



## GLOBAL CANNABIS CONSUMERS

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Ackrell Capital Cannabis Team

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### About Ackrell Capital

Founded in 2003, Ackrell Capital is a leading independent investment bank focused on emerging growth companies. Ackrell Capital's expertise includes:

- Private Equity
- Mergers and Acquisitions
- Private Placements
- Corporate Development
- Cannabis, Consumer, Technology, Digital and Other Emerging Growth Industries

Ackrell Capital is based in San Francisco, CA. Ackrell Capital is a member of FINRA and SIPC.

- The United Nations recently estimated that more than 180 million people globally between the ages of 15 and 64, or more than 4% of this age group, consume cannabis annually.
- At least 20 countries have implemented medical cannabis laws, including Australia, Canada, Colombia and Germany; countries without such laws include China, Japan, Russia and the United States.
- Although federally illegal in the United States, 46 states and the District of Columbia have passed at least one law that permits the manufacture, distribution, dispensing or possession of cannabis. While most of these laws are medical cannabis laws, 8 states have enacted recreational laws.
- Across all medical cannabis laws in the United States, cannabis is legally recognized as a form of therapy or medicine for more than 50 qualifying conditions, including Alzheimer's disease, anorexia, arthritis, cancer, chronic pain, epilepsy and post-traumatic stress disorder.
- California is poised to become the largest recreational cannabis market in the world with the implementation of its recreational law in January 2018—a watershed moment for the industry.
- The illegal cannabis market in the United States is estimated to be more than \$45 billion annually. (We estimate that the 2017 U.S. state-legal cannabis market was \$8.0 billion.) If federal legalization occurs, we believe that the legal market could be more than two times the size of the current illegal market, ultimately exceeding \$100 billion annually.
- The cannabis industry provides a broad range of investment opportunities in both the public and private markets for sophisticated investors who are willing to take significant risks.

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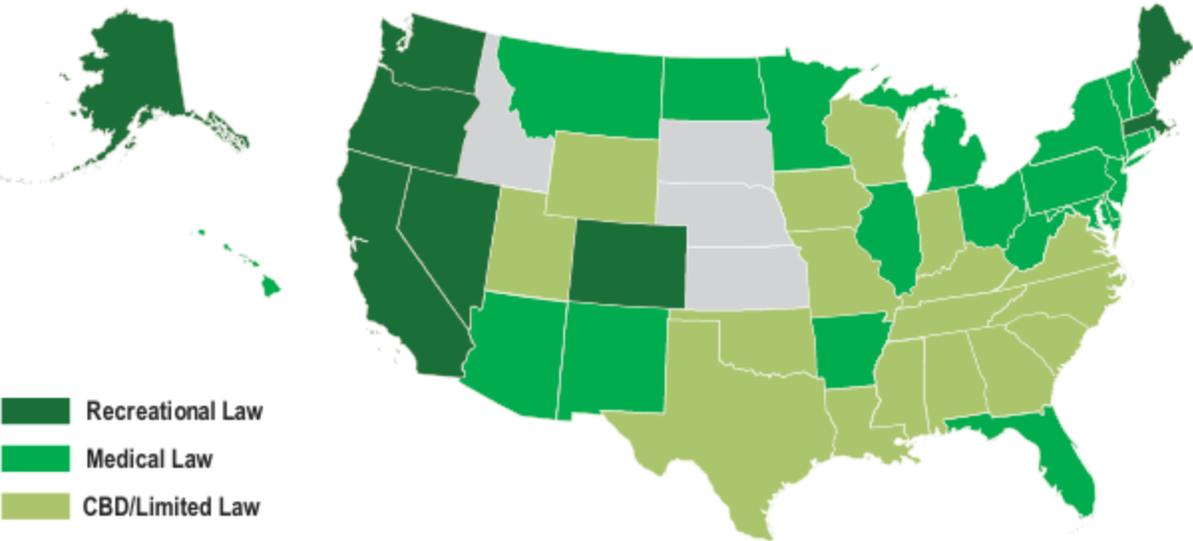
# REPORT HIGHLIGHTS

## Select Countries with Legalized Cannabis Access (January 2018)

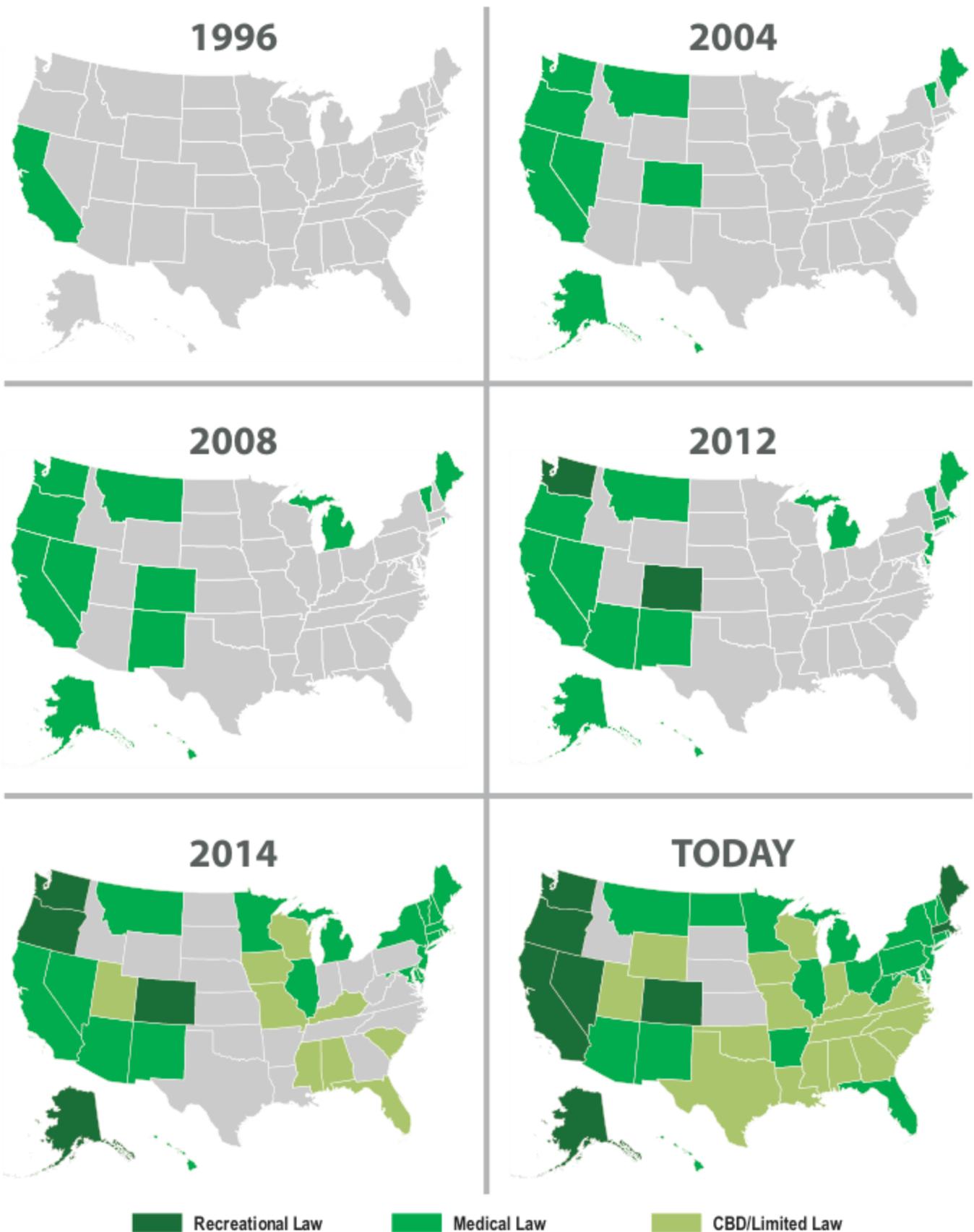


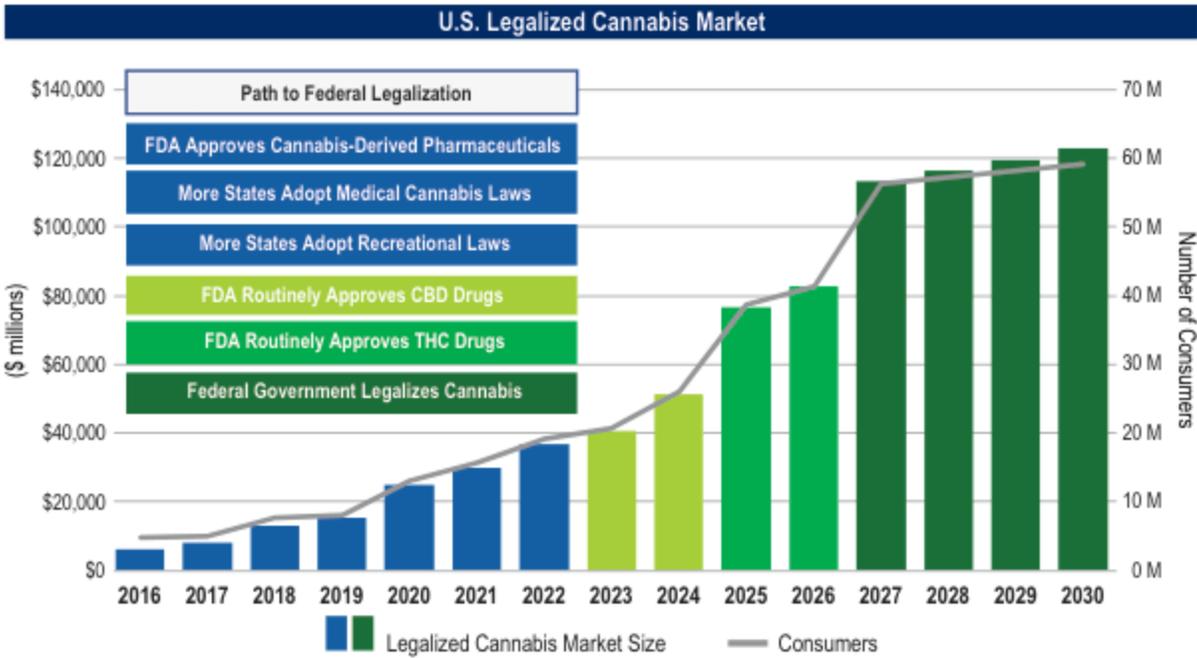
\*Canada currently has a medical law. Assumes Canada enacts a proposed recreational law in mid-2018.

## U.S. State Cannabis Laws (January 2018)

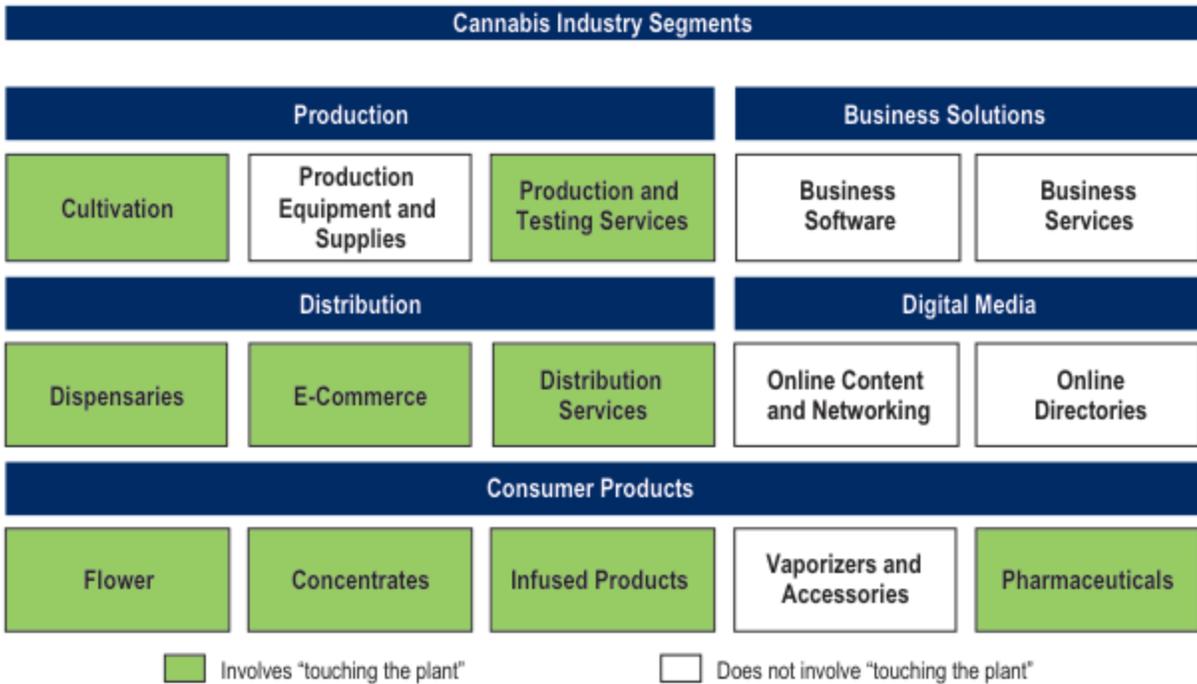


Progression of U.S. State Cannabis Laws





Source: Ackrell Capital. Assumes cannabis will be legalized federally by 2027. Cannabis may never be legalized federally in the United States.



## Foreword

Ackrell Capital is pleased to present our 2018 Cannabis Investment Report. Much has happened in the nearly two years since we published our inaugural report: the cannabis industry grew significantly, companies in the industry raised large amounts of capital and their stock prices performed well, and the legalization movement continued worldwide as more countries and U.S. states implemented a framework for legal cannabis access. There was also a presidential election in the United States; its ultimate impact on the cannabis industry remains uncertain. What did not happen since we launched our inaugural report? Federal legalization: “marijuana” continues to be classified as a Schedule I controlled substance under the Controlled Substances Act in the United States.

In this new edition, we introduce an outlook on global cannabis markets, analyze capital markets for cannabis companies and present updated market estimates. We also expand on the first edition by providing more in-depth analyses of the various market segments within—and analyzing the legal issues pertinent to—the cannabis industry. The *Top 100 Private Cannabis Companies* list has been updated and our industry landscape, *The Green Field*, has been updated and expanded to include more than 500 companies.

Cannabis legalization has accelerated domestically and internationally. In the 2016 U.S. elections, four states, including California, legalized recreational cannabis (bringing the total number of states with recreational laws to eight) and an additional four states legalized medical cannabis. Cannabis use is now state-legal in some form in 46 states.

In January 2018, California will implement its recreational law, making it the largest market globally for the recreational use of cannabis. Similarly, Canada is expected to pass its recreational law in mid-2018. And in 2017, Germany became the most populous country in the world to pass a medical cannabis law.

Cannabis has mass consumer appeal around the world. (According to the United Nations, more than 180 million people per year use cannabis and it is the most-consumed drug worldwide). While it is clear that there is significant demand for cannabis, less clear is how quickly illegal markets will transition to legal markets, as well as the extent to which legalization may increase overall demand.

We continue to believe that it is a question of when—not if—the U.S. federal prohibition on cannabis will end. We believe that a path toward federal legalization exists and we believe this process has commenced. According to Gallup, 64% of Americans today believe that cannabis use should be legal.

Who is the cannabis consumer? It is the 80-year-old cancer patient ingesting cannabis to treat side effects of chemotherapy. It is the 12-year-old child using cannabis extracts on a doctor’s recommendation to reduce epileptic seizures. It is the 30-something mother or father seeking to relax after a full day. It is a group of 20-year-olds on a Friday night heading to a concert. It is the millions of people suffering from anxiety and depression. It is the millions of people treating chronic pain and nausea. It is the millions of people using cannabis recreationally.

