

U.S. Region Products	Units	Assessed		
		Price	Low	High
CBD Biomass (0-25k pounds)	\$ / %CBD / pound	\$2.32	\$0.99	\$3.70
CBD Biomass (25k-100k pounds)	\$ / %CBD / pound	\$2.15	\$0.95	\$3.40
CBD Biomass (100k-1M pounds)	\$ / %CBD / pound	\$1.83	\$1.00	\$3.10
CBD Biomass (1M+ pounds)	\$ / %CBD / pound	\$1.61	\$1.05	\$2.50
CBG Biomass	\$ / %CBD / pound	\$22.42	\$13.00	\$31.25
CBD Flower (Bulk)	\$ / pound	\$319	\$75	\$600
Clones	\$ each	\$4.58	\$2.50	\$6.00
Industrial Seeds	\$ / pound	\$5.59	\$1.19	\$13.80
CBD Seeds (Non-Feminized)	\$ / pound	\$2,333	\$1,900	\$2,600
CBD Seeds (Feminized)	\$ each	\$1.05	\$0.50	\$2.50
Crude Hemp Oil	\$ / kilo	\$1,016	\$600	\$1,876
Refined Hemp Oil (Aggregate)	\$ / kilo	\$3,551	\$1,030	\$6,250
Distillate - THC Free	\$ / kilo	\$4,485	\$3,100	\$6,250
Distillate - Broad Spectrum	\$ / kilo	\$3,883	\$2,800	\$5,500
Distillate - Full Spectrum	\$ / kilo	\$2,831	\$1,030	\$5,000
CBD Isolate	\$ / kilo	\$2,489	\$1,734	\$3,200

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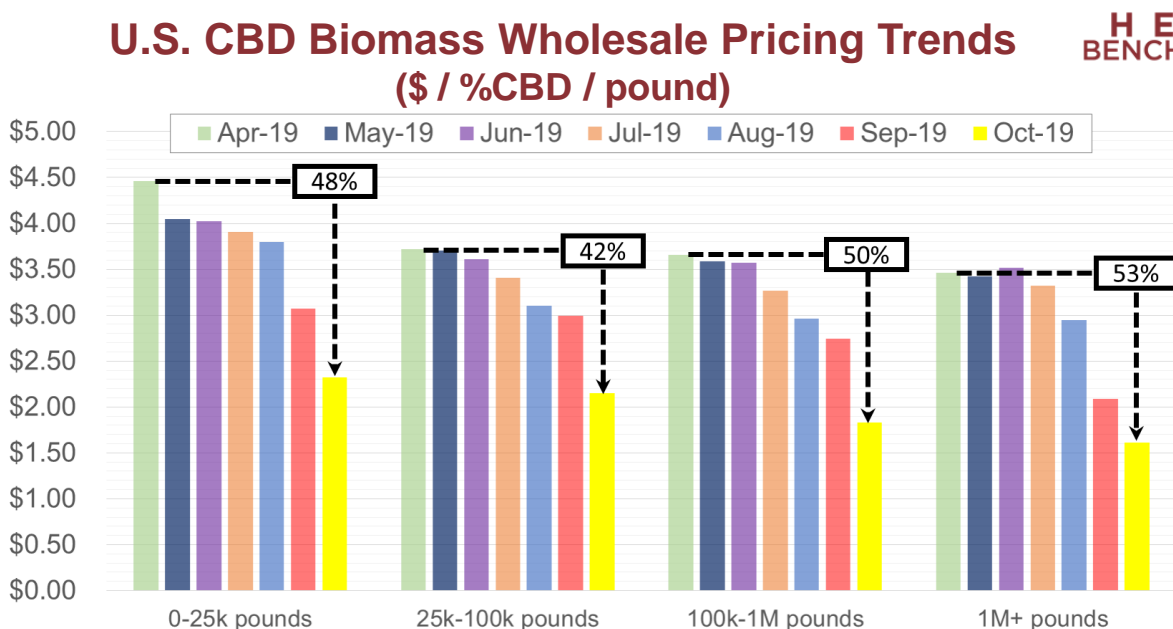
**Commodity market participants benefit from increased price transparency.**

### U.S. Price Commentary

Feedback from our price contributor network paints a picture of many market participants scrambling in the wake of the harvest, which was in some cases carried out hurriedly or under duress due to inclement weather conditions. Numerous farmers with whom Hemp Benchmarks have spoken have not found buyers for their biomass. Such market conditions are reflected in the significant downturns in prices for CBD Hemp Biomass observed this month; assessed prices for every volume bracket declined month-over-month by between 23% and 33%.

At the processing level, an operator in Colorado stated that they have more biomass on hand than they can process currently and are seeing offers for such material as low as \$0.90 / %CBD / pound. Another Colorado processor reported that they are fielding many calls from farmers trying to move their produce, but they are not purchasing biomass at this time. The second processor said that material that

### U.S. CBD Biomass Wholesale Pricing Trends (\$ / %CBD / pound)



Source: Hemp Benchmarks®

is at least 10% CBD appears scarce; he expects to see the average CBD potency for biomass harvested this year decline overall compared to last year. He also stated that he is seeing a lot of seedy biomass.

As we expand upon in more detail below, bad genetics, poor weather conditions, and lack of drying infrastructure in many major hemp-producing states have not only impacted yield, but in some cases the quality of successfully harvested biomass has been compromised in various ways.

Even with those difficulties, the reports noted above point to an apparent glut of biomass, or at least more than current processing capacity can take in all at once. Further down the supply chain, prices for Crude CBD Oil are also on the downswing, dropping by more than 40% month-over-month. Market participants have reported rates as low as \$500 to \$600 per kg, with some expecting price erosion in this category to continue. Prices for CBD Isolate and Refined Hemp CBD Oil – which includes Full Spectrum, Broad Spectrum, and THC Free Distillate – also sank this month by large margins.

Other market participants are more sanguine. A veteran hemp farmer in southern Oregon predicted wholesale prices will dip in the wake of the harvest, but “not precipitously.” Although that sentiment is contradicted somewhat by this month’s price assessments, he said that he expects international markets will help absorb the growth in supply, noting that there is a premium on U.S.-produced hemp, as it is the only country in which CBD-rich cultivars are grown widely. He also said that major retailers carrying CBD products are driving higher quality standards, which hemp products made from biomass grown in countries such as China and Canada can have trouble meeting due to issues such as soil contaminated with heavy metals.

Demand for CBD products remains difficult to quantify definitively, but there continue to be indicators that it is strong and growing. A late October report published by USA Today noted new research that showed, “Google searches for CBD have substantially increased since 2014 and are accelerating.” At the moment, however, this month’s price assessments saw the prior downward trend in rates for most product categories persist, even in the face of strong demand from consumers and what appears to be a smaller-than-expected harvest from weather impacts and supply chain bottlenecks. As we pointed out above, falling wholesale prices for industrial hemp biomass and CBD products appear to be the result of current domestic processing capacity being occupied fully by the significant year-over-year uptick in biomass production, rather than supply simply overwhelming demand.

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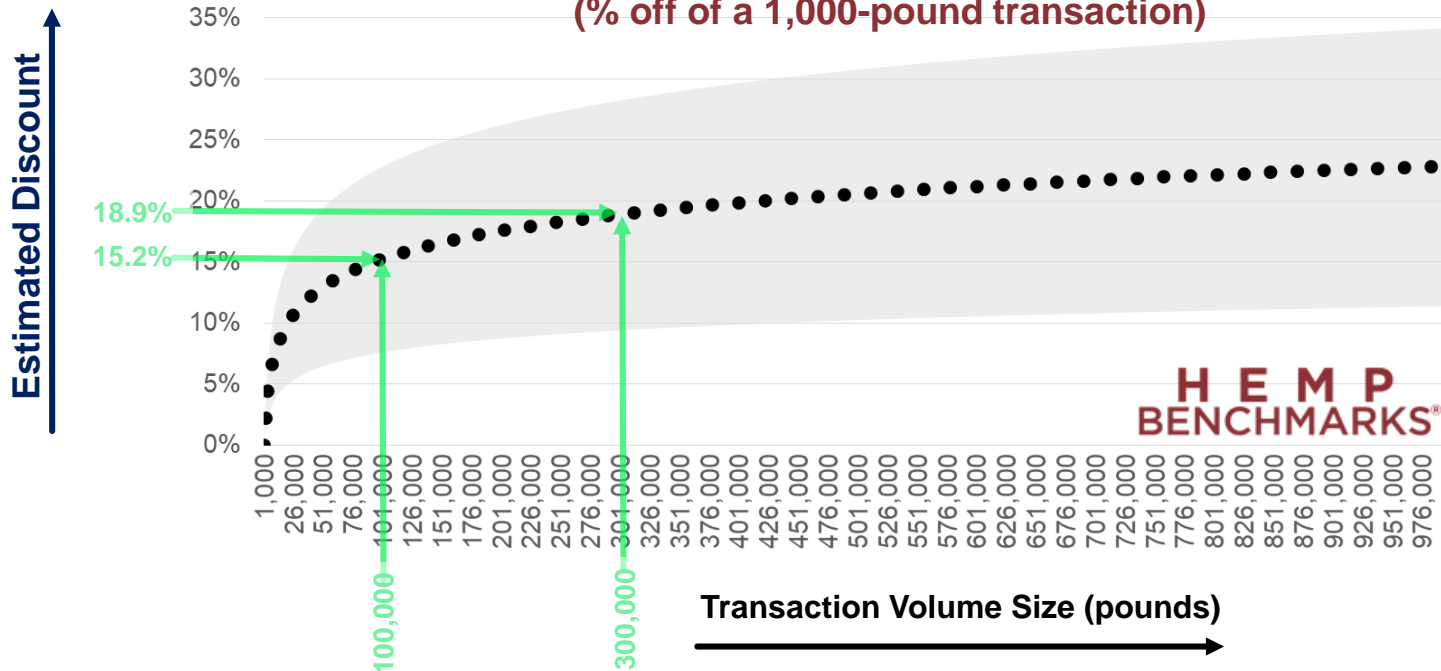
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### CBD Biomass Volume Discount Pricing

Volume discount pricing is a strategy that provides a financial incentive for purchasing a product or service in large amounts. In simple terms, customers purchasing more generally receive a lower price per unit.

