoop houses) was measured independently with exacting precision. While there may be two to four times the impacted space by grow operations, only the irrigated square footage was measured.

Below are examples of the six styles:

A – wide-spaced outdoor – IR 1.85 AF

Generally an area that contains a lot of mid-sized plants in one area.



A(x) very wide-spaced large plants outdoor  
 – 2,000 Gal./ season each

Large plants easy to count in a legacy grow style. They are so far apart, it makes sense to estimate the IR by plant, not sq. ft.



B – wide-spaced hoop house – IR 1.6 AF

These are grows where plants are in individual bags and spread out so that there are about 240 plants in 3,600 sq. ft. This is about 15 sq. ft. per plant. After harvest, abandoned grow sites were viewed to reveal this information.



C – close-spaced sea-of-green outdoor – IR 2.85 AF

These grows plant very closely in what's called a Sea-of-Green to maximize pounds per square foot.



D – close-spaced sea-of-green hoop house – IR 2.6 AF

These grows maximize the inside of hoop houses more densely than individually potted plants, and is the most prevalent way hoop houses are used.



E – row crops typical of hemp fields – IR 1.1 AF

Row crops with drip tape spaced out similar to other crops.





## A typical Sea-of-Green



Photo courtesy of an anonymous resident -- 2021

## A typical B-Style Hoop House with Plants Spaced Out



## Additional Research and Calculations:

There are calculations to explore beyond simple totals outlined in Section 4 of this report, and further research can be done in this area. Some information on the spreadsheet between and below the green lines past row 1,000 contains the relative acreages and gallons each growing style used. For example,

“A” used 6.63% of the total acreage but only 5.97% of the water;  
 “A(x)” used 5.55% of the total acreage but only 2.69% of the water  
 “B” used 14.45% of the total acreage but only 7.05% of the water (the reason this water use is so low is because the super huge cartel grows typically used this grow-style and law enforcement busted them, accounting for less water use);  
 “C” used 23.46% of the total acreage and 30.72% of the water;  
 “D” used 38.18% of the total acreage but only 47.49% of the water; and  
 “E” used 11.73% of the total acreage but only 6.09% of the water.

These percentages can be compared to each other, and ratios produced to line up the growing styles in a way that places them into relation with each other. Refer to the spreadsheet, rows 1027 to 1032 to see the IR (water use) ratio as a function of sq. ft. (area). Legacy-style plants are shown to use the least amount of water per area, while “C” outdoor sea-of-green uses the most water per area.

The author estimated the trimmed pounds of “A-quality buds” each growing style would produce per area based on years of knowledge growing legacy plants and speaking with growers who maximize yield by the square foot. The author has worked in hemp as well, and has knowledge of production rates that are the basis of the weight estimates. More research is needed to standardize weight estimates and production rates. Adding in “B-quality” buds and trim (shake) would increase the total weight by 30%.

The author estimates that:

“A” growing style produced 5.51% of cannabis grown in 2021;  
 “A(x)” growing style produced 3.11% of cannabis grown in 2021;  
 “B” growing style produced 4.96% of cannabis grown in 2021 (again, the cartels appeared to use this grow-style, and law enforcement busted some of their biggest grows leading to zero pounds harvested);  
 “C” growing style produced 29.9% of cannabis grown in 2021;  
 “D” growing style produced 48.59% of cannabis grown in 2021;  
 “E” growing style produced 7.93% of cannabis grown in 2021;

View rows 1034 to 1039 to see the ratio of square feet (area) to pounds (weight). This figure shows that the “sea-of-green” growing style maximizes crop yields per area, which is no



surprise.

View rows 1041 to 1046 to see the ratio of pounds (weight) to IR (water). This figure shows that row crops are the most efficient use of water to get weight, with legacy grows close behind.

These calculations are surely in need of mass replication, and further research and they point much more to the possibility of conducting such research than they point to useful results. This is only on such study, and there is reason to believe that much better results can be achieved in controlled studies.