Our team has met with more than 1,000 companies in the cannabis industry. We understand the opportunities and challenges facing the industry, and we are happy to provide our insights.

Sincerely,

The Ackrell Capital Cannabis Team

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## CHAPTER I

# Executive Summary

### ■ Global Cannabis Consumers

Cannabis has mass consumer appeal around the world. Millions of people use cannabis recreationally. Millions more use it medicinally. In aggregate, across all state medical cannabis laws in the United States, cannabis is legally recognized as a form of therapy or medicine for more than 50 medical conditions, including Alzheimer's disease, anorexia, arthritis, cancer, chronic pain, epilepsy and post-traumatic stress disorder. Similar to the alcohol and pharmaceutical markets, we believe that the total addressable consumer market for cannabis consists of a significant portion of the global adult population.

Cannabis is the most widely cultivated, produced, trafficked and consumed drug worldwide, according to the United Nations Office on Drugs and Crime (UNODC). In 2003, the UNODC estimated that the global illegal cannabis market was \$113 billion, with 160 million consumers. The UNODC continues to estimate the number of cannabis users worldwide and recently estimated that 183 million people globally between the ages of 15 and 64, or more than 4% of this age group, consumed cannabis in 2015.

In 2010, the RAND Corporation (RAND) estimated that the U.S. illegal cannabis market was \$40 billion. Adjusting this estimate solely for inflation and population growth, the U.S. illegal market would now be approximately \$48 billion.

Both the UNODC and RAND acknowledge the challenges inherent in studying an illegal consumer market, and both allow significant room for error in their estimates. However approximate, their estimates make clear that there is significant global demand for cannabis. Less clear is how quickly illegal markets will transition to legal markets, as well as the extent to which legalization may increase overall demand.

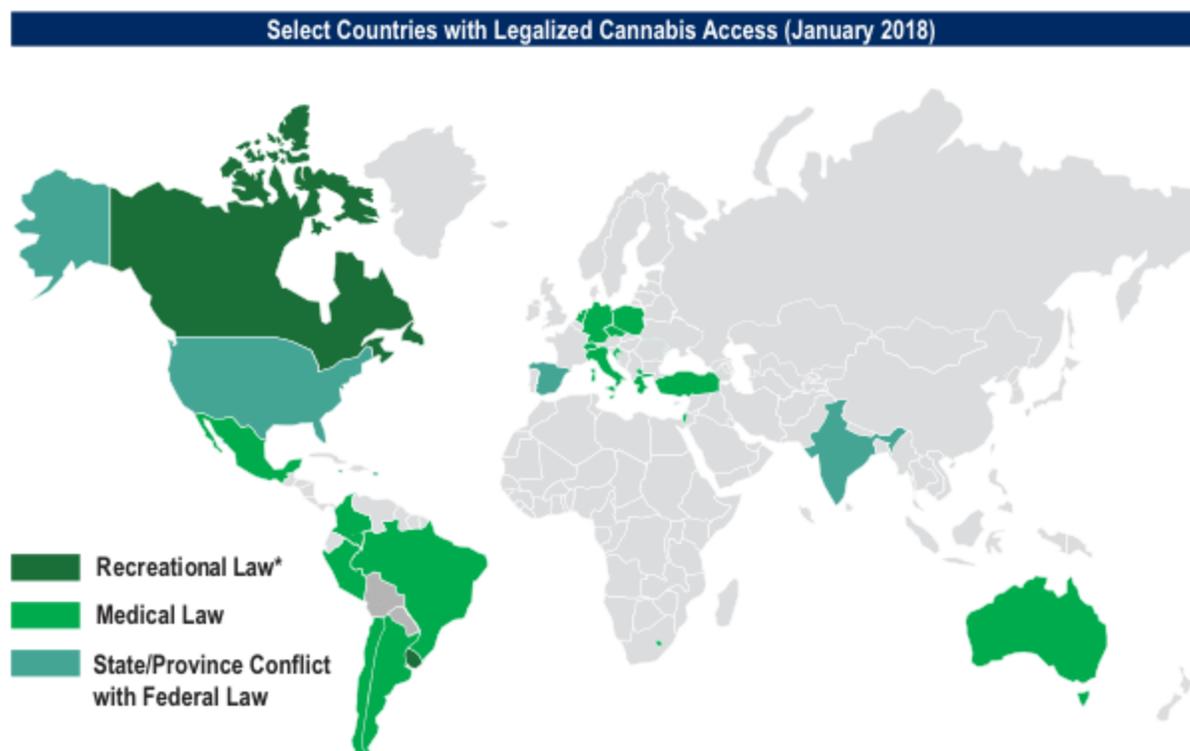
We believe that the growth of the global legal cannabis industry will be driven by increasing penetration in largely untapped "mainstream" consumer markets, and that the legal industry could grow to more than two times the estimated size of the current illegal market. We believe that cannabis will eventually become federally legal in the United States, for recreational enjoyment by adults and for use in a broad range of safe drugs and therapeutic products. After U.S. federal legalization, we believe that

the U.S. market will exceed \$100 billion annually, with more than 50 million consumers. Globally, we estimate that the legal cannabis market has the potential to reach \$500 billion annually, approaching one billion consumers.

### The Global Legal Cannabis Market

Cannabis legalization is gaining momentum around the world. This momentum is driven primarily by the increasing recognition that cannabis may have a range of legitimate medicinal benefits and therapeutic applications. At least 20 countries now have medical laws that facilitate patient access to cannabis or cannabis concentrates for treating specified medical conditions. Notable countries with such medical laws include Australia, Canada, Colombia and Germany; countries without such laws include China, Japan, Russia and the United States. (Contrary to U.S. federal law, 29 states, encompassing 62% of the U.S. population, permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions.) While the merits of medical cannabis are currently driving legalization, we believe that—like Uruguay and numerous U.S. states—other countries will ultimately enact legislation permitting the production, sale and use of recreational cannabis. (Canada is widely expected to do so in mid-2018.)

The following world map illustrates select countries that (i) have enacted medical laws that facilitate patient access to cannabis or concentrates for treating specified medical conditions, (ii) have enacted recreational laws that permit the commercial production and sale of cannabis to adults for recreational and other uses, or (iii) include a state or province that has a cannabis law or policy in conflict with federal law.



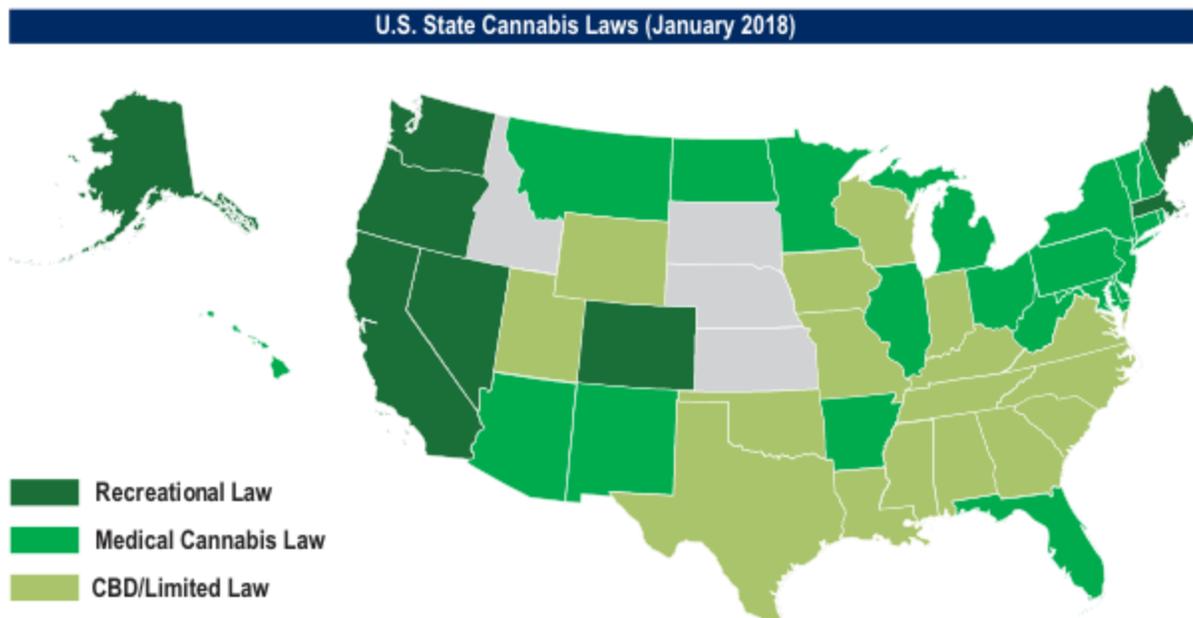
\*Canada currently has a medical law. Assumes Canada enacts a proposed recreational law in mid-2018.

## The U.S. State-Legal Cannabis Market

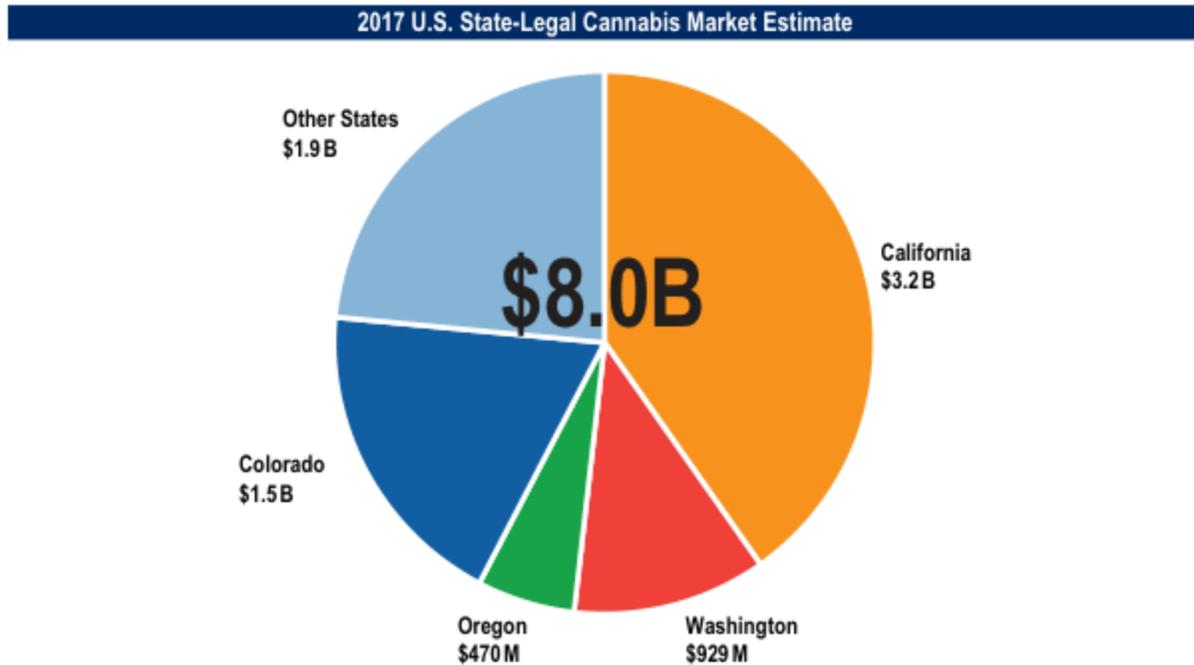
The legal landscape for the cannabis industry in the United States continues to be characterized by conflict between federal prohibition and the steady advance of state legalization. According to federal policy, Americans can access tobacco, alcohol and prescription drug products that kill thousands each year, but they cannot access cannabis because it is a dangerous drug with no currently accepted medical application in the United States (notwithstanding the federal government holds a U.S. patent for methods of treating diseases with cannabinoids). Meanwhile, 46 U.S. states have enacted at least one law that permits the manufacturing, distribution, dispensing or possession of cannabis or concentrates. These laws fall into three general categories:

- 29 U.S. states (and the District of Columbia) have enacted medical cannabis laws that permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions.
- 19 U.S. states have enacted narrow CBD/limited laws that permit possession of small amounts of low-THC/high-CBD cannabis concentrates for use in treating a few serious medical conditions—in particular, severe forms of childhood epilepsy.
- 8 U.S. states have enacted recreational laws that permit the commercial production and sale of cannabis to adults for recreational and other uses.

The following map of the United States shows states with medical cannabis laws, CBD/limited laws or recreational laws (a state with more than one of these laws is represented on the map by its most permissive law).



The U.S. cannabis industry has proven adept at navigating this federal-state conflict, and is experiencing rapid growth despite it. We estimate that the 2017 U.S. state-legal cannabis market was \$8.0 billion, with more than four million consumers. While the overall state-legal market has grown significantly, the addressable market has been constrained due to the lack of access to purely recreational consumers and the sometimes-narrow scope of medical conditions that qualify a patient for access to medical cannabis. The breakdown of this market estimate by state is shown in the following chart.



Source: Ackrell Capital

### U.S. Federal Law

Current federal law effectively prohibits all cannabis use and all commercial cannabis activity in the United States. Producing, selling and possessing cannabis are federal crimes. No cannabis-derived drug has ever been federally approved for use in treating any medical condition. Otherwise legitimate business transactions conducted by cannabis companies—and their banks, for those who can access banking services—are legally suspect. Certain intellectual property and bankruptcy protections critical to many U.S. businesses are not available to cannabis companies. Cannabis companies pay federal income tax at effective rates significantly higher than other businesses.

Despite official prohibition, however, federal policies and laws recently passed by Congress have carved out a limited space in which the state-legal cannabis industry has managed to thrive. Enforcement policies published by the U.S. Department of Justice have unofficially invited cannabis business to proceed if certain conditions are respected. The U.S. Department of the Treasury established reporting policies that create room for banks to service the cannabis industry. Federal budget legislation

has prevented allocated funds from being used to prosecute conduct that complies with state medical cannabis laws. And recent developments indicate the federal government may be pursuing policies and practices that create space for cannabis research and approval of cannabis-derived drugs.

The following chart shows three general areas of federal law that impact the cannabis industry—food and drug regulation, banking and finance, and intellectual property—as well as specific laws and federal policies related to each area. (We expand on these laws, regulations and policies in Chapter IV, U.S. Legal Landscape.)



## The Path to Federal Legalization

We believe that the variable which will most impact the future size of the U.S. legal cannabis market is the federal legalization process. How and when federal legalization occurs will impact other primary drivers of the market, including the number of eligible consumers, penetration rates and consumer spending. We predict six developments relating to federal legalization: (1) the U.S. Food and Drug Administration (FDA) will begin approving individual pharmaceutical-grade drugs derived from cannabis; (2) more states will adopt medical cannabis laws; (3) more states will adopt recreational laws; (4) the FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties; (5) the FDA will adopt routine approval procedures for drugs with extracts of high-THC cannabis varieties; and (6) cannabis parts and derivatives will be removed from the CSA schedules (either incrementally, starting with CBD, or all at once) and will be fully legal for medical and recreational purposes. (We expand on these predicted developments in Chapter IV, U.S. Legal Landscape.)