Based on the data we have collected over the past six months, we have calculated the volume discounts that biomass purchasers received each month when doing deals greater than 1000 pounds. Each month has shown a drastically different discount curve (as represented in the grey area) dictated by the absolute price level, season, and transactions collected. The black dotted line below shows the average of the past six monthly discount curves and represents a good proxy that buyers and sellers can use to settle trades of various sizes.

### U.S. Biomass Volume Purchase Discounts (% off of a 1,000-pound transaction)



**Ask us how  
our pricing  
can help  
negotiate  
your next  
transaction**

U.S. Region Products	Units	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19
CBD Biomass (0-25k pounds)	\$ / %CBD / pound							\$2.32
CBD Biomass (25k-100k pounds)	\$ / %CBD / pound							\$2.15
CBD Biomass (100k-1M pounds)	\$ / %CBD / pound							\$1.83
CBD Biomass (1M+ pounds)	\$ / %CBD / pound							\$1.61
CBG Biomass	\$ / %CBD / pound							\$22.42
CBD Flower (Bulk)	\$ / pound							\$319
Clones	\$ each							\$4.58
Industrial Seeds	\$ / pound							\$5.59
CBD Seeds (Non-Feminized)	\$ / pound							\$2,333
CBD Seeds (Feminized)	\$ each							\$1.05
Crude Hemp Oil	\$ / kilo							\$1,016
Refined Hemp Oil (Aggregate)	\$ / kilo							\$3,551
Distillate - THC Free	\$ / kilo							\$4,485
Distillate - Broad Spectrum	\$ / kilo							\$3,883
Distillate - Full Spectrum	\$ / kilo							\$2,831
CBD Isolate	\$ / kilo							\$2,489

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### Hemp Harvest 2019: Market Participants Face Challenges on Several Fronts as Industry Grows and Takes Shape

It appears that many state departments of agriculture, as well as hemp cultivators, will not know exactly how much hemp was harvested and processed this season until sometime next month, most likely around Thanksgiving. Industry observers are still expecting a record hemp crop. But reports from the field, as well as from state officials and from some companies, indicate that 2019 could end up being a very difficult hemp harvest in the United States.

As we expand upon below, unpredictable and unfavorable weather continued into the harvest season in many of the country's major hemp-producing states, impacting yield and quality negatively. Furthermore, farmers faced pressures from a variety of other sources at nearly every stage of the growing season, from bad genetics, to weeds, to a lack of manual labor.

Even growers that were able to bring in a crop successfully found that infrastructure for drying the greatly increased amount of biomass produced this year was insufficient in some areas of the country. Due to the aforementioned difficulties, we have revised our estimate of how much biomass will be generated from this year's harvest downward from our previous projections.

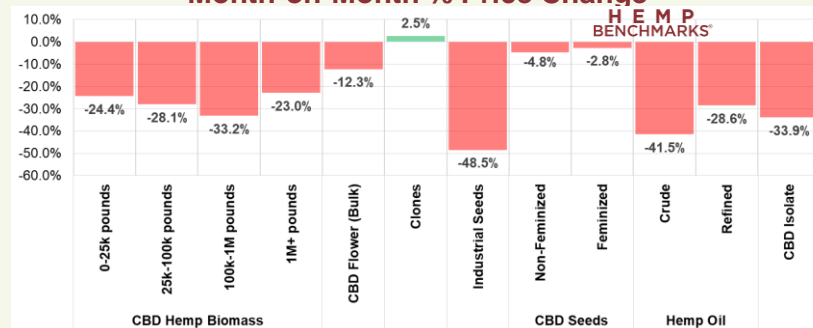
Farm equipment manufacturers and market participants are using their experiences to develop more efficient and effective tools and

approaches for getting crops out of the field. Meanwhile, a rash of litigation has hit the hemp industry, with lawsuits arising generally from a lack of agreed-upon standards in numerous aspects of hemp production and commerce.

The fact that federal and state rules remain under construction throws additional uncertainty into such matters, with questions continuing to arise regarding how THC potency is to be measured in determining whether or not a crop and the products generated from it are classified as industrial hemp or cannabis.

However, the USDA released a draft of its Interim Final Rule (IFR) for hemp production on October 29. Market participants hope the IFR will bring clarity to numerous facets of the nascent industry, but the USDA's initial interpretation of how THC potency is to be measured may result in the opposite. Hemp Benchmarks will undertake a detailed examination of the IFR and its implications for hemp commerce in our November report.

### Month-on-Month % Price Change



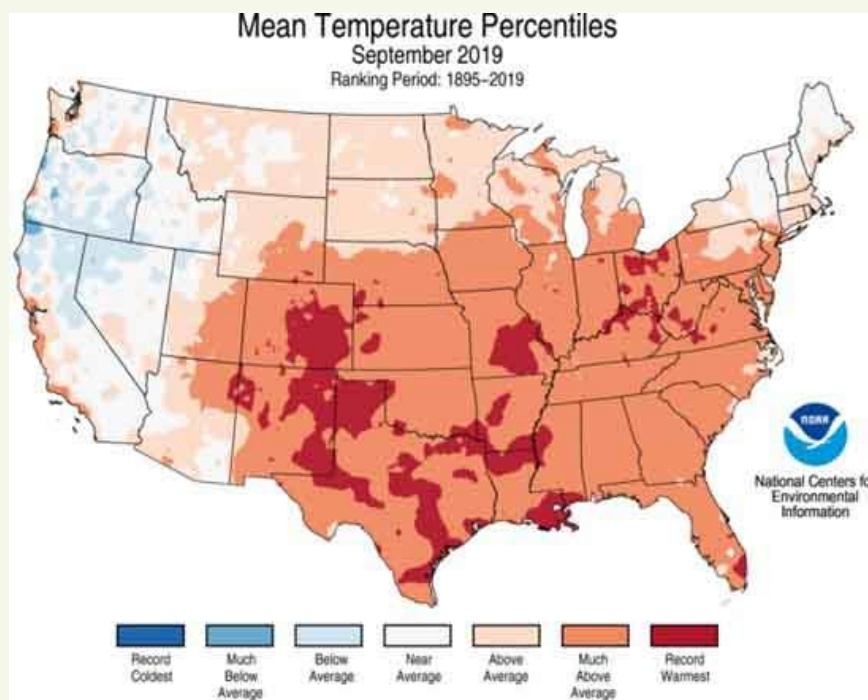
Source: Hemp Benchmarks®

### Weather & Crop Reports

Farmers across the country are dealing with difficult autumn harvest conditions, from blizzards to drought, capping off a year that has seen inclement weather challenge growers repeatedly. Following the record heat wave of this past summer, parts of the Midwest, the Northwest, and the Rocky Mountain region also had to contend with unexpected wintry weather and even blizzard conditions in October.

One hemp cultivator and industry consultant in central Oregon - one of the nation's most-densely planted hemp regions - noted that the state just endured its wettest September in 100 years. "To even get seven days without rain has been a challenge," he told Hemp Benchmarks. In comparison to last season, when there were sunny skies and temperate Indian Summer temperatures through October, Oregon has been coping with rain, cold weather, and freezing temperatures at night, making hemp farming "treacherous," he said.

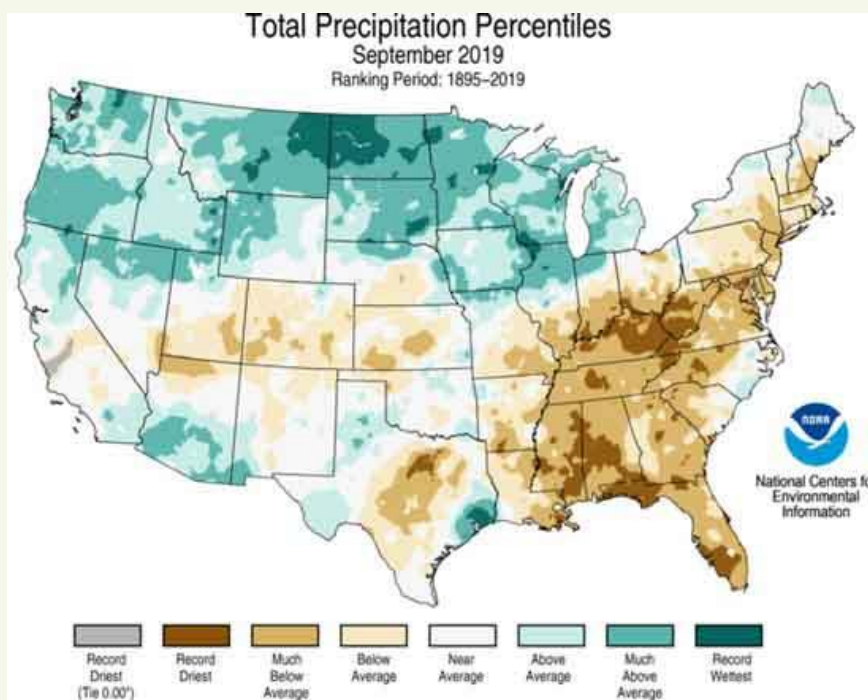
Consequently, many Northwestern hemp farmers who started their seasons relatively late are dealing with lower yields and reduced CBD potency. "People who got it in and planted prior to Father's Day [June 16] ... were able to harvest in September," the grower quoted above said. "The people who waited until after Father's Day are scrambling now. They didn't get the size out of the plant [during the growing season] and then they're crossing their fingers for the weather to cooperate."



