Cannabis

Global Equity Research
9 September 2019

Bobby Burleson | Analyst | Canaccord Genuity LLC (US) | BBurleson@cgf.com | 1.415.229.7163
Jonathan DeCourcey | Associate | Canaccord Genuity LLC (US) | jdecourcey@cgf.com | 617.371.3884

Industry Update

Understanding CBD's tremendous growth potential

Demand for CBD (cannabidiol) products is experiencing strong growth, which we believe will only accelerate following the recent passage of the Farm Bill. From lotions and balms in the topicals category to edibles and beverages targeting health and wellness, the expanding variety of CBD products is matched only by the increase in reasons cited for their use. With a growing class of companies targeting this opportunity and a looming regulatory update from the FDA, we thought it timely to take a closer look at everything CBD.

In this overview, we offer our detailed forecast for CBD product sales in the US and review hemp-derived CBD's current regulatory status. We also examine some of the science behind CBD's rise and take inventory of its therapeutic benefits. The hemp CBD supply chain is fleshed out as well, from the cultivation of hemp and extraction to brands and retail distribution. In our view, the overall picture that emerges is compelling: despite lingering FDA uncertainty, we believe CBD's broad range of therapeutic applications, dramatically increasing consumer interest, and recent federal legalization in its hemp-derived form bode well for future growth.

Many of the companies in the Canaccord Genuity coverage universe have meaningful exposure to the US CBD market. Backgrounds can differ broadly, including companies focused largely on marijuana and hemp-based consumer-branded products, traditional multi-state operators (MSOs) primarily intent on building out dispensary networks, and Canadian LPs developing US-facing revenue streams. For a full discussion of CBD exposure for covered companies, please refer to page 40 of this document.

Notable content includes a state-level forecast and US estimates that differentiate between hemp CBD and marijuana CBD channels, an overview of regional US hemp production, and descriptions of over 30 public and private CBD companies along with their roles within the emerging supply chain. Following an executive summary and high-level takeaways, we begin with a discussion of the science underpinning CBD's substantial therapeutic promise.

Key takeaways

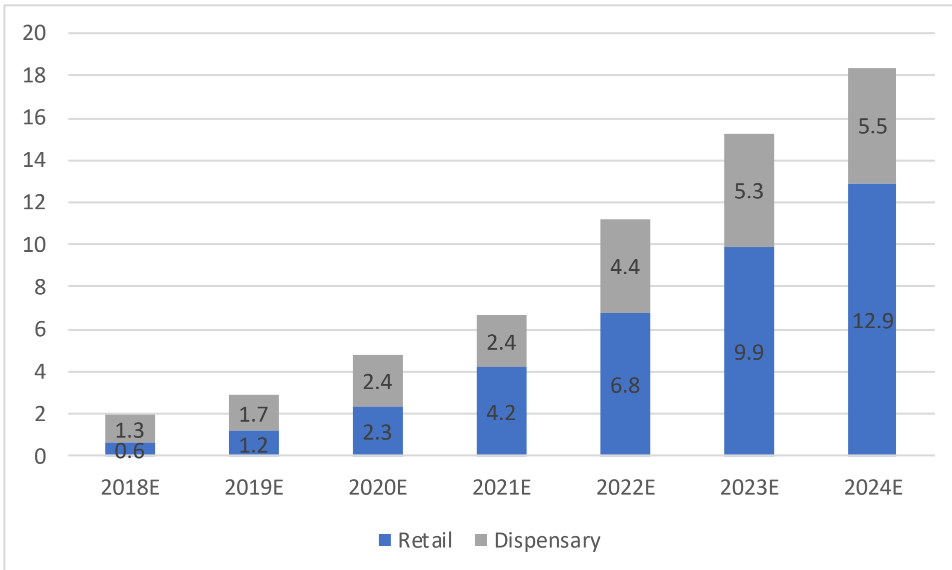
- We estimate US CBD sales will deliver a dramatic 45% CAGR to $18B by 2024
- US states with robust legal cannabis markets should see disproportionately high share of this demand
- Mix of consumer products is likely to mirror marijuana product mix, albeit with less smokable flower
- Competition is rising across the supply chain with the entry of Canadian LPs, mainstream CPG, and mass retail
- Looming guidance from FDA could accelerate the pace of innovation and compel more outside interest by allowing ingestables

Table of contents

Executive summary

We see strong growth ahead for the CBD market, with an estimated $1.9B in US retail sales in 2018 growing to $18.4B by 2024, a 45% CAGR. Growth is being driven by a confluence of factors. On the demand front, consumer awareness and acceptance of CBD are increasing, benefitting from a general normalization of cannabis through the rise of legal state markets and CBD's association with a broader health and wellness category. Easier consumer access to hemp CBD products is also contributing to the industry's growth potential, as mass retailers enter the fray following federal legalization with passage of the Farm Bill. Finally, greater availability of capital should allow the CBD industry to live up to its potential, delivering innovative new products and leveraging scale and supply chain efficiencies only recently made possible with federal legalization.

Figure 1: CBD sales by channel ($M)



Source: Canaccord Genuity estimates

Inflection for CBD opportunity traced to federal legalization and surge in consumer interest

Passage of the 2018 Farm Bill removed hemp from the Controlled Substances Act (CSA). No longer classified as marijuana, the implications for products based on CBD derived from hemp are significant, and the timing highly opportune. With hemp now legally decoupled from its psychoactive cousin, the hemp CBD industry can begin to function more or less like other industries within a diverse health and wellness category. At the same time, consumers appear to be taking a great interest. A recent survey by Consumer Reports found that roughly 25% of adults in the US claim to have tried CBD. This is striking considering most of these same adults likely hadn't heard of CBD a few years ago. With 15% of respondents 60 years or older admitting to some form of CBD use, there appears to be massive headroom for growth, especially considering this demographic's heavy consumption of over-the-counter and prescription medications.

Forecasting US CBD sales is more art than science

While CBD products are relatively new on the scene, federal legalization has made corollaries with other health and wellness products more useful when sizing the market opportunity. Nevertheless, results from this exercise span a wide range: compared with vitamins and supplements, our CBD usage rates and annual per capita spending assumptions look spot on; however, viewed against the backdrop of a massive functional food and beverage market, our estimates appear conservative. We also looked at trends for cannabis sales through the dispensary channel to inform our estimates. In the end, we attempted a bottom-up forecast curated somewhat using legal cannabis state markets as a proxy for varying degrees of consumer acceptance. Wellness, nutraceuticals, and other related products served mainly as sanity checks against where our numbers shook out.

Looming FDA regulatory framework could provide positive catalyst

Despite hemp's removal from the CSA, FDA regulations do not yet permit CBD as a food additive or dietary supplement. As a result, engagement by mass retail and major CPG has so far been largely confined to the "topicals" market. With the FDA evaluating how it might update its regulatory framework to address products for non-drug uses, a pathway to federally legal ingestible CBD consumer products appears to be opening. We expect an update from the FDA on these issues this fall. Permissibility of CBD in foods and other ingestible forms could prove a major catalyst for companies across the space, heralding a new level of investment in CBD assets by outside players and enhancing overall growth for the industry.

The science of CBD: Budding evidence supports health claims

In order to appreciate rising interest in everything CBD, it is important to better understand this "medical" cannabinoid by exploring its origins and how it works, noting that CBD is only one of a hundred or so other known cannabinoids.

Highlights

- Non-psychoactive cousin of THC found in the cannabis plant
- Shown to treat a host of medical issues with serious pharmacological research still early stages
- Effects enhanced when combined with terpenes and other cannabinoids (entourage effect)
- Possible to be produced in ways other than extraction from marijuana or hemp

CBD's story beginning to be told to a wider audience

CBD (cannabidiol) is non-psychoactive cannabinoid found in the hemp strain of cannabis sativa. Grown for a wide range of industrial purposes, hemp is distinct from other strains of cannabis by containing higher concentrations of CBD and very small amounts of the psychoactive compound THC. CBD is one of more than 80 cannabinoids that can be extracted from hemp. Each cannabinoid affects the body differently, and CBD is known to offer a range of health benefits including suppressing seizures, managing pain, reducing inflammation, relieving anxiety, combating addition, and promoting sleep.

CBD has therefore come to be popularly known as the medical cannabinoid, although medical benefits have been cited for other cannabinoids including THC, THCV, and CBN. First discovered in 1940 by Dr. Roger Adams at the University of Illinois, it is not until the past few years that CBD has become part of the common lexicon, and a serious topic of study in medical research, despite testing on the therapeutic benefits of cannabinoids as far back as the 1970s.

Rapid increase in amount of academic research post Farm Bill

While anecdotal evidence supporting the therapeutic benefits of hemp CBD and other cannabinoids has been extant for some time, there has recently been a dramatic rise in the amount of academic research on the subject. Funding remains largely from private sources, although much of the increase in research activity can be attributed to hemp's new federally legal status. Prior to passage of the Farm Bill, the DEA relaxed requirements for conducting clinical trials into CBD back in 2015. Research is being conducted into CBD's efficacy for managing pain, treating Alzheimer's, and reducing cartilage damage from arthritis. Research is also being funded by growers who want to experiment with different lighting sources in order to improve yields. We believe the number of universities engaged in hemp CBD related research is likely to grow meaningfully over the next few years now that universities are free to take money from hemp and hemp CBD companies.

Figure 2: CBD's potential therapeutic benefits

Disease/Condition	Effect
Alzheimer's	Shown to be an inhibitor of inflammation and cell death in neurodegenerative models
Parkinson's	Lessened dopamine impairment, improved psychiatric rating and lessened aggressive behavior
Multiple Sclerosis	Reduced signs of brain inflammation in animal studies
Huntington's	Shown to be neuroprotective in animal studies
Chronic Pain	Positive effects on patients suffering neuropathic pain that are resistant to other measures
Psychosis	Lessened behavioral and nervous system effect in animal testing for schizophrenia
Anxiety	Reduction of muscular tension, social anxiety, problems concentrating, and fatigue in patients
Depression	Shown to have an anti-depressant effect in animal testing
Cancer	Antiproliferative affect for certain caner types, chemopreventive effects
Nausea	Known to supress nausea is animal testing
Inflammation	Proven inhibitor of inflammatory proteins, cytokines, and pathways
Arthritis	Shown to inhibit TNF-alpha an inflammation causing protein
Crohn's	Displayed reduction in disease activity index with Crohn's patients
Cardiovascular	Shown to reduce infarct size lessening the chance of a cardial event
Diabetes	Lessened effect of fibrosis and/or cardial events

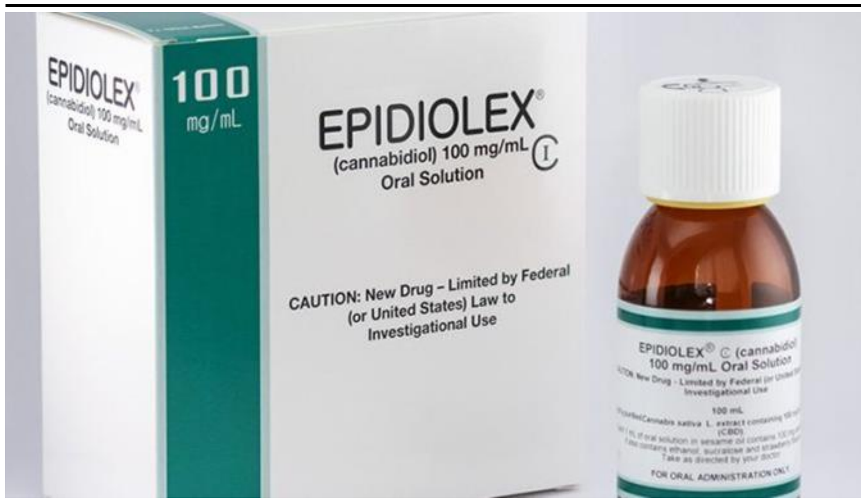
Source: Expert Committee on Drug Dependence, Geneva 2017

FDA approval of Epidiolex a critical milestone

While the science continues to progress, CBD has been shown to benefit patients suffering from epilepsy and other neurological conditions including Alzheimer's, Parkinson's and brain cancer. CBD's proven ability to work as an inhibitor to inflammation carries the hope of numerous applications from pain relief to neurological disorders. Last year, a significant milestone was achieved when the FDA approved Epidiolex, a CBD drug and the first approved cannabis drug to be plant derived. The FDA is responsible for regulating all drugs in the US. Any drug manufactured for consumption in the US must first receive approval from the FDA based on safety and efficacy treating a specified medical condition. Essentially the risks of taking said drug must be determined to be outstripped by the rewards. This approval process typically involves multiple layers of testing on animals and humans for safety and clinical application. To date, several drugs containing synthetic cannabinoids or cannabinoid-like compounds have received FDA approval and are being used by patients.

GW Pharmaceuticals, the manufacturer of Epidiolex, is targeting the treatment of seizures associated with Lennox-Gastaut and Dravet syndromes, two rare and severe forms of epilepsy. An estimated 30,000 children and adults suffer from Lennox-Gastaut syndrome and a smaller number from Dravet. While Epidiolex is the first drug to be approved that contains substances derived from cannabis similar drugs have previously been approved by the FDA derived from synthetic CBD. Epidiolex is available for sale through licensed pharmacies and can now be covered by insurance (unlike state authorized medical cannabis), and GW Pharmaceuticals has other cannabis drug at various stages in the FDA approval process.

Figure 3: Epidiolex



Source: CNBC

Potential as opioid alternative and palliative for withdrawal

Similar to how cannabinoids are understood to function in the endocannabinoid system, opioids work by attaching to a wide range of receptors within the endogenous opioid system, where they play a significant role in managing pain. While effective, high rates of addiction are a major downside. Opioids change the chemistry of the human brain, enhancing tolerance for opioid-based drugs and driving a need to increase usage to maintain effectiveness. Greater usage increases dependence, which can lead to addiction and in many cases overdoses.

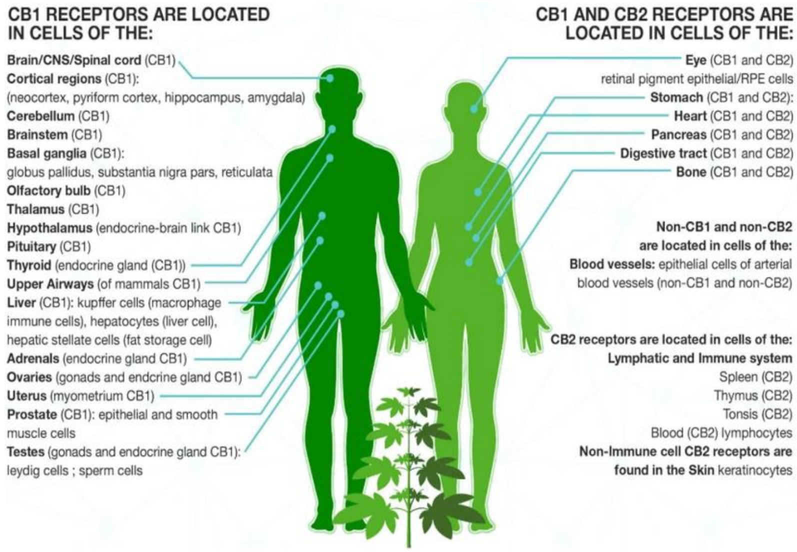
According to data from the National Institute on Drug Abuse, more than 130 people in the United States die from opioid related overdoses daily, and opioid addiction has become so prevalent that government officials including President Donald Trump have deemed it a national crisis. CBD, especially when used in conjunction with THC, offers an alternative method of managing pain, but without risk of addiction and other negative side effects of opioids such as drowsiness, physical impairment and constipation. Meanwhile, CBD has been shown in studies to help reduce or eliminate many of the withdrawal symptoms faced by individuals who have been long-term opioid users.