We do not predict that these developments necessarily will occur in the order presented. We do expect some of them to develop in parallel, and none of them depends fundamentally on any other. For example, Congress could cause development (6) at any time by passing legislation that removes

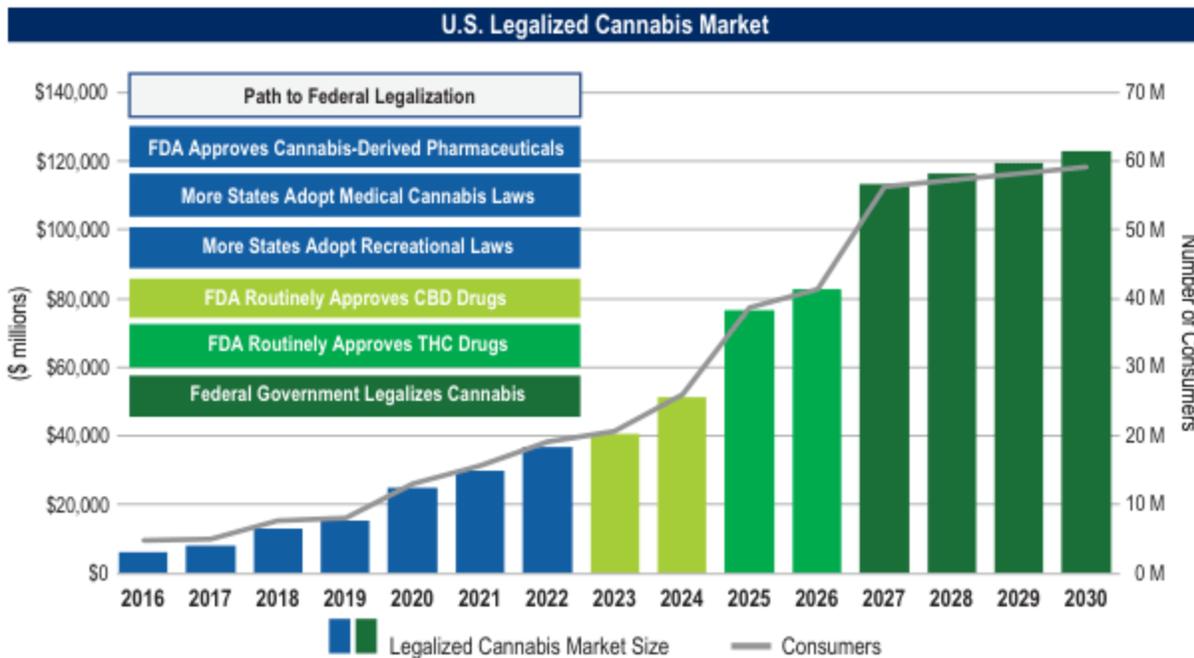
### Path to Federal Legalization

1. The U.S. Food and Drug Administration will begin approving individual pharmaceutical-grade drugs derived from cannabis.
2. More states will adopt medical cannabis laws.
3. More states will adopt recreational laws.
4. The FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties.
5. The FDA will adopt routine approval procedures for drugs with extracts of high-THC cannabis varieties.
6. Cannabis parts and derivatives will be removed from the CSA schedules and will be fully legal for medical and recreational purposes.

cannabis from the CSA schedules and establishes a national framework for recreational and medical cannabis regulation. Developments (1) through (3) largely reflect incremental developments within the existing legal environment. We do not expect developments (4), (5) or (6) to occur during the current presidential term, but we believe that there is a reasonable chance development (4) could begin within the next five years and development (5) could occur within two years thereafter. In total, we believe it could take up to 10 years or more before the federal legalization process reaches development (6) and cannabis becomes fully legal under federal law. For our market estimates, we assume (i) development (4) begins in 2023, (ii) development (5) follows two years thereafter and (iii) development (6) occurs by 2027 and cannabis becomes fully legal in the United States.

We believe that federal legalization will trigger rapid growth in the U.S. market, propelled by interstate commerce, access to the federal banking system and acceleration of the cannabis-derived pharmaceuticals market. A change in the federal status of cannabis in the United States will not only drive U.S. market growth, but should provide a significant catalyst to the market worldwide.

The following graph illustrates the timeline of our predicted developments and the estimated impact on the U.S. legalized cannabis market. As discussed on page 175, readers are cautioned to not place undue reliance on our predictions or estimates. Almost certainly, our predictions and estimates will prove inaccurate in some respects.



Source: Ackrell Capital. Assumes cannabis will be legalized federally by 2027. Cannabis may never be legalized federally in the United States.

## ■ To Watch in 2018

We believe that the following events will impact the legalized cannabis industry in 2018.

### Increasing Recreational Legalization

We expect 2018 will be a watershed year for recreational markets, both in the United States and internationally. California will begin implementing its new recreational law in January 2018, and Canada’s proposed recreational law is widely expected to be approved in some form by mid-2018.

California, which has a population of 38 million people and receives 250 million visitors annually, is poised to transition from the world’s largest medical cannabis market to the largest recreational market with the implementation of its recreational law in January 2018.

In each of the three largest U.S. states to implement recreational laws—Colorado, Oregon and Washington—the size of the legalized cannabis market expanded significantly, doubling the size of the overall market in each of these states in the first full calendar year after implementation. The world has yet to experience a legalized recreational cannabis market in a jurisdiction as large as California, and how the supply chain, consumer response and regulatory framework will coalesce in such a market remains to be seen.

### To Watch in 2018

- Increasing Recreational Legalization
- Cannabis Consumer Experience goes “Mainstream”
- FDA Approval of Cannabis-Derived Pharmaceuticals
- Commoditization of Cannabis Flower
- Access to Banking Services for U.S. Cannabis Companies
- Increasing Strategic Investor Activity; Continuing Funding Gap

Nonetheless, we believe that California's state-legal market may double from an estimated \$3.2 billion in 2017 to approximately \$6.5 billion in 2018.

Canada has assumed the role of a global leader of cannabis legalization. Although Canada's legal cannabis market is presently limited to medical cannabis, it is currently the largest federally legal cannabis market in the world, estimated at \$1.5 billion in 2017. In April 2017, a proposed recreational law was introduced in the Canadian parliament; the proposed Cannabis Act would allow adults to purchase cannabis from federally licensed producers and to possess and share cannabis with other adults. The Cannabis Act is widely expected to be approved in some form by the Canadian parliament by mid-2018. If approved, Canada would be the largest country in the world to legalize recreational cannabis on a national level, and we believe that the implementation of the Cannabis Act would significantly expand the size of Canada's overall market. Canada has demonstrated that by providing a national legal framework for cannabis, companies operating legally within the industry have had a clear "first to market" advantage, allowing them to raise significant amounts of capital and to pursue domestic and international expansion opportunities.

If these recreational laws stimulate demand, as expected, and are otherwise viewed as successful, we expect more U.S. states and additional countries to follow suit with similar laws. In the United States, legislatures in eight states (Arizona, Delaware, Florida, Michigan, New Jersey, Ohio, Rhode Island and Vermont) are expected to introduce ballot measures or explore regulatory frameworks for recreational cannabis in 2018.

### **Cannabis Consumer Experience Goes "Mainstream"**

Cannabis consumer product companies and retailers are rapidly evolving to meet the needs of the "mainstream" cannabis consumer. Cannabis consumers are no longer limited to smoking flower with joints, pipes or bongs, but have their choice of an increasing variety of products, including concentrates, infused products and topicals. Products coming to market increasingly address the attributes demanded by the modern consumer—greater discretion, ease of use, product safety and accurate dosing. To attract more mainstream customers, companies have responded to these demands with increasingly sophisticated packaging and advertising.

Where a consumer purchases a product can be as important as the product itself. In the United States, cannabis dispensaries play a critical role by providing consumers with access to a wide variety of products and "high-touch" education and sales services. Merchandising and branding have become more prominent as dispensaries increasingly seek to provide consumers with an experience similar to other mainstream retail shopping experiences. In 2018, we see an opportunity for cannabis dispensaries to drive consumer penetration and mainstream acceptance of cannabis by establishing storefronts in malls and other high-profile retail locations.

In 2018, we believe that product innovation and advancements in cannabis varieties, concentrates, infused products, vaporizing technology and cannabis-derived pharmaceutical products will drive consumer adoption and spending. However, because numerous product categories have low barriers to entry, we expect a significant influx of cannabis brands that will aggressively compete for limited display space in dispensaries. We also believe product differentiation and availability will be more prevalent in legalized cannabis markets and will drive consumer transition from illegal to legal markets.



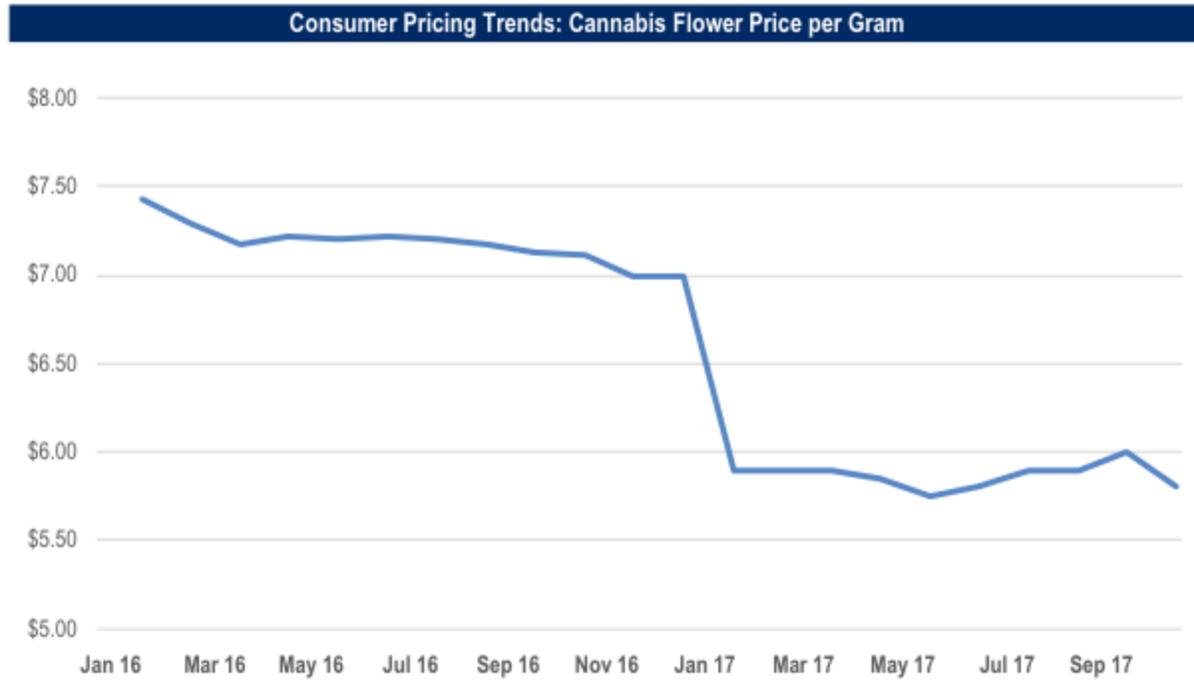
*"Mainstream" Consumer Experience*

### FDA Approval of Cannabis-Derived Pharmaceuticals

The FDA’s first-ever approval of a cannabis-derived pharmaceutical may occur in 2018. The FDA has previously approved several drugs with chemically synthesized cannabinoids or cannabinoid-like compounds, but has never approved a drug derived from the cannabis plant. In October 2017, U.K.-based GW Pharmaceuticals submitted a New Drug Application (NDA) to the FDA for Epidiolex, an oral formulation of cannabis-derived cannabidiol, or CBD, intended to treat severe forms of childhood epilepsy. (GW Pharmaceuticals also manufactures Sativex, a mouth spray used for treatment of spasticity caused by multiple sclerosis; it includes THC and CBD derived from cannabis. Sativex was first approved for use in the United Kingdom in 2010, and has been approved for use in at least 30 countries, but not in the United States.) If the FDA approves Epidiolex, such a precedent could be followed by similar approvals in the United States for other cannabis-derived drugs and result in a significant increase in the medical use of cannabis by consumers.

### Commoditization of Cannabis Flower

The supply of cannabis in the United States has increased considerably with expanded state legalization. This increase has started to dampen retail and wholesale prices in various markets. While retail prices vary across the country, an examination of the price per gram of cannabis flower, or “bud,” in the three largest states to implement recreational laws—Colorado, Oregon and Washington—reveals a downward trend. The following graph shows the average price per gram of cannabis flower in these three states since the beginning of 2016.



Source: BDS Analytics

As prices decline, we are starting to see closer price parity between state-legal and illegal markets (in the United States, cannabis is generally priced lower in illegal markets than in state-legal markets). We believe that lower retail prices in state-legal markets will accelerate consumer transition from illegal to state-legal markets and drive increased overall penetration rates. However, state and local taxes will continue to impact pricing for cannabis products in state-legal cannabis markets, which will impede the transition to legal markets.

In international markets, cannabis cultivators in South America, particularly in Colombia and Uruguay, are expected to proceed with large-scale operations in 2018, with the anticipated supply of cannabis entering the market in late 2018 or early 2019. These operations are designed to produce output that exceeds local demand, and South American countries are expected to export products to other legal markets, such as Canada and Germany. As legal markets increasingly import cannabis products, we anticipate downward-pricing pressure for cannabis in both the wholesale and retail markets. Cannabis cultivators in domestic markets that permit imports may be challenged by large, low-cost cannabis producers in South America and elsewhere. While these dynamics are expected to impact international cannabis markets, they should not materially affect prices in the United States until the importation of cannabis products becomes legal under federal law.

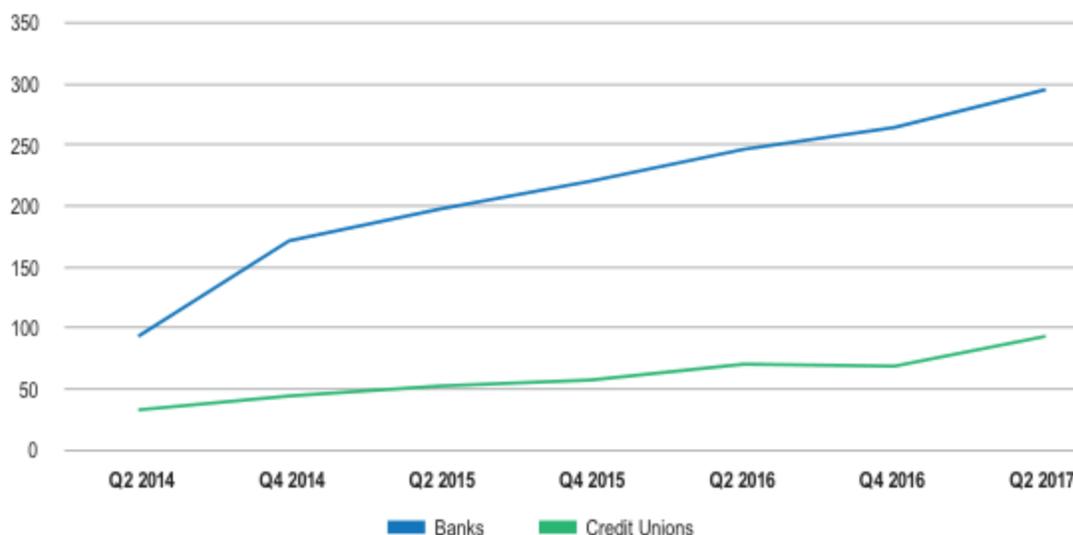
### **Access to Banking Services for U.S. Cannabis Companies**

Because most cannabis-related businesses in the United States violate federal law, most domestic financial institutions do not provide services to participants in the cannabis industry. Companies in the cannabis industry may not be able to open or maintain bank accounts or access other products and services—such as credit facilities, payment processing and insurance coverage—typically provided by traditional financial institutions. A lack of access to banking and other traditional financial products and services continues to impede the growth of the industry; it increases the time, effort and expense related to ongoing operations and increases risks associated with cash transactions and the use of alternative products and services.

The California State Treasurer's Cannabis Banking Working Group—a panel convened by California State Treasurer John Chiang that includes representatives from the cannabis industry and financial institutions, and government tax collection, law enforcement and regulatory agencies—issued a report in November 2017 on the cannabis industry's banking challenges. In the report, the State Treasurer's Office stated that the cannabis industry's lack of access to banking services is one of the biggest threats to the success of the state's recreational cannabis law, which is scheduled for implementation starting in January 2018.