The wet, cold harvest season in the Northwest and Northeast has also resulted in outbreaks of mold. Botrytis, also known as grey mold, bedeviled farmers from Oregon to Vermont. Mason Walker, CEO of East Fork Cultivars, a registered hemp farm in southern Oregon, told Hemp Benchmarks that some farmers in the area began seeing botrytis as early as September due to the wet conditions, which is quite rare. An experienced hemp and cannabis farmer, Walker said he expects a yield of about 1,200 pounds per acre, but that is lower than what he was hoping for at the outset of the season. Josh Gulliver, who planted 35 acres in Philomath, Oregon, told the Corvallis Gazette-Times in late September that he estimates he will lose 30% to 40% of his crop to botrytis.

As a result of issues such as botrytis, there are concerns that what was planted as top-grade CBD flower will now end up being harvested as biomass sent to processors, which is not as profitable as smokable hemp. Nicolaas Vanderwey, owner of NV Farms in Medford, Oregon, told KOB-TV in early October, "Biomass prices are super low."

Oregon was not alone when it came to damage from earlier-than-anticipated winter weather. The National Weather Service (NWS) reported that a record-breaking winter storm brought snow, blizzard conditions, and bitter cold temperatures to parts of Montana in the closing days of September. Adam Gray, the Hemp Program Coordinator for the Montana Department of Agriculture, reported that the September snow storm dumped up to four feet of snow in some areas of the state and that temperatures were





extremely cold. This was followed by another storm that resulted in more than a foot of snow accumulating. He estimated that more than 50% of the state's crop was frozen or snowed over.

Also in the north-central portion of the U.S., John Mortenson, Plant Protection Specialist with the North Dakota Department of Agriculture, said the hemp season in his state was going well, "until we got two feet of snow." North Dakota is also going through one of its wettest autumns on record.

However, Mortenson told Hemp Benchmarks that about half of his state's hemp crop was harvested ahead of the October blizzard. "Most of our grain guys, they're not just growing hemp, they're growing other crops as well," he said. "Prior to the snow they actually focused more on the hemp [harvest], just because of the lack of insurance on it. With their other crops they at least have some insurance to fall back on."

Colorado also saw early-season snow and freezing temperatures in early October. Such conditions were reported even in Pueblo, in the southeastern portion of the state, where a number of hemp and cannabis growers have set up operations in recent years.

The Southeastern U.S. and parts of the Mid-Atlantic region, meanwhile, have been contending with what the NWS describes as a "flash drought;" a combination of lower-than-normal rainfall coupled with periods of abnormally high temperatures that began in late August and continued through September and into October.

"The drought here in Kentucky has been pretty substantial across

every crop, including hemp." Sean Southard, Communications Director for Kentucky's Department of Agriculture, told Hemp Benchmarks. As a result, he said, Kentucky's hemp harvest period has been compressed from the usual 10 weeks to around six or seven weeks, putting pressure on farmers to get their plants out of the field.

Also in the Southeast, Tennessee was badly impacted by mold, according to an October 3 report from UPI. Harold Jarboe of Tennessee Homegrown told the outlet that many of the farmers in the state had their crops infected by mold, due to heavy spring rains that were followed by extreme heat into October. "This summer might have been the perfect storm as far as going and wrecking people's dreams," Jarboe stated to UPI.

In the Northeast, farmers also faced an unusually cold and wet harvest season from mid-September through October. Rain kept harvesters, both human and mechanical, out of the fields, extending the harvest period and increasing the risk of mold. One Vermont farmer reported that some of the biomass that was baled early was fermenting in the fields from the moisture.

Still, Stephanie Smith, of the Vermont Agency of Agriculture, Food and Markets (VAAF), stated to Hemp Benchmarks in an email on October 28, "crops that came in early are cleaner with less mold than we saw last year." However, she also wrote, "there are concerns about crops still in the field, and the potential of damage due to weather conditions, as many growers in Vermont continue to harvest."

# HEMP BENCHMARKS®

## U.S. Wholesale Hemp Price Benchmarks

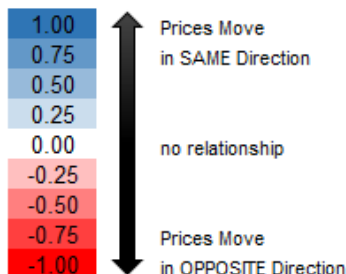
### Wholesale Prices - Correlation Matrix April 2019 to October 2019 Data

### HEMP BENCHMARKS®

	Biomass	CBD Flower (Bulk)	Clones	Industrial Seeds	CBD Seeds (Non-Feminized)	CBD Seeds (Feminized)	Crude Hemp Oil	Refined Hemp Oil	CBD Isolate
Biomass		0.02	0.83	-0.53	0.73	0.60	0.72	0.92	0.95
CBD Flower (Bulk)	0.02		-0.50	0.66	-0.45	0.25	-0.12	-0.09	-0.08
Clones	0.83	-0.50		-0.88	0.91	0.37	0.76	0.86	0.87
Industrial Seeds	-0.53	-0.88	-0.88		-0.73	-0.03	-0.49	-0.54	-0.57
CBD Seeds (Non-Feminized)	0.73	0.91	0.91	-0.73		0.56	0.92	0.84	0.83
CBD Seeds (Feminized)	0.60	0.37	0.37	-0.03	0.56		0.65	0.51	0.54
Crude Hemp Oil	0.72	0.76	0.76	0.92	0.92	0.65		0.87	0.85
Refined Hemp Oil	0.92	0.86	0.86	0.84	0.84	0.51	0.87		0.99
CBD Isolate	0.95	0.87	0.87	0.83	0.83	0.54	0.85	0.99	

#### Example:

The correlation between Refined Hemp Oil and CBD Biomass is +0.92. This means that, based on currently available data, the prices of these two products have almost always moved in the same direction by nearly the same magnitude month-to-month.



### What does this mean?

This wholesale price correlation matrix was generated from historical Hemp Benchmarks price assessments. It shows which product prices move together, move in opposite directions, or have no relationship at all.

Correlations range from 1 to -1. If two products have a perfect positive correlation coefficient of 1, then the prices for each have been observed to move in the same direction, either up or down, by the same magnitude. A perfect negative correlation of -1 means that prices for two products move in opposite directions. A correlation of 0 indicates no relationship at all.

### Interpretation

The correlation matrix shows most product prices are positively correlated, indicating that they generally move in unison and the hemp value chain is highly interconnected. The major exception is Industrial Seeds, which have shown a strong negative correlation. In other words, as prices have been deteriorating for most products, rates for Industrial Seeds have been on the upswing. Interestingly, the matrix also shows that prices for CBD Flower (bulk) and CBD Hemp Biomass have almost no relationship to one another.

### Hemp Crops Under Pressure from Numerous Sources

In addition to crop loss and negative impacts on the quality of the harvest due to poor weather, several other issues have caused difficulties for market participants and resulted in a smaller, lower-quality harvest than many had hoped for.

A number of state agriculture departments reported that bad genetics were the biggest factor in crop loss in their states. Some seeds sold as legal hemp resulted in “hot” plants that exceeded the 0.3% THC threshold. Vermont officials stated to Hemp Benchmarks that they were actively investigating reports of hot crops that may be a result of poor genetics. As we discuss below in more detail, though, determining whether a crop’s THC potency is compliant is not always as clear-cut as it might seem at first glance.

Also in regard to genetics, farmers and state agriculture departments reported that many batches of seeds had low germination rates or were not feminized as advertised. This resulted in large numbers of male plants that had to be culled by hand and female plants that went to seed if such efforts were not completely successful. The difficulties and large damages created by issues with genetics have spawned a number of lawsuits, as we detail below in the section on litigation.

In addition to the threat of pollination from male plants, “ditch weed,” or feral cannabis plants that grow wild in some parts of the country, can also pollinate female hemp crops being grown for CBD production. A farmer told Hemp Benchmarks that a 50-

square mile area in southern Colorado suffered from cross pollination. We also received reports from southern Oregon, Wisconsin, Illinois, and Kansas that hemp crops had been affected by cross pollination.

Steve Marsh, with the Kansas Department of Agriculture, reported that around four out of five fields were not producing, according to an early October report from the Abilene Reflector-Chronicle. The report states that growers attributed the poor production to a combination of bad genetics, poor seed planting, weeds, weather, and cross pollination from ditch weed.

Weeds also created issues for growers across the country. Chemical herbicides used widely to suppress weeds in the cultivation of traditional crops are not yet able to be used legally on hemp. Some farmers who planted seeds directly found it almost impossible to stay ahead of the weeds. Crop Infrastructure Corp., a public company with a large hemp operation in Nevada, reported that eight out of their 10 pivots were severely impacted by invasive weeds and estimated that 850 acres were lost. Many farmers simply did not have access to enough labor to suppress weeds manually in large plots.

In general, a major difficulty this year was the lack of the manual labor required to successfully weed, pull male plants, and harvest. Farmers without access to sufficient workers were struggling to bring their crops in, especially those that were forced to do so on short notice due to inclement weather.

Post-harvest, drying capacity remains a critical bottleneck in many parts of the country. Drying equipment is in short supply, and mechanical dryers have had problems with throughput and maintenance issues. Additionally, in some cases fires that have reportedly consumed barns and other buildings in which hemp was drying.