Works in concert with a system of receptors

CBD functions by interacting with the endocannabinoid system (ECS), which helps to regulate of a range of biological functions. Its constituents of the ECS include neuromodulatory lipids (fats; waxes; vitamins A, D, E, and K; and sterols) and dedicated receptors that can receive certain compounds. These receptors are classified into types 1 and 2 or CB1 and CB2, based largely on their location and function. CB1 is found primarily in the brain and central nervous system (hippocampus/memory, cerebral cortex/behavior, cerebellum/motor control, putamen/movement, hypothalamus/appetite and amygdala/emotion), while CB2 and CB1 can be found in other locations such as the spleen, other organs, glands, bones, and blood vessels.

Signal transduction occurs when a cannabinoid receptor binds with a cannabinoid (or cannabinoids), resulting in a cellular event or series of events. Events can include changes in a cell’s behavior, the regulation of its genes, the transmission of signals sent to other cells, or a combination thereof. While we are focused on humans, the presence of endocannabinoid systems in other animals has created the possibility for cannabis-derived therapies for pets, and there are already CBD products in the market targeting the pet industry.

Figure 4: Endocannabinoid system receptors



Source: MYcannabis.org/the-science

On short list of better-known cannabinoids

Generally, the organic compounds in cannabis responsible for psychoactive and therapeutic effects in humans and other mammals are known as cannabinoids, while the organic compounds that determine odor and taste are called terpenes and flavonoids. Cannabinoids are found in their highest concentrations on the cannabis flower. While this paper is primarily concerned with CBD, in order to provide context, we offer brief descriptions of several additional cannabinoids including CBG (cannabigerol), THC (tetrahydrocannabinol), THCV (tetrahydrocannabivarin), and CBN (cannabinol)., as well as some of the more commonly found terpenes.

CBG - A relatively recent discovery, CBG can be viewed as the parent compound for THD, CBD, and CBN. Essentially, CBG turns into THC and CBD through heat and CBN by aging. On its own, CBG is known to promote feelings of relaxation by inhibiting the uptake of GABA (a neurotransmitter) and relaxing muscles.

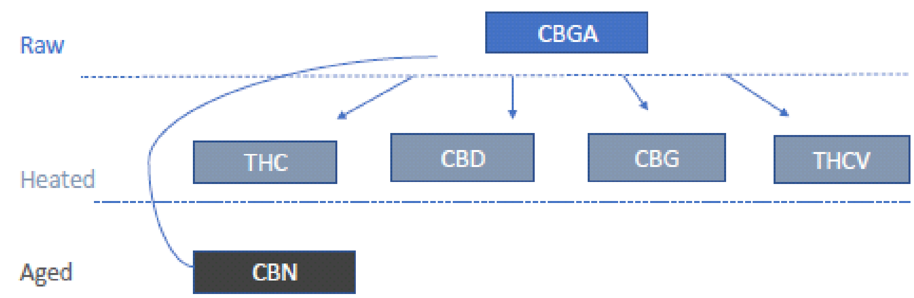
THC - The most abundant and commonly known cannabinoid, THC is responsible for the “high” or euphoric feeling that comes from consuming cannabis. THC must be activated by heat in order to bind to cannabinoid receptors in the body. In modern cannabis strains, THC content is typically 15% to 20%, although it can have a wider range of potencies depending on desired effect. In order to avoid any psychoactive effect, cannabis strains should contain 1% THC or lower.

CBD - CBD is non-psychoactive and can counter some of the psychoactive effects of THC. CBD is also known as the medical cannabinoid, exhibiting a wide range of medical effects including suppression of seizures in children with epilepsy. CBD-heavy strains tend to have anywhere from a 1:1 CBD/THC ratio to 3:1, and often rely on extraction processes to achieve high CBD ratios in edibles and tinctures.

THCV - Another psychoactive cannabinoid, THCV delivers a jolt of energy and can act as an appetite suppressant. It must reach 428 degrees Fahrenheit to activate.

CBN - While less is known about CBN, it is currently understood to have some of the benefits of CBG, including aiding sleep, but with a narrower scope. CBN forms from degraded or aged CBG, THC and THCV, leaving just trace elements of the source compounds. Extraction methods are being discovered that can isolate CBN and yield higher quantities.

Figure 5: Cannabinoids



Source: Canaccord Genuity estimates

Therapeutic benefits enhanced by the entourage effect

CBD affects the ECS in a variety of ways when terpenes and other cannabinoids are present. This interplay between cannabinoids and terpenes is known as the "entourage effect." Given myriad formulations made possible by blending and adjusting levels of THC, CBD, other cannabinoids and terpenes, manufacturers and their partners are busy developing customized cannabis formulations to differentiate their product lines. First introduced by scientists in Israel, the entourage effect asserts that user experience can be optimized through custom formulations. The theory proposes that certain blends and dosages of cannabinoids and terpenes can work together to achieve "best-use" profiles for customers, when compared to the compounds in isolation. One highly practical use of the entourage effect is the inclusion of CBD in sufficient levels to partially mitigate the psychoactive effects of THC, which in today's more powerful strains can sometimes lead to cases of over-medication.

On another front, testing labs have begun working with terpene solutions providers to develop processed products that more closely resemble native plants in flavor and potency. The bulk of efforts to exploit the entourage effect are focused on formulations, whether in specific strains of flower or processed product, targeted to specific medical treatments. Further, the industry from cultivators to dispensaries is beginning to more systematically articulate the effects of its offerings

One common method uses a color spectrum to classify THC and CBD content and respective use cases. These formulation spectrums range from THC dominant to CBD dominant, with balanced formulations in the middle.

The entourage effect is not limited to CBD and THC; various other cannabinoids interact in the system with CBG, CBN, and THCV being recently discovered cannabinoids with distinct benefits. CBG is a raw cannabinoid found in unprocessed flower; it can be viewed as the parent compound for THD, CBD, and CBN. Essentially, CBG turns into THC and CBD through heat and CBN by aging. On its own, CBG is known to promote feelings of relaxation by inhibiting the uptake of GABA (a neurotransmitter) and relaxing muscles. CBN is currently understood to have some of the benefits of CBG, including aiding sleep, but with a narrower scope. CBN forms from degraded or aged CBG, THC and THCV, leaving just trace elements of the source compounds. Extraction methods are being discovered that can isolate CBN and yield higher quantities. Finally, THCV is a psychoactive cannabinoid that delivers a jolt of energy and can act as an appetite suppressant. It must reach 428 degrees Fahrenheit to activate. Hemp, like other varietals of cannabis, has a diverse spectrum of active molecules. With CBD, extracts that capture the full range of these molecules rather than isolating just the CBD are known as full spectrum. Many believe full spectrum CBD oils result in better bio-availability (absorption) and more directly can achieve the enhanced benefits of the entourage effect.

Novel methods of sourcing CBD beginning to emerge

It is important to distinguish between hemp-derived CBD and marijuana-derived CBD, despite the hemp strain of cannabis being closely related to its psychoactive cousin. According to the US Department of Agriculture, the key difference between hemp- and marijuana-derived CBD is the amount of THC found in the flower during harvest. For industrial hemp, the THC concentration is less than 1%, with the legal limit for production in the US capped at 0.3% THC. Marijuana, by comparison, typically has THC concentrations ranging from 3% to 15%, and can even exceed 30%.

Use cases offer another notable difference between hemp and marijuana. Hemp is used for a variety of industrial purposes including to make paper, clothing, textiles, food and other products, while marijuana is produced largely for its psychoactive and medicinal effects.

Sales channels demonstrate divergence between hemp-derived CBD and marijuana-derived. CBD from hemp can be purchased through traditional retail channels and online and is legal for sale in all fifty states in the US. Marijuana-derived CBD can only be sold through licensed dispensaries (medical and recreational licenses) in states where the sale of and consumption of cannabis products is legal (at the state level at least).

Emerging sources of CBD include Synthetic and yeast-derived. Synthetic CBD offers a third type and can be manufactured without the presence of any THC. Synthetic CBD is distinct from synthetic marijuana and can be viewed as a purified analog of CBD. CBD's simple molecular structure allows for its production in a pharmaceutical environment and promises to greatly reduce costs and streamline FDA approval long term. Lastly, CBD is being produced using yeast. While this method is also at an early stage, several companies in Canada and the US have already demonstrated its viability and are working to scale the process.

Figure 6: Sources of CBD

CBD Type	Description	Availability
Cannabis Derived	CBD derived from the cannabis plant. Contains THC above the legal 0.3% level.	Only though licensed dispensaries in legal states
Hemp Derived	CBD derived from industrial hemp. Contains less than 1% THC	Traditional retail and e-commerce
Synthetic Derived	CBD that has been created in a lab. Can be manufactured to contain no THC.	Traditional retail and e-commerce
Yeast Derived	CBD that is synthesized from yeast. Can separate to contain less than 1% THC	Still in experimental stages not commercially available

Source: Canaccord Genuity Research

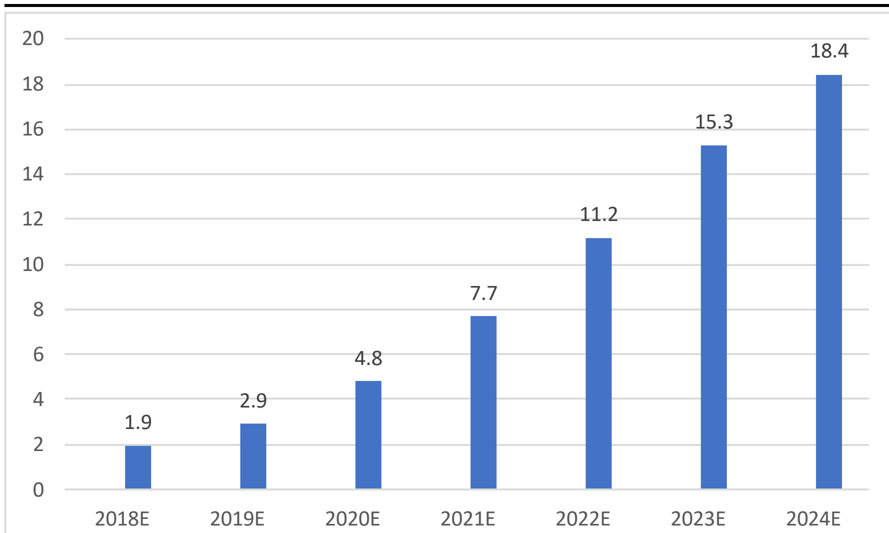
Canaccord Genuity forecast: US CBD spending to be led by legal cannabis state markets

Key takeaways

- Strong growth expected for CBD through 2024 forecast period and beyond
- States with robust legal cannabis markets should see strongest hemp CBD demand
- Two distinct channels for hemp CBD and marijuana-based CBD
- Dispensary CBD sales mix instructive for where hemp CBD mix will trend once regulations clarified
- For now, topicals are main mass retail opportunity

We are forecasting US CBD sales to grow at a 45% CAGR, from $1.9B in 2018 (BDS Analytics estimate) to over $18B in 2024. We note that our 2024 estimate does not reflect the peak revenue opportunity for the US CBD market and may prove conservative given rapid CBD adoption to date and likely meaningful expansion of distribution channels. For context, BDS's 2018 estimate was approximately 23% the size of our estimate for legal cannabis sales, and we expect US CBD sales to increase to 42% of the US cannabis market in 2021 and 51% in 2022. While our forecast involves two distinctly separate channels for hemp-based CBD and marijuana-based CBD (dispensaries), we see synergies between legal US cannabis markets and hemp-based CBD demand. Interestingly, demand has been increasing for CBD dominant formulations (primarily 4:1 and 2:1 CBD:THC) at dispensaries, with CBD dominant products growing from roughly 2.5% of dispensary sales in 2014 to more than 11% YTD in 2019 according to point of sale data from BDS Analytics.

Figure 7: Annual CBD sales estimates (2018-2024E)



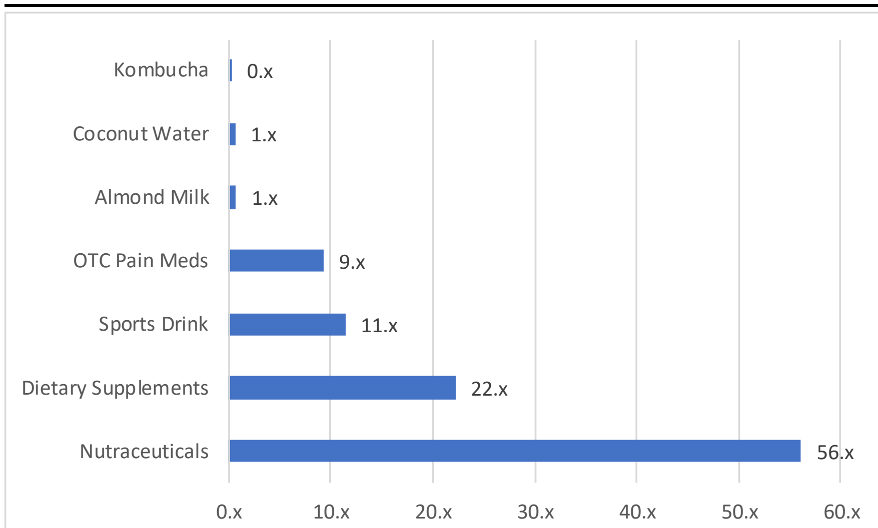
Source: BDS Analytics, Canaccord Genuity estimates

CBD forecasts appear conservative in relation to traditional product categories

Another way to size the US CBD opportunity is to view it in relation to existing products focused on health and wellness, pain management, and use cases like those addressed by CBD. Our forecast for $10B in CBD sales by 2023 appears conservative when compared to several of these product categories. For example, the global market for nutraceuticals, of which the US represents roughly 25%, is expected to grow from approximately $435B in 2018 to more than $670B in 2024 (a 7.5% CAGR), according to estimates from. Nutraceuticals include functional foods, dietary supplements and functional beverages.

Meanwhile, according to analysis by Reports and Data, the US dietary supplements market was estimated to be $43B in 2018 and is expected to grow at a 5% CAGR through 2026, while the global market is estimated to have been $125B last year and growing to more than $210B in 2026. Within functional beverages, almond milk, coconut water and kombucha, which all have experienced rapid growth over the past few years, drove roughly $1.4B, $1.2B and $500M is sales last year respectively whiles sports drink sales were roughly $22B. Lastly, spending on over-the-counter pain medications in the US including Tylenol and Advil was $18B last year and expected to grow to $19B this year.

Figure 8: Traditional retail product categories in relation to CBD sales (2018)



Source: Grand View Research, Reports and Data

Spending assumptions in line with vitamins and supplements

While our CBD forecasts differ by state based on multiple factors, and our average spending rate varies by the state's level of adoption, our annual spending rate per consumer is $116 this year and growing at an estimated inflation rate over our forecast period. This rate is largely in line with the average spending per person in the US on vitamins and supplements (approximately $114 in 2018) according to a CRN Consumer survey.

Several trends are behind rising CBD demand

The market for CBD products can be broken down into two primary categories, consumer (or nutraceutical) and medical. Medical products in this paper refer strictly to those that can be obtained with a prescription. Consumer products are purchased from traditional retailers (and dispensaries in the case of CBD derived from cannabis or combined with THC) for health and wellness purposes. According to research from the Brightfield Group, the average CBD user is female and between the ages of 26 and 49. In terms of economic standing, CBD user demographics cross a wide range of income levels. In terms of frequency, approximately 80% of CBD consumers use the products at least once a week and more than one third of users do so daily.