A still image from video -- cannabis grow set in a junkyard -- 2021

## Appendix C – Municipal Bulk Water Sales Tables and discussion:

Bulk water sales in the Illinois Valley were relatively consistent over the years but increased in 2020 and then jumped considerably in 2021. This is likely to be a similar trend in other areas of southwest Oregon. Evidence of an early start by cannabis growers in April 2021 over previous years is notable, with a peak in August, and significant continuation in September with a trail-off in October. While, the megadrought of the past 22 years must play a part in the need for municipal bulk water sales, the recent sharp increase in sales in 2021 can reasonably be attributed to the increase in unlicensed cannabis grows.

See the municipal bulk water sales table is on the facing page.

The municipal bulk water sales totaled 17.19 million gallons in 2021. Baseline sales when cannabis is not growing is <50,000 gallons per month. It is believed – not calculated – that pressure on groundwater aquifers and neighborly well-interference from April through October contributes to the need for some non-growing residents to purchase municipal water in bulk volumes. Due to the seasonal hard pumping of groundwater for cannabis grows, both cannabis grows and some of their non-growing neighbors will rely on municipal bulk water sales. Therefore, the hypothesis is that cannabis growing drives the vast majority of municipal bulk water sales, one way or the other. Some non-growing residents may experience a hardship for having the cost of cannabis growing externalized onto them; further research could reveal the actual cost.

There is reason to believe that the bulk water sales-trend compares with the time-scale of all water use in the Illinois Valley for cannabis grows. As such, this chart can be used to extrapolate the time cannabis growers use water in the Illinois Valley. Below the chart is a graph that shows an arc for each year, and that arc is highly likely to be a visual representation of the 505 million gallons used to irrigate cannabis crops in the Illinois Valley in 2021.

2021 bulk water sales are not more than 1/30th (3.4%) of the total estimated water used to irrigate cannabis in the Illinois Valley. While this is a small number, it represents the needs of those who grew cannabis. Because it is estimated that four out of five cannabis grows were unlicensed in the Illinois Valley in 2021, the volume of municipal bulk water sales used to irrigate unlicensed (illegal) cannabis crops would not have been more than 13.7 million gallons of the total 17.19 million gallons sold. The local municipality charges \$0.03 per gallon. Taking into consideration both the direct sales to illegal cannabis grows and their externalized costs onto their neighbors whose well dried up, the cost for this water would have been \$411,000 plus the cost of delivery. The total income from bulk water sales was \$515,000, or about 8.5% of the total FY 2020/ 2021 budget.





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 email: cityofcj@cavenet.com

The table below reflects gallons sold each month at the bulk water station for the years 2017-2021. The cost of bulk water has been \$.03/gallon since May 2017. Prior to that bulk water was sold at \$.01/gallon. This information is being provided in response to the public information records request submitted by Gordon Lyford (PO Box 118, O'Brien, OR 97534), dated 01/03/2022. Response to said request was completed and forwarded as instructed to capay@frontiernet.net on 1/4/2022 @ 1:00pm.

Signed by: Rebecca Patton, City Recorder/Treasurer for the City of Cave Junction

<b>GALLONS SOLD</b>					
<b>MONTH</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
JANUARY	31,000	0	20,000	28,000	15,000
FEBRUARY	19,000	16,000	15,000	16,000	21,000
MARCH	29,000	9,000	2,000	22,000	38,000
APRIL	50,000	14,000	5,000	32,000	154,000
MAY	76,000	31,000	90,000	72,000	537,000
JUNE	290,000	160,000	235,000	256,000	1,744,000
JULY	321,000	415,000	272,000	1,198,000	4,842,000
AUGUST	1,275,000	775,000	808,000	2,730,000	5,539,000
SEPTEMBER	1,023,000	738,000	929,000	3,290,000	3,148,000
OCTOBER	348,000	220,000	161,000	857,000	1,055,000
NOVEMBER	72,000	72,000	36,000	163,000	52,000
DECEMBER	27,000	27,000	31,000	25,000	42,000

*Affirmative Action / Equal Opportunity Employer*



This is a bar graph of the volume of water sold each month from 2017 to 2021.