A hemp farmer and broker in the Mid-Atlantic region told Hemp Benchmarks, “We’ve been hearing terrible stories about multiple states with mold [on their hemp plants].” Part of the problem, he said, is “first year farmers hanging the plants really tight [to dry], not having proper air flow. And once you have mold, you have to take the plant into isolation and make it into an isolate.”

Problems with drying and processing this year’s expanded crop are arising even in states with more established hemp programs, namely Oregon. Mason Walker of East Fork Cultivars told Hemp Benchmarks that drying infrastructure in the state was insufficient to take in all the biomass produced this year by new and expanded farms.

He said that all of the drying services that he spoke to told him that they were, “bursting at the seams.” As a result, some farmers were attempting to dry their crops in the field, but persistent rains have resulted in hundreds of acres of rotting biomass in both southern Oregon and the Willamette Valley, a bit further north.

East Fork Cultivars is a relatively small farm, with 12 acres planted this year, and so they are able to dry their own harvest on-site. Walker also pointed out that, as a certified USDA Organic

operation, if East Fork were to attempt to contract out drying and other post-harvest processing services they would have to find similarly certified drying and processing businesses to take their biomass in order for the resulting products to maintain their organic status. Whether other farms certified as organic are being circumspect regarding this requirement is an open question.

Companies have been rushing to address the drying bottleneck. For example, Paragon Processing in Colorado is expanding its climate-controlled storage facility, increasing its current capacity of 3,000 to 4,000 pounds of wet weight per hour more than threefold.

“Now is prime harvesting time, and there is a lot of panic in the farming community because farmers have no way to dry their hemp crop,” said Paragon Processing Co-President Matt Evans in a late October press release. “This is a huge issue for farmers, and by adding 10,000 pounds of wet weight per hour of drying, we are taking action to help them save their hemp crop.” The press release states that Paragon will charge \$3 to \$4 per pound of dry weight for their drying services.

In North Dakota, John Mortenson of the state agriculture department told Hemp Benchmarks that about half of the hemp growers in the state are established commercial farmers. “So they have machine sheds and facilities,” he said, “and guys that don’t are renting buildings or are friends with somebody that has a building that they’re going to dry it in.”

For those without access to such resources, lack of drying capacity is reportedly prompting some desperate farmers to grind up their plants whole. This is not an ideal solution according to one hemp processor, as the resulting melange of flower, leaves, stalks, seeds, and other material results in lower processing efficiency.

Kris Schneider, of Biomass Isolation in Colorado, stated in an email to Hemp Benchmarks, “while I certainly understand the appeal of using existing (and often paid for) equipment like silage grinders to grind whole plants, many don’t seem to understand the cost dynamics surrounding sales on an open market and toll processing - no sense paying more money to process more material in order to get the same yield.”

Insufficient storage and processing capacity in some regions are cutting into the margins of farmers who are forced to move their production across state lines. An October 22 report from the Ashland Tidings quotes Pete Gendron, president of the Oregon SunGrowers’ Guild, as stating, “The vast majority of Oregon’s production is going out of state,” he continued, “We just don’t have sufficient production capacity to handle the load.” The Tidings report says that buyers in other states are “clamoring” for hemp grown in southern Oregon due to its high quality, with Gendron estimating that 70% of the crop will leave the state for markets such as Colorado, where there are more processing facilities.

Other states with established hemp programs have been working to eliminate processing and storage bottlenecks. Sean Southard, of the Kentucky Department of Agriculture, said there were 202 hemp processors in his state at last count, including, “what we

think is one of the first hemp storage warehouses coming online in central Kentucky; kind of like what we saw in the [state’s] tobacco era.”

Unsurprisingly, the difficulties seen in some of the major hemp-producing states are also being felt in those with newer programs. In Indiana, some farmers in the state have reportedly been taken aback at the difficulties they have encountered in getting the plant from the field to the warehouse.

Don Zolman, who recently started harvesting his hemp crop in Warsaw, Indiana, told the South Bend Tribune he had hoped to use a sickle mower during his harvest. But that harvester, he said, shook the hemp so much he was afraid of losing most of the plants’ CBD-rich flowers. Instead he has resorted to manual labor, using machetes to cut down the thick-stalked plants.

Similar accounts have emerged from around the country, as growers realize how thick and fibrous the stalks of the hemp plant can be. In the following section, we detail equipment and approaches being employed by farmers to bring in their crops successfully and efficiently.

### Harvesting Hemp: Challenges Spur Innovation in Approaches and Equipment

Harvesting hemp fields presents another set of challenges, as we have noted already. As our reporters visited hemp farms across the country, we saw farmers experimenting with different types of harvesting equipment, with many of the smaller (less than 100-acre) farms relying on labor-intensive hand harvesting. Farmers of industrial hemp for fiber and seed seem to have successfully adapted combine harvesters and sickle bar mowers to harvest their hemp fields. Harvesting the thick stemmed, heavily flowered CBD cultivars, on the other hand, can present difficulties.

Many farmers we visited were in the process of hand harvesting the large clusters of flowers at the tops of hemp plants, known as colas. The large buds are then carefully dried and trimmed for sale as smokable CBD, as well as CBG, flower, which has been a very strong market with premium prices. While labor intensive, farmers believe that the product will garner prices high enough to justify the expense.

Farmers are experimenting with many different types of traditional, in many cases re-engineered, forage harvesters, tobacco harvesters, and combines, with somewhat mixed results. Landin Butterfield, the Director of Operations for Swan Lake Farms, with 220 acres under pivot cultivation in Oregon, told the Lancaster Farming Podcast on August 14 that after hand harvesting the colas, with a team of 15 people harvesting five to six acres a day, he used a combine to harvest up to 60 acres of CBD biomass a

day without significant issues.

Other farmers are encountering challenges in attempting to adapt equipment expressly developed to harvest, corn, wheat, or tobacco to the tasks of cutting the thick stems of CBD plants and stripping the flowers from them cleanly. However, farm equipment companies are innovating quickly.

In the Northeast, United Hemp Services has had good success with a John Deere 8300 harvester, retrofitted with a proprietary header that is stripping and destemming the hemp plants to produce clean biomass very efficiently. United Hemp reported that there are two harvesters in Vermont, with 14 similar types of harvesters in Colorado and Oregon.

Two leading manufacturers of tobacco harvesters, KIRPY MFG Inc. and the MarCo Manufacturing Company, have re-engineered tobacco harvesters for hemp. The KIRPY CBD Hemp Harvester - the Triminor - is an automatic, whole plant harvester for cutting, notching, and loading entire CBD hemp plants. It is reportedly capable of processing up to five acres per day. MarCo re-engineered the 6027 burley tobacco harvester to adapt it for hemp; it is now known as the 6031 hemp harvester.

New equipment is being shown at agricultural fairs around the country. At the National Farm Equipment Show, Hinker Company displayed a second-generation prototype hemp harvester with a single-row rotary cutter shear that uses different spacing, designed specifically for CBD hemp. Bish Enterprises displayed the

SuperCrop hemp header, a combine that was designed to reduce or eliminate the wrapping issues with hemp fiber. Agri-Products has designed the Hempster, which mechanically separates the flowers and the leaves from the stem.

But large farm equipment is expensive and, in most cases, unproven. Many farmers, particularly with smaller farms, are resorting to hand harvesting, cutting the plants down with electric tobacco knives, shears, or machetes. The plants are then laid flat on a truck for transport to a drying facility or compressed in the field using a baler. While hand harvesting results in less loss and damage than the harvesters and combines, it requires access to a large labor pool, and it can take weeks to bring in a crop. Such considerations may overwhelm farmers who have not made adequate plans for the harvest.

### Revisiting Estimates of Biomass Yield (Again)

In August, Hemp Benchmarks estimated that between 240,000 and 288,000 of the roughly 480,000 permitted acres counted at the time had actually been planted. Last month, we revised that estimate to account for new reports of licensed acreage from state departments of agriculture and reduced our planting rate assumptions slightly to arrive at an estimate of roughly 272,000 acres planted out of about 544,000 licensed.

Subsequent assumptions regarding how much of the acreage is being grown for CBD production, as well as how much will actually be harvested successfully, resulted in Hemp Benchmarks estimating last month that between 98,000 and 122,000 acres of

CBD-rich hemp would be harvested and processed this year, generating between 98 and 122 million pounds of biomass at an average CBD potency of 8%.

However, given the inclement weather that has transpired from September into October in many of the country's highest-producing hemp states, along with reports from the field of substantial crop loss and post-harvest bottlenecks in drying and processing, we have once again revised our supply estimate for the 2019 hemp growing season.

We are now estimating that only 35% of the roughly 272,000 planted acres will be harvested, dried, and processed successfully. At an average yield of 1,000 pounds per acre, this will result in just over 95 million pounds of biomass. Additionally, as we noted above, there are concerns that the overall quality of the harvest will be impacted negatively by the poor weather conditions experienced in numerous regions of the country.

A final caveat to consider when attempting to gauge U.S. hemp production is an account from a researcher who has been studying the industry, including working on farms in a major hemp-producing state. This individual stated to Hemp Benchmarks that they had first-hand knowledge of one large farm that planted between 25% and 40% more acres than the several hundred that it registered with the state agriculture department. According to the researcher, other anecdotal accounts indicated that this was not uncommon. If such reports are accurate, then estimates of U.S. hemp production using licensed acreage as a baseline assumption may be low.

### Delta-9 or Total THC? Conflicting Definitions of Hemp Cause Confusion

Another area of confusion and concern in the market is the technical definition of industrial hemp under federal and state laws. The common definition of hemp is now fairly well known: cannabis sativa containing less than 0.3% THC. The issue is whether the calculation of THC tests only the level of delta-9 tetrahydrocannabinol (the psychoactive molecule responsible for the “high” felt by cannabis users, commonly referred to simply as “THC”) or also includes THCA (the acidic, non-psychoactive form of THC present in the plant). Including both THCA and delta-9 THC in such calculations has become known as the “Total THC” standard.