The U.S. Bank Secrecy Act (BSA) requires financial institutions to file “suspicious activity reports” (SARs) with the Financial Crimes Enforcement Network (FinCEN) regarding customers engaged in “marijuana-related business.” From February 2014 through June 2017, FinCEN received a total of 33,692 marijuana-related SAR filings from a total of 390 banks and credit unions (out of approximately 11,500 depository institutions). The following graph based on FinCEN data shows the number of banks and credit unions making such filings. While the percentage of the total number of depository institutions serving the cannabis industry remains small, the growing number of depository institutions making SAR filings indicates that cannabis businesses increasingly are accessing the federal banking system despite federal law.

### Depository Institutions Making Marijuana-Related SAR Filings



Source: Financial Crimes Enforcement Network

FinCEN has published guidance outlining how financial institutions can, consistent with their BSA obligations, provide services to marijuana-related businesses. However, this guidance does not provide financial institutions with a legal defense for any violation of federal law. Consequently, financial institutions willing to serve the cannabis industry tend to be smaller institutions, such as credit unions and state-chartered banks. “Big” banks generally do not serve, or are not willing to state publicly that they serve, the cannabis industry. For example, according to American Banker, a spokeswoman for Wells Fargo Bank recently said the bank’s policy worldwide is to not bank marijuana businesses.

However, as cannabis-related companies increasingly participate in the formal U.S. economy, the notion of what constitutes a “marijuana-related business” is being blurred, and banks are finding it more difficult to institute and follow their own policies. For example, it may be straightforward for a bank to identify and refuse to transact with a cannabis cultivator, but the bank may be unsure whether it can provide services to (or whether it is providing services to) the cultivator’s accountant, landlord or investors. For example, Constellation Brands, Inc. (NYSE: STZ), a large beverage company, recently invested approximately \$190 million in Canopy Growth Corporation (TSX: WEED), a Canadian cannabis company. According to public filings, Constellation Brands has credit agreements with a number of large financial institutions, including Bank of America, Bank of the West, Fifth Third Bank, Goldman Sachs Bank, JPMorgan Chase Bank, PNC Bank, SunTrust Bank and Wells Fargo Bank. How these institutions respond to the investment by Constellation Brands and other similar transactions may indicate how large financial institutions will interact with the industry in the foreseeable future.

In the current environment, we believe more financial institutions will start to provide some level of service to the cannabis industry. We also agree with the view of the California State Treasurer’s Office, as expressed in the working group’s report, that it is only a matter of time until cannabis businesses have normal access to banking services. However, if the U.S. federal government were to change its

current practice and aggressively enforce existing federal cannabis laws, including penalizing financial institutions for serving the cannabis industry, it would have a dampening effect on the industry both in the United States and abroad.

### **Increasing Strategic Investor Activity; Continuing Funding Gap**

We share the belief held by many that, ultimately, established companies from analogous industries—alcohol, pharmaceutical, tobacco and consumer products—will enter the cannabis industry through minority investment, by acquisition or otherwise. We have already seen examples: Constellation Brands' investment in Canopy Growth referenced above and the more than \$400 million spent by The Scotts Miracle-Gro Company (NYSE: SMG) to acquire soil, fertilizer, hydroponic equipment and lighting companies that supply the cannabis industry. These types of transactions help validate investor enthusiasm for and valuations in the cannabis industry, and we expect similar transactions to occur with increasing frequency during 2018 and beyond.

Retail investors and an increasing number of family office and strategic investors are providing most of the investment capital to the cannabis industry. Cannabis-related companies raised more than \$2.0 billion in the public and private markets in 2017, but many of the financings were small—less than \$5 million. We expect that many institutional investors (most notably, the traditional venture capital and private equity communities) will not invest in the industry until it matures and the legal environment becomes more favorable.

Without institutional support for the cannabis industry, a funding gap exists—companies are seeking more capital than investors are willing or able to provide. We believe that this is especially true in the private markets, where many companies struggle to raise necessary financing. Although capital may be available for select issuers in both public and private markets, we believe that without participation from institutional investors, the cannabis industry will continue to face a significant funding gap for the foreseeable future.

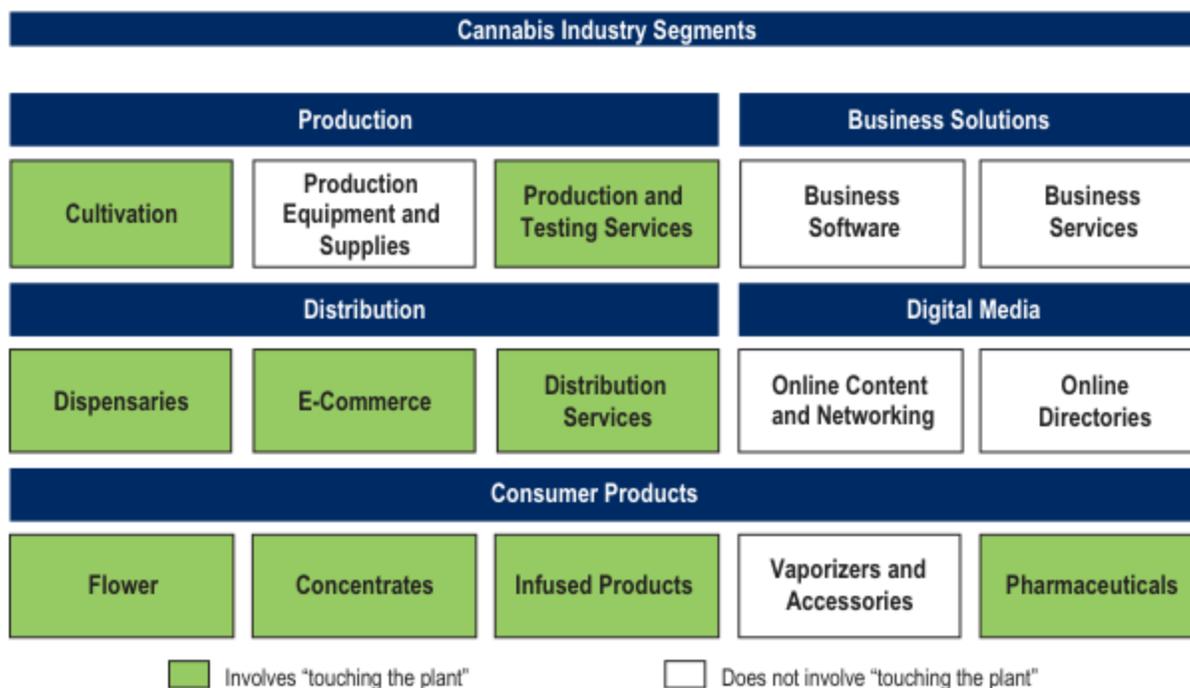
## **■ Investment Outlook**

Hundreds, if not thousands, of cannabis-related companies are seeking to raise capital—thus presenting investment opportunities for sophisticated investors who want to participate in the cannabis industry. Investors have their choice of investing in the more than 300 publicly traded cannabis-related companies, or in the significant number of private companies raising capital. Investors may also choose among stock markets (both within the United States and internationally), type of security (equity versus debt) and type of company (companies across all segments of the industry are raising capital).

Most of the cannabis-related companies raising capital—even publicly traded companies—are in early stages of development, have de minimis revenue and are not profitable. More than 85% of publicly traded cannabis-related companies have annual revenue less than \$5 million, and less than 5% have annual revenue greater than \$25 million.

To help investors better evaluate investment opportunities in the cannabis industry, we currently define five primary segments: production, distribution, consumer products, business solutions and

digital media. We further divide each segment into multiple subsegments. Each segment has unique opportunities and risks. For example, companies that possess, manufacture or distribute cannabis (commonly known as “touching the plant”) face risks related to violating federal law—and state-law compliance obligations—not generally faced by providers of business software or digital media content. Many businesses operate in multiple segments, and we expect industry leaders to emerge in each segment. The five primary segments and their subsegments are illustrated in the following chart.



In our view, valuations and stock price fluctuations in the cannabis industry continue to be driven more by expectations for the cannabis industry in general than by individual company fundamentals. Today, in the public markets for cannabis-related companies, trading volumes are too low, trading prices are too volatile and operating histories are too limited to place any reliance on current valuation levels. We believe that this dynamic will continue until cannabis-related companies have matured and start to realize meaningful revenue, profitability and other financial metrics that will allow investors to evaluate companies within the industry by more traditional methodology.

It is still too early to know how the cannabis industry or its sectors will be valued in the future. It may come to pass that companies in the cannabis industry are valued comparably to public companies in industries with similar characteristics, such as the alcohol, tobacco, pharmaceutical and consumer products industries, especially as companies from those industries look to enter the cannabis industry, through acquisition or by other means. What is clear now, however, is that investors will continue to have a range of investment opportunities from which to choose in this rapidly growing, dynamic industry.

## CHAPTER II

# Cannabis Science 101

### ■ The Cannabis Plant

Cannabis is a genus of flowering plant indigenous to Eurasia. For millennia, humans have consumed cannabis for therapeutic, medicinal, social or spiritual purposes and have used the seeds and fibrous stalks of the cannabis plant to produce goods such as rope, paper, clothing and soap.

There are at least three principal cannabis species: *Cannabis sativa*, *Cannabis indica* and *Cannabis ruderalis*.<sup>1</sup> These three species can be distinguished by their plant structures and leaves. Sativa plants are generally tall, thin and wispy; indica plants tend to be shorter and bushier than sativa plants; and ruderalis plants are shaggy and the shortest of all three species. The following pictures depict the *Cannabis sativa*, *Cannabis indica* and *Cannabis ruderalis* plants and their leaves.



*Cannabis Sativa Plant*



*Cannabis Indica Plant*



*Cannabis Ruderalis Plant*

<sup>1</sup>Botanists disagree about whether sativa, indica and ruderalis are distinct species or are instead distinct subspecies of a single plant species. Some botanists propose renaming these three species to reflect their geographic origins. This report takes no position on these botanical debates; it merely adopts one set of commonly used nomenclature.

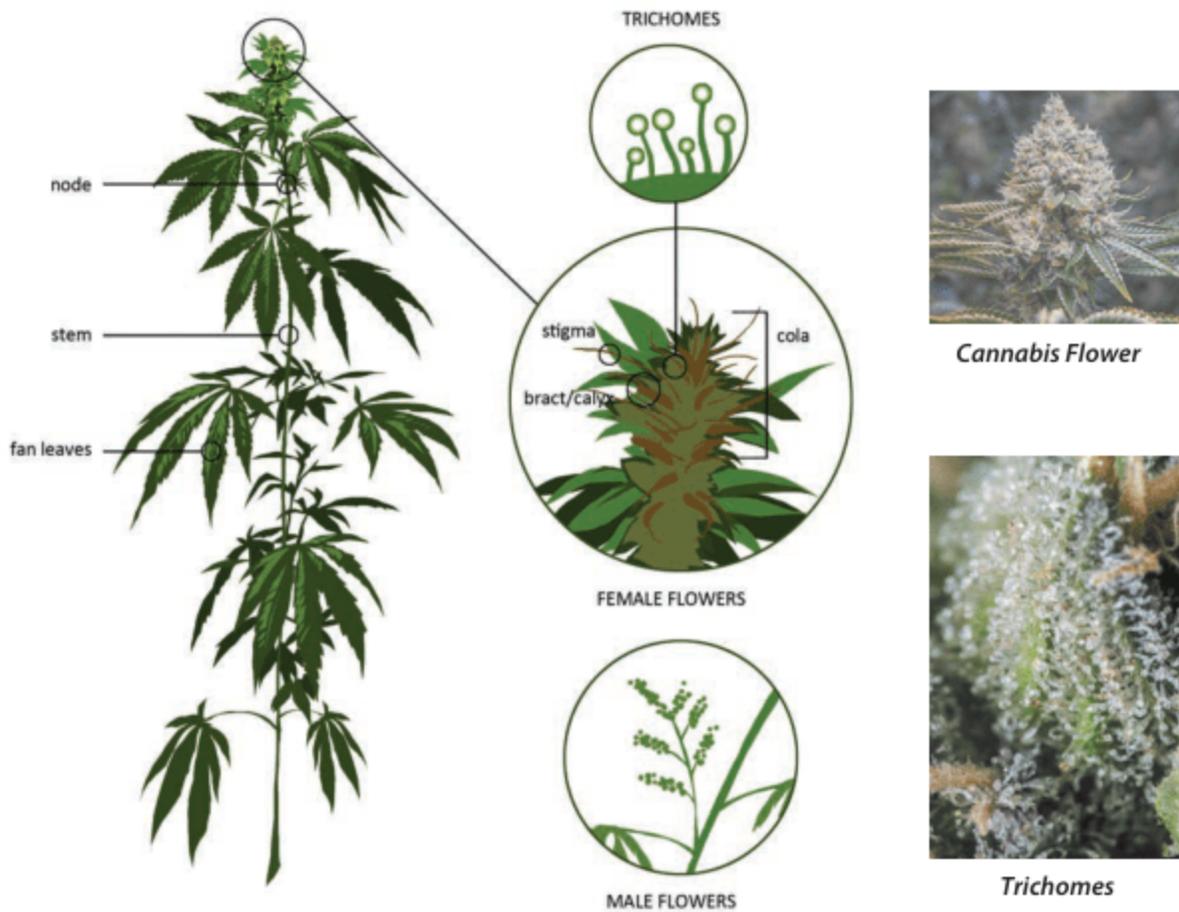
*Cannabis Sativa Leaf**Cannabis Indica Leaf**Cannabis Ruderalis Leaf*

Many hybrid varieties of cannabis—sometimes referred to as strains—have developed from these three species, both through selective breeding and in the wild. Most cannabis varieties grown today are hybrids that exhibit features of two or more of these principal species. Cannabis varieties consumed for physiological effects generally are hybrids of sativa and indica that produce relatively large and dense flowers. Certain cannabis varieties—known as hemp—that are grown to produce industrial goods generally are sativa-dominant varieties or hybrids of sativa and ruderalis that produce relatively small and sparse flowers.

Cannabis yields more than 100 different compounds known as “cannabinoids,” which, when consumed, act on cannabinoid receptors in cells in the human nervous and immune systems. The primary cannabinoid in most cannabis is tetrahydrocannabinol, or THC, the psychoactive compound responsible for the “high” or euphoric feeling commonly associated with cannabis consumption. The next most abundant cannabinoid is cannabidiol, or CBD, which produces a physical effect without the psychoactive effects associated with THC.

Cannabis also includes a variety of compounds known as “terpenes,” which are understood to interact with cannabinoids to produce some of the physiological effects sought by cannabis consumers. Terpenes are present in cannabis and many other types of plants and are responsible for a plant’s aroma and flavor. Examples of terpenes found in cannabis include limonene, which is known for its citrus smell and is also present in citrus fruit rinds, and pinene, which is known for its pine and fir aromas and is also found in pine resin.

The highest concentrations of cannabinoids and terpenes are found in the “trichomes” on the flowers of unpollinated female cannabis plants. Trichomes are crystalline or hairlike components that secrete cannabinoids, terpenes and other compounds; they generally occur all over the cannabis plant but are found in highest concentration on the flower. The following illustration shows the basic anatomy of a cannabis plant, and the images to the right show a female cannabis plant flower and a close-up view of trichomes.