Brand loyalty is strong among CBD users, with most purchasing the same brand repeatedly and, in many cases, exclusively. As mentioned previously, CBD is known as the medicinal cannabinoid. While certain claims about its effects have yet to be proven, CBD is being used to treat a wide range of ailments including chronic pain, anxiety, menstrual cramping, insomnia, mild depression, nausea, acne, digestive issues and inflammation. CBD products are largely self-prescribed to treat these issues, and often supplement or replace traditional over-the-counter products. A recent study published in the US National Library of Medicine found that 62% of CBD users were attempting to treat an existing medical condition. While 36% stated that CBD on its own was sufficient for relief, only 4% reported inefficacy.

Given the medical community's ongoing acceptance of CBD, it is also interesting to note how participants were introduced to CBD. The vast majority of participants stated they were introduced to CBD by independent internet research, family or friends – all independent of the medical community. In fact, less than 10% of respondents indicated that they were informed by doctors regarding either treatment or wellness options with CBD. In a study performed by the Brightfield Group and HelloMD, the effectiveness of hemp-derived CBD products was compared to other forms of medication including THC products, over-the-counter products, prescription drugs, and common herbal remedies. In each case 50% or more of respondents responded that hemp-derived CBD relieved their medical conditions "more effectively or much more effectively," than the other products groups. This response was highest (77%) when compared with over-the-counter products, and lowest (50%) when compared with THC-dominant products.

CBD for pets could also offer a large market opportunity

The US pet industry is large, but growth is slow, with an estimated $75B in expected spending in 2019 up slightly from $73B last year, according to the American Pet Products Association. Growth is more dramatic in the over-the-counter pet meds and specialty foods categories, however. Of that total spending, more than $16B is expected to be on supplies and over-the-counter medication while nearly $32B is expected to be on food. CBD-based products in the form of oils, topicals, food, pills, treats and supplements are increasingly given to pets to manage pain, promote digestion, reduce inflammation, or treat anxiety and other conditions.

CBD products fall into a broader category of alternative therapies including aromatherapy, reflexology and naturopathy. A survey by the Michelson Found Animals Foundation revealed that nearly 75% of pet owners have tried alternative therapies for their pets in order to treat a list of conditions similar to those aforementioned. Companies with notable exposure to pet CBD products include 1933 Industries, Better Choice, Canna-Pet, HolistaPet, King Kanine, Mary's Whole Pet and Medterra.

Figure 9: Bona Vida CBD dog chews

Source: Company reports

Consumption to favor infused products, despite pause for FDA

We believe CBD consumption trends will largely mirror those observed in legal cannabis markets, albeit with dramatically lower levels of smokable flower. For legal recreational markets, the fastest growth areas have been concentrates and edibles, and within those categories growth has been strongest for vape, gummies and beverages.

While hemp-derived CBD edibles are fairly limited in availability today, we believe forthcoming FDA guidance may liberalize their distribution, eventually allowing availability in mass retail channels. Consumption formats likely to prove popular for CBD include edibles, beverages, tinctures, and vape. As an indication of the industry's conviction in looming liberalization by the FDA, we know of major beverage players already stocking inventory of CBD beverages in the US ahead of the mass retail opportunity.

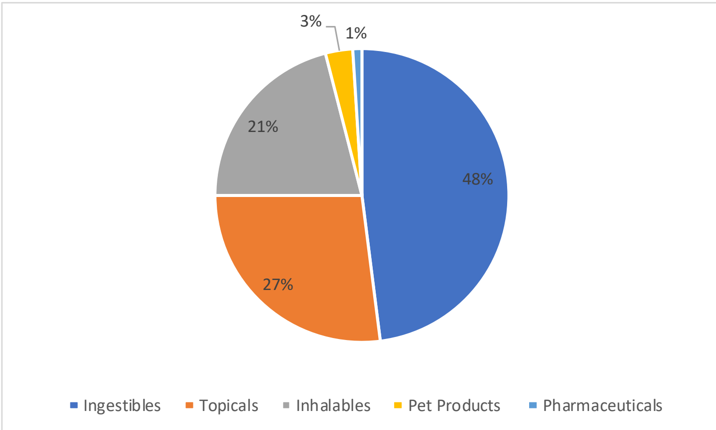
Figure 10: INDUS Holdings' Humble Flower Co. CBD products

Source: Company reports

For a sense of how consumption has shifted in the cannabis market, we can look at BDS Analytics point-of-sales data. While the latest dispensary points-of-sales data for key markets including Arizona, California, Colorado and Oregon from BDS Analytics shows flower representing the large category, flower's share is on the decline. In June of 2019, flower represented approximately 36% of dispensary sales versus 40% in June 2018. Meanwhile, vape accounted for 26% of sales, up from 22% in June 2018, non-beverage edibles were 12%, non-vape concentrates were 10%, pre-rolls were 7%, and beverages were 1%. Non-beverage edibles, non-vape concentrates, pre-rolls and beverages sales as a percentage of the total market sales in June were in line with last year; however, there was significant growth in the market. We expect the shift away from flower and toward other product areas will continue, and we see vape and edibles as major beneficiaries.

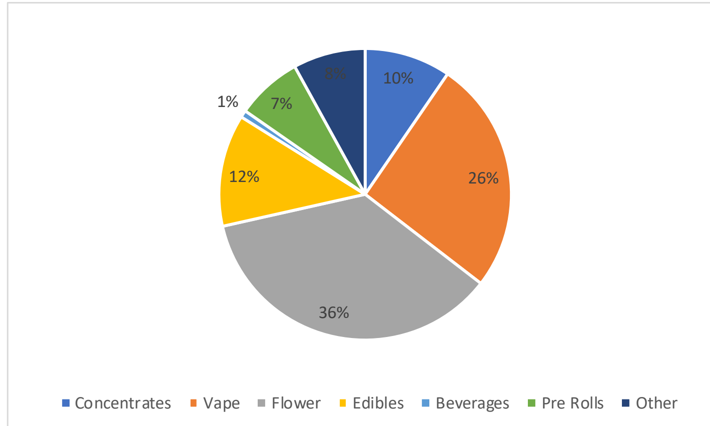
BDS has also tracked the product mix for CBD sales in the US. Of the roughly $1.9B in sales in 2018, ingestables (includes edibles) were the largest category, accounting for 48% share. This was followed by topicals with 27% share, inhalables (includes vape and flower) at 21% of the mix, pet products with a little over 3%, and pharmaceuticals with under 1%.

Figure 11: June 2019 CBD category mix



Source: BDS Analytics

Figure 12: June 2019 cannabis category mix



Source: BDS Analytics (AZ, CA, CO, OR)

We see CBD beverages as one of the biggest potential winners

We believe CBD beverages present an attractive opportunity for mainstream beverage companies. While there has been more focus on the impact of cannabis consumption on sales of alcoholic beverages, we see huge incentives for purveyors of sugary drinks to enter the CBD market. Shifting consumer trends have been favoring functional beverages for some time, and kombucha, kefir, and coconut water are just a few of a wide range of drinks popularized by their association with health and wellness. With a notable slowing of demand for sugary sodas and other sugary drinks, industry players are looking to reinvigorate growth by expanding their product portfolios. Recent media reports suggest that Coca-Cola is interested in making investments in cannabis-infused beverages, and we believe CBD-based beverages are a good option, complementing investments in sports drinks and other wellness beverages.

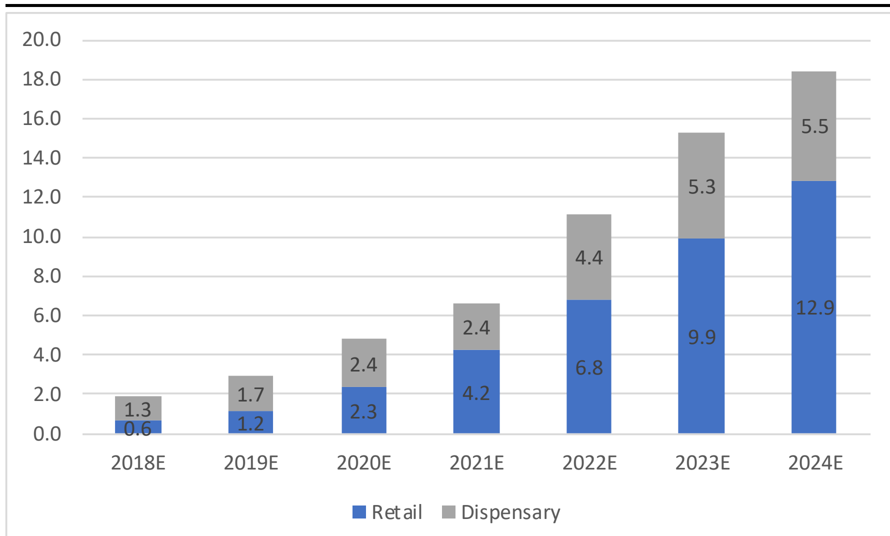
Ironically, CBD may turn out to be a better fit than THC for the mainstream beverage market. Investments in cannabis such as Constellation Brands' investment in Canopy Growth are certainly motivated in large part by a long-term goal of offsetting declining alcohol sales in states with robust legal cannabis markets. A 2018 study by the University of Connecticut and Georgia State University found that lower alcohol sales in the US were in large part directly caused by the introduction of legal marijuana markets. We note that in Aspen, Colorado, cannabis sales recently surpassed those for alcohol for the first time, a clear expression of the substitution effect. However, the THC products cannibalizing alcohol sales are not in beverage form, and there is a sound argument against THC-infused beverages ever gaining significant traction due to slow time-to-onset and other factors.

Mass retail could offer meaningful upside opportunity

As previously mentioned, we believe the majority of CBD sales will continue to be in markets with sizable legal cannabis sales. Beyond e-commerce, retail distribution is currently largely through dispensaries, specialty health and wellness stores, vitamin and supplement stores, convenience and grocery stores, and fitness centers. Following passage of the Farm Bill, mass retail is likely to grow faster than other channels, driving the bulk of sales toward traditional retail in coming years.

As previously mentioned, our estimates have the total CBD market growing at a 45% CAGR over our forecast period with traditional retail sales increasing at a 66% CAGR through 2024 versus dispensary sales growth of 27%. Growth for mass retail could be even stronger. In 2019 we expect especially strong demand, with dispensary CBD sales increasing by 32% Y/Y and traditional retail growing by roughly 87%. By the end of our forecast period, we believe the mix shift will have almost completely flipped, with traditional retail representing the majority of CBD sales at nearly $13B versus $5.5B for dispensaries.

Figure 13: CBD sales by channel ($M)



Source: Canaccord Genuity estimates

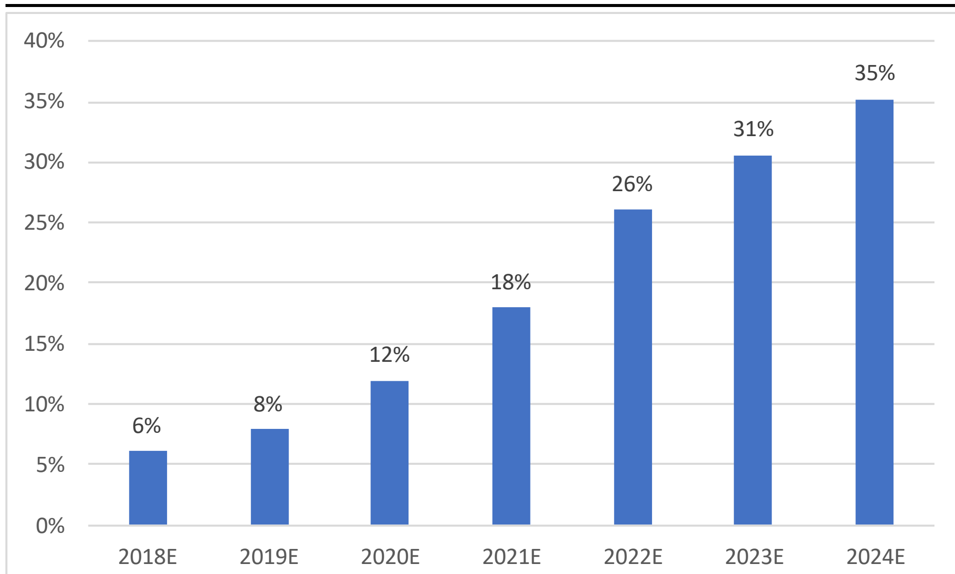
Drilling down to the state level

As a proxy for what the CBD market could look like at the state level, we have assumed some symmetry between hemp-based CBD adoption and that of cannabis in legal cannabis markets. Key states in our forecast include Arizona, California, Colorado, Florida, Illinois, Massachusetts, Michigan, Nevada, New Jersey, New York, Ohio, Oregon, Pennsylvania and Washington and represent 79% of our total forecast for 2019. This compares to 93% for the cannabis market, allowing for differences in the structure of the distribution channels of each market.

We expect adoption in legal cannabis markets to be the highest for CBD despite federal legalization and national availability for CBD products, due to greater overall acceptance in legal markets. We believe the usage rate amongst adults (over 18) for CBD across the US was roughly 6% in 2018 with Colorado and Washington having the highest usage rates last year at 21% and 17% of adults respectively. We note that along with Oregon, Colorado and Washington represent the most mature legal cannabis markets in the US with total legal sales of $1.5B and $1B respectively last year (Oregon had $644M). Meanwhile, we believe CBD adoption was less material last year in states without significant legal medical or adult-use cannabis markets.

Moving forward, we expect adoption to grow significantly in currently legal US cannabis markets and in states with nascent cannabis sales today. We are forecasting a US usage rate of 8% in 2019, growing to roughly 35% by 2024. Growing usage will be driven by greater awareness of CBD products and their benefits, continued development of pharmaceutical products, availability of CBD products through mass retail channels and e-commerce including ingestible CBD.

Figure 14: US CBD usage rates (% of adult population)



Source: Canaccord Genuity estimates

State-by-state forecasts

By state, we expect there to be a significant range in usage, with the most mature cannabis markets achieving usage rates of approximately 45% of the adult population in future years. We believe the 45% represents a reasonable peak usage rate for adults in mature markets. We note that markets with limited or no legal cannabis sales today have usage rates of less than 5%.

We expect California ($730M), Florida ($291M), New York ($215M), Washington ($160M) and Colorado ($151M) to see the highest levels of CBD spending this year, accounting for a total spending of more than $1.4B or 54% of our 2019 estimate. Following the top tier, we expect Arizona ($134M), Michigan ($123M), New Jersey ($109M), Massachusetts ($107M), Oregon and Illinois (both $78M) to see the next highest spending levels for CBD in 2019.

Each of the above states has a robust legal cannabis market for recreational sales (California, Washington, Colorado, Massachusetts and Oregon) or medical (Florida, New York, Michigan, New Jersey and Illinois). We note that Michigan and Illinois will soon evolve from medical markets to recreational (launching 2020).

In total, the top ten states within our CBD forecast are expected to have combined legal cannabis sales of nearly $10B this year (as compared with $2.1B for CBD).

By 2024, we expect California, Florida and New York to remain the largest CBD, markets, followed by Illinois and Michigan. In total we expect the top ten markets to represent approximately 68% of our total forecast for the CBD market or $12.4B in sales. Outside of our current focus cannabis markets, we believe Texas ($539M CBD sales in 2024E), Virginia ($511M), Missouri ($367M), Maryland ($362M) and Tennessee ($282M) to be the largest markets for CBD in the US in 2024.