As we expand upon below, the statutory language of the 2014 and 2018 Farm Bills appears to dictate that only delta-9 THC be tested for. However, several states - most notably Oregon - have adopted the Total THC standard. Further complicating matters, the draft of the U.S. Department of Agriculture’s (USDA’s) Interim Final Rule (IFR) for hemp production - released on October 29 - also calls for hemp to be tested for Total THC.

Under the 2018 Farm Bill: “the term ‘hemp’ means the plant Cannabis sativa L. and any part of that plant, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.” This is the same definition found in Section

297a of the Agricultural Marketing Act of 1946.

Section 7606 of the 2014 Farm Bill had a more concise definition of industrial hemp: “the plant Cannabis sativa L. and any part of such plant, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.”

We believe the definitions of hemp in the 2014 and 2018 Farm Bills offer a difference without a distinction. In a legal memorandum dated May 29, 2019, the general counsel of the USDA seemed to gloss over the differences in the definition, stating, “[h]emp is defined under the 2018 Farm Bill to include any cannabis plant, or derivative thereof, that contains not more than 0.3 percent delta-9 tetrahydrocannabinol (“THC”) on a dried weight basis.”

Neither statute has any explicit reference to THCA and the general consensus in the industry - at least until the USDA’s recent release of the IFR draft - was that the federal definition would not include THCA. However, the USDA’s interpretation, in the “Definitions” section of the draft IFR, is that:

*The 2018 Farm Bill mandates that all cannabis be tested for THC concentration levels using “postdecarboxylation” or similar methods. In the context of this part, “postdecarboxylation” means testing methodologies for THC concentration levels in hemp, where the total potential delta-9- tetrahydrocannabinol content, derived from the sum of the THC and THCA content, is determined and reported on a dry weight basis.*



Even prior to the release of the USDA rules, conflicting regulations and confusion arose at the state level. Some states, or state agricultural departments, interpreted the specific reference to “acids” in the 2018 Farm Bill to include THCA in determining if a crop’s THC levels are above or below the 0.3% legal threshold; the Total THC standard, in other words. Adopting this criteria would have a significant impact on what CBD-rich cultivars currently being grown in the U.S. qualify as hemp, as many reportedly exceed 0.3% Total THC fairly commonly.

The vast majority of states have either expressly referenced or adopted the federal standard and use language in their rules nearly identical to that found in either the 2014 or 2018 Farm Bills. Only three states explicitly reference Total THC in the definition of industrial hemp: Illinois, Rhode Island, and Washington.

Five states - Arkansas, Colorado, Florida, Nevada, and Oregon - have formulated their own definition of industrial hemp as cannabis with less than 0.3% tetrahydrocannabinol, or THC, by dry weight, without a reference to delta-9 THC or THCA. The Colorado and Nevada statutes, however, expressly confirm in different sections that delta-9 THC has the same meaning as THC, without reference to THCA. In other words, it is unclear whether the rules in Arkansas or Florida intend to define hemp according to its delta-9 THC potency alone or the Total THC standard.

In Oregon, the state Department of Agriculture (ODA) has created confusion and concern by ruling that hemp grown in the state must meet the Total THC standard in some cases. In fact, the ODA was

receiving so many inquiries regarding its testing requirements that on October 23 it sent out a bulletin detailing them. According to the ODA’s bulletin, “Pre-harvest testing for 2019 is for delta-9 THC only. The plants must be in the field. The pre-harvest sampling and testing qualifies the plants legally as industrial hemp.” However, it notes that beginning in 2020 pre-harvest testing will employ the Total THC standard.

Post-harvest testing is also required in certain instances in Oregon. The ODA’s bulletin specifies that if biomass is being sold directly to a “handler” or if it is going to be processed into an extraction or concentrate that includes a sterilization step, as is the case with some solvents and alcohol extraction, then post-harvest testing is not necessary.

However, the Total THC standard is technically supposed to be used currently in Oregon for smokable hemp flower. According to the ODA, “If the plant material (biomass) is going to be turned into retail-ready flower/bud/pre-rolls. [It] must be tested in 30 pound batches for potency (total THC and CBD), pesticides, water activity, and moisture content.”

Although the ODA’s position is controversial, lawyers in Oregon are advising clients to test for Total THC. Producers in other states are concerned that other agricultural departments might follow the lead of the ODA.

Potential issues created by the ODA adopting the Total THC standard may be mitigated, at least this season, for a couple reasons. First, Oregon law does not require that hemp exceeding

0.3% Total THC must be destroyed; such product may still be processed into compliant extracts. This apparently only creates a risk if a producer needs to move the non-compliant biomass out of state for processing. Even then, issues would only arise if the biomass was moved to one of the three states that has adopted the Total THC standard, or if the biomass was also above 0.3% delta-9 THC. (Biomass can be below 0.3% delta-9 THC and exceed 0.3% Total THC simultaneously.)

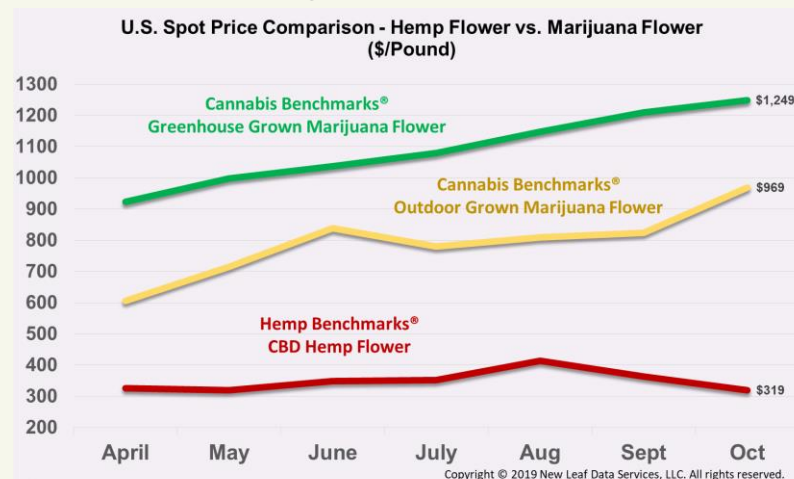
Second, as a grower in Oregon emphasized to Hemp Benchmarks, the ODA is not a body with significant enforcement capabilities. The grower stated the “one saving grace for the industry” is that the Total THC standard is not being stringently enforced.

The grower said that essentially all of the cultivars available from Oregon’s most prominent sellers of high-CBD hemp seeds will result in plants that exceed the 0.3% Total THC threshold if taken to full maturity, although plant material from such varieties will typically pass pre-harvest testing and qualify legally as hemp when sampled roughly a month prior to harvest, which is the customary approach.

Yet, reports from market participants indicate that smokable flower that is non-compliant according to Oregon’s Total THC standard is still being bought and sold largely without incident. Additionally, Hemp Benchmarks has heard reports from market participants across the country that certificates of analysis (COAs) from labs affirming that a batch of hemp qualifies legally as such are sometimes being faked, while valid COAs are sometimes being

appended to different batches of product.

In other words, while many have concerns about “hot” hemp, market participants are apparently finding ways, sometimes unscrupulous ones, to get their products into commerce.



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Additionally, varying standards at the state level are causing confusion as to which state's definition of hemp and accompanying THC standard applies in transactions between parties in different states. For example, if smokable flower grown in Oregon does not meet the Total THC standard but is under 0.3% delta-9 THC, can it legally be sold to a buyer in a state that uses the latter standard?

Prior to the USDA's publication of the draft IFR, industry observers said it would be helpful for the agency to explicitly clarify that the 0.3% threshold in federal law excludes THCA. Doing so would also likely motivate states such as Oregon change its definition of hemp to one based on delta-9 THC potency only, as farmers and other hemp businesses would be put at a serious competitive disadvantage if held to the Total THC standard.

However, the USDA's draft IFR for hemp production will disappoint those that called for a THC standard for hemp based on the delta-9 form of the molecule. The draft IFR states (emphasis ours):

*The THC concentration of all hemp must meet the acceptable hemp THC level. Samples must be tested using post-decarboxylation or other similarly reliable analytical methods where the total THC concentration level reported accounts for the conversion of delta-9-tetrahydrocannabinolic acid (THCA) into THC. Testing methodologies currently meeting these requirements include those using gas or liquid chromatography with detection.*  
**The total THC, derived from the sum of the THC and THCA content, shall be determined and reported on a dry weight basis.**

The IFR provides some leeway, with testing labs required to calculate the measurement of uncertainty (MU) of their methods and equipment and report it along with THC test results. The MU will be taken into account when evaluating THC test results, potentially allowing some crops to qualify as legally compliant even if initial test results put them over 0.3% Total THC, according to the draft IFR. For example, if a sample tests at 0.35% Total THC, but the MU reported by the lab is 0.06%, then a THC level of 0.29% is within the range of possibilities and the crop in question would qualify legally as hemp.

As we note below, in the "Federal Regulatory Updates" section, the USDA's draft IFR is not yet set in stone. The document itself states that what is actually published in the Federal Register on October 31 could change from the draft. A comment period will follow its publication and stakeholder input could result in changes prior to a final rule being published.

Overall, though, if the Total THC standard is maintained in the official IFR published in the Federal Register, then much of the current hemp industry will be operating in contravention of the new rule, which goes into effect immediately upon publication. Dozens of state departments of agriculture, as well as the farmers and processors in those states, have been using delta-9 THC potency to qualify crops and the products generated from them as legal hemp. How exactly the USDA's IFR will impact the industry remains to be seen, a matter that we will cover in depth in our subsequent report.