## Community Sentiment:

Aside from those who purchased water for cannabis grows, the community took a dim view of local municipalities participating in such sales. Municipal bulk water sales symbolized cashing in on the green rush. Additionally, those whose wells dried up and attributed the problem to their cannabis-growing neighbors were especially perturbed by having to pay for water deliveries. In all cases, large plastic holding tanks, plumbing, and electrical power would have been installed to service water to both cannabis grows and domestic residential uses.

At the [September 13, 2021, Cave Junction City Council meeting](#), the mayor asked OWRD Southwest Regional Manager, Jake Johnstone, who was present to offer his testimony on municipal bulk water sales, “It’s been said several times that selling to the illegal grow is a nonbeneficial use of the city. Can you explain why people think that?”

Mr. Johnstone replied: “The city has its municipal water right, and if you go into the 690.300 definitions and you look at what the municipality is allowed under the municipal definitions, the municipal definition reads anything under the sun that water can be used for pretty much. It says: “including but not limited to these uses,” and it lays out irrigation, commercial, industrial, fire protection, dust abatement, whatever the case may be. So, the bulk water fill station is a commercial fill station. That’s a commercial use. We’re not policing



where that water ends up after it leaves the bulk fill station; it was delivered through your municipal system within the terms of your water right.”

For perspective [*emphasis added*]:

ORS 540.610 states:

(1) Beneficial use shall be the basis, the measure and the limit of *all rights to the use of water in this state*.

OAR 690-300-0010 states:

(5) “Beneficial Use” means the reasonably efficient use of water without waste *for a purpose consistent with the laws, rules and the best interests of the people of the state*.

(29) “Municipal Water Use” means the delivery and use of water through the water service system of a municipal corporation *for all water uses usual and ordinary to such systems*.

ORS 540.510 Appurtenancy of Water to Premises, Section 3 states:

(a) Any water used under a permit or certificate issued to a municipality, may be applied to beneficial use on lands to which the right is not appurtenant if:

(A) The water is applied to lands which are acquired by annexation or through merger, consolidation or formation of a water authority, so long as the rate and use of water allowed in the original certificate is not exceeded;

(B) *The use continues to be for municipal purposes* and would not interfere with or impair prior vested water rights.

The [Opinion Request OP-6499 in August 2, 1993](#) by the Office of the Attorney General of the State of Oregon on the matter of municipalities selling bottled water that the OWRD uses to justify municipal bulks water sales states [*emphasis added*]:

“A water right for municipal use is distinguished by the fact that the water is delivered through a municipal water system, not by the ultimate use of the water, *so long as that ultimate use falls within the wide range of uses designated as “usual and ordinary.”* [...] We conclude that bottling water for sale is a commercial use that falls within the “usual and ordinary” use of water from a municipal supply system...”

This information was widely shared with the community in the town halls and on various forms of social media as well as with elected and appointed officials in the state of Oregon as part of the work of the Community Organizer.

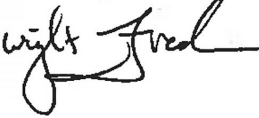
HB 4061, in the 2022 Oregon legislative session, directly addresses this issue, in particular, the concern that irrigating illegal cannabis crops is not a municipal purpose that is “usual and ordinary,” nor is it a beneficial use of water “consistent with the laws, rules and the best interests of the people of the state” of Oregon.

## Appendix D – Assessment of Groundwater Pumping Impacts

### MEMORANDUM

To: Barbe Poage, Lisa Graham, Kim French (Water Right Application Caseworkers)

CC: Alyssa Mucken, Ivan Gall, Justin Iverson

From: Dwight French } ) 

Date: August 5, 2019

Re: Processing Groundwater Applications in or above the Rogue River Scenic Waterway

Alyssa and I met with Ivan Gall, Justin Iverson and Ken Stahr last Wednesday, July 31, 2019. We agreed that the 1 CFS limit had been reached and any applications received as of August 1, 2019 or later would receive findings to this affect.