Figure 15: State market estimates (top twenty CBD markets 2024)

	2019E Sales	% Market	2024E Sales	% Market	19-'24E CAGR
CA	730	25%	3318	18%	42%
FL	291	10%	1807	10%	58%
NY	215	7%	1550	8%	50%
IL	78	3%	992	5%	42%
MI	123	4%	836	5%	54%
PA	63	2%	828	5%	68%
NJ	109	4%	709	4%	58%
OH	57	2%	648	4%	88%
WA	160	6%	609	3%	39%
AZ	134	5%	578	3%	70%
MA	107	4%	552	3%	42%
TX	47	2%	539	3%	49%
VA	28	1%	511	3%	44%
CO	151	5%	459	2%	35%
MO	40	1%	367	2%	69%
MD	35	1%	362	2%	65%
OR	78	3%	323	2%	40%
TN	28	1%	282	2%	77%
IN	27	1%	277	2%	77%
CT	23	1%	262	1%	71%
Other	941	32%	2591	14%	
Total	2900	100%	18401	100%	51%

Source: Canaccord Genuity estimates

Emerging group of attractive CBD state markets, distinct from top cannabis markets

While we expect the current key cannabis state markets to grow at an average CAGR of roughly 42% from 2019 through 2024, certain small medical markets appear positioned for outsized CBD growth. With sizable populations and demographics favorable to CBD adoption, these states are forecast to grow at an average 60% CAGR from 2018 levels. States within this category include Texas, Tennessee, Hawaii, Indiana, Missouri, Oklahoma, Virginia, Connecticut and Kentucky. Of these states we expect Texas to experience the highest level of incremental spending ($492M) through our forecast period. The only states in this group with legal recreational cannabis sales are Hawaii and Vermont, but all the other states within this group border at least one state with sizable and growing legal cannabis sales. We believe close vicinity to legal cannabis markets should drive greater awareness and acceptance in these states for CBD.

Meanwhile, our more conservative assumptions are reserved for Georgia, Minnesota, North Carolina, Wisconsin, Alabama, Louisiana, South Dakota, Nebraska, Montana, North Dakota and Wyoming. On average we expect CBD sales in these states to grow at a five-year CAGR between 2019 and 2024 of roughly 45%. We note that our slow growth states have mostly nascent markets today. We expect the slower growth to be driven by the continued restrictive attitude toward cannabis sales in the states even for medical purposes. Georgia could defy our conservative expectations given the state’s large population, the progressive culture of Atlanta, and its close vicinity to Florida’s large and growing cannabis market. Further, legalization of recreational use in the upper midwestern states of Illinois and Michigan could spur greater acceptance in Wisconsin and Minnesota, helping those markets best our estimates.

Texas could prove an attractive medical cannabis market and a boon for CBD sales

To date, Texas has been one of the most restrictive medical cannabis markets in the country, only approving consumption for patients suffering from intractable epilepsy and only at low dosages. As of this spring, the patient pool for medical marijuana in Texas was only approximately 500 people. Last month, however, lawmakers passed bill HB 3703, increasing the number of qualifying conditions and easing access by requiring approval from only one specialty physician.

Governor Greg Abbot signed the bill earlier this month. Patients in Texas can now purchase low level THC cannabis products (less than or equal to 0.5% THC) for all forms of epilepsy, seizure disorders, autism and terminal cancer. Previously even patients with intractable epilepsy were required to get a recommendation from two licensed neurologists which proved to be a challenging and costly process. In addition, the bill authorizes the Texas Department of Public Safety to oversee the regulation and administration of cannabis distribution.

We note that even with this expansion, the number of qualifying conditions in Texas is limited in comparison to those of other more mature medical markets. We believe a broadening of qualifying conditions and other liberalizing actions could drive substantial upside to CBD forecasts in the state, which already reflect sizable growth. As a reminder we expect Texas to have $539M in CBD sales in 2024.

CBD regulations are evolving

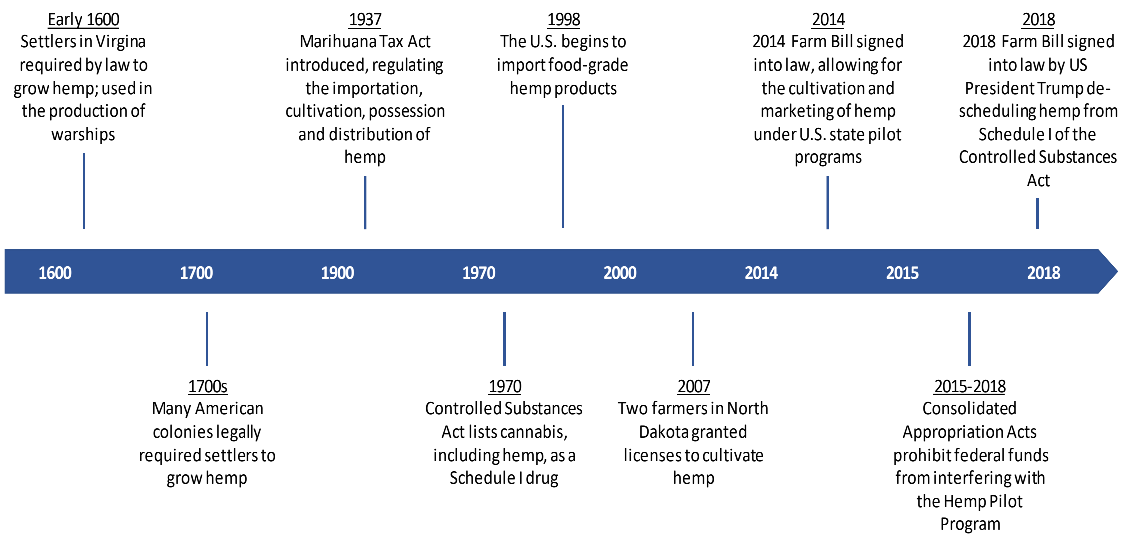
Key takeaways

- Farm Bill was major catalyst for CBD industry growth
- Hurdles remain, especially regarding treatment by FDA
- States have stepped up with regulations of their own
- Awaiting guidance from FDA that could to open broader mass retail opportunity

Brief history of hemp in the United States

Hemp has a very long history within the United States, with hemp cultivation tracing its roots as far back as the early 1600s, when settlers in Virginia grew hemp to make rope, sails and clothing. Throughout the 17th and 18th centuries, hemp production continued to be practiced by farmers across many North American colonies, where it was used in the production of sails, ropes and caulking for warships and merchant vessels, at the time in high demand. Cultivation of hemp began to decline in the 19th century, as production shifted to steamships with steel hulls.

Figure 16: US hemp milestones



Source: Canaccord Genuity

In the 1900s, regulation in the United States would further diminish hemp production. Beginning in 1906, there was a general increase in restrictions on all forms of cannabis including hemp, with many states labelling the plant a poison.

While the Marihuana Tax Act of 1937 was the first federal law to regulate cannabis, it was the 1970 Controlled Substances Act that sealed hemp's fate by making no distinction between hemp and psychoactive varietals of cannabis, ultimately imposing strict regulation on its cultivation. The distinction between hemp and marijuana resurfaced in 2014, with passage of the 2014 Farm Bill. Importantly, the bill provided a separate definition for industrial hemp within the framework of a hemp cultivation pilot program. Under the program, industrial hemp was defined as Cannabis sativa L., with a THC concentration of no more than 0.3%. This bill laid the foundation for the transformational 2018 Farm Bill.

Implications of 2018 Farm Bill

On December 20, 2018 the Agriculture Improvement Act of 2018 ("2018 Farm Bill") was officially signed into law by President Donald Trump. The 500+ page bill outlined the annual spending to be made by the US Department of Agricultural and contained key regulations relating to industrial hemp. Importantly, the bill removed industrial hemp from the definition of marijuana, effectively de-scheduling hemp and removing it from the purview of the Controlled Substances Act (CSA). This also had the effect of removing hemp-derived CBD from the CSA and the jurisdiction of the Drug Enforcement Agency (DEA). Accordingly, it is now legal for these products to be manufactured, distributed and sold throughout the United States. It is important to note that CBD extracted from non-hemp varietals of the cannabis plant is beyond the cover offered by the Farm Bill.

Less burdensome tax rates

Following hemp deregulation, hemp and its derived products are no longer impacted by IRS Code Section 280E, which disallows deduction of operating expenses for cannabis companies when calculating taxable revenue and has resulted in cannabis profits taxed at rates as high as 70%, compared to the corporate rate of 21%. Under Section 471 of the Farm Bill, commercial hemp farmers may now deduct costs for direct materials, direct labor, utilities, maintenance, rent, and quality control.

A series of indirect costs are also allowed in the calculation of the cost of goods sold, including production taxes, depreciation, employee benefits, factory costs, and administrative insurance. In this way, commercial hemp farm using cash accounting can grow relatively tax free by investing earnings into deductibles, until the business reaches annual revenue ceiling of $25 million. Furthermore, businesses under this $25 million ceiling are no longer required to track inventory, allowing companies to deduct the cost of production, even if the entire harvest has not been sold.

Greater access to banking and potential for public listings on major exchanges

The Farm Bill opens to door for commercial hemp businesses to gain access to banking services and structured borrowing agreements, though it has yet to be seen how willing banks will be to lend against the harvest of hemp. In recent months, there has been progress on this front, in both debate on the floor of Congress and in the regulation that allows for hemp companies to bank at credit unions. The National Credit Union Administration (NCUA) has said that banking services are available to hemp and hemp-derivative businesses due to the passage of the Farm Bill.

While end regulation will be dependent on what the US Department of Agriculture allows, the current guidance from the NCUA allows for "the customary range of financial services for business accounts, including loans, to lawfully operating hemp related businesses within their fields of membership." The NCUA will be updating its guidance this fall, after the USDA gives its federal rules for hemp production. However, these actions have not moved the US Treasury, meaning that traditional banks are still out of reach.

As far as up-listing opportunities, CV Sciences is exploring a move to NASDAQ. If successful, we expect a flurry of capital markets activity to ensue as US hemp-based CBD companies attempt to capitalize on larger pools of institutional investor capital.

Questions linger on treatment by FDA, although guidance forthcoming

While the 2018 Farm Bill removed hemp from the definition of marijuana and thus from the purview of the Controlled Substances Act, questions regarding federal legality of hemp-derived CBD products persist. Major sticking points include CBD products ingested through the mouth, marketing CBD products with medical claims, and labelling. According to a recent FDA update, it remains federally illegal to market products that add CBD to foods, or label CBD as a dietary supplement. Following the passage of the Farm Bill, then-FDA Commissioner Scott Gottlieb, while acknowledging CBD's therapeutic value, issued a statement saying the FDA maintained the authority to regulate products containing cannabis and its constituents under the federal Food, Drug and Cosmetic Act.

The FDA has yet to establish regulations allowing hemp-derived CBD products to be lawfully marketed as food products or dietary supplements. Also, if a CBD product is sold along with therapeutic claims, the general rule is that it cannot be sold without express FDA approval, or an FDA monograph if it is an over-the-counter product. This issue recently came to a head when the FDA issued a warning letter to Curaleaf , the largest cannabis operator in the US, for selling CBD with unsubstantiated medical claims. Subsequently, CVS pulled Curaleaf's CBD products from its shelves. Importantly, according to Canaccord Genuity analyst Matt Bottomley, Curaleaf has highlighted that the FDA's letter was not related to any concerns over product quality, safety or packaging but stemmed from links on its website to National Institutes of Health reports discussing various uses and benefits of CBD.

We believe clarification from the FDA on the above outstanding issues will be forthcoming. Late May, the FDA held public hearings on hemp-derived CBD and listened to lengthy testimony from numerous industry stakeholders and policy makers as part of a discovery phase for setting up a regulatory framework for CBD products. The FDA recently announced that it will expedite the development of rules regarding CBD and will issue a report on its progress in developing regulatory rules by the early fall.

USDA slow to draft testing rules

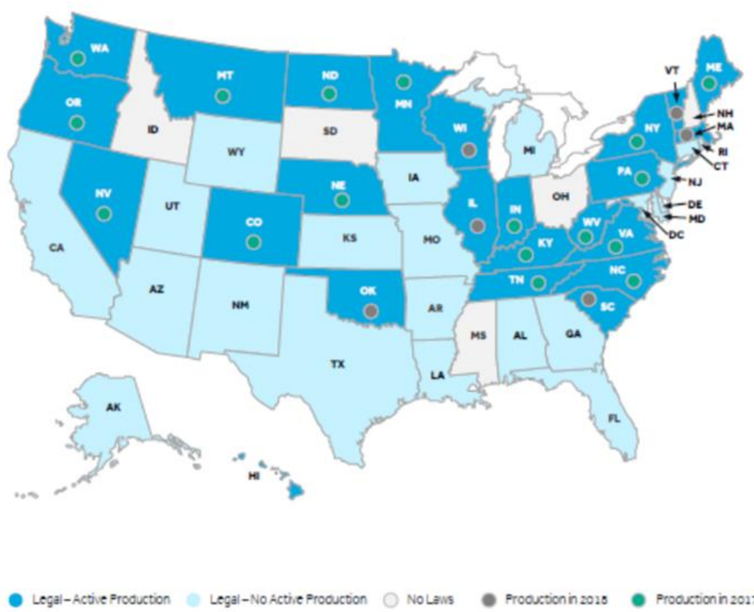
When the Farm Bill was passed in 2018, it not only removed hemp from the CSA but also generated a series of regulatory tasks touching multiple agencies. One such task is to establish standards for producing hemp safely and lawfully and involves setting testing standards. This falls under the purview of the US Department of Agriculture (USDA), and so far developing those standards has been slow going. Testing THC appears to have become a stumbling block. Despite explicit language in the bill naming pos-decarboxylation as a preferred testing method, no such method exists for testing THC levels, and the default approach called gas chromatography (GC) has been known to increase the levels of THC to above the 0.3% threshold. While this issue will likely be resolved, the USDA's self-imposed August deadline for the release of rules has slipped. One impact is that state and local authorities will continue to find it difficult distinguishing between hemp and marijuana. This in turn delays full progress toward unfettered hemp movement throughout the US.

Somewhat vague regulatory status of hemp-derived CBD has spurred state regulation

Without a coherent FDA regulatory framework in place, hemp-derived CBD is presently subject to state by state regulations, at least when it comes to food, beverages and dietary supplements. Regulatory fragmentation is keeping national and multi-national food and beverage companies on the sidelines, allowing smaller players opportunities to capture market share before increasing competition ensues.

Hemp-based CBD rules vary widely by state. Some states including Tennessee require CBD to be made in state-certified facilities, while others like Alaska subject the product to regulatory review from several state agencies. Certain states have slowed the role out of derivative CBD products. Massachusetts bans CBD-infused food and beverages, limiting delivery format to capsules, tinctures, and vape. Even with the passage of the Farm Bill in 2018, some states have been slow adopters, with Texas only legalizing CBD at the state level in June of 2019.

Figure 17: Hemp regulations by state

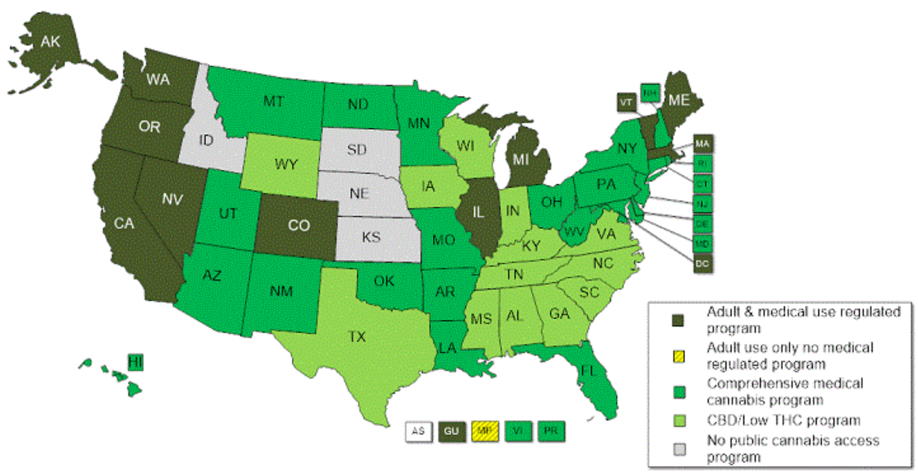


Source: Hemp Business Journal

Disparate state regulations for marijuana-derived CBD are also evident in state cannabis programs

Encompassing cannabis-derived CBD, laws legalizing the use of marijuana for medical purposes or medical and recreational use have been passed in 35 states, along with the District of Colombia and the territory of Puerto Rico. Of the remaining states, only Idaho, Nebraska, Kansas and South Dakota do not have programs through which CBD use is legal. Kansas recently passed a law to permit the use of CBD products with 5% THC for treating debilitating medical conditions. States with medical programs restricted to CBD products include Alabama, Georgia, Indiana, Iowa, Kansas, Kentucky, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Utah, Virginia, Wisconsin and Wyoming.