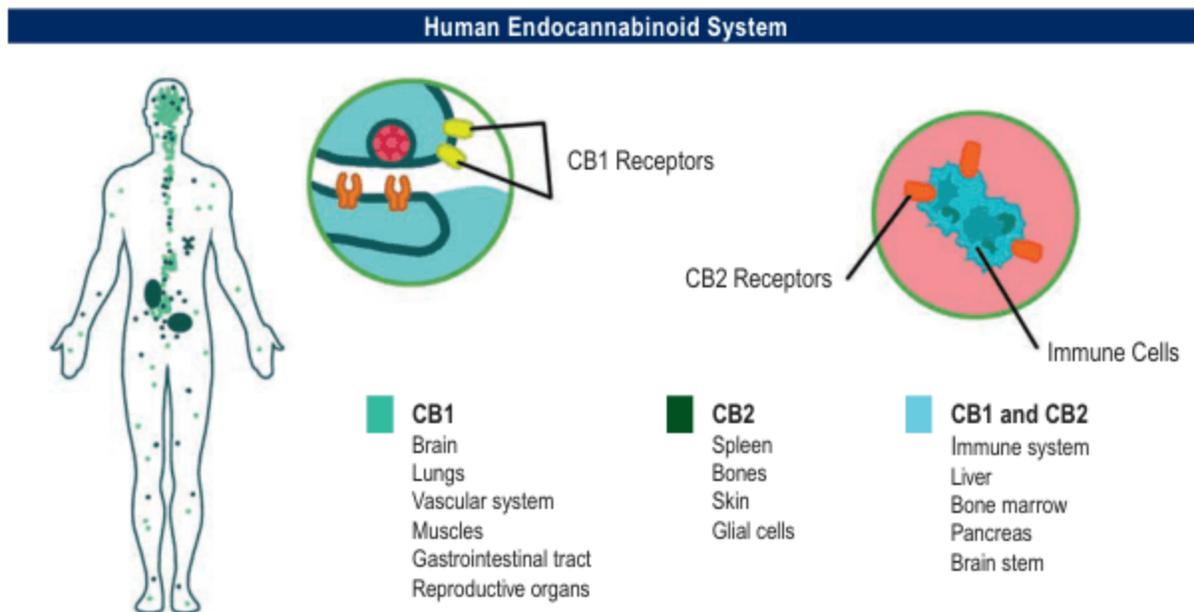
*Cannabis Plant Anatomy*

Cannabis can be consumed in a variety of ways that introduce its active compounds into the body: smoking cannabis flower or its extracts, vaporizing cannabis flower or its extracts, ingesting cannabis extracts or food products prepared with cannabis and topical application of cannabis products. Human consumption of cannabinoids and terpenes is widely believed to have numerous medicinal benefits and therapeutic applications. Depending on the types and relative concentrations of the cannabinoids and terpenes consumed, these benefits may include pain relief, reduction of inflammation, and promotion of an energetic, uplifting mood or a calm, relaxed mood.

Although humans have used cannabis therapeutically for thousands of years, only recently have scientists begun to research and understand at the chemical and biological levels how cannabis works with the human body. In the 1940s, the American organic chemist Roger Adams performed numerous studies on cannabis and identified and isolated the cannabinoids THC, CBD and cannabidiol, or CBN. In the 1960s, a team of scientists led by Raphael Mechoulam at the Weizmann Institute of Science in Israel more completely determined the chemical composition of THC, CBD and certain other cannabinoids. This research on cannabinoids ultimately led to the discovery that the human body naturally produces its own cannabinoids and uses them to regulate homeostasis (a process by which biological systems tend to maintain internal stability, or balance).

## ■ The Human Endocannabinoid System

The human endocannabinoid system consists of nervous and immune system receptors involved in regulating health and physiological functions. There are two types of endocannabinoid receptors, CB1 and CB2 receptors, which are located in the brain and in other organs, tissues and glands throughout the human body. The human body actively regulates variables related to appetite, immune response, memory, mood, pain, sleep and other functions by naturally creating compounds known as “endocannabinoids” and delivering them to these receptors. The following illustration depicts the human endocannabinoid system and the location of CB1 and CB2 receptors.



The physiological effects of cannabis consumption are believed to be primarily the result of THC, CBD and other cannabinoids bonding with the body’s endocannabinoid receptors and the consequent impact on functions regulated by the endocannabinoid system. As scientists gain a deeper understanding of the human endocannabinoid system, they are beginning to explore the application of cannabinoids to a broad range of medical conditions and ailments. Although medical research on cannabinoids is nascent, cannabis is currently being used to manage many conditions, including anxiety, depression, inflammation, insomnia, nausea, neural disorders and pain.

### CB1 and CB2 Receptors

CB1 and CB2 endocannabinoid receptors, which are found on cell surfaces throughout the body, are believed to be more numerous than any other cellular receptor signaling system in the human body. The CB1 receptors are located primarily in the brain, central nervous system and other tissues; these receptors play a modulatory role in memory, mood, sleep, appetite and pain sensation. The CB2 recep-

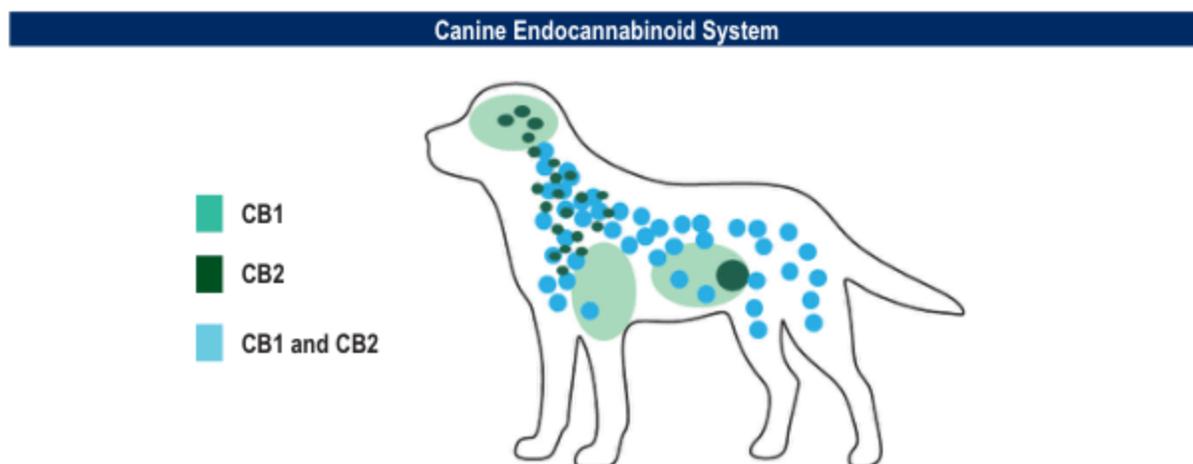
tors are located primarily in peripheral organs associated with the immune system, with the greatest concentration in the spleen, and are responsible for managing inflammation and autoimmune function. Many tissues contain both CB1 and CB2 receptors, with each receptor type linked to a different physiological function.

### Human Endocannabinoids

Endocannabinoids are the cannabinoids created naturally by the human body for delivery to CB1 and CB2 receptors. In contrast with cannabinoids introduced through cannabis consumption, endocannabinoids are broken down quickly by the body and cause effects with shorter durations. One well-studied endocannabinoid is anandamide (AEA). AEA is associated with the maintenance of mood, and AEA deficiency is understood to be anxiogenic (anxiety-inducing). Maintaining appropriate AEA levels within the human body is believed to reduce pain and inflammation, counter the proliferation of cancer cells, relieve anxiety and promote adult neurogenesis (a process whereby nerve cells are generated from neural stem cells). Like THC, AEA has a small molecular structure that binds to CB1 receptors. AEA is currently being studied for its effects on angiogenesis (the process of developing new blood vessels), anxiety, cancer and memory consolidation. AEA is also present outside the human body; for example, it is a natural component of chocolate.

### Endocannabinoid Systems in Animals

Nonhuman mammals, including dogs, cats and horses, have been shown to have endocannabinoid systems that are similar to their human counterparts: these systems employ CB1 and CB2 receptors and function through the natural production of endocannabinoids. This implies that the endocannabinoid system is not a recent evolutionary development, but rather an ancient physiological feature of mammals in general. The cannabinoids found in cannabis, particularly CBD, have been shown to have a range of therapeutic applications for certain animals, including antibacterial and anti-inflammatory properties, appetite and bone-growth stimulation, and pain relief. The following chart depicts the canine endocannabinoid system and CB1 and CB2 receptors.



## ■ Cannabinoids

Cannabinoids are compounds present in the cannabis plant that act on human cannabinoid receptors in cells in the nervous and immune systems. Scientists have identified more than 100 cannabinoids in the cannabis plant. Generally, the most abundant cannabinoid is THC, a psychoactive compound that causes a euphoric “high,” and the second most abundant cannabinoid is cannabidiol, or CBD, which produces a relaxing physical effect without a psychoactive effect. Consuming cannabinoids has been shown to have numerous medicinal benefits and therapeutic applications. The following table lists 20 common conditions for which medical cannabis use has been legalized under U.S. state laws and identifies 8 cannabinoids that are used or being studied to treat these conditions. A brief description of these cannabinoids follows the table.

Common Qualifying Medical Conditions and Potentially Therapeutic Cannabinoids								
	THC	CBD	CBC	CBG	CBGA	CBN	THCA	CBDA
Alzheimer's disease	●							●
Amyotrophic lateral sclerosis (ALS)	●	●				●		
Anorexia	●							
Arthritis	●	●						
Cachexia	●	●						
Cancer	●	●	●	●			●	●
Chronic pain	●	●	●		●	●	●	
Crohn's disease				●				
Epilepsy		●						
Glaucoma	●	●		●				
Hepatitis C	●	●						
HIV/AIDS	●	●						
Inflammation		●	●	●	●		●	●
Migraine	●	●						
Multiple sclerosis	●							
Nausea	●	●					●	
Nervous system degeneration		●						
Parkinson's disease		●						
Post-traumatic stress disorder (PTSD)		●						●
Spasms	●	●				●	●	

**THC Tetrahydrocannabinol:** THC refers to delta-9-tetrahydrocannabinol and certain chemical variants, including delta-8-tetrahydrocannabinol. THC is the most abundant cannabinoid in cannabis and is understood to be the psychoactive compound in cannabis primarily responsible for the euphoric feeling of being “high.” Both recreational and medicinal users often seek the psychoactive effects of THC and may prefer certain cannabis products based solely on the quality and level of THC. THC is believed to have wide-ranging medicinal benefits: analgesic, antianxiety, antibacterial, anticancer,

antidepressant, antiemetic, anti-inflammatory, anti-nausea and antispasmodic. It also is believed to have therapeutic applications, such as appetite stimulation, bronchodilation, neuroprotection and pain relief.

**CBD Cannabidiol:** CBD is considered to be the second most abundant cannabinoid in cannabis. It is nonpsychoactive and is believed to counteract the psychoactive effects of THC. CBD also is believed to have wide-ranging medicinal benefits: analgesic, antianxiety, antibacterial, anticancer, anti-convulsant, antidepressant, antiemetic, anti-inflammatory, anti-insomnia, anti-ischemic, antipsychotic and antispasmodic. In addition, CBD is believed to have therapeutic applications, including appetite stimulation, bone-growth stimulation, immunosuppression and neuroprotection. CBD can be derived from many cannabis strains, including low-THC strains ordinarily grown to produce industrial hemp products.

**CBC Cannabichromene:** CBC is thought to be the third most abundant cannabinoid in cannabis and is nonpsychoactive. Like THC and CBD, CBC is believed to have several medicinal benefits, including analgesic, antibacterial, anticancer, antidepressant, antifungal, anti-inflammatory and anti-insomnia. CBC is also used as a therapeutic bone-growth stimulant. Ongoing research seeks to determine the role of CBC in reducing gastrointestinal inflammation. CBC may also have applications in pain management—in addition to binding to the CB1 and CB2 endocannabinoid receptors, it has been shown to interact with certain pain receptors.

**CBG Cannabigerol:** CBG is nonpsychoactive and is believed to have several medicinal benefits—analgesic, antibacterial, anticancer, antidepressant and antifungal—as well as a therapeutic application for bone-growth stimulation. CBG is present primarily during the early stages of the cannabis plant's growth cycle; only small amounts can be extracted from the plant during its flowering stage (although strains of cannabis have recently been bred to have high levels of CBG). CBG is believed to partially counteract the psychoactive effects of THC and to decrease anxiety and muscle tension.

**CBGA Cannabigerolic Acid:** CBGA is a nonpsychoactive precursor to all other cannabinoids, including THC, CBD, CBC and CBG. Much of a cannabis plant's CBGA ultimately transforms into other cannabinoids through the chemical process of decarboxylation. CBGA is used for analgesic and anti-inflammatory applications. Certain cannabis strains cultivated to produce industrial hemp products are believed to contain high levels of CBG relative to other strains.

**CBN Cannabinol:** CBN has been shown to produce some psychoactive effects and is believed to have several medicinal benefits, such as analgesic, antibacterial, anticonvulsive, anti-inflammatory and anti-insomnia. Unlike many other cannabinoids, CBN is not derived directly from CBGA decarboxylation; instead, it results from THC degradation. The CBN level of a cannabis plant is sometimes used as a measure of the plant's overall quality for consumption.

**THCA Delta-9-Tetrahydrocannabinolic Acid:** THCA is found abundantly in raw cannabis flower and is the precursor to THC. THCA is nonpsychoactive and is believed to have several medicinal benefits, including anticancer, anti-inflammatory and antispasmodic. THCA decarboxylates into THC through drying or application of intense heat, such as the heat applied during smoking or vaporizing the cannabis plant.

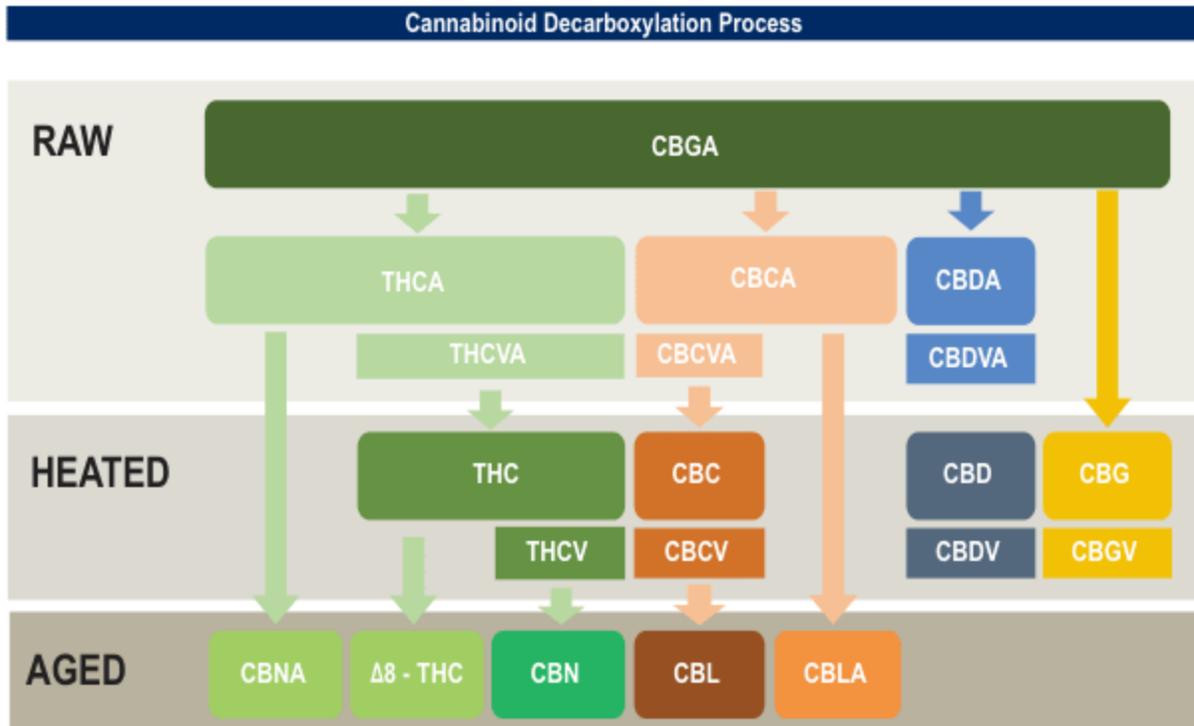
**CBDA Cannabidiolic Acid:** CBDA, the precursor to CBD, is nonpsychoactive and is believed to have several medicinal benefits—anticancer, antiemetic and anti-inflammatory—as well as therapeutic applications. Generally, CBDA is present in the cannabis plant in low levels, although recently some strains have been grown with CBDA levels comparable to typical THC levels. Like THCA, CBDA decarboxylates into other compounds when heated. (An explanation of decarboxylation follows.)