### Hemp Litigation

Inevitably, as the amount of capital at risk in the hemp sector has exploded, so have the number of lawsuits. There has recently been an increase in the amount of litigation up and down the supply chain, which has included a number of prominent companies and high-dollar damage claims. In what follows, we provide examples of the areas in which litigation has been initiated in the young hemp industry.

#### *Bad Seeds*

As we have pointed out, bad seeds have led to heavy losses across the industry. Problems include, but are not limited to, poor germination rates, a high frequency of male plants in supposedly feminized seed, and actual CBD potency not matching what was advertised. In a recent headline-grabbing lawsuit, The Oregonian reported in late September that Elemental Processing, a large Kentucky-based operation, sued an Oregon seed company for \$44 million. Elemental said it had purchased from the Oregon company 6.4 million seeds that were supposed to be feminized with a high germination rate.

The Oregonian report states that Elemental distributed the seed to local farmers, but claimed that as many as 70% of the resulting plants were male. The Kentucky crop was destroyed to avoid pollinating other area hemp crops, resulting in a large loss for the farmers and the processor.

A New Jersey hemp company with operations in California,

meanwhile, filed a suit against an Oregon seed distributor in California federal court, according to Law360. The suit alleges the seed distributor supplied 450,000 defective hemp seeds in violation of California unfair competition and false advertising laws, causing about \$30 million in losses.

In addition to these large cases, we have talked to dozens of farmers that are in dispute with seed companies for bad genetics, for cases of non-feminized seed sold as feminized, as well as for seeds with low germination rates. Many of these disputes are settled quietly, but in some cases the seed distributors disappear, refuse to cooperate, or have no assets that can be put toward recouping the losses of those that purchased the seeds.

#### *Biomass*

There have also been several high-profile lawsuits between producers and processors over biomass purchase agreements. A case reported on by Montana Public Radio in early October described a lawsuit in which farmers in Montana and North Dakota are seeking \$7 million, plus punitive damages, from a local processor. The suit claims the processor refused to purchase the biomass that was grown under contract.

Another example includes dueling breach of contract claims filed by Canopy Growth and Go Farm Hemp. The two companies entered into two biomass purchase agreements for farms in New York, North Carolina, Colorado, and Kentucky. The farms in question covered a total of 1,115 acres, with the purchase price to be paid in three installments.

First, Go Farm sued Canopy for allegedly failing to make the final installment payment of \$1.9 million. In turn, Canopy sued Go Farm for fraudulently taking \$8 million in installment payments, alleging that Go Farm concealed poor or nonexistent output at its farms and diverted the payments for personal use.

### ***Class Action Suits Over Mislabeled CBD Products***

The publicity around mislabeled CBD retail products has attracted the attention of the class action bar. Class action lawsuits over label claims have been an ongoing occurrence in the food industry. That trend has also spread into the health, beauty, and cosmetics spaces, making it unsurprising that it would arise in the nascent hemp-CBD industry, where uniform labeling standards of the type that consumers are accustomed to in mature, regulated industries are essentially nonexistent.

To date, we are aware of three class action suits claiming that CBD brands mislabeled their products, specifically that the amount of CBD contained therein was misrepresented. These suits typically seek refunds, disgorgement of profits from the sale of the products, and treble or punitive damages. Consumers often get a coupon - usually a small amount for each individual, but a large aggregate amount for the class - while the class action lawyers can secure large fees for themselves. These lawsuits should encourage emerging brands to focus on quality control and quality assurance, which will benefit the market.

### ***An Attorney's Viewpoint***

Garrett Graff, Managing Attorney at the Denver-based Hoban Law Group, told Hemp Benchmarks that litigation is not unusual in the agriculture business and is a sign of a maturing industry. He noted that in any early-stage industry there will be what he described as “regulatory deficiencies.”

One example: unlike other agricultural sectors that rely on certified genetics, Graff pointed out, “the hemp industry is in this odd, awkward purgatory ... where much of the industry relies upon non-certified genetics.” As a result, inconsistencies between what is being advertised in regard to the genetic characteristics of seeds and clones and what actually manifests in the growing crops lead to lawsuits such as the ones described above.

Ultimately, he does not expect current litigation to significantly impact the hemp boom. In fact, Graff said, “I think you’ll absolutely see more lawsuits of this kind. Any industry in a rapid growth stage is going to see issues that are derivatives of those growing pains. So it’s not unexpected.” Graff added that, in the future, a more settled regulatory landscape “will help root out some of these issues,” as well as “better define the parameters by which all these operators will play.”

# Federal Regulatory Update



### Federal Regulatory Update

Even though Congress and the federal government have been preoccupied with a wide variety of issues this autumn, there has been some movement regarding hemp regulations, guidelines, and protocols.

### *USDA Hemp Production Regulations Released*

A draft of the USDA's long-anticipated regulations for hemp production were published on October 29. As we have mentioned in multiple prior monthly reports, the agency's Agricultural Marketing Service (AMS) first said the agency would release the new federal regulations in August. Through most of this month, USDA officials stated that the rules were still being subjected to interagency review.

On October 28, Politico reported that the USDA's Interim Final Rule (IFR), titled, "Establishment of a Domestic Hemp Production Program," had been approved by the White House Office of Management and Budget (OMB).

The following day, USDA released a [draft version of the IFR](#). The document states, "The official publication of the interim final rule in the Federal Register may include changes from this version. The effective date of the interim final rule is, and the comment period will not begin until the date of publication in the Federal Register."

As indicated, there will be an opportunity for public comment on

the IFR subsequent to its official publication, with the possibility that it could be modified based on stakeholder input.

Bill Richmond, head of the Hemp Program at the USDA's Agricultural Marketing Service, stated to Hemp Benchmarks in an email, "Since the document we are issuing is an interim final rule we need to issue a permanent final rule down the road. We will rely on the feedback submitted during the public comment process to help decide what to include in the final rule."

A subsequent update from Richmond, emailed on October 29, stated, "The official version of the rule will be published in the Federal Register on Thursday, October 31. The rule is effective immediately and there is a 60-day comment period. We are also issuing several new forms and guidance documents to accompany the rule, which are available on our website."

Hemp Benchmarks will undertake a detailed analysis of the USDA's IFR for hemp production and its implications for commerce in our November report.

### *The EPA and Pesticides for Hemp*

As mentioned in last month's report, the U.S. Environmental Protection Agency (EPA) has taken steps towards the eventual approval of regulations that would allow pesticides to be used on hemp crops. That movement has come after continued pressure by hemp advocates and the agricultural industry.

In late September, the National Industrial Hemp Council (NIHC) and American Farm Bureau Federation sent a joint letter to the EPA, asking the agency to move forward in approving the 10 existing pesticide applications currently under consideration. “[F]or hemp to reach its full potential, it is essential that EPA take a leadership role in consistent review of applications for use on hemp,” the letter said, “to facilitate a consistent and equal playing field to the degree possible across state jurisdictions.”

The letter continued, NICH “therefore encourages EPA to approve all ten applications to add hemp uses to the label promptly. It is essential to the industry that key crop protection tools for hemp production are in place for the 2020 growing season and beyond.”

### ***Schumer Urges Federal Financial Agencies to Issue Hemp Industry Guidelines***

New York Senator Chuck Schumer is calling on the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), and the Office of the Comptroller of the Currency (OCC) to issue guidelines to financial institutions that could confirm the legality of the hemp industry and allow it to expand.

“If the financial institutions aren’t given updated guidance by the major federal financial regulators clarifying the legality of industrial hemp, the industry in Western New York ... will continue being tightly bound, prevented from growing and creating the good-paying jobs they’d otherwise be able to,” Schumer said during a public appearance in early October.

### ***Dietary Supplement Industry Asks Congress to Address Federal Status of CBD***

Four major trade associations, representing the U.S. dietary supplement industry, are urging that federal lawmakers “ensure consumer safety and provide legal clarity” in the nation’s CBD product marketplace.

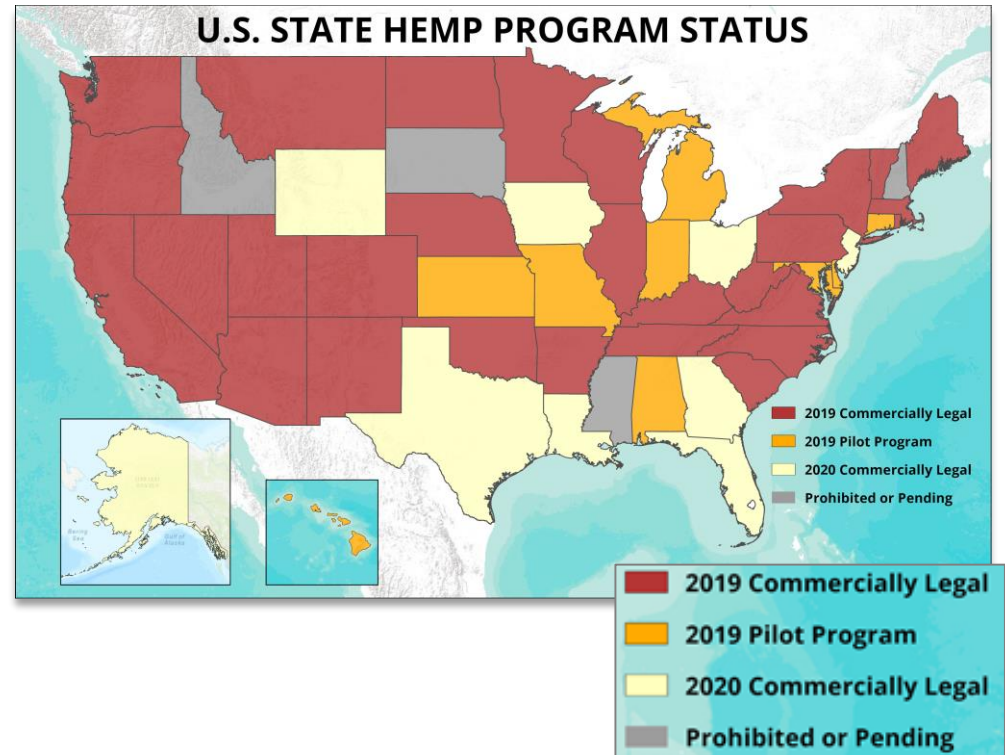
In an October 8 letter, the American Herbal Products Association (AHPA), Consumer Healthcare Products Association (CHPA), Council for Responsible Nutrition (CRN), and the United Natural Products Alliance (UNPA) called on Congress “to pass legislation to clarify that CBD derived from the hemp plant is a lawful dietary ingredient if the dietary supplement containing the CBD meets established product safety and quality criteria.”