Figure 18: State cannabis programs



Source: National Conference of State Legislatures

Figure 19: State cannabis programs (treatment of marijuana-derived CBD)

Alabama	2014	Law allows for the legal possesion of CBD for people suffering from a debilitating epleptic condition.
Georgia	2015	Allows the use of cannabis oil that contains equal or less than 5% THC.
Indiana	2017	Allows the use of CBD for treatment resistant epilepsy that is less than 5% in strength and has no more than 0.3% THC.
Iowa	2014	
Kansas	2018	Allows for the use of CBD that contains no more than 5% THC for debilitating disesases. Current law passed May 2019.
Kentucky	2014	Cannabidiol is excluded from the definition of marijuana and can be dispensed by physicians.
Mississippi	2014	Allows for the use of extracts, oils and resins with no more than 15% CBD and no less than 0.5% THC for patients with seizure disorders.
North Carolina	2014	Allows for the use of hemp extract that is less than 0.9% THC and at least 5% CBD by weight. It remains illegal to cultivate and manufacture hemp extract in the state.
South Carolina	2014	Patients Suffering from certain forms of epilepsy may use CBD oil that is less than 0.9% THC and more than 15% CBD.
South Dakota	2017	CBD is a controlled substance although separate from cannabis. Law specifies that CBD must be a product approved by FDA.
Tennessee	2015	Cannabis oil that is less than 0.5% THC and at least 10% CBD can be used for intractable epilepsy, seizure disorders, multiple sclerosis, spasticity, terminal cancer, Alzheimer's, Parkinson's, Huntington's, autism and ALS.
Utah	2014	Allows the use of cannabis extract which is less than 0.3% THC and at least 15% CBD for intractable epilepsy.
Virginia	2015	Oils that contain at least 15% CBD and no more than 5% THC can be used for patients for which a practioner determins there to be a benefit.
Wisconsin	2014	CBD can be used for the treatment of medical conditions.
Wyoming	2015	Hemp extract can be used when containing at least 15% CBD and no more than 0.3% THC for the treatment of intractable epilepsy.

Source: ProCon.Org

The 2020 election likely to bring the topic of cannabis legalization back to the forefront

In the upcoming election, all candidates seeking the Democratic party nomination, except Joe Biden, have shown support for full legalization of cannabis. So far, cannabis legalization does not appear to be an issue Republicans are likely to champion, despite bipartisan support for The STATES Act and The SAFE Act. While President Trump has recently been vocal about combating the opioid crisis, his office is yet to draw a connection between cannabis legalization and potential for weaning Americans off of these addictive drugs. Evidence of the role CBD might be able to play fighting opioid addiction is on the rise, however, and perhaps Trump could take up the cause. According to a report by the American Journal of Psychiatry, patients who took CBD had a lessened craving for opioids or heroin when recovering from addiction. Given Trump signed the Farm Bill into law, he has an easy path toward taking credit for a CBD based addiction treatment program in key battleground states like Ohio, where opioid addiction is endemic.

Supply chain: "Heartland meets the Left Coast"

Highlights

- Hemp already global crop, mainly for industrial products
- US hemp production expanding dramatically to meet CBD demand
- Increasing extraction efficiency and growing capacity has driven down CBD costs
- Fragment share for leading CBD brands as outside competition looms
- E-commerce a key retail channel for hemp CBD, but mass retail increasingly entering the picture

The CBD supply chain is constantly evolving given rapid growth for the industry and a changing regulatory landscape. Its most basic structure has four stages: cultivation, extraction, formulation, and retail & distribution. We note that while hemp CBD companies are rarely active in just one stage, there are also few examples of companies spanning all four in a meaningful way. We are mainly focused on the hemp-derived CBD supply chain, although we may allude to other sources of CBD.

Large-scale producers such as Charlotte's Web have been working to create vertically integrated channels from seed to sale. In cultivation and manufacturing, companies use proprietary genetics and extraction systems to create their desired product, backed up by step-by-step testing. Distribution continues to be varied, with companies like Charlotte's Web getting 55% of sales from e-commerce.

Principal segments:

- Cultivation: The planting, growing and harvesting of the raw plant materials used to produce CBD, whether from the cannabis plant or hemp. Cultivation methods vary based on regulations, the cost of local resources, weather, and desired predictability and yield of plant.
- Extraction: The process of CBD's removal from the plant raw material.
- Formulation: Transforming extracted CBD into a consumable product.
- Retail and distribution: The marketing and sale of CBD-derived products in a store setting, and their direct delivery to the end-consumer.

Figure 20: Supply chain

Source: Canaccord Genuity

Hemp production already flourishes on a global scale

Hemp can be refined for use in a variety of products including textiles, clothing, food, biodegradable plastics, and other industrial products. It follows that there are many established markets for hemp worldwide. China is the largest market, accounting for over $1B in hemp sales or 1/3 of the global hemp market, according to Hemp Business Journal. Most production in China is focused on textiles, while roughly 20% is for other industrial products and personal care, with under 10% for CBD. China is a unique market as only Chinese companies can growl and sell hemp domestically as part of the country's five-year plan to establish hemp as a crucial infrastructure crop.

Thailand is also a producer in Asia, with a legalized sector that defines hemp as having levels of THC at 1% or lower, rather than the 0.3% level found in other countries. This law could become telling as the industry continues to evolve and producers around the globe push regulators to relax the THC limit.

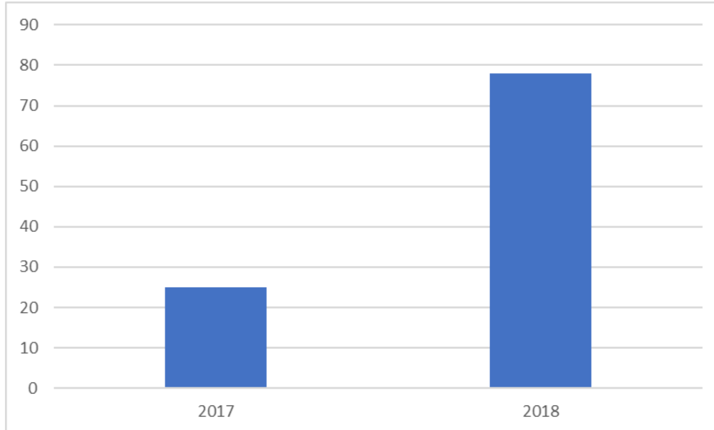
In Europe, France is the largest producer, growing over 35,000 acres of hemp, with the next, Estonia, growing 8,500 acres, and the Netherlands growing 6,000 acres. Prior to passage of the Farm Bill in 2018, some US CBD suppliers sourced their hemp from Europe. The European hemp market has expanded dramatically, with 20,000 acres of production in 2011 increasing to 80,000 in 2017, according to the *Hemp Business Journal*.

Canada's hemp production has grown rapidly since 2008, when it only grew 20,000 acres, to 2017 when it grew 138,000 acres, according to the *Hemp Business Journal*. Given the now-legal status of cannabis, the market has continued to grow, and Canada has now established a position as a hemp exporter. As example, hemp exports to South Korea grew from $235,000 in 2015 to $31.7 million in 2017, according to the Canadian Seed Trade Association. While China is dominant, Canada does have certain advantages, due to open markets and a clearer regulatory environment. For example, the requirement of 0.3% THC content is taken on an average of ten years of crop harvest, rather than a single plant, allowing producers a bit of leeway. Canada also has the designation of Generally Recognized as Safe (GRAS) which removes regulatory restrictions for hemp-based consumables such as food.

US hemp production on the rise

Since passage of the Farm Bill in 2018, independent farmers and industrial hemp producers have expanded their production. In addition, 16,877 state cultivation licenses have been issued this year, which compares with 3546 in 2018 according to the 2019 US Hemp License Report from Vote Hemp. In 2018, 78 thousand acres of hemp were planted across 23 states, and 41 states enacted hemp legislation. This production level was a roughly 300% increase over 2017, and an approximate 800% increase over 2016, according to Vote Hemp, a national nonprofit advocacy group for the industrial hemp industry. Colorado, Kentucky, Montana and Oregon are currently leading in state hemp production for hemp-derived CBD.

Figure 21: US acres licensed for hemp (K)



Source: Public disclosure

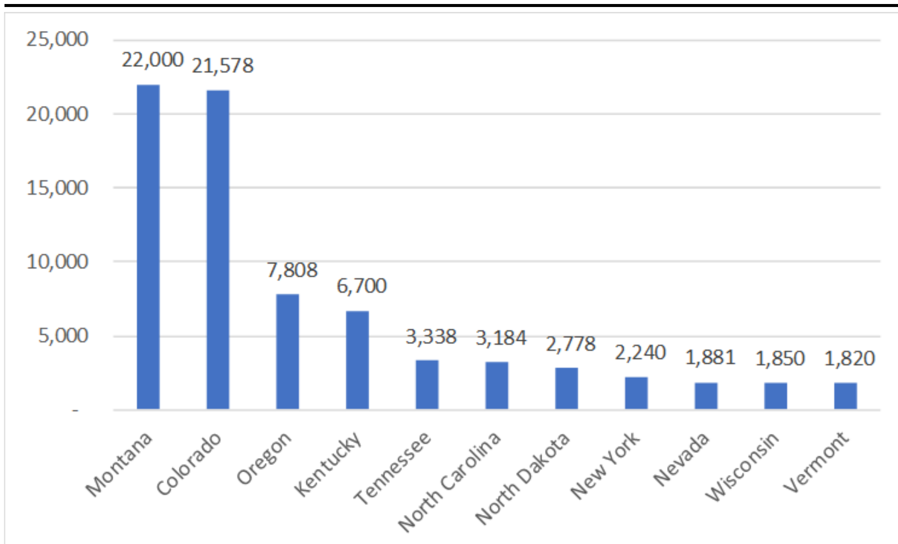
US hemp production by state

While hemp production occurs across dozens of US states, the following overview focusses on what we believe are some of the key state hemp markets for CBD going forward.

- Colorado: Based on available statistics from Hemp Industry Daily in 2019, Colorado is currently the market leader with 80,000 licensed acres for production, as well as 9 million square feet worth of indoor growth capacity. The state currently has active 2,300 registered growers with economics of $200-$500 per pound for hemp flower, and $25-$60 per pound of whole plant biomass. Given the adoption of hemp-based CBD, this growth is expected to continue.
- Montana: The largest producing state in 2018, Montana continues to grow with over 40,000 acres of production in 2019 and more than 250 growers according to Hemp Industry Daily. Montana has a state hemp program that sets guidelines for all production, establishing safety and labeling standards to give the state industry a stamp of approval.
- Kentucky: With its long standing as a large grower of hemp, Kentucky is expected to roughly triple its 2018 output of 16,000 acres, growing 50,000 acres in 2019 according to a CNBC report. Furthermore, the number of active licensed growers has increased at the same pace to a little over 1,000. Given the large number of CBD-focused companies in the states, and their extract capabilities, it can be expected that the hemp production and extraction industries will continue to grow in Kentucky in the coming years. Senator Mitch McConnell of Kentucky helped push the Farm Bill in 2018 and hopes for hemp to become a new staple agriculture product and cash crop for the state moving forward.
- Oregon: Building on the legal cannabis business that already exists in the state, Oregon has been a growth area in hemp production. In 2019, 46,219 acres of hemp were planted by 1,342 active licensed growers according to the state's Department of Agriculture. A cause for concern is Oregon's history with general cannabis, as overproduction caused a glut of product, depressing pricing and hurting business. Hemp however has the advantage of exportation to different states, so it is possible that high-quality hemp and CBD can be exported to new markets, like operations in Colorado and Washington.

- New York: While currently an active market in the cultivation and extraction of hemp and hemp-based CBD, New York has not made its figures public at this time in terms of acres, licenses, and in state-economics. It should be noted that New York has been a major area for hemp and CBD investment with Canopy Growth investing $150 million to create a 48-acre, 308,000 square foot facility to enter the US hemp and CBD market.
- Florida: As of July 2019, hemp is legal in the state of Florida, but regulator frameworks for grow permits, seed use, and extraction will not be set until fall 2019. An interesting market opportunity, Florida's citrus farms have been in decline following the outbreak of greening disease, and hemp could help to replace the agricultural and revenue loss in the coming months and years.
- Ohio: On July 30 of this year, the state legislature voted to allow farmers and researchers to grow industrial hemp, while also legalizing the sale of hemp-derived CBD. The bill is now law, taking immediate effect, though actual hemp production will not actually commence until the 2020 growing season.

Figure 22: Acres licensed for hemp by state



Source: Public disclosure

Hemp state certification programs attempt to normalize supply chain

Given the growth in CBD demand and federal scrutiny, a hemp trade group announced a voluntary certification program that sets safety and quality controls for CBD. These certifications are then issued by the U.S. Hemp Authority, all in an effort to demonstrate a clear path to regulating hemp CBD. So far, a dozen or so companies have received certification, including CV Sciences, HempMeds, and Medterra CBD in California; Charlotte's Web in Colorado; MetaCan in Florida; Balanced Health Botanicals, HD Distribution, Bluebird Botanicals, GenCanna, and Shell Farms in Kentucky; Hempworx in Nevada; and Barlean's in Washington. Only three of the companies receiving certification are based in states without meaningful hemp production.

Extraction capacity is on the rise

CBD must be derived through an extraction and distillation process. First, hemp is combined with a CO2 solvent that separates and extracts the oil found in the plant, which is rich in cannabinoids. To separate this oil into individual cannabinoid compounds, it will need to go through the distillation process, beginning with winterization. Winterization works to remove impurities in the oil such as waxes and fats, due to plant residue. The extracted raw oil is mixed with 200-proof ethanol alcohol and left in a freezer for a period of time ranging from 12 hours to several days. Following the freeze, the resulting mixture is run through a filter paper into an extraction jar, before heat is used to boil off the alcohol. At this point, what is left is a CBD-infused oil that can be consumed when baked into food or in the form of smoke. Given there are no standards for defining a CBD-rich oil, concentration can vary from below 50% to above 75%. An additional step can also be taken to create CBD isolate, a dry power that consists of pure CBD. This process, known as short path distillation, takes the already refined oil and continues to boil it in order to create the CBD isolate. According to industry statistics, the average extraction rate is 45kg/day, distillation is 3kg/day, and crystallization for distillate is 2kg/day.

The thee forms of CBD concentrate – extract, distillate, and isolate – have increasing degrees of CBD content and are used in a range of end products. Extract is primarily used in wellness and holistic products, contains a CBD concentration typically ranging from 50% to 70%, and is paste-like at room temperate and dark brown in color. Distillate has an average CBD concentration of around 85% and is the main active ingredient in recreational and medicinal products such as vapes. This compound is usually a dull yellow and malleable crystal at room temperature. Finally, isolate contains 99% CBD and is a white powder used in pharmaceuticals and high-end products.

Currently, the largest extractors are integrated CBD companies with large upstream operations that control the production of raw product, as well as proprietary extraction facilities. Extraction relies upon scale to keep costs down, and utilizes a variety of propriety methods, each marketed as the most efficient. The largest US player in extraction, working from extract to distillate, is Mile High Labs in Colorado which can produce 120,000 kg of extract annually.