### Cannabinoid Composition Levels

As a general rule, THC and CBD are the most prevalent cannabinoids found in many strains of the cannabis plant, with other cannabinoids appearing in relatively minuscule amounts. (One exception to this rule is the low-THC strains grown to produce industrial hemp.) THC-dominant strains historically have been the most popular with cannabis consumers, but CBD-dominant strains and strains with high levels of other cannabinoids are believed to have medicinal benefits and hold promise for therapeutic applications.

### Cannabinoid Creation: Decarboxylation

All cannabinoids present in cannabis begin as cannabigerolic acid, or CBGA. CBGA is ultimately transformed into various other cannabinoids through decarboxylation, a process by which a compound's chemical structure changes due to light, heat, alkaline conditions or other chemical forces. The two main catalysts for decarboxylation of CBGA and other cannabinoids are heat and time (the aging process). The following chart depicts the process of cannabinoid decarboxylation.



Source: Elemental Wellness

As examples of the decarboxylation process, consider the changes to THCA that result from heat and aging. If the nonpsychoactive THCA naturally present in raw cannabis is heated, it quickly decarboxylates into psychoactive THC; this is what commonly occurs when cannabis flower is smoked or vaporized for its psychoactive effect. THCA may also be stored and aged to produce CBN.

### Cannabinoid Boiling Points

Cannabinoids boil at temperatures lower than the temperature at which cannabis flower burns. Based on this property, vaporizers have been developed to heat cannabis flower to a point at which its active compounds boil and can be inhaled as vapor but at which point the flower does not combust and create smoke. The approximate temperatures at which select cannabinoids boil and cannabis flower combusts are shown in the following table.

Compound Boiling and Flower Combustion Temperatures	
Compound/Flower	Temperature (°F)
THCA	220
CBDA	250
THC	315
CBD	355
CBN	365
Flower	450

Smoking cannabis flower remains the most popular form of cannabis consumption, even though it is believed to destroy as much as 30% of the active cannabinoids and is less efficient than merely heating the desired compounds to their boiling points. Vaporizers are becoming increasingly sophisticated, and those that can maintain temperatures which target the activation of specific cannabinoids are becoming popular.

### ■ Terpenes

Terpenes are a class of organic compounds present in cannabis and many other plants; they are responsible for a plant's aroma and flavor. The strong odors produced by terpenes are believed to be part of the natural defense of many plants. Cannabis contains more than 100 different terpenes, which are believed to interact with cannabinoids in a way that contributes to the medicinal benefits and therapeutic applications of cannabis. Like cannabinoids, terpenes are present in highest concentration in the flowers of cannabis plants. (Terpenoids are certain chemical variants of terpenes, and this report uses the general term "terpene" to refer to both terpenes and terpenoids.)

Terpenes are believed to interact in various ways with the human physiology: by acting on receptors and neurotransmitters, combining



or dissolving with fats, inhibiting serotonin uptake and increasing dopamine activity in the brain. Scientists have yet to develop an extensive and detailed understanding of the mechanisms and effects of many terpenes. However, consumption of certain cannabis strains with particular terpene profiles and corresponding aromas are generally associated with certain experiences. For example, cannabis strains that smell of musk or clove (indicating the presence of myrcene) tend to cause sedative and relaxing effects, strains with a piney scent (indicating the presence of pinene) are used to promote focus and memory retention, and strains with a lemony scent (indicating the presence of limonene) are consumed for mood uplift.

The following table identifies eight terpenes found in cannabis and lists the medicinal benefits and therapeutic applications commonly associated with each.

Potential Medicinal Benefits and Therapeutic Applications of Notable Terpenes								
								
	Camphene	Caryophyllene	Humulene	Limonene	Linalool	Myrcene	Pinene	Terpinolene
Antianxiety				●	●			
Antibacterial	●	●	●	●	●	●	●	●
Anticancer		●		●		●	●	
Anticonvulsive				●	●			
Antidepressant				●	●			
Antifungal	●	●		●	●	●	●	●
Anti-inflammatory	●		●			●	●	
Anti-insomnia					●			●
Anti-ischemic		●						
Antiseptic						●		●
Antitumor			●					
Appetite suppressant			●					
Bronchodilator	●	●					●	

**Camphene:** Camphene smells strongly of damp woodlands and fir needles and is believed to have several medicinal benefits, such as antibacterial, antifungal and anti-inflammatory, and a therapeutic application as a bronchodilator. Some studies have shown that camphene could be used to combat heart disease as an alternative to other pharmaceutically based therapies with harsh side effects. Camphene is a minor component of many essential oils and is used as a food additive.

**Caryophyllene:** Caryophyllene is known for its peppery, woody and spicy smell. It is believed to have several medicinal benefits, such as antibacterial, anticancer, antifungal and anti-ischemic, and a therapeutic application as a bronchodilator. Caryophyllene is found in many plants, including Thai basil, cloves, cinnamon leaves and black pepper.

**Humulene:** Humulene is well known for giving beer its hoppy aroma and is believed to have several medicinal benefits: antibacterial, anti-inflammatory and antitumor. Humulene is used to aid weight loss by acting as an anorectic (appetite suppressant). It is also found in hops and coriander.

**Limonene:** Limonene is recognized for its citrusy smell. Its medicinal benefits are believed to include antianxiety, antibacterial, anticancer, anticonvulsive, antidepressant and antifungal. Limonene present in cannabis quickly enters the bloodstream upon inhalation, which may facilitate the quick absorption of other terpenes and thus contribute to an uplifting experience. Limonene is also present in citrus fruit rinds, rosemary, juniper, peppermint and pine needle oils, and its strong smell serves as a natural insect repellent.

**Linalool:** Linalool has floral and lavender aromas. It is believed to have medicinal benefits that include antibacterial, antidepressant, antifungal and anti-insomnia. Linalool may also counteract anxiety induced by THC consumption. Some research suggests that linalool may boost the immune system, reduce lung inflammation and restore cognitive and emotional function (potentially making it useful in the treatment of Alzheimer's disease). Linalool is found naturally in hundreds of plants and is a common ingredient in bath products.

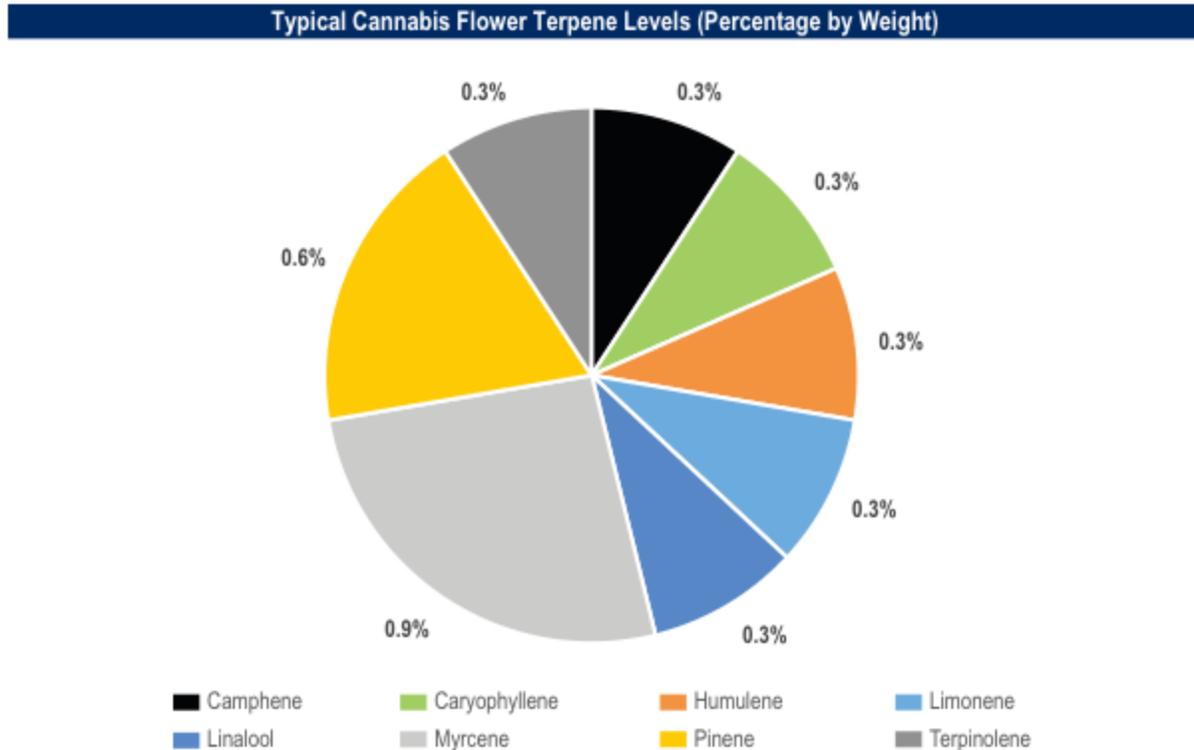
**Myrcene:** Myrcene is generally the most abundant terpene found in cannabis and is known for its musky and earthy herbal smell, comparable to the smell of cloves. Myrcene is believed to have several medicinal benefits, including antibacterial, anticancer, antifungal, anti-inflammatory and antiseptic. Myrcene is understood to enable and hasten the psychoactive effect of THC by lowering resistance posed by the blood-brain barrier and increasing the THC saturation capacity of the CB1 receptors. Consuming cannabis with high levels of myrcene may contribute to sedative and relaxing effects suitable for the treatment of insomnia and pain. Myrcene is present in hops, citrus fruits, bay leaves, eucalyptus, wild thyme, lemongrass and many other plants.

**Pinene:** Pinene is known for its pine and fir aromas and is believed to have medicinal benefits, such as antibacterial, antifungal and anti-inflammatory, and a therapeutic application as a bronchodilator. Pinene has shown potential to function as an anticancer agent and is believed to counter some of the psychoactive effects of THC. Pinene is present in conifers, pine resin and citrus fruits and is one of the terpenes most prevalent in nature.

**Terpinolene:** Terpinolene has a piney aroma and subtle herbal and sweet floral scents similar to citrus fruits. Terpinolene is believed to have medicinal benefits, including antibacterial, antifungal, anti-insomnia and antiseptic. It is also thought to be a central nervous system depressant and is used to induce sleep or reduce psychological distress. Terpinolene is found in sage and rosemary and is used in soaps and perfumes.

### Cannabis Plant Terpene Profile

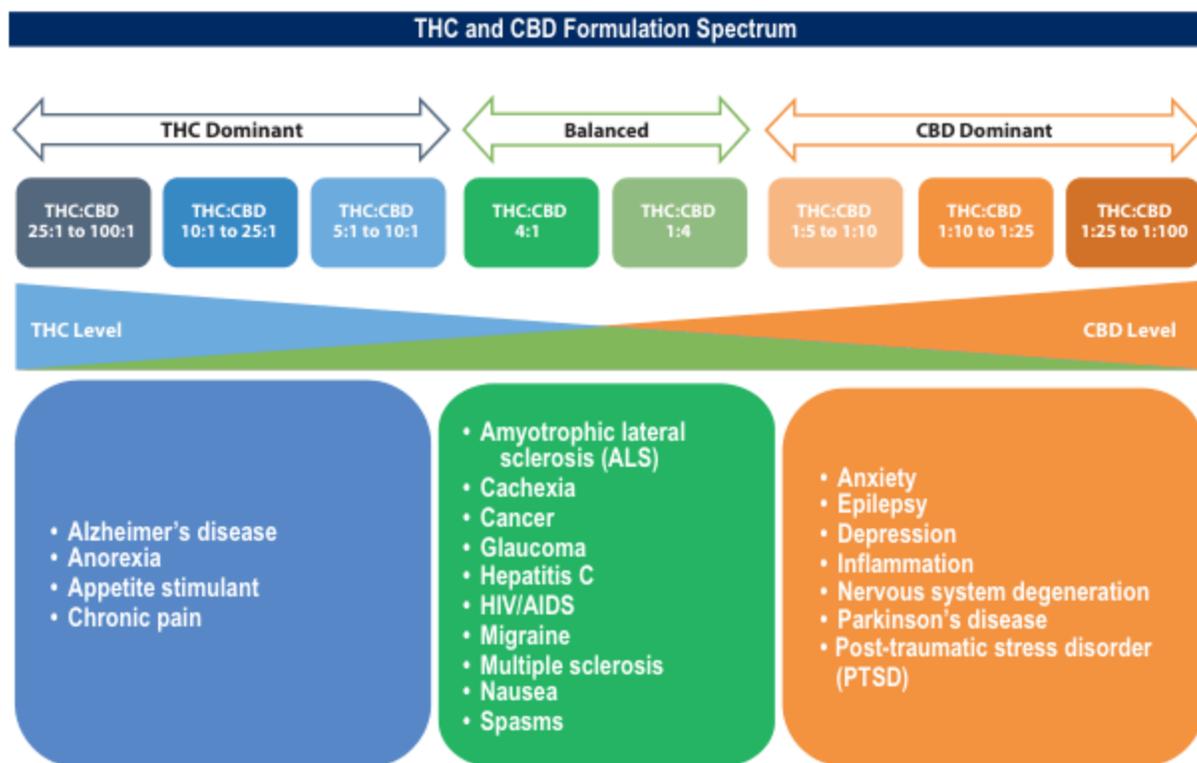
Myrcene is the most abundant terpene found in many cannabis strains, and other terpenes are generally present in lesser, varying amounts. The following chart shows the terpene levels (percentage by weight) found in the flower of a typical strain of cannabis.



## Cannabis Formulations

### The “Entourage Effect”

The cannabis industry is currently focused on identifying and producing customized formulations of cannabinoids and terpenes that may effectively target specific health conditions or otherwise cause an intended, desirable effect on users. Cannabis strains with specific THC to CBD ratios are currently the predominant focus for therapeutic applications. THC to CBD ratios in strains popular for treating certain medical conditions generally range from 100:1 through 1:100, as illustrated by the following chart.



The “entourage effect” refers to the overall user experience produced by the interactions among all active compounds in the cannabis plant. The various cannabinoids and terpenes in a particular cannabis plant are believed to work synergistically with each other and with the human endocannabinoid system to create an effect very different from the effect any one compound would create. This phenomenon may partially explain why different cannabis strains are used to treat diverse medical conditions.

There are several generally accepted examples of the entourage effect. CBD is believed to regulate the psychoactive effects of THC and reduce short-term memory loss, sleepiness and paranoia that may be caused by THC. Myrcene is understood to enable and hasten the psychoactive effect of THC by lowering resistance posed by the blood-brain barrier and increasing the THC saturation capacity of the CB1 receptors. Other terpenes have been shown to block endocannabinoid receptors in the brain while promoting bonding by endocannabinoid receptors located elsewhere in the body.