I have attached two memos from our groundwater section that discusses groundwater hydrology of the Rogue Basin and the groundwater interconnection with surface water.

Let me know if you have any questions.



Water Resources Department

State of Oregon

*Interoffice Memorandum*

Date: 8/5/2019

To: File

From: Justin Iverson, Groundwater Section Manager

Subject: Assessment of Groundwater Pumping Impacts on the Rogue and Illinois State Scenic Waterways in Groundwater Technical Reviews of New Water Right Applications

The Rogue River is designated as a State Scenic Waterway for 83 miles from the confluence with the Applegate River (Josephine County) downstream to the confluence with Lobster Creek (Curry County). The lower end of the Rogue Scenic Waterway is downstream of the confluence with the Illinois River and downstream of nearly all major permitted water uses in the basin. The Illinois River is also designated as a State Scenic Waterway and is tributary to the Rogue Scenic Waterway.

The Department is charged with assessing impacts of groundwater production on Scenic Waterways during the water right application review process. OAR 690-310-0260 instructs the Director to *"...issue water rights within or above the designated reach of a scenic waterway provided the free-flowing character of the waterway is maintained in quantities necessary for recreation, fish and wildlife uses."* ORS 390.835 allows appropriation of groundwater within or above a Scenic Waterway *"...except upon a finding...based on a preponderance of evidence that the use of ground water will measurably reduce the surface waterflows necessary to maintain the free-flowing character of a scenic waterway ..."* ORS 390.835(12) defines "measurably reduced" as use that *"...will individually or cumulatively reduce surface waterflows within the scenic waterway in excess of a combined cumulative total of one percent of the average daily flow or one cubic foot per second, whichever is less..."* As such, the Department must assess whether groundwater use in the Rogue Basin will measurably reduce flows in the Rogue or Illinois Scenic Waterways as per ORS 390.835 and OAR 690-310.

The Scenic Waterway impact assessment requires the Department to quantify stream depletion, which is typically done with either an analytical model using site-specific data or a basin-scale numerical model. In the Klamath and Deschutes Basins, the Department has used basin-scale numerical groundwater flow models to conclude that groundwater use in any part of the basin has an impact on the Scenic Waterway flows in those basins [1] (OAR 690-505-0600). Where a basin-scale numerical model does not exist, estimates of the impacts are assessed during the initial review of new groundwater right applications on a case-by-case basis, often utilizing an analytical model of stream-depletion (e.g., Hunt, 1999) [2].

Currently, impacts to the Scenic Waterways in the Rogue Basin are assessed with a water balance analysis based on the Department's physically-based hydrogeologic understanding [3] and application of generally-accepted hydrogeological principals of groundwater-surface water interaction (e.g., Barlow and Leake, 2012) (4). This approach is aligned with laws and rules governing protection of Scenic Waterway flows, which do not limit the timescale in which the Department considers impacts from new groundwater uses. Over the lifetime of a water right, which is issued in perpetuity, stream capture from groundwater production in the Rogue basin will increase over time until approaching a steady state in which groundwater withdrawal and stream-depletion are equivalent [4]. After a steady state is reached, stream-depletion will be approximately equal to the total consumptive use of the water

right. Therefore, groundwater reviews estimate the impacts of year-round and seasonal uses associated with future groundwater right applications tributary to the Rogue and Illinois Scenic Waterways as the full volume of consumptive use distributed evenly by month throughout the year. As compared to estimating the timing of groundwater impacts to Scenic Waterways with an analytical or numerical model, this approach is expected to overestimate stream depletion during the cool, high-precipitation months and underestimate stream depletion in the hot, dry summer months. This bias will be greatest for wells that are closest to streams, and will lessen the further a well is located from a stream (4).