Figure 23: Distillation process

Source: Stillcanna Company report

Nano emulsification could drive CBD beverages boom

Recent strides in nano emulsification may enable formulations that transform the edibles and beverage markets. Since cannabinoids are fat soluble and hydrophobic, in their infusible form they tend to have an oily texture as well as a flavor that is difficult to disguise – hence, all of the sugary edibles lining dispensary shelves.

While cannabinoids aren't technically water soluble, there has been progress in making them "water compatible," using nanoemulsions. Droplets of the nanoemulsion variety can be smaller than 100nm, be optically translucent, and exhibit several characteristics that are attractive to edibles cannabinoid formulations, including low viscosity and kinetic stability. Nanoemulsions are created with shear force using ultrasonic cavitation, which is essentially a mechanical process whereby sound is used to break down oil droplets to nanometer size. A nanoemulsion concentrate (majority water with carrier oil, surfactant, and nanometer cannabinoid droplets) can then be formulated with varying degrees of cannabinoid content, and ultimately added to a beverage or edible without detectability by the consumer. This is not the only approach to flavorless and textureless cannabinoids, and we see water-compatible cannabinoids as an important source for edibles and beverages in the future.

Formulation and brands remain fragmented

While brands from Charlotte's Web, CV Sciences, and Green Roads occupy the top three slots in for market share. We believe consolidation, as well as new and recent entrants with substantial resources, could challenge the status quo. Curaleaf and Select CBD come to mind, as do Canadian LPs that have set their sights on the US hemp-based CBD market since passage of the Farm Bill.

Figure 24: Top 10 CBD brands

Charlotte's Web
CV Sciences
Green Roads
Medterra
Irwin Naturals
CBDfx
CBDistillery
Garden of Life
Social CBD
Medical Marijuana Inc.

Source: Brightfield Group

Broad spectrum of popular CBD products

As previously mentioned, we expect product categories for hemp CBD to evolve similarly to what has been witnessed in the cannabis dispensary channel. With that in mind, edibles and vape are likely to drive meaningful revenue longer term. In the near-term, constraints on retail distribution have made topicals a much larger category when compared to the broader cannabis market. Another key difference is likely to be seen in the beverage category, where we expect CBD beverages to grow meaningfully while their THC counterparts remain a small piece of the overall cannabis market.

Edibles

Innovation is flourishing in the edible's category, driving the introduction of a wide range of CBD edibles. Popular products include gummies and chocolates, with the hemp CBD variety often marketed as having better taste compared to their marijuana derived brethren. According to a Vape360 ranking, CBDfx has the top ranked hemp CBD edible line with their gummy products. According to Tuck, the sleep information provider, CBDistillery was labeled as the "editor's pick" for CBD products. Finally, in an online review done by Mashable, Green Roads CBD edibles were designated the top variety, while CBDistillery was given best value.

Figure 25: CBD edibles

Source: Company reports

Beverages

We see CBD beverages as one of the biggest potential winners post passage of the Farm Bill and subsequent likely broadening of retail distribution (still awaiting FDA regulations for hemp CBD in food, beverage and supplements). The trend toward functional beverages has put CBD in the cross-hairs of global CPG players, and this category is poised to grow faster than most in our view. With the variety of beverage types there is no clear winner, but according to Remedy review, Kickback CBD cold brew, Sprig sparkling soda, and Aurora Elixirs are all well reviewed by customers.

Figure 26: CBD beverages

Source: Beverage Daily.com

Tinctures

Part of the broader indigestibles category, tinctures currently account for more CBD sales than any other product type (we believe greater than 30%), although topicals are a close second. We expect topicals sales to soon surpass sales for tinctures given expanded distribution, and other product types to gain ground as the CBD industry evolves. According to the site RaveReviews, Lazarus Naturals was ranked first by customers, while Vape360 gave that title to CBDfx. Also, Tuck named Medterra the best hemp-derived CBD oil in their own study.

Figure 27: CBD tinctures

Source: Company reports

Vape

Similar to what we see in legal state cannabis markets, consumers often prefer to vape CBD oils rather than smoke CBD flower or other formats. We believe vape hardware is innovating to address design challenges peculiar to CBD isolate (less viscosity), and consumers are beginning to favor certain brands of CBD vape oil. According to CannaInsider, Social CBD has the top reviewed vape pen, while Vape 360 gives the top vape oil spot to CBDfx.

Figure 28: CBD cartridges

Source: Company reports

Topicals

Topicals are driving demand for CBD in 2019. With the CBD supplements and CBD additives in food/beverages not yet permitted by the FDA, (waiting on update from FDA on regulatory framework), branded products manufacturers and retails have focused on lotions, ointments, and other products applied to the skin to sooth and relieve localized pain. According to CBDHacker, the top topical product is Lazarus Naturals cedar citrus balm. Remedy Review also published a list of hemp CBD products, placing Charlotte's Web and CBDistillery in the top ten of topicals.

Figure 29: CBD topicals

Source: Company reports

Large retailers could transform distribution

We believe current retail distribution of hemp CBD is largely through online channels (Charlotte's Web does roughly 55% of its sales online), followed by specialty health and wellness stores, vitamin and supplement stores, and convenience and grocery stores. As mentioned previously in this report, we estimate mass retail will drive the majority of CBD sales by 2023, and large retailers are starting to enter the fray.

Kroger, the largest supermarket chain in America, recently announced plans to offer CBD products in 945 stores covering 17 states according to a company newswire. Kroger is focusing on the topical applications of hemp-derived CBD, offering lotions, oils, and creams across its stores. Kroger also has an existing partnership agreement with Walgreens, anther CBD carrier, in which the two cross-sell items. To date, Kroger has partnered with Charlotte's Web for this venture and has expanded its store count to 1,350 locations across 22 states. Meanwhile, Amazon through its core e-commerce channel and Whole Foods stores offers a wide range of CBD products.

Many large clothing retailers have also announced plans to carry CBD products as they attempt to attract a younger demographic and increase foot traffic. American Eagle will soon offer CBD products in 500 stores across the country with Abercrombie having offerings in 160 stores, DSW carrying CBD in 96 stores. Both of these companies are supplied by Green Growth Brands. Meanwhile Saks Fifth Avenue and other top cosmetics retailers have recently begun selling select cosmetic products infused with CBD, and some of the world's leading spas including those at hotel chains such as Ritz Charlton, Four Seasons and St. Regis began offering CBD-based treatments.

One of the more consequential entrants to this space will be large pharmaceutical and wellness chains. CVS has already brought CBD to 800 stores in eight states (although, as we mentioned, it recently pulled Curaleaf product), while its main competitor, Walgreens, is introducing CBD to 1,500 stores across nine states.

CBD pricing likely to follow trend experienced by THC products

Following the passage of the Farm Bill, large amounts of legal production capacity were able to come online, and with continued investment in extraction technology and capacity, the price of CBD in the US has begun to fall. Since Hemp Benchmarks began publishing wholesale CBD prices in April 2019, the price of concentrate has fallen 50%, with distillate and isolate falling 24% and 26% respectively. These declines have reflected improvements in the efficiency of extraction systems and the evolution of ethanol extraction.

The price of hemp biomass and flower has not experienced this same degree of decline thus far, as states have been slow to implement cultivation growth initiatives and approve licenses. The price of hemp flower had risen 8% through July from April and jumped another 18% in August. The price of biomass has also been solid, falling 11% through July from April before rebounding 16% in August.

Longer term, we believe the prices for bulk hemp flower and other biomass used for CBD extraction are likely to follow trends exhibited for THC products. While prices have varied widely between states, based on supply constraints overall as the legal cannabis market has expanded, prices for wholesale flower have declined. As of August 30, the wholesale price of flower in the US per pound was just over $1,400 which is down from roughly $1,500 last year. Furthermore, we believe retail pricing trends for cannabis products sold through dispensaries could be telling for future CBD pricing. Across product categories, the price per gram of product sold in June in Arizona, California, Colorado and Oregon increased by 2% as the price of edibles and pre-rolls increased by 4% and 7%, respectively, over June 2018 levels, according to BDS Analytics Point of Sale data. The ASP for all other categories declined in June with flower pricing down 11% Y/Y, concentrates down 3% Y/Y and beverages down 1%. ASP results for the month reflect a continued trend from prior periods, particularly with edibles pricing defying broader price declines. One takeaway from the data is potential for margin expansion in edibles and pre-rolls in the face of healthy pricing and potentially lower raw material costs.

Figure 30: June cannabis pricing ASP per gram Y/Y

	Y/Y Change
Flower	-11%
Concentrates	-3%
Vape	-7%
Edibles	4%
Beverages	-1%
Pre-Rolls	7%
Total	2%

Source: BDS Analytics

Public markets: CBD touches wide array of companies in CG coverage universe

Many of the companies in the Canaccord Genuity coverage universe have meaningful exposure to the US CBD market. Backgrounds can differ broadly, including companies focused largely on marijuana and hemp-based consumer branded products, traditional multi-state operators (MSOs) primarily intent on building out dispensary networks, and Canadian LPs developing US-facing revenue streams. We also note that historically non-plant touching companies Greenlane and Kush Co. are expanding their CBD exposure.

A range of brand centric players

Within the brands category, Charlotte's Web is a pure play on hemp-derived CBD, commanding the greatest share of the market of any player. Other names with high CBD revenue exposure include 1933 Industries and Green Growth Brands, through their respective CannaHemp and Seventh Sense lines. We also note that cannabis brand plays DionyMed, Indus Holdings, PLUS Products, and SLANG have been making a push into hemp- and marijuana-based CBD to varying degrees, in certain cases leveraging their hefty wholesale distribution footprints (DionyMed and Indus).

MSOs growing their CBD portfolios

While many of the MSOs under coverage have a CBD strategy in place, Curaleaf stands out as the largest player, especially post acquisition of Select CBD. Other MSO CBD brands include Cresco's Well Beings, Harvest's Colors and CBx Essentials, and Ianthus' CBD For Life. Although Planet 13 and Cansortium thus far have narrower state exposure, their respective CBD brands appear to be gaining traction.

Canadian LPs seeing green

With federal legalization of hemp CBD, a rash of licensed cannabis producers out of Canada, "Canadian LPs," have begun to assertively move into the US CBD market. Players include majors like Canopy Growth and Tilray, who are taking the direct approach of acquiring processing licenses and IP (Canopy) or selling well established Canadian hemp brands and CBD-infused products into the US (Tilray). Smaller Canadian LPs entering the US hemp CBD market are pursuing joint ventures and focusing on states with burgeoning cannabis markets. Village Farms, for example, is focused on Texas and is converting greenhouses used for growing vegetables into hemp facilities. Other LPs setting up US subsidiaries, partnerships, and JVs to tackle the opportunity include HEXO, The Green Organic Dutchman, and CannTrust Holdings, while Cronos, Aurora, and Organigram have all announced intentions to enter the US CBD market. Ultimately, we believe these investments offer long term strategic value, allowing Canadian LPs the ability to build operational footprints in the US based initially on CBD, but eventually translatable to other cannabis products once full-blown federal legalization occurs.

Ancillary players are also expanding CBD exposure

Traditionally non-plant-touching companies Greenlane and Kush are addressing the CBD opportunity in different ways. In addition to packaging and hardware, Greenlane has launched CBD products through distribution partnerships with Bloom Farms, Bouquet, Cookies and others. Kush has remained focused on packaging and hardware, although the company is ramping the sale of solvents for extraction and has entered into a fee-sharing arrangement with C.A. Fortune for distribution services to mass retail.

Notable transactions highlight CBD as attractive alternative to traditional cannabis

Based on the size of the market opportunity and the evolving consumer demand and regulatory environment, public and private capital raises have been on the ascent for companies with a focus on the CBD market, both hemp-derived and marijuana-derived offerings. For companies, the early capital investment has been utilized to scale operations ahead of a ramping market, while the federal de-regulation solidifies the case for M&A from large verticals. We expect activity will increase once the US FDA provides visibility into regulations.

Recent transactions have included a $161M Charlotte's Web follow-on offering this past spring, a $36M private placement for Hemp Fusion in August and a $30M follow-on for Valens GroWorks. Importantly, we note that US companies focused on hemp-based CBD exclusively offer an alternative to cannabis investing, with easier sources of capital and the ability to list on US exchanges and the Toronto Stock exchange. We note that US -based cannabis companies are limited to secondary Canadian stock exchanges (including the Canadian Stock Exchange and the Neo Exchange) and are widely restricted from traditional banking relationships due to the overhanging federal prohibition.

In terms of M&A, many companies in the cannabis market including Aurora, Canopy Growth, Green Growth Brands, Pasha Brands, iAnthus Holdings, TerrAscend, Level Brands, Indus Holdings, 1933 Holdings, Leviathon Cannabis and Tilray have all recently made or are in the process of making significant CBD-focused investments in acquiring companies with CBD branded products, cultivation or extraction expertise. Acquisitions have included companies with both hemp- and marijuana-derived CBD expertise.

Valuation analysis for cannabis companies

Below is a valuation comparison for cannabis companies covered by Canaccord Genuity, based on EV/EBITDA and EV/Revenue.