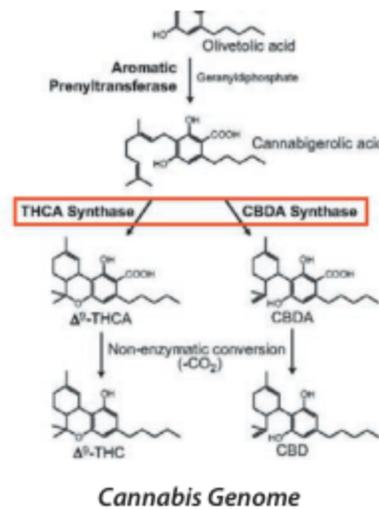
Many cannabinoid and terpene formulations developed for therapeutic applications are created by combining extracts from multiple cannabis strains, a process known as “Frankensteining.” Some believe Frankenstein formulations are less effective than formulations developed from a single strain because the natural balance of compounds in a single strain translates to a naturally balanced effect on the human body.

An understanding of entourage effects and how to effectively combine cannabinoids and terpenes is believed to be critical to the development of targeted cannabis therapies. Examples of cannabis-based therapies being developed with specific cannabinoid-terpene profiles include acne medication containing CBD and limonene, linalool and pinene; antiseptic agents containing CBG and pinene; treatments

for social anxiety disorders containing CBD, limonene and linalool; and sleeping medicines combining CBD, THC, caryophyllene, linalool and myrcene.

### Genetics and Propagation

Selective breeding and other botanical techniques are being used to develop cannabis varieties with desired profiles of compounds, and scientists are developing tools to synthesize isolated cannabinoids in laboratory settings in order to study cannabis at the genetic level. For example, the first mapping of a cannabis genome was completed in 2011 by a team of Canadian botanists, led by Jon Page from the National Research Council Canada and Timothy Hughes from the University of Toronto, who sequenced 30,000 genes in a sativa variety named “Purple Kush.”



Genetic copies, or “clones,” of cannabis plants are generally produced using two methods, “clone clipping” and micropropagation, or “tissue culture.” Clone clipping involves cutting a growing tip from a cannabis plant that is several inches long and inserting the cut tip into a growing medium, where it then grows into a new plant. Tissue culture involves taking a small tissue sample (which may even be a single cell) from a plant and growing it temporarily in a sterile nutrient solution before transferring it to a permanent growing medium. Controlling cannabis plant genomes is expected to be an important intellectual property issue in the cannabis industry (at least one U.S. patent has been issued for a strain of cannabis).



*Cannabis Plant Tissue Cultures*

Synthetic cannabinoids and terpenes can be manufactured by modifying plant-based compounds or through tools of synthetic biology and biocatalysis. For example, a synthetic version of THC known as dronabinol is the active compound in the pharmaceutical product Marinol, which was approved by the FDA in 1985 for use in treatment of nausea and vomiting associated with cancer chemotherapy. Methods for biosynthetic production of cannabinoids have been patented in the United States. Some medical practitioners and cannabis users have found synthetic compounds to be less effective than plant-based cannabinoids and have attributed this reduced efficacy to the lack of an entourage effect.

### **Dosage, Safety and Side Effects**

Cannabis dosing schedules provided by doctors and producers generally lack scientific rigor and, although industry participants strive to create a reliable dosing framework, users generally determine dosage through self-titration and trial and error. (This method of dosing does not always lead to the desired effect, but it is generally agreed that there is a low risk of death from an overdose of cannabis.)

Product packaging commonly indicates that a 10-mg serving of cannabinoids represents one dose, and servings of 2 mg to 5 mg are commonly characterized as “microdoses.” Examples of representative dosage amounts used to treat some common medical conditions are presented in the following table.

## Representative Dosage Amounts

Desired Effect or Ailment	Dosage	Dosage Ratio (THC:CBD)
"High"	10 mg THC	10:1 to 100:1
Anxiety, depression, spasms	25 mg CBD	1:10
Cancer	25 mg CBD	1:1
Chronic pain	2.5–20 mg THC	10:1
Epileptic seizures	200–300 mg CBD	1:5
Glaucoma	20–40 mg CBD	1:2 to 1:4
Increased appetite	2.5 mg THC	5:1
Multiple sclerosis	2.5–120 mg THC	1:1
Schizophrenia	40–1,280 mg CBD	1:4 to 1:128
Sleep disorders	40–160 mg CBD	1:4 to 1:16

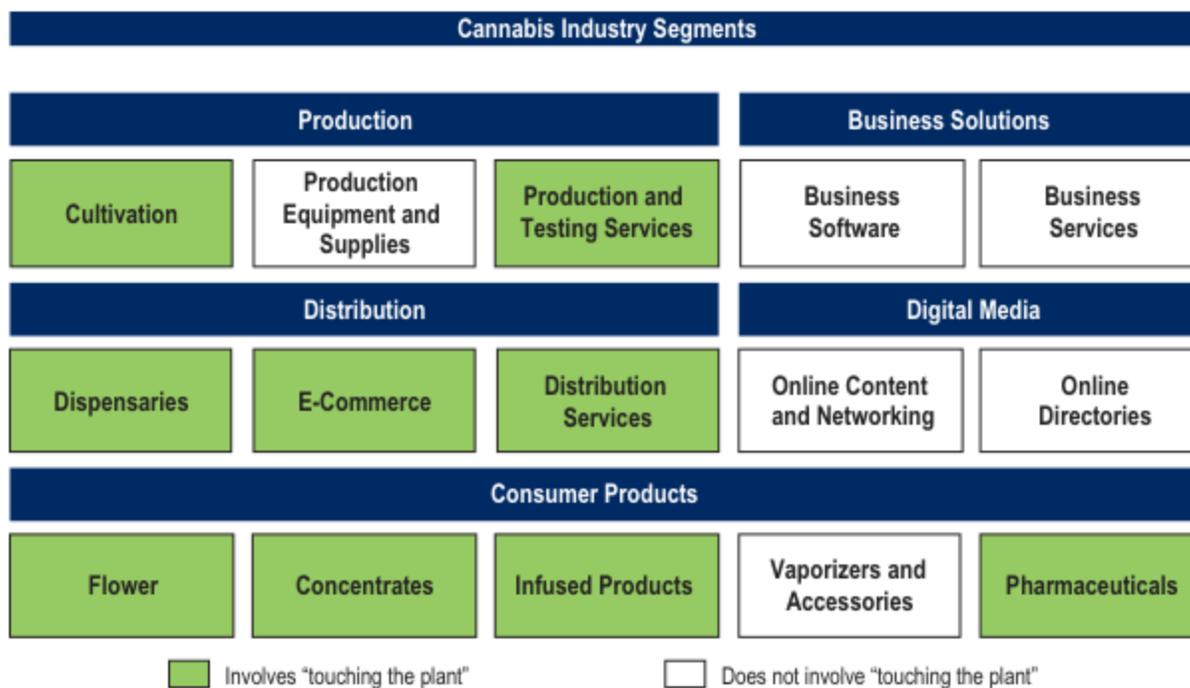
Neither the potential medicinal benefits and therapeutic applications of cannabis consumption nor the negative side effects of cannabis use have been thoroughly researched by medical science. Short-term negative side effects are believed by some to include sensory distortion, panic, anxiety, poor coordination of movement, reduced reaction time, lethargy or drowsiness, depression and elevated heart rate. Longer-term effects may include suppression of the immune system, growth disorders, destruction of lung fibers, brain lesions, reduced sexual capacity, difficulties with concentration, reduced ability to learn and retain information, and personality and mood changes. There is also an ongoing debate about whether cannabis consumption may lead to the abuse of more harmful substances (the so-called "gateway drug" debate).

## CHAPTER III

# Cannabis Industry Segmentation

The nascent cannabis industry is often viewed by investors and others as a single, homogeneous industry, in much the same way the “technology” industry was viewed in the early 1990s. As the technology industry became more important to the global economy and was better understood by the investment community, however, investment banks and other industry analysts tracked an increasing number of discrete yet related industry segments. In the cannabis industry we are seeing a similar trend, which we expect to continue as the industry evolves.

To help investors better evaluate investment opportunities in the cannabis industry, we currently define five primary segments: production, distribution, consumer products, business solutions and digital media. We further divide each segment into multiple subsegments. Each segment has unique opportunities and risks. For example, companies that possess, manufacture or distribute cannabis (commonly known as “touching the plant”) face risks related to violating federal law—and state-law compliance obligations—not generally faced by providers of business software or digital media content. Many businesses operate in multiple segments, and we expect industry leaders to emerge in each segment. The five primary segments and their subsegments are illustrated in the following chart.



## ■ Production

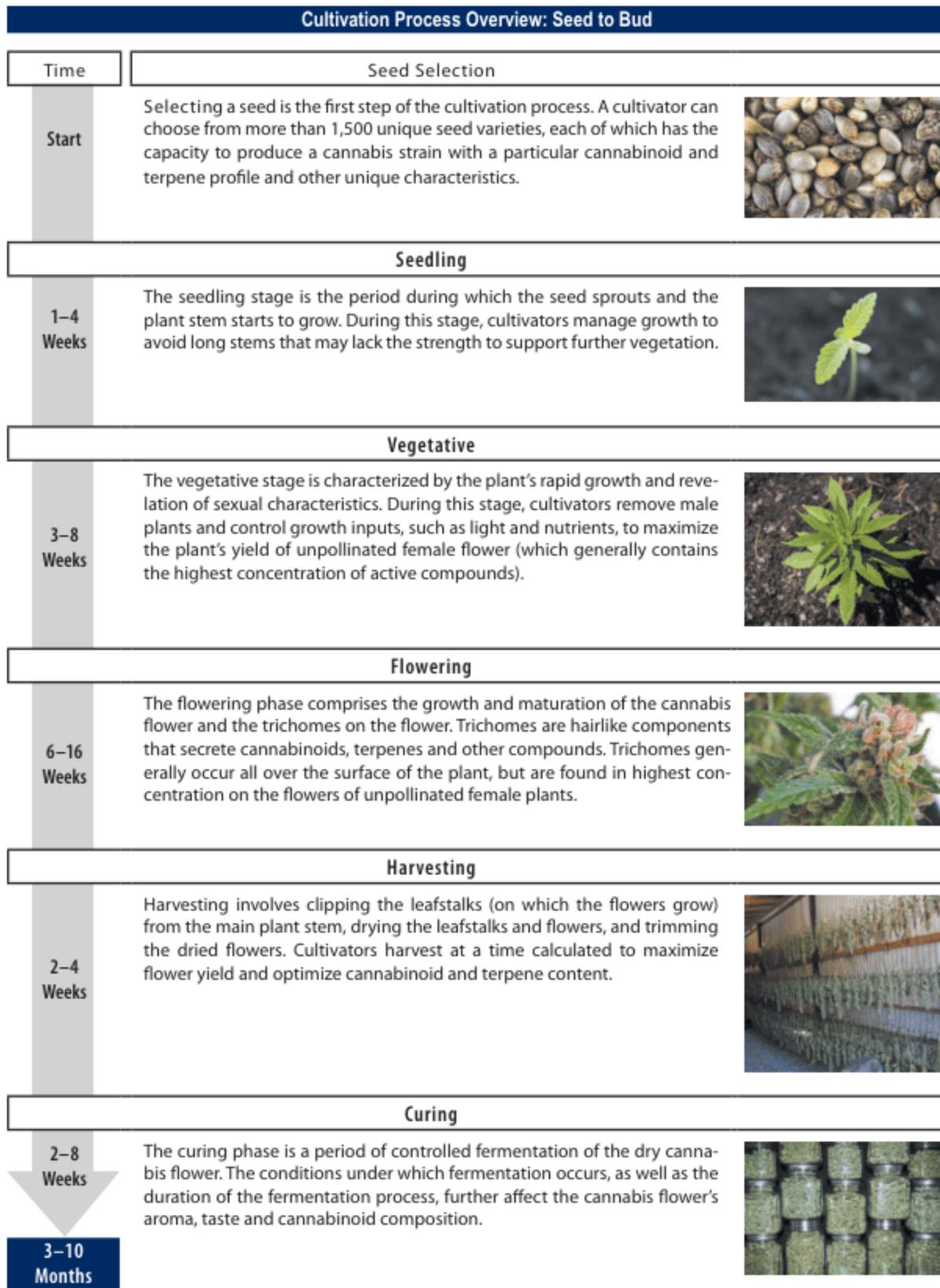
We divide the production segment of the cannabis industry into three subsegments: cultivation, production equipment and supplies, and production and testing services. Cultivation involves operating grow facilities, propagating cannabis strains, and harvesting and curing cannabis flower. Production equipment and supplies include the physical components used in production, such as extraction equipment, testing equipment, lighting, irrigation systems and plant nutrients. Production and testing services include services that support production, such as extraction or packaging, as well as testing services related to product safety, composition and quality control. Each of these production subsegments is described in more detail in the following discussion.

### Cultivation

The principal function of a cannabis cultivator is to produce cannabis plants and flowers with the aromas, flavors, active compounds and overall quality demanded by consumers and production intermediaries. A cultivator can access hundreds of existing cannabis strains by purchasing seeds or clones from commercial seed banks or nurseries, or developing unique strains through selective breeding. A cultivator seeks to optimize the quality and quantity of a plant's yield by managing cultivation input variables such as light, air, nutrition, and drying and curing times.

#### *Cannabis Cultivation Process*

Ordinarily, a period of three to ten months is required to grow and prepare cannabis flower for consumption. The cultivation process generally can be organized into six phases: seed selection, seedling, vegetative, flowering, harvesting and curing. Each of these phases is summarized in the following table.



### ***Cultivation Facilities***

There are three general types of cannabis cultivation facilities: outdoor facilities, where cannabis is grown under natural sunlight and widely exposed to the elements; greenhouse facilities, where cannabis is grown under filtered sunlight and environmental conditions are partially controlled; and indoor facilities, where cannabis is grown under electrical lighting and environmental conditions are tightly controlled. Some facilities combine features of these general types. For example, some greenhouses rely primarily on filtered sunlight but also employ supplementary electrical lighting to influence the plant flowering cycle. Each type of facility is suitable for certain purposes.

Growing indoors under electrical lighting is the most expensive way to grow cannabis, but typically yields the highest quality cannabis by providing for maximum control over variables such as light, air, nutrition, and exposure to contaminants and pests. Electrical lighting products for indoor cultivation include traditional and compact fluorescent lamps, high-intensity discharge (HID) lamps and light-emitting diode (LED) lamps. Adequate carbon dioxide levels can be maintained indoors with either bottled CO<sub>2</sub> or CO<sub>2</sub> generators. Common indoor growth mediums include soil, hydroponic systems (wherein nutrients are added to sand, gravel or liquid growth medium) and aeroponic systems (wherein roots hang suspended in a nutritional aerosol solution). Indoor cultivation facilities are prevalent in Canada and certain parts of the United States where climatic conditions are not favorable to outdoor cannabis cultivation.



*Indoor Grow Rooms*



*Aeroponic Systems*

Compared to indoor cultivation facilities that use electrical lighting, greenhouse and outdoor facilities are generally less expensive to operate and more appropriate for large-scale projects, but provide less control over growing conditions. The use of natural sunlight provides substantial savings on lighting equipment and energy costs, but may limit the number of grow cycles per year. Outdoor and greenhouse environments are more exposed to environmental risks that may negatively affect crops, such as pests, contaminants and adverse weather. Outdoor and greenhouse cultivation facilities are prevalent in Oregon, California and certain Latin American countries, which have climates conducive to outdoor growing.