#### Works Cited

- (1) I. Gall, *Analysis of Groundwater Pumping Impacts on Klamath Scenic Waterway Flows: Oregon Water Resources Department*, OWRD, 2013.
- [2] 8. Hunt, "Unsteady Stream Depletion from Ground Water Pumping," vol. 37, no. 1, 1999.
- [3] J. Kemper and M. Thoma, Hydrogeologic Conceptual Model of the Rogue River Basin, Oregon Water Resources Department Memorandum, 2019.
- (4) P. Barlow and S. Leake, "Streamflow Depletion by Wells-Understanding and Managing the Effects of Groundwater Pumping on Streamflow," US Geological Survey• Circular 1376, 2012.



Water Resources Department

State of Oregon

*Interoffice Memorandum*

Date: 8/5/2019  
 To: Justin Iverson; Groundwater Section Manager  
 From: Joe Kemper, GIT and Michael Thoma, PhD, RG  
 Subject: Hydrogeologic Conceptual Model of the  
 Rogue River Basin



The Rogue River Basin is located in southwest Oregon, draining 5,156 square miles across five Oregon counties as well as part of California. The upper Rogue Basin (located in eastern Jackson County) is underlain by Tertiary terrestrial sedimentary rocks (e.g., Payne Cliffs Fm.), and Paleogene to recent volcanoclastic and extrusive volcanic rocks of the Western Cascades [1], [2], [3]. The headwaters of the Rogue River lie in the High Cascades geologic terrane (31).

The middle and lower Rogue Basins (located in Curry, Josephine, and western Jackson counties) are underlain by a series of accreted terranes composed predominately of metamorphosed, late-Paleozoic to Mesozoic, marine sedimentary and marine volcanic rocks, which collectively comprise the backbone of the Klamath Mountains (41, (11, [SJ, (6). Mesozoic-aged stitching plutons ranging from < 1 square mile to > 100 square miles intruded into these accreted terranes and were later unroofed as the overlying rock was eroded. These plutonic rocks, being generally more easily weathered than the surrounding rocks, form many of the prominent valleys in the basin (e.g., Grants Pass, Evans Valley, Williams Valley) [SJ, {6]. Continued regional uplift and erosion of the Klamath Mountains has created extensive, high-relief topography with a lack of discrete regional upland/lowland zones or significant basin-fill valleys (the exception being the Upper Illinois Valley). Significant alluvial deposits are limited to major river valleys (Illinois, Rogue, and Applegate) and seldom exceed 100 feet in thickness (6), (2).

Despite the inherent structural complexity and diverse provenance of the underlying geology, the hydrogeology of the Rogue Basin can be generally characterized as a fractured-bedrock aquifer system in which water moves predominantly through interconnected fracture networks (secondary porosity) as opposed to the primary porosity of the host rock. While aquifer properties differ somewhat between the major geologic terranes in the Rogue Basin (e.g., the Grants Pass Batholith vs the Applegate Group), major aquifer properties, such as storativity and transmissivity, are controlled primarily by fracture density and interconnection, which are a function of weathering, topography, depth, and structure in addition to lithology [7], [8]. Conceptually, fractured-bedrock aquifers can be separated into distinct zones: an upper zone of weathered bedrock (saprolite or mobile regolith), a middle zone of moderate to highly-fractured bedrock, and a deeper zone where fracture density decreases rapidly with depth [9]. Because fracture density is highest in the upper and middle zones and decreases with depth, aquifer storativity and transmissivity also typically decrease with depth (7), (8), [9].

The conceptual model of the groundwater flow regime of the Rogue River Basin summarized in this memo is based upon available data sources such as drillers' well log reports, pumping tests, and water level trends. Water bearing zones identified in well logs typically identify where the well bore intersects fracture systems sufficient to produce water. Reported well yields generally decrease with the depth of the well as fracture density decreases. Well logs indicate low well yields (1 to 50 gallons

per minute) across most of the Rogue Basin and low specific capacities (large pumping drawdowns with minimal yields) [10]. Analyses of pumping tests in the Rogue Basin consistently estimate transmissivity values of  $<1,000 \text{ ft}^2/\text{day}$  and storativity values of  $<0.01$  [10]. With the exception of areas in the High Cascades, there are no large spring complexes within the Rogue Basin which would indicate a highly transmissive, regionally-connected groundwater system. Additionally, available water level data, geologic data, and well logs do not provide evidence of laterally extensive aquifer systems below the fractured-rock aquifer system that could serve as additional sources of water. The young lavas of the High Cascades are recognized as an exception to the fractured-bedrock conceptual model outlined herein but, because the High Cascades terrane underlies very little arable and private land in the Basin, it is not addressed further in this memo.