Figure 31: Comparable for Canaccord Genuity covered companies

Canadian Cannabis Company	Coverage	Ticker	Share Price ($)	Rating	Market Cap (M)	EV/EBITDA		EV/Revenue	
						CY2019E	CY2020E	CY2019E	CY2020E
Aphria Inc.	Bottomley	APHA	8.96	SPEC BUY	$ 2,276	N/A	15.6x	5.8x	2.7x
Aurora Cannabis	Bottomley	ACB	7.85	SPEC BUY	$ 8,364	87.3x	19.3x	15.6x	8.2x
CannTrust	Dley	TRST	2.23	HOLD	$ 310	N/A	1.2x	0.7x	0.3x
Canopy Growth	Bottomley	WEED	35.88	SPEC BUY	$ 16,712	N/A	N/A	15.9x	9.4x
Cronos Group Inc.	Bottomley	CRON	14.84	HOLD	$ 6,560	N/A	37.0x	35.6x	14.9x
Delta 9 Cannabis	Hedlin	DN	0.93	SPEC BUY	$ 105	37.0x	4.0x	1.8x	0.8x
HEXO Corp.	Bottomley	HEXO	5.82	SPEC BUY	$ 1,791	41.3x	10.2x	6.4x	3.5x
High Tide	Hedlin	HITI	0.37	SPEC BUY	$ 81	N/A	40.5x	1.4x	0.8x
MediPharm Labs Corp.	Hedlin	LABS	5.13	SPEC BUY	$ 787	19.4x	8.9x	4.7x	2.7x
OrganiGram Holdings	Bottomley	OGI	6.23	SPEC BUY	$ 1,006	17.1x	9.1x	6.0x	3.6x
Supreme Cannabis Company	Bottomley	FIRE	1.42	SPEC BUY	$ 568	19.4x	6.5x	4.6x	2.5x
The Green Organic Dutchman Holdings	Dley	TGOD	2.83	HOLD	$ 792	N/A	13.5x	15.5x	2.1x
VIVO Cannabis	Hedlin	VIVO	0.44	SPEC BUY	$ 139	N/A	2.6x	2.0x	0.7x
Westleaf	Hedlin	WL	0.42	SPEC BUY	$ 66	N/A	3.1x	8.7x	0.5x
Average of Cdn companies						36.9x	12.6x	8.4x	3.6x
1933 Industries	Burleson	TGIF	0.37	SPEC BUY	$ 88	19.9x	7.5x	2.7x	2.0x
Acreage	Bottomley	ACRG.USD	8.55	SPEC BUY	$ 1,470	N/A	5.3x	4.6x	1.7x
Ayr Strategies Inc.	Burleson	AYR.A	13.64	SPEC BUY	$ 761	17.7x	4.3x	6.6x	1.9x
Cansortium	Burleson	TIUM.USD	1.14	SPEC BUY	$ 331	23.2x	3.9x	5.0x	1.8x
Charlotte's Web	Dley	CWEB	21.99	BUY	$ 2,337	46.2x	16.8x	13.5x	5.1x
CLS Holdings USA	Burleson	CLSH.U	0.21	SPEC BUY	$ 55	2.6x	0.8x	0.8x	0.3x
Columbia Care Health & Wellness	Bottomley	CCHW	5.40	SPEC BUY	$ 1,203	N/A	6.1x	6.0x	1.9x
Cresco	Dley	CL	12.41	SPEC BUY	$ 4,650	408.5x	16.4x	24.1x	4.7x
Curaleaf	Bottomley	CURA	9.91	SPEC BUY	$ 6,943	36.9x	16.5x	8.6x	4.7x
DionyMed Brands	Burleson	DYME	1.10	SPEC BUY	$ 85	N/A	1.7x	0.8x	0.3x
Golden Leaf	Bottomley	GLH	0.05	SPEC BUY	$ 29	0.7x	0.4x	0.1x	0.1x
Green Growth Brands	Dley	GGB	1.82	SPEC BUY	$ 658	7.9x	3.7x	1.6x	0.9x
Greenlane Holdings, LLC2	Dley	GNLN	5.40	SPEC BUY	$ 307	241.5x	12.5x	0.8x	0.6x
Harvest Health and Recreation	Bottomley	HARV	6.97	SPEC BUY	$ 3,117	55.2x	7.7x	7.1x	2.5x
IAN + MPX	Bottomley	IAN	3.16	SPEC BUY	$ 789	N/A	4.0x	2.9x	1.2x
Khiron	Hedlin	KHRN	1.66	SPEC BUY	$ 211	N/A	N/A	15.4x	3.9x
KushCo Holdings2	Burleson	KSHB	3.80	SPEC BUY	$ 446	N/A	25.7x	2.0x	1.3x
Liberty Health Sciences	Bottomley	LHS	0.53	SPEC BUY	$ 197	8.0x	3.6x	1.9x	1.1x
MedMen	Bottomley	MMEN	2.65	SPEC BUY	$ 1,757	N/A	7.6x	3.7x	2.0x
Mjardin	Burleson	MJAR	1.02	HOLD	$ 78	45.3x	3.5x	3.6x	1.5x
Origin House (CannaRoyalty)	Bottomley	OH	8.01	SPEC BUY	$ 604	13.1x	7.0x	3.0x	1.9x
Planet 13	Burleson	PLTH	2.69	SPEC BUY	$ 348	17.3x	8.7x	3.4x	2.2x
SLANG	Burleson	SLNG	0.92	SPEC BUY	$ 331	N/A	5.2x	10.5x	1.2x
TILT	Burleson	TILT	0.64	SPEC BUY	$ 221	154.8x	2.0x	0.8x	0.4x
Trulieve	Bottomley	TRUL	10.78	SPEC BUY	$ 1,205	9.5x	6.3x	4.0x	2.5x
Vireo	Bottomley	VREO	2.24	SPEC BUY	$ 245	14.4x	3.8x	3.5x	1.0x
Average of U.S. companies						53.9x	6.4x	5.5x	2.0x

[1] Not rated - Based on consensus estimates

[2]Trade in USD but market cap converted to CAD for the purposes of the comp table

Source: Company reports, Canaccord Genuity estimates, FactSet as at Sept 5, 2019

Key public and private CBD industry participants

The ecosystem of companies involved in hemp-derived CBD is vast, and the following list in no way captures all the players. In the companies we have highlighted below we also see varying degrees of scale and vertical integration with a handful of companies touching the entire ecosystem and many focused-on brand and distribution. We describe key CBD participants within the context of their supply chain participation.

Source: Company reports

1933 Industries

1933 Industries is a vertically integrated cannabis brand operator. The company owns the CannaHemp brand, its CBD line. The company sells a variety of extract products as well as infused topicals, along with a mix of CBD and THC combined products. 1933 Industries has expanded its extraction capacity to enhance CBD isolate production.

Figure 32: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
1933 Industries	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Abacus Health Products

Abacus Health Products is a CBD company involved in the formulation and retail & distribution parts of the sector's value chain. The company sells business to consumer through its CBD Medic line and business to business through CBD Clinic. It seeks to address the pain relief and skincare markets with products present in 2,000 retail locations and 10,000 medical practitioner offices. Abacus Health has also participating in the National Wellness Expo, Paleo f(x), and the National Products Expo to continue to educate the public on CBD.

Figure 33: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Abacus Health			☑	☑

Source: Company reports

Source: Company reports

American Shaman

American Shaman is a CBD company involved in the formulation and retail & distribution segments of the value chain. The company sells through retail locations which can be franchised, and through wholesale, with the option to join in an affiliate program. The company also sells at a discount through its Compassionate Care program, designed to help customers with chronic conditions.

Figure 34: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
American Shaman			☑	☑

Source: Company reports

Source: Company reports

Better Choice Co

The Better Choice Co is involved in the formulation and retail & distribution of CBD products designed for animal consumption. The North American company operates in direct to consumer fashion and specialty retail with a non-CBD line, Trupet, and a CBD line, Bona Vida. Currently the company has 150,000 customers and 13,000 signed to a subscription service, coupled with plans to expand to general retail, as well as partnerships with veterinary distributors.

Figure 35: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Better Choice Co			☑	☑

Source: Company reports

Source: Company reports

CBDfx

CBDfx is CBD company involved in the extraction, formulation, and retail & distribution of products. The company has a market leading brand and is also active selling through its wholesale channel.

Figure 36: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
CBDfx		☑	☑	☑

Source: Company reports

Source: Company reports

CBDistillery

CBDistillery is a CBD company involved in the extraction, formulation, and retail & distribution of products. The company sells in retail locations across the country, along with an e-commerce option as well as a wholesale channel.

Figure 37: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
CBDistillerey		☑	☑	☑

Source: Company reports

Source: Company reports

Charlotte's Web

Charlotte’s Web is the largest CBD company in North America, fully integrated across the CBD value chain, active in cultivation, extraction, formulation, and retail & distribution. The company operates farms in three states and is expanding into 177,000 square feet of production space for extraction and packaging. It is currently expanding its distribution network, selling in 8,000 retail locations in the U.S. as well as targeting partnerships with 5 national chains, and the company has a large ecommerce presence with takes in 55% of total sales.

Charlotte’s Web is also a leader in agricultural science relating to hemp production. In July 2019 the company signed a partnership with the Rodale Institute and Natural Care to research regenerate hemp agriculture. This is part of a larger push into sustainable agriculture as the company has shifted to regenerative means of hemp production, from conventional forms, over the past five years.

Figure 38: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Charlotte's Web	☑	☑	☑	☑

Source: Company reports

Source: Company reports

CV Sciences

CV Sciences is one of the larger CBD brand operators in the U.S., operating in the formulation and retailed & distribution channels. The company has two business lines in consumer products and drug development. The consumer products section is built around health and wellness with over fifty products and a focus on supplements and topicals. CV Sciences is the only company to date to adopt the Generally Recognized as Safe (GRAS) designation for its consumer products.

The medical side is focused on the development of a CBD based treatment for smokeless tobacco, which causes 250,000 deaths per year in the U.S. To date, CV Sciences has engaged with the FDA and is in the process of completing nonclinical toxicology studies this year, along with the submission of the investigation new drug application (IND). The company expects to begin clinical trials in late 2019.

Figure 39: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
CV Sciences Inc			☑	☑

Source: Company reports

Source: Company reports

EcoGen Laboratories

EcoGen Labs is a fully integrated CBD company covering cultivation to retail & distribution. The company has two main channels: selling distillate, isolate, flower, and seeds at the wholesale level, while also running a white-label operation covering almost all CBD produces from tinctures to dog food. The company has built a reputation as a provider of superior genetics for its hemp seeds and is a large manufacture and seller of proprietary extraction and processing machines.

Figure 40: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
EcoGen Labs	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Elixinol

Elixinol is a global owner and operator of CBD consumer brands, working both formulation and retail & distribution. The consumer products portfolio operates across two segments, dietary supplements and hemp foods. The company gains 87% of its revenues from the dietary supplements side, selling 45 products over the full spectrum of CBD consumption methods. Within the consumer segment the company sells through direct to consumer, wholesale, private label, and bulk channels. 12% comes from hemp foods selling 43 products covering hemp seeds, flower, protein, and topicals. Elixinol is a global operator, with operations in North America, Europe, Japan, and Australia.

Elixinol is also planning to expand to the pharmaceutical space and submitted a license application to the Office of Drug Control in 2018. To this end, the company has also purchased and is holding 60 acres in Australia for continued development.

Figure 41: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Elixinol			☑	☑

Source: Company reports

Source: Company reports

Empower Clinics

Empower Clinics is a CBD company active through extraction, formulation, and retail & distribution. The company operates across a clinic franchise model, tele-medicine, and CBD product sales in clinics and at wholesale. In the main clinic business, the company has treated more than 165,000 patients and has a point of sale for its Sollievo CBD line. It also is HIPAA compliant, collecting patient data to better serve its extraction operations and understand customer drivers.

Figure 42: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Empower Clinics		☑	☑	☑

Source: Company reports

Source: Company reports

Garden of Life

Garden of Life is a wellness company focused on the vitamin and supplement sectors. The company owns a market leading CBD brand in Dr. Formulated. The company maintains a fully integrated supply chain for its CBD line using U.S. hemp, clean extraction, and formulation by board certified doctors.

Figure 43: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Garden of Life	☑	☑	☑	☑

Source: Company reports

Source: Company reports

GenCanna

GenCanna is an integrated CBD company covering cultivation to retail & distribution. The company operates the GenCanna Production Platform through family farmers in Kentucky, then works through a property extraction and manufacturing process. The end product is tested and sold in a variety of forms from tinctures to isolate and topicals, with isolate and oil being sold at bulk wholesale in addition to distribution.

Figure 44: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
GenCanna	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Green Growth Brands

Green Growth is a cannabis company that operates a large CBD personal care line in the formulation and retail & distribution segments of the value chain. The company sells its products through retail locations such as its innovative mall kiosks, at wholesale, and through ecommerce. Green Growth Brands has also signed agreements with retailers American Eagle, Abercrombie, and DWS to exclusively supply CBD products to be sold in their stores.

Figure 45: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Green Growth Brands			☑	☑

Source: Company reports

Source: Company reports

Green Roads

Green Roads is a U.S. based integrated CBD company covering cultivation to retail & distribution in the value chain. The company produces pharmacist-formulated CBD that is sold in over 10,000 locations in the U.S. in a variety of available forms. Green Roads also operates a wholesale channel and has received numerous industry awards for its formulation and testing standards, including a #1 privately held CBD company ranking by Brightfield Research.

Figure 46: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Green Roads	☑	☑	☑	☑

Source: Company reports

Source: Company reports

GW Pharmaceuticals PLC

GW Pharmaceuticals is the market leader in regard to CBD-based medical treatment operating in the formulation channel. The company was the first to have a CBD-based drug, Epidiolex, be approved for sale in the U.S. as well as Europe. The London-based company also has numerous other CBD-based drugs in the pipeline, including Sativex, CBDV, GWP42002, and GWP 432003.

Figure 47: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
GW Pharmaceuticals			☑	

Source: Company reports

Source: Company reports

HeavenlyRx

HeavenlyRx is an integrated CBD company controlling cultivation through retail & distribution. The company owns a number of CBD brands that cover the entirety of the value chain, and also works to develop cannabinoids outside of CBD. The brands Bluhen Botanicals, Envy Hemp, and Cause+Medic sell a full spectrum of CBD products.

Figure 48: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
HeavenlyRx	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Hemptown

Hemptown is a CBD company currently involved in cultivation, extraction, and the formulation of CBD products. The company, a member of the U.S. Hemp Roundtable, operates in Oregon, Colorado, and Kentucky with plans to expand to California in 2020. Extraction facilities are locating in Oregon and are both CGMP and ISO certified. In June of 2019 Hemptown acquired Kirkman, giving the company more robust formulation capabilities as well as future distribution channels.

Figure 49: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Hemptown	☑	☑	☑	

Source: Company reports

Source: Company reports

Integrated CBD

As the name suggests, Integrated CBD is a CBD company active across the entire industry value chain. The vertically integrated. company controls over 10,00 acres of farmland for industrial hemp and employs GMP standards in extraction and formulation. Integrated CBD sells at bulk, offering both CBD isolate and distillate, with an option for bespoke orders.

Figure 50: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Integrated CBD	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Irwin Naturals

Irwin Naturals is a wellness products company that is also active in the formulation and retail & distribution of CBD products. The company has its own labeled CBD products and also owns a variety of brands, including the topical line HydroCanna, the infused beverage line FloChi CBD, and the pet line LoveMyPet.

Figure 51: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Irwin Naturals			☑	☑

Source: Company reports

Source: Company reports

Isodiol

Isodiol is an integrated CBD company that operates from cultivation to retail & distribution; it also owns a family of CBD brands. The company sells though a diverse set of channels including bulk, white label, wholesale, and general retail. Isodiol has applied to use CBD isolate in pharmaceuticals and has expanded into the infused beverage market through its brand Pot-O-Coffee.

Figure 52: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Isodiol	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Lazarus Naturals

Lazarus Naturals is an integrated CBD company involved in the cultivation, extraction, formulation, and retail & distribution of products. The company sells in retail locations across the country, along with an e-commerce option as well as through wholesale.

Figure 53: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Lazarus Naturals	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Mary's Medicinals

Mary's Medicinals is a consumer products company with a cannabis product line including transdermal patches, gels, compounds, capsules and vaporizers. Along with Mary's Medicinals, the company offers two additional product lines in Mary's Nutritionals and Whole Pet that focus exclusively on hemp-based CBD products. The company's cannabis products are currently sold in licensed dispensaries in Arizona, California, Colorado, Florida, Illinois, Maryland, Michigan, Nevada, Oregon, Vermont and Washington, while the hemp-based CBD products are sold throughout the country.

Figure 54: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Mary's Medicinals			☑	☑

Source: Company reports

Medical Marijuana

Source: Company reports

Medical Marijuana is a fully integrated CBD company that operates across the value chain. The company owns the HempMeds Brand, their subsidiaries in Mexico and Brazil, and Kannaway, a CBD sales and marketing company that operates in over 30 countries.

Figure 55: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Medical Marijuana Inc.	☑	☑	☑	☑

Source: Company reports

Medterra

Source: Company reports

Medterra is a vertically integrated consumer products company based in Kentucky which manufactures CBD products including capsules, topicals and tinctures along with a line of pet products. The company's products are sold online as well as through retail stores and are available in all fifty states.

Figure 56: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Medterra	☑	☑	☑	☑

Source: Company reports

Mile High Labs

Source: Company reports

Based in Colorado, Mile High Labs is the largest private hemp and CBD producer in the US. The company has annual extraction capacity of 120,000 kg of extract, derived from propriety industrial-scale facilities. The company operates in three main segments: bulk wholesaling, white labeling CBD products, and in June 2019 the company announced it was launching its own Private Label.

In the bulk division, Mile High sells both isolate and extract in 1kg sizes. On the white label side, Mile High sells through different consumer brands, with RXoil, Advant Garden Extract, Mountain of Youth, Gold CBD, and LIV CBD all being a part of its portfolio. The company has a distribution channel in 4,000 domestic stores, with planned expansion into European and Australian markets.

Figure 57: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Mile High Labs	☑	☑	☑	☑

Source: Company reports

Source: Company reports

MYM Nutraceuticals

MYM Nutraceuticals is an integrated company though cultivation to retail & distribution, focusing on the hemp- based CBD and cannabis markets with operations in the US, Colombia, Canada, Australia, Mexico and Europe. In the US the company is focused on hemp biomass and extract wholesale production, while in Canada and Colombia the company manufactures cannabis flower and extracts. In total the company has four hemp cultivation and extraction projects, two medical cannabis projects and three distribution offices.