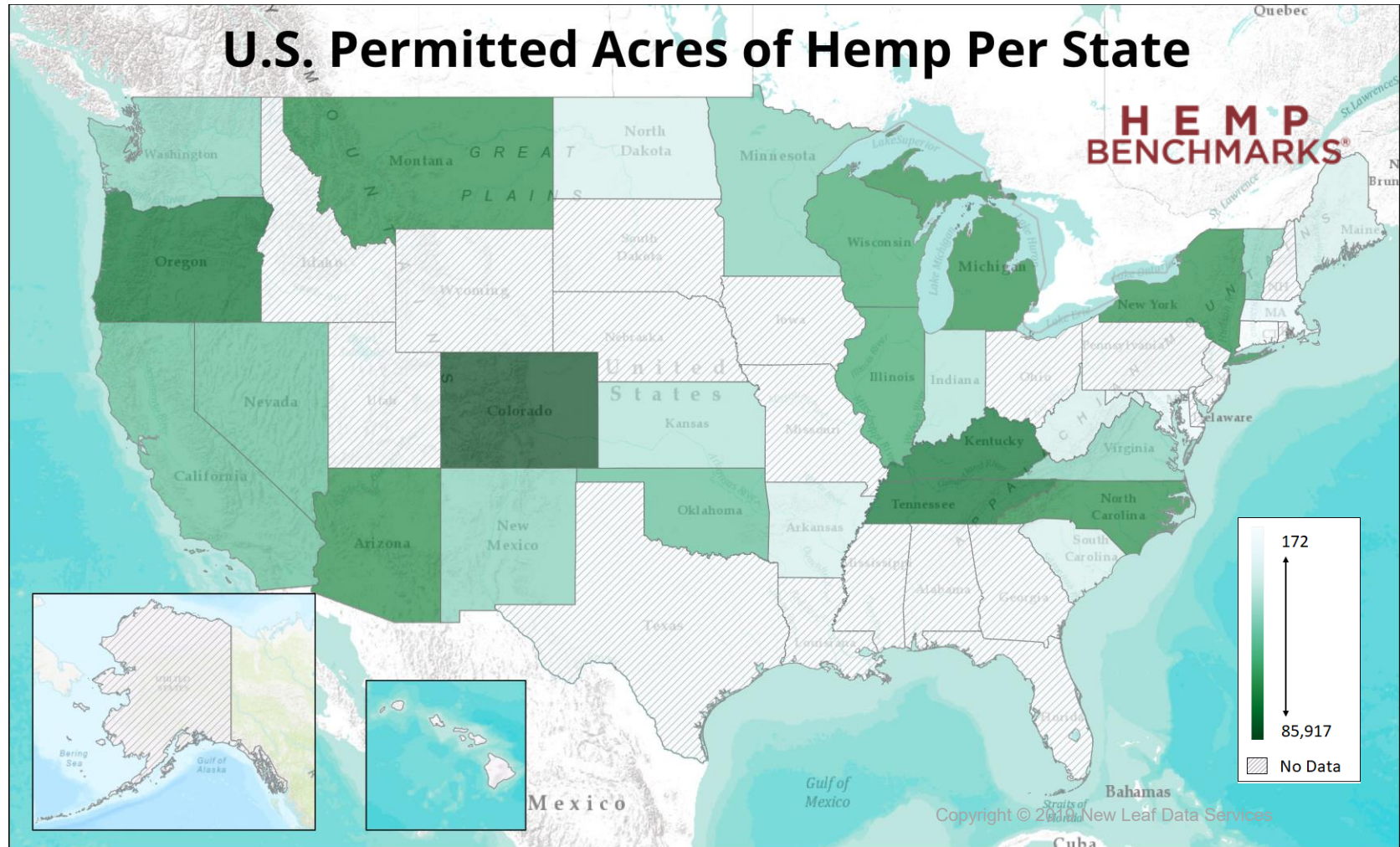
The trade groups noted that the FDA has been working “to craft its policy on hemp-derived products.” However, the letter points out, “in July 2019 testimony before the Senate Agriculture Committee, the [FDA] stated that it could take three to five years for even an expedited rule-making process to establish a legal regulatory pathway for use of CBD in dietary supplements and conventional foods”

Given the rapidly-growing marketplace of hemp products, the letter continued, “it is crucial that Congress take quick action to clarify the legal status of hemp-derived CBD dietary supplements. At the same time, it is equally essential for FDA to have the resources it needs to protect the public from unsafe CBD products.”

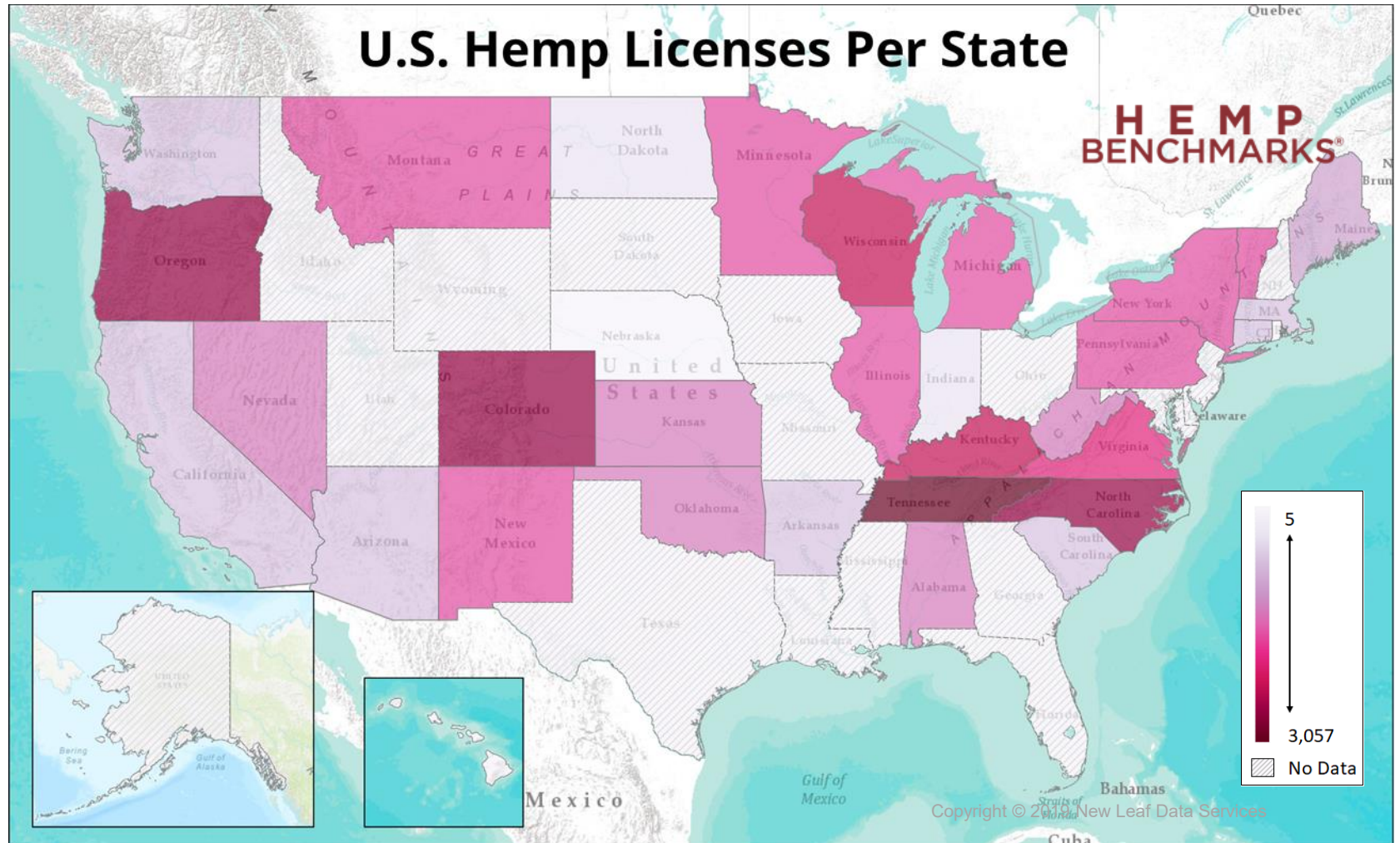


# State Updates





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### UNITED STATES COVERAGE

STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft	STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft	STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft
Alabama	157	2,000		Louisiana				Ohio			
Alaska				Maine	162	3,000		Oklahoma	225	9,606	
Arizona		37,000		Maryland		1,400		Oregon	1,883	63,000	10,156,834
Arkansas	101	3,200		Massachusetts	102	730	147,000	Pennsylvania	323		
California	114	8,862		Michigan	541	32,243		Rhode Island	5		
Colorado	1,933	85,917	13,800,000	Minnesota	314	7,667	681,077	South Carolina	113	3,300	
Connecticut	82	294		Mississippi				South Dakota			
Delaware				Missouri				Tennessee	3,057	37,432	115,144,316
Georgia				Montana	277	45,000		Texas			
Florida				Nebraska	10			Utah			
Hawaii	30	172		Nevada	207	10,030		Vermont	570	7,800	
Idaho				New Hampshire				Virginia	700	7,000	
Illinois	530	18,860		New Jersey				Washington	133	7,000	
Indiana	140	5,300	515,000	New Mexico	404	7,448	7,600,000	West Virginia	178	2,531	
Iowa				New York	267	20,727		Wisconsin	1,247	16,958	
Kansas	196	5,732		North Carolina	1,523	33,908	10,076,710	Wyoming			
Kentucky	1,047	60,000		North Dakota	56	3,212		<b>TOTAL</b>	<b>16,627</b>	<b>547,329</b>	<b>158,120,937</b>

#### State Updates

Below are updates on developments in industrial hemp and CBD production, market formation, legislation, and regulation at the state level.