Observed groundwater levels across the basin typically mimic a subdued surface topography, indicating hydraulic gradients and groundwater flow from higher elevations toward adjacent valley floors (discharge areas) [10]. The high-relief topography and decreasing transmissivity with depth generate short, shallow flow paths that are predominately limited to the upper few hundred feet below land surface and transmit groundwater to surface water. Observed water level data show a timely response to precipitation - water levels in wells rise shortly after precipitation begins in mid-autumn and decline after precipitation decreases in mid-spring [10]. Seasonally-elevated water levels combined with a dense stream network that is deeply incised into high relief topography results in increased groundwater discharge to perennial stream reaches and the resumption of intermittent stream reaches during the high-precipitation season. As precipitation decreases in mid-spring, groundwater storage drains out of the upper zones of the aquifer system via this stream network, groundwater levels decline, discharge to surface water decreases, and stream inception points (where streams begin flowing) migrate down-valley. In synthesis, the Rogue Basin groundwater system is dominated by near-surface flow paths through fracture networks and overlying regolith which closely follow surface topography and follow relatively short flow-paths before discharging to surface water.

Beginning as early as 1940 [11], groundwater scientists established that the two fundamental sources for groundwater pumping are a) reduction in aquifer storage and b) capture. Reduction in storage is typically manifested as lowering of the water level or piezometric surface and a change in the total volume of water in the aquifer. Capture, on the other hand, is further divided into 1) induced recharge -drawing water into an aquifer that would not have entered otherwise, either from adjacent aquifers or surface water, and 2) captured discharge-diverting water from the natural flow-paths that otherwise would have led to discharge to the surface [11], (12), (13). In a fractured aquifer system such as the Rogue Basin, fracture density and well yield decrease with depth, and no aquifer systems underlying the fractured-bedrock system have been identified or are thought to exist. Therefore, production from water supply wells will come primarily from the upper fracture zones of the aquifer, thus inducing recharge from overlying sediments through the upper boundaries of the aquifer and reducing discharge to surface water through lower boundaries (discharge zones) of the aquifer. Long-term groundwater level data show a lack of groundwater level declines implying that water that is taken from storage by pumping is replenished by capture (water that would have otherwise discharged to surface water) rather than reduction in storage [10]. The hydrogeologic regime described by this conceptual model and supported by basin-specific observations indicates that groundwater throughout the Rogue River Basin is connected to surface water and that groundwater pumping from wells will impact surface water within relatively short timescales.



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## Appendix E – Community Sentiment Data

<b>What Issue?</b>	<b>Number</b>	<b>Percent</b>
<b>Water Concerns</b>	<b>243</b>	<b>100.0%</b>
Drought Concerns	32	13.2%
Water Theft	62	25.5%
Pumping from Stream illegally/ dries-heats up rivers	25	10.3%
Pumping from well/ spring (trucks & no POU)	22	9.1%
My well is going dry	26	10.7%
My creek/ spring is going dry unlike the past	5	2.1%
Illegal pond	6	2.5%
Well drillers not documenting new wells	2	0.8%
Not getting my water right!!!	1	0.4%
Install ag well meters	2	0.8%
Who is testing streams for water quality?	2	0.8%
Don't sell city water for Ag.	25	10.3%
Water Trucks making roads unsafe/ unlicensed/ unregistered	15	6.2%
How does the city of CJ monitor its impact? City enabling illegal water use	9	3.7%
Where does the CJ money go/ used for?/ Why is the money so important?	4	1.6%
Water buyers from CJ should prove legal use	5	2.1%
<b>Grows</b>	<b>45</b>	<b>100.0%</b>
Owners leasing for an illegal grow	18	40.0%
Ban commercial cannabis farming	2	4.4%
Grow next door has gotten huge	25	55.6%
<b>Cartels/ Human Rights</b>	<b>76</b>	<b>100.0%</b>
Cartels are a concern	27	35.5%
Armed guards	2	2.6%
Cartels know this area is unenforced	3	3.9%
Lack of care & concern for community/ environment	8	10.5%
Human Rights violations/ slavery/ low wages	23	30.3%
Illegal immigration	4	5.3%
Out of town bosses/ owners	2	2.6%
Racism towards workers	7	9.2%