Figure 58: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
MYM Nutraceuticals	☑	☑	☑	☑

Source: Company reports

Source: Company reports

New Age Beverages

New Age Beverages is a Colorado-based company that is involved in the formulation and retail & distribution aspects of the value chain. The company's branded product line includes: Bucha, CoCo Libre, Illy Coffee, Marley and WaterisLife. New Age is among the first beverage companies to experiment with CBD drinks in the US.

Figure 59: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
New Age Beverages			☑	☑

Source: Company reports

Source: Company reports

Pax Labs

Pax Labs is a leading vape hardware company based in San Francisco with sales throughout the world. Pax launched in 2017 and has since created vape technology for multiple product categories including e-cigarettes. Juul, the popular e-cigarette brand, was a spin-out of Pax Labs in 2017. In April, Pax closed a $420M equity round with existing and new investors at a post-money valuation of $1.7B. The proceeds of the financing are expected to be used for a number of initiatives, including exploring hemp-based CBD products.

Figure 60: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
PAX				☑

Source: Company reports

Source: Company reports

Sentia Wellness

Sentia Wellness recently launched new products under its Social CBD brand in 10,000 retail locations including drug and grocery stores across the US and online. The Social CBD branded products include drops, gel capsules, vape pens, patches and topicals. In addition, the company has a line of pet products..

Figure 61: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Social CBD	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Stem Holdings

Stem Holdings is a vertically integrated cannabis company with cannabis facilities located in California, Oklahoma, Oregon and Nevada. It has numerous consumer brands offering both cannabis and hemp-based CBD products. The company's hemp-based CBD brand is Dose-Ology.

Figure 62: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Stem Holdings	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Stillcanna

Stillcanna is one of the largest operators in Europe and is an integrated company covering cultivation to retail & distribution. Stillcanna only sells in bulk to avoid expenses associated with retail, such as containers and multiple deliveries and labels. By selling in 1kg bulk form the company is able to streamline operations and have superior pricing for customers, enabling a larger scale, lower cost approach.

Figure 63: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
StillCanna Inc.	☑	☑	☑	☑

Source: Company reports

Source: Company reports

Uleva

Uleva is the CBD line created by Contract Pharmacal, which is the manufacturer for brand OTC drugs at CVS and Walgreens. Uleva formulates and distributes six different CBD products based on different needs, ranging from sleep to relief.

Figure 64: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Uleva			☑	☑

Source: Company reports

Source: Company reports

Vertical Wellness

Vertical Wellness is a vertically integrated CBD company that owns multiple CBD brands working as a seed to sale MSO. Vertical Wellness is a spin-off of the California cannabis producer Vertical Companies. In addition to its own brands, Vertical Wellness plans to sell its CBD to consumer packaged goods companies. Vertical Wellness has secured 2,000 acres of Kentucky farmland and has a 90,000-sq.-foot processing and manufacturing facility in the state.

Figure 65: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Vertical Wellness	☑	☑	☑	☑

Source: Company reports

Source: Company reports,

Zelios

Zelios is U.S.-based CBD company involved in the cultivation, extraction, and formulation of CBD products. The company operates facilities in Colorado, Kentucky, and Oregon, and then sells both extract and distillate at bulk. The company also sells its extraction and formulation expertise to other CBD companies.

Figure 66: Supply chain position

Company	Cultivation	Extraction	Formulation	Retail & Distribution
Zelios	☑	☑	☑	

Source: Company reports

Appendix: Important Disclosures

Analyst Certification

Each authoring analyst of Canaccord Genuity whose name appears on the front page of this research hereby certifies that (i) the recommendations and opinions expressed in this research accurately reflect the authoring analyst's personal, independent and objective views about any and all of the designated investments or relevant issuers discussed herein that are within such authoring analyst's coverage universe and (ii) no part of the authoring analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by the authoring analyst in the research.

Analysts employed outside the US are not registered as research analysts with FINRA. These analysts may not be associated persons of Canaccord Genuity LLC and therefore may not be subject to the FINRA Rule 2241 and NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

Sector Coverage

Individuals identified as "Sector Coverage" cover a subject company's industry in the identified jurisdiction, but are not authoring analysts of the report.

Investment Recommendation

Date and time of first dissemination: September 09, 2019, 23:12 ET

Date and time of production: September 09, 2019, 23:12 ET

Compendium Report

This report covers six or more subject companies and therefore is a compendium report and Canaccord Genuity and its affiliated companies hereby direct the reader to the specific disclosures related to the subject companies discussed in this report, which may be obtained at the following website (provided as a hyperlink if this report is being read electronically) http://disclosures.canaccordgenuity.com/EN/Pages/default.aspx; or by sending a request to Canaccord Genuity Corp. Research, Attn: Disclosures, P.O. Box 10337 Pacific Centre, 2200-609 Granville Street, Vancouver, BC, Canada V7Y 1H2; or by sending a request by email to disclosures@cgf.com. The reader may also obtain a copy of Canaccord Genuity's policies and procedures regarding the dissemination of research by following the steps outlined above.

Past performance

In line with Article 44(4)(b), MiFID II Delegated Regulation, we disclose price performance for the preceding five years or the whole period for which the financial instrument has been offered or investment service provided where less than five years. Please note price history refers to actual past performance, and that past performance is not a reliable indicator of future price and/or performance.

Distribution of Ratings:

Global Stock Ratings (as of 09/09/19)

Rating	Coverage Universe		IB Clients
	#	%	%
Buy	515	58.59%	52.04%
Hold	208	23.66%	35.58%
Sell	23	2.62%	13.04%
Speculative Buy	133	15.13%	74.44%
	879*	100.0%	

*Total includes stocks that are Under Review

Canaccord Genuity Ratings System

BUY: The stock is expected to generate risk-adjusted returns of over 10% during the next 12 months.

HOLD: The stock is expected to generate risk-adjusted returns of 0-10% during the next 12 months.

SELL: The stock is expected to generate negative risk-adjusted returns during the next 12 months.

NOT RATED: Canaccord Genuity does not provide research coverage of the relevant issuer.

"Risk-adjusted return" refers to the expected return in relation to the amount of risk associated with the designated investment or the relevant issuer.

Risk Qualifier

SPECULATIVE: Stocks bear significantly higher risk that typically cannot be valued by normal fundamental criteria. Investments in the stock may result in material loss.

12-Month Recommendation History (as of date same as the **Global Stock Ratings** table)

A list of all the recommendations on any issuer under coverage that was disseminated during the preceding 12-month period may be obtained at the following website (provided as a hyperlink if this report is being read electronically) http://disclosures-mar.canaccordgenuity.com/EN/Pages/default.aspx

General Disclaimers

See "Required Company-Specific Disclosures" above for any of the following disclosures required as to companies referred to in this report: manager or co-manager roles; 1% or other ownership; compensation for certain services; types of client relationships; research analyst conflicts; managed/co-managed public offerings in prior periods; directorships; market making in equity securities and related derivatives. For reports identified above as compendium reports, the foregoing required company-specific disclosures can be found in a hyperlink located in the section labeled, "Compendium Reports." "Canaccord Genuity" is the business name used by certain wholly owned subsidiaries of Canaccord Genuity Group Inc., including Canaccord Genuity LLC, Canaccord Genuity Limited, Canaccord Genuity Corp., and Canaccord Genuity (Australia) Limited, an affiliated company that is 50%-owned by Canaccord Genuity Group Inc.

The authoring analysts who are responsible for the preparation of this research are employed by Canaccord Genuity Corp. a Canadian broker-dealer with principal offices located in Vancouver, Calgary, Toronto, Montreal, or Canaccord Genuity LLC, a US broker-dealer with principal offices located in New York, Boston, San Francisco and Houston, or Canaccord Genuity Limited., a UK broker-dealer with principal offices located in London (UK) and Dublin (Ireland), or Canaccord Genuity (Australia) Limited, an Australian broker-dealer with principal offices located in Sydney and Melbourne.

The authoring analysts who are responsible for the preparation of this research have received (or will receive) compensation based upon (among other factors) the Investment Banking revenues and general profits of Canaccord Genuity. However, such authoring analysts have not received, and will not receive, compensation that is directly based upon or linked to one or more specific Investment Banking activities, or to recommendations contained in the research.

Some regulators require that a firm must establish, implement and make available a policy for managing conflicts of interest arising as a result of publication or distribution of research. This research has been prepared in accordance with Canaccord Genuity's policy on managing conflicts of interest, and information barriers or firewalls have been used where appropriate. Canaccord Genuity's policy is available upon request.

The information contained in this research has been compiled by Canaccord Genuity from sources believed to be reliable, but (with the exception of the information about Canaccord Genuity) no representation or warranty, express or implied, is made by Canaccord Genuity, its affiliated companies or any other person as to its fairness, accuracy, completeness or correctness. Canaccord Genuity has not independently verified the facts, assumptions, and estimates contained herein. All estimates, opinions and other information contained in this research constitute Canaccord Genuity's judgement as of the date of this research, are subject to change without notice and are provided in good faith but without legal responsibility or liability.

From time to time, Canaccord Genuity salespeople, traders, and other professionals provide oral or written market commentary or trading strategies to our clients and our principal trading desk that reflect opinions that are contrary to the opinions expressed in this research. Canaccord Genuity's affiliates, principal trading desk, and investing businesses also from time to time make investment decisions that are inconsistent with the recommendations or views expressed in this research.

This research is provided for information purposes only and does not constitute an offer or solicitation to buy or sell any designated investments discussed herein in any jurisdiction where such offer or solicitation would be prohibited. As a result, the designated investments discussed in this research may not be eligible for sale in some jurisdictions. This research is not, and under no circumstances should be construed as, a solicitation to act as a securities broker or dealer in any jurisdiction by any person or company that is not legally permitted to carry on the business of a securities broker or dealer in that jurisdiction. This material is prepared for general circulation to clients and does not have regard to the investment objectives, financial situation or particular needs of any particular person. Investors should obtain advice based on their own individual circumstances before making an investment decision. To the fullest extent permitted by law, none of Canaccord Genuity, its affiliated companies or any other person accepts any liability whatsoever for any direct or consequential loss arising from or relating to any use of the information contained in this research.

Research Distribution Policy

Canaccord Genuity research is posted on the Canaccord Genuity Research Portal and will be available simultaneously for access by all of Canaccord Genuity's customers who are entitled to receive the firm's research. In addition research may be distributed by the firm's sales and trading personnel via email, instant message or other electronic means. Customers entitled to receive research may also receive it via third party vendors. Until such time as research is made available to Canaccord Genuity's customers as described above, Authoring Analysts will not discuss the contents of their research with Sales and Trading or Investment Banking employees without prior compliance consent.

For further information about the proprietary model(s) associated with the covered issuer(s) in this research report, clients should contact their local sales representative.

Short-Term Trade Ideas

Research Analysts may, from time to time, discuss "short-term trade ideas" in research reports. A short-term trade idea offers a near-term view on how a security may trade, based on market and trading events or catalysts, and the resulting trading opportunity that may be available. Any such trading strategies are distinct from and do not affect the analysts' fundamental equity rating for such stocks. A short-term trade idea may differ from the price targets and recommendations in our published research reports that reflect the research analyst's views of the longer-term (i.e. one-year or greater) prospects of the subject company, as a result of the differing time horizons, methodologies and/or other factors. It is possible, for example, that a subject company's common equity that is considered a long-term 'Hold' or 'Sell' might present a short-term buying opportunity as a result of temporary selling pressure in the market or for other reasons described in the research report; conversely, a subject company's stock rated a long-term 'Buy' or "Speculative Buy' could be considered susceptible to a downward price correction, or other factors may exist that lead the research analyst to suggest a sale over the short-term. Short-term trade ideas are not ratings, nor are they part of any ratings system, and the firm does not intend, and does not undertake any obligation, to maintain or update short-term trade ideas. Short-term trade ideas are not suitable for all investors and are not tailored to individual investor circumstances and objectives, and investors should make their own independent decisions regarding any securities or strategies discussed herein. Please contact your salesperson for more information regarding Canaccord Genuity's research.

For Canadian Residents:

This research has been approved by Canaccord Genuity Corp., which accepts sole responsibility for this research and its dissemination in Canada. Canaccord Genuity Corp. is registered and regulated by the Investment Industry Regulatory Organization of Canada (IIROC) and is a Member of the Canadian Investor Protection Fund. Canadian clients wishing to effect transactions in any designated investment discussed should do so through a qualified salesperson of Canaccord Genuity Corp. in their particular province or territory.

For United States Persons:

Canaccord Genuity LLC, a US registered broker-dealer, accepts responsibility for this research and its dissemination in the United States. This research is intended for distribution in the United States only to certain US institutional investors. US clients wishing to effect transactions in any designated investment discussed should do so through a qualified salesperson of Canaccord Genuity LLC. Analysts employed outside the US, as specifically indicated elsewhere in this report, are not registered as research analysts with FINRA. These analysts may not be associated persons of Canaccord Genuity LLC and therefore may not be subject to the FINRA Rule 2241 and NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

For United Kingdom and European Residents:

This research is distributed in the United Kingdom and elsewhere Europe, as third party research by Canaccord Genuity Limited, which is authorized and regulated by the Financial Conduct Authority. This research is for distribution only to persons who are Eligible Counterparties or Professional Clients only and is exempt from the general restrictions in section 21 of the Financial Services and Markets Act 2000 on the communication of invitations or inducements to engage in investment activity on the grounds that it is being distributed in the United Kingdom only to persons of a kind described in Article 19(5) (Investment Professionals) and 49(2) (High Net Worth companies, unincorporated associations etc) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (as amended). It is not intended to be distributed or passed on, directly or indirectly, to any other class of persons. This material is not for distribution in the United Kingdom or elsewhere in Europe to retail clients, as defined under the rules of the Financial Conduct Authority.

For Jersey, Guernsey and Isle of Man Residents:

This research is sent to you by Canaccord Genuity Wealth (International) Limited (CGWI) for information purposes and is not to be construed as a solicitation or an offer to purchase or sell investments or related financial instruments. This research has been produced by an affiliate of CGWI for circulation to its institutional clients and also CGWI. Its contents have been approved by CGWI and we are providing it to you on the basis that we believe it to be of interest to you. This statement should be read in conjunction with your client agreement, CGWI's current terms of business and the other disclosures and disclaimers contained within this research. If you are in any doubt, you should consult your financial adviser.

CGWI is licensed and regulated by the Guernsey Financial Services Commission, the Jersey Financial Services Commission and the Isle of Man Financial Supervision Commission. CGWI is registered in Guernsey and is a wholly owned subsidiary of Canaccord Genuity Group Inc.

For Australian Residents:

This research is distributed in Australia by Canaccord Genuity (Australia) Limited ABN 19 075 071 466 holder of AFS Licence No 234666. To the extent that this research contains any advice, this is limited to general advice only. Recipients should take into account their own personal circumstances before making an investment decision. Clients wishing to effect any transactions in any financial products discussed in the research should do so through a qualified representative of Canaccord Genuity (Australia) Limited. Canaccord Genuity Wealth Management is a division of Canaccord Genuity (Australia) Limited.

For Hong Kong Residents:

This research is distributed in Hong Kong by Canaccord Genuity (Hong Kong) Limited which is licensed by the Securities and Futures Commission. This research is only intended for persons who fall within the definition of professional investor as defined in the Securities and Futures Ordinance. It is not intended to be distributed or passed on, directly or indirectly, to any other class of persons. Recipients of this report can contact Canaccord Genuity (Hong Kong) Limited. (Contact Tel: +852 3919 2561) in respect of any matters arising from, or in connection with, this research.

Additional information is available on request.