##### Alabama

Alabama Agriculture Commissioner Rick Pate told the Decatur Daily in late September, “Only 126 approved applicants actually planted a crop.” A mid-October report from local outlet WSFA noted that 157 growers were approved to cultivate hemp in Alabama this year and that over 2,000 acres were planted.

The Daily’s report also quoted Pate as saying that none of the hemp samples collected in the state at the time exceeded the 0.3% THC potency limit.

##### California

On October 12, California Governor Gavin Newsom signed Senate Bill 153 into law. The measure revised the state’s earlier hemp laws, according to an October 15 rundown by the attorneys at Canna Law Blog (CLB). According to CLB, SB 153 added a new definition of industrial hemp to the state’s food and agriculture code that is specific to hemp cultivation. It also creates enforcement protocols against false statements on applications.

Under the new measure, California’s Secretary of Food and Agriculture must develop and submit to the USDA a state plan on hemp cultivation that complies with the 2018 Farm Bill by May 2020.

##### Florida

Florida’s Department of Agriculture and Consumer Services began a series of public hearings in mid-October to discuss final draft rules for the state’s hemp program. Earlier this year, Governor Ron DeSantis signed into law legislation that authorizes a legal commercial hemp program.

The state is expected to issue permits for the 2020 growing season. According to Florida Politics, farmers in the state are concerned about hemp seed quality for their crops. The report notes that the draft rules specify hemp seed with less than a 60% germination rate cannot be sold in the state.

##### Indiana

An October 15 report from local outlet WTHR states that the Office of the Indiana State Chemist granted 140 licenses to grow roughly 5,300 acres of industrial hemp across Indiana this season. 515,000 square feet of hemp is also being grown in warehouses and greenhouses in the state. Those licenses reportedly include about 15 different varieties of hemp that are being grown for grain, fiber, and CBD, according to WTHR.

The state had a very wet beginning to its 2019 season, according to an October 16 Indianapolis Star report, which also notes that estimates put the number of acres actually planted at about 3,000.

#### **Kansas**

The Kansas Department of Agriculture (KDA) released an update in September on the Department's Industrial Hemp Research Program. According to the KDA, 260 hemp-related licenses were issued this season: 196 growers, 20 distributors, 35 processors, and nine to universities.

2,376 acres were planted in 57 Kansas counties, or about 47% of the acreage licensed. 30 licensees have not indicated whether or not they have planted. 17 licensees indicated they did not plant at all. Reasons given for not doing so include conditions being too wet, not being able to find seed, and it being too late to plant. As we noted above, local media reports indicate that the state's crop did not fare particularly well this year, based on remarks from state agriculture officials.

#### **Montana**

Montana grew about 22,000 acres of hemp last year, the most of any state, as part of its pilot program. Those numbers increased substantially this season. "We have 43,626 total registered acres," Ben Thomas, Montana Department of Agriculture director, told the Billings Gazette in late September. "There are an additional 13,036 acres that were projected but not yet reported on, they should come in over the next two weeks. So, 50,000 acres as a ballpark should be pretty close, with 45,000 acres being a more conservative estimate."

The state agriculture department reports there are 277 farmers currently licensed by Montana to cultivate hemp. Above, in the "Weather & Crop Reports" section, we quoted a state agriculture

official who estimated that as much as half of Montana's crop was subjected to late September snowstorms and freezing temperatures.

#### **New Mexico**

In a late October report, the Albuquerque Journal quotes Duke Rodriguez, president and CEO of licensed medical cannabis producer Ultra Health, which is the parent company of Ultra Hemp, as stating that he expects only about a third of the hemp grown in New Mexico to be harvested successfully. Rodriguez told the Journal that Ultra Hemp's own operation saw "mixed results" this season. The report states that growing conditions were less than ideal, with a very hot summer, high winds, and autumn rains impacting New Mexico's hemp crop.

#### **North Carolina**

On October 24, WRAL reported that North Carolina lawmakers agreed to provisions of the state's Farm Act, Senate Bill 315, that will ban smokable hemp beginning in June 2020. Farmers may still sell their produce as smokable hemp until that time.

#### **West Virginia**

The Associated Press, quoting West Virginia Agriculture Commissioner Kent Leonhardt's office, reported that about 130 farmers grew 641 acres of industrial hemp this season, up from 155 acres in 2018.

### Wisconsin

Sheri Walz, Assistant Legal Counsel in the Office of the Secretary at the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) provided the following information to Hemp Benchmarks this month.

From the beginning of this year to October 11, 2,037 hemp samples were processed by the state's lab, with 291, or 14.3%, failing due to being above 0.3% THC potency. In the same span, Wisconsin officials issued 1,646 Fit for Commerce (FFC) certificates.

A mid-October report from Wisconsin Public Radio quoted several hemp market participants in the state who were concerned that delays in processing samples for THC testing by the DATCP's lab were resulting in crops testing "hot." The report states that the THC potency of industrial hemp plant material can increase over time.

## PRODUCT DEFINITIONS

### **CBD BIOMASS**

Dried hemp plant materials from cultivars that primarily produce cannabidiol (CBD) including the stalks and leaves that may include flowers/buds and/or seeds that have been harvested. Free of mold, grit, minimal (< 0.1%) non-hemp organic matter, and at least 80% dry. An industry-wide acceptable moisture content is necessary to establish uniform pricing for hemp biomass. Any hemp biomass material that is above the standard moisture content will result in decreased value and an adjusted sale price to reflect a lower volume of the end product to account for further water evaporation. Biomass can also be milled, ground or pressed into pellets.

### **CBG BIOMASS**

Dried hemp plant materials from cultivars that primarily produce cannabigerol (CBG) with the same specifications described above in regard to CBD Biomass.

### **DRIED CBD FLOWER**

Dry flower is the dried flower and bud fraction of a hemp plant that has been removed from the stalks and contains minimal stems. Flower is suitable for smoking and for use in pre-rolled joints.

### **CLONES**

A clone refers to a plant that is an exact reproduction of an original parent plant, known as a mother plant, through asexual propagation. A clone is made by taking a stem cutting (or tissue culture) from a mother plant and placing the cutting into media to facilitate root growth. Once the roots begin to grow, the clone is transplanted into a field or cultivation facility.

### **INDUSTRIAL SEEDS**

Industrial hemp seeds comprise a broad range of hemp cultivars used to grow hemp biomass, hemp seed and grain for food oils and food products, and fiber for woven and non-woven applications.

### **CBD SEEDS (Non-Feminized)**

Hemp plants that are pollinated naturally or with traditional breeding techniques produce both male or female seeds. These are known as regular, or non-feminized, seeds and generally result in an even split between the two sexes.

### **CBD SEEDS (Feminized)**

Feminized seeds are seeds that have been modified to produce almost 100% female plants. There are a few techniques that can produce reliably feminized seeds. Feminized hemp seeds can be genetically modified to produce only female plants by eliminating the X chromosome. A non-genetic technique is to stress a healthy female plant by interrupting its light cycle during flowering. Another common and controlled method is to spray female plants with a colloidal silver or silver thiosulphate solution.

### **CRUDE HEMP OIL**

Crude hemp oil is extracted from the hemp plant and contains all of the cannabinoids, terpenes and other plant compounds found in the biomass. Processors use a number of different methods to extract crude oil from hemp. Supercritical CO2 extraction uses pressurized carbon dioxide (CO2) to pull CBD (and other phytochemicals) from the plant. Solvent extraction uses ethanol or hydrocarbons, such as butane or propane, to process hemp biomass into crude oil. Other processes use olive oil or water as a solvent.

Crude hemp oil is often “winterized.” Crude oil is winterized to remove organic plant compounds, such as lipids, waxes and chlorophyll, that increases the potency of the oil and creates a more transparent distillate.

### **REFINED HEMP OIL**

Crude hemp oil is further refined through distillation to produce refined hemp oil, which includes full spectrum oil, broad spectrum oil, and THC Free Distillate.

CBD full spectrum oil distillate is refined hemp oil extract that contains all the compounds found naturally occurring in the plant, including all the cannabinoids, terpenes and essential oils.

CBD broad spectrum oil distillate is refined hemp oil extract with various plant material, cannabinoids or terpenes that have been partially or fully removed.

THC Free Distillate is a broad spectrum oil distillate that has had all THC components removed using advanced techniques such as chromatography.

### **CBD ISOLATE**

CBD isolate is the purest form of CBD, which is produced by removing all other compounds found in the plant including terpene, flavonoids, plant parts and other cannabinoids. CBD isolate comes in a granular or powder form and is odorless and tasteless. The end product contains 0% THC and is made up of 96% to 99.9% CBD.