<b>Negative Impacts</b>	<b>201</b>	<b>100.0%</b>
Negative impact on way of life	33	16.4%
Negative impact on environment	36	17.9%
Negative impact on fish population	14	7.0%
Negative impact on water quality/ quantity	56	27.9%
Too much clearing of trees/ brush	24	11.9%
Negative impacts on wildlife/ less wildlife	12	6.0%
Negative impact of greed/ money	26	12.9%
<b>Enforcement, Laws, Corruption</b>	<b>148</b>	<b>100.0%</b>
Why no officials enforcing laws/ need better enforcement/ gov. officials pass the buck/ Watermasters ignore us (If the citizens see the problems, then why don't the city, county, state, & feds see it too?)	87	58.8%
Existing laws/ policies insufficient	33	22.3%
Change laws through ballot measures	9	6.1%
Circumstantial evidence of corruption/ paid off officials	10	6.8%
Who is monitoring stream flows/ groundwater?	9	6.1%
<b>Codes &amp; Public Health</b>	<b>120</b>	<b>100.0%</b>
Trucks, RV trailers, tents	2	1.7%
Unpermitted grading of earth	6	5.0%
Unpermitted structures/ poor housing/ lack of code enforcement	9	7.5%
Plastic everywhere	7	5.8%
No Bathrooms for workers/ bathing in river/ Dumping Sewage/ pit latrines	26	21.7%
Trash piling up on ground/ in rivers	43	35.8%
Unregulated Pesticides/ fertilizers/ contamination	27	22.5%
<b>Fear, Danger, Anger</b>	<b>88</b>	<b>100.0%</b>
Intoxicated/ dangerous driving	17	19.3%
Wanton killing of wildlife	7	8.0%
Dangerous dogs running loose	6	6.8%
Fire Risk!	4	4.5%
We're scared and intimidated	14	15.9%
The Gall! Scofflaws threaten us with lawsuits!	6	6.8%
Climate Change concerns	1	1.1%
Gunshots and guns pointed at us	33	37.5%



<b>Solutions</b>	<b>245</b>	<b>100.0%</b>
Use property sales to fund enforcement	6	2.4%
City should pass ordinance for water truck changes	1	0.4%
Need education on Water Rights & Conservation best practices	3	1.2%
Hire lawyers and sue them all (scofflaws & officials)	3	1.2%
Identify a baseline & the holding capacity of the watershed (availability vs. use)	22	9.0%
What is our future collective vision?	1	0.4%
Local family agriculture	26	10.6%
Cultivate the riches of diversity in this community	1	0.4%
Farmers' union to assist with conservation best practices	2	0.8%
Do the Takelma People has first-in-line water rights?	1	0.4%
Public demonstration against the city	1	0.4%
Identify the community vision of effective water usage	2	0.8%
Bulldozing plastic greenhouses is not an environmentally friendly best practice/ Recycle	9	3.7%
Need to respect water as a living being/ rivers ave rights too	7	2.9%
Require city of CJ to sell only to end-users/ follow Gold Beach model	15	6.1%
DOT checkpoints for water trucks	8	3.3%
Legalize Cannabis federally	50	20.4%
Make Cannabis Illegal Again (MCIA)	12	4.9%
Only permit people to farm who have water rights on their property	32	13.1%
3 to 5 year residency requirement	32	13.1%
Decolonize & give first rights of production to the oppressed	11	4.5%

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