*Outdoor Greenhouses*

### ***The Business of Cannabis Cultivation***

Cultivation businesses must navigate a host of operational challenges, including state and local licensing requirements, facility design and construction, research and acquisition of cannabis strains, intellectual property protection, cultivation process engineering, supply-chain management, yield optimization, facility management and security. Many cultivation businesses retain outside consultants to advise on one or more of these issues, although some businesses manage their entire cultivation operations internally. A cultivator may wholesale cannabis flower and other plant material to cannabis concentrate manufacturers or retail dispensaries, or it may be part of a vertically integrated production and retail business that sells its flower and other internally manufactured products through its own dispensaries.

Certain U.S. laws, foreign laws and international treaties currently restrict interstate and some international movement of cannabis products. A cultivation business that wishes to scale its operations into a new jurisdiction often must invest significant capital in a new cultivation facility located within the new jurisdiction. As laws change to allow more interstate and international transportation of cannabis products, cultivators who are operating redundant facilities or expensive indoor facilities will face increased margin pressure. As the cannabis industry matures and becomes more commoditized, we expect the most successful cultivators will be those with strong consumer brands or scalable low-cost operations in regions where the climate is conducive to agricultural production.

## Production Equipment and Supplies

Production equipment and supplies include the physical components used in cannabis production. Many industry participants in this subsegment provide products to a broad range of fully legal industries and do not “touch the plant”; therefore, these participants typically do not require special cannabis-related licenses and generally avoid legal risks related to violations of federal law.

Some components of cannabis production are similar or identical to components used in other agricultural industries (such as irrigation systems), and some are specialized for application to the cannabis industry (such as extraction machines). Components supplied for many indoor and greenhouse cultivation facilities include electrical lighting equipment, air filtration and circulation systems, irrigation systems, nutrient management systems, drying and curing equipment, and computer-controlled automation and monitoring systems. Specialty cannabis equipment companies now provide “all-in-one” automated indoor cultivation systems that can be used for in-home cultivation or scaled for commercial purposes.



*Extraction System*



*Cultivation System*

## Production and Testing Services

Production services include cannabis extraction and product manufacturing services provided primarily on a business-to-business basis to cultivators, consumer product companies and retail dispensaries. Extraction companies invest in specialized equipment that transforms cannabis flower into concentrates intended for wholesale. Product manufacturing services companies process cannabis flower or concentrates, or provide packaging and wholesale services.

Testing services include scientific testing of cannabis products and reporting of information about product quality, safety and composition. Cannabis products are tested at multiple stages of production for genetic information and strain verification, cannabinoid and terpene composition and

potency, moisture content and the presence of contaminants, such as residual solvents, heavy metals, mycotoxins, microorganisms and pesticides. Testing, labeling and certification requirements vary widely across jurisdictions, but increasingly are being required by state law and demanded by supply-chain intermediaries and consumers. Uniform standards for testing and reporting are expected to emerge as scientific understanding of cannabis increases and as industry consensus about cannabis-related health and safety concerns develops.

Providers of extraction, manufacturing and testing services generally must obtain state and local cannabis licenses and are exposed to risks related to federal legal violations.

### ***Composition and Potency***

Laboratories ordinarily test cannabis for the specific amounts of 10 to 15 cannabinoids and more than 30 terpenes. Cultivators and production intermediaries rely on these test results to identify and track cannabis varieties and to monitor the quality and consistency of production methods. Retailers and consumers use test results information to assist in purchasing decisions. Almost all consumer products now include labeling that, at a minimum, indicates the amounts of THC and CBD.

### ***Pesticides***

Controlling and disclosing the presence of pesticides in cannabis products is increasingly becoming a focus of regulators and producers. Even cannabis grown under organic conditions can be exposed to pesticides inadvertently, so many states now require all cannabis products to be tested by a state-licensed laboratory for pesticides. Pesticides can be especially problematic in cannabis concentrates; studies have shown extraction processes may concentrate pesticides at a rate higher than cannabinoids and terpenes.

### ***Microbiological Organisms***

Certain molds, other fungi and bacteria found in and on the cannabis plant can damage the plant or certain cannabis products and can be harmful if consumed by humans. Mold is a problem most commonly found in indoor growing environments and during the cannabis drying and curing process. Organisms found in cannabis and identified by testing includes aspergillus, salmonella, pseudomonas and *E.coli*.

### ***Residual Solvents***

Most extraction processes use solvents to extract the active compounds from cannabis plant material. Commonly used solvents include butane, carbon dioxide, ethanol or propane. Residual solvents are those trace amounts of solvents that remain in a cannabis concentrate after the extraction process. Some residual solvents can be harmful if consumed by humans in sufficient amounts, and others should not be consumed in any amount.



## Certificate of Analysis

**Sample Name:** 

**Tested for:** 

**Sample ID:** 

**Date Tested:** 

**Sample Type:** 

**Total Sample Wt:** 

### Potency Test Results

Full spectrum cannabinoid profiling and analysis utilizing High Performance Liquid Chromatography (HPLC/UV)

Cannabinoid Summary			
<b>Total THC</b>	Δ9THC+THCa		N/A
Total Potential Δ9THC			0.00 %
<b>Total CBD</b>	CBD+CBDA		N/A
Total Potential CBD			0.00 %
<b>Total CBN</b>	Total CBN		N/A

### Full Cannabinoid Profile

Tetrahydrocannabinol	Δ9THC	
Tetrahydrocannabinolic Acid	THCa	
Cannabidiol	CBD	
Cannabidiolic Acid	CBDA	
Cannabinol	CBN	

**Total Active Cannabinoids:**

### Terpene Test Results

Screening and profiling for 34 terpenes found in Cannabis utilizing Gas Chromatography - Flame Ionization Detection (GC-FID)

	mg/g / %		mg/g / %
α Bisabolol	3.65 / 0.365	α Terpinene	0.29 / 0.029
α Pinene	239.09 / 23.909	Linolol	4.21 / 0.421
3 Carene	0.09 / 0.009	Limonene	22.28 / 2.228
Borneol	0.00 / 0.000	Myrcene	28.87 / 2.887
β Caryophyllene	54.13 / 5.413	Fenchol	1.48 / 0.148
Geraniol	0.00 / 0.000	α Phellandrene	0.24 / 0.024
α Humulene	20.08 / 2.008	Caryophyllene Oxide	5.51 / 0.551
Terpinolene	1.08 / 0.108	Terpineol	0.11 / 0.011
Valencene	6.20 / 0.620	β Pinene	101.26 / 10.126
Menthol	0.00 / 0.000	R-(+)-Pulegone	0.00 / 0.000
Nerolidol	3.34 / 0.334	Geranyl Acetate	0.00 / 0.000
Camphene	5.32 / 0.532	Citronellol	0.00 / 0.000
Eucalyptol	2.65 / 0.265	p-Cymene	0.14 / 0.014
α Cedrene	0.00 / 0.000	Ocimene	2.74 / 0.274
Camphor	0.00 / 0.000	Guaiol	6.69 / 0.669
(-)-Isopulegol	0.15 / 0.015	Phytol	0.27 / 0.027
Sabinene	0.49 / 0.049	Isoborneol	0.00 / 0.000

**Total Terpene Concentration** 510.35 mg/g / 51.035 %

### Pesticide Test Results

HPLC-Mass Spectrometry for 12 compounds including pesticides, fungicides, and plant growth regulators

Acequinocyl	N/A	Imidacloprid	N/A
Pyrethrum	N/A	Spinosad	N/A
Spiromesifen	N/A	Spirotetramat	N/A
Abamectin	N/A	Bifenazate	N/A
Daminozide	N/A	Fenoxycarb	N/A
Myclobutanil	N/A	Paclitubtrazol	N/A

### Residual Solvent Test Results

Headspace-Gas Chromatography for alkane and alcohol extractions

Propane	N/A	Ethanol	N/A
Methanol	N/A	Isopropanol	N/A
Isobutane	N/A	Mercaptan	N/A
2,2-Dimethylbutane	N/A	2-Methylpentane	N/A
3-Methylpentane	N/A	Cyclohexane + Benzene	N/A
Isopentane	N/A	Neopentane	N/A
n Butane	N/A	n Heptane	N/A
n Hexane	N/A	n Pentane	N/A

### Microbiological Test Results

3M Petrifilm and plate counts for microbiological contamination

Total Aerobic Plate Count	N/A	Total Yeast and Mold	N/A
Coliforms	N/A	E coli	N/A
Salmonella	N/A	Pseudomonas	N/A

### Sample Certification



This sample has been tested by SC Labs and the results are valid until the expiration date shown.



Scan QR code at sclabs.com

**Sample Laboratory Test Results**

## Production Opportunities

We believe opportunities in this segment include:

**Specialized Production Services.** Production services companies that invest in the necessary equipment and facilities should see strong demand for high-margin specialized services from cultivators and other production intermediaries. We expect opportunities will expand for companies that provide extraction services (particularly those who professionally manage hazardous processes such as hydrocarbon extraction) or develop proprietary infused-product manufacturing processes.

**Energy-efficient, Integrated Cultivation Components.** We anticipate continued design and construction of sophisticated indoor cultivation facilities, which should present a significant opportunity for suppliers of advanced cultivation components that improve yield and reduce energy costs. We believe companies that provide all-in-one integrated systems for automation, monitoring and control of the production process are more likely to succeed than companies that merely offer a single-point solution.

**Branded Laboratory Test Certification.** Given the importance of product testing, we believe that leading providers of high-quality testing services have an opportunity to establish an industry recognized “certification,” and that such a certification may become a key factor in influencing consumer confidence and demand.

**Efficiencies in Cannabis Cultivation.** We believe that certain segments of the market will become increasingly commoditized and that cultivators with low production costs and high yields will have significant competitive advantage. Cultivators with operations in regions conducive to low-cost natural production should benefit as laws are changed to facilitate interstate and international cannabis commerce.

## Production Challenges

Challenges in this segment include:

**Scaling Cultivation Operations.** Current laws typically force cultivators to build, and obtain licenses for, potentially redundant, capital-intensive cultivation facilities in each jurisdiction they serve. The capital requirements and uncertainty around licensing present serious challenges to cultivators seeking to scale their operations.

**Downward-pricing Pressure on Cannabis Flower.** Cannabis wholesale prices are declining as large-scale cultivators begin to commoditize cannabis flower. Small and inefficient cultivators (including high-cost indoor producers) may struggle to produce cannabis at effective margins as cannabis cultivation migrates to global regions with conditions that support low-cost, sustainable production.

**Lack of Standardized Testing.** Currently, it may be difficult or impossible to reliably compare test results between providers of testing services because the cannabis industry has not yet developed uniform testing standards. Until the industry adopts uniform standards that address testing procedures and reporting for a broad variety of flower, concentrates and infused products, providers of testing services may struggle to develop an industry-wide brand and reputation for quality.

**Access to Capital.** Participants in this segment generally engage in capital-intensive operations. In particular, cultivation, contract manufacturing and testing facilities require significant capital investment. Emerging companies in this segment may struggle to raise sufficient capital to compete effectively.

## Production Outlook

Due to U.S. federal and international legal restrictions on cannabis commerce, producers currently must invest significant capital in potentially redundant facilities located in separate jurisdictions, and many large agricultural producers and equipment suppliers that could effectively compete in the cannabis industry are reluctant to enter the market. In the near term, we expect that cultivators will continue to raise capital for facilities across multiple jurisdictions, and well-managed and well-financed cultivators will differentiate themselves by creating consistent, high-quality strains, developing strong distribution relationships, vertically integrating other supply-chain functions and offering branded products and competitive pricing. We also expect production services companies will benefit from increasing demand for specialized extraction and manufacturing services that cultivators and other production intermediaries cannot efficiently perform themselves, and providers of testing services will benefit from increasingly robust testing and safety regulations. In the long run, we expect more permissive domestic and foreign laws will result in increased competition from large enterprises that are able to realize economies of scale or have operations in regions best suited for efficient, sustainable production.

## ■ Distribution

We divide the distribution segment of the cannabis industry into three subsegments: dispensaries, e-commerce and distribution services. Dispensaries are retail outlets where consumers purchase cannabis products for medical or recreational purposes. E-commerce includes digital applications used to enhance the cannabis shopping experience. Distribution services include wholesale and related transportation and logistics services. Participants in the distribution segment generally “touch the plant” and therefore must comply with state and local regulations—which often require licenses or permits—and must accept legal risks related to federal cannabis restrictions.

### Dispensaries

Cannabis dispensaries are “point of sale” retail establishments where consumers may purchase medical or recreational cannabis products. Cannabis dispensaries are the face of the cannabis industry in many communities and, consequently, they occupy one of the most heavily regulated and scrutinized positions in the cannabis supply chain.

Dispensaries in established state-legal markets provide consumers with a typical retail shopping experience. Dispensaries typically range in size from 1,000 to 10,000 square feet of retail space. A dispensary may offer between 10 to 50 strains of cannabis flower and a variety of concentrates, edibles, topicals and accessories. Inventory is either acquired from cultivators and other wholesale product suppliers, or cultivated and produced internally. Products may be illustrated in menus or displayed on shelves and may also be available for customers to touch, smell or otherwise examine. Trained customer service staff, often known as “budtenders,” are typically available to educate customers about product offerings.



*Dispensary Exterior Views*



*Dispensary Interior Views*



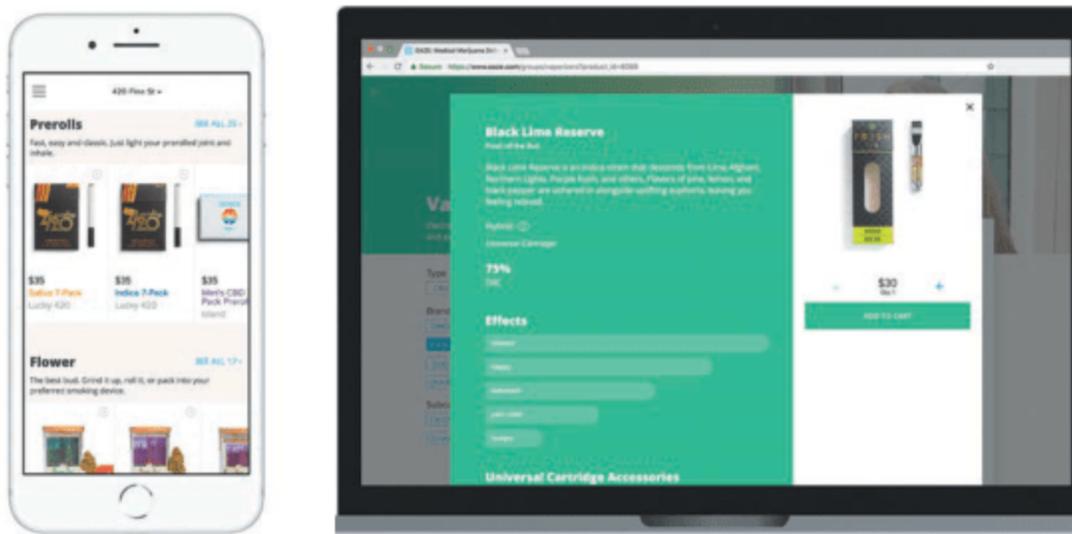
*Customer Interactions*

Because dispensaries “touch the plant,” they must usually obtain a state license. Obtaining a state dispensary license generally involves a multi-month application process that requires the applicant to demonstrate compliance with complex license criteria and local regulations, such as producing their own products (or being prohibited from doing so), locating their dispensary outside a city’s ordinary retail or commercial zones, operating as a nonprofit cooperative or collective, tracking cannabis products from “seed to sale,” and collecting taxes on behalf of the state. Dispensaries must also comply with applicable regulations related to product testing, packaging and labeling, security, and health and sanitary conditions.

An extensive network of dispensaries across jurisdictions will facilitate the growth of the cannabis industry and its ability to attract new consumers. Currently, states with the most extensive networks of dispensaries are those that have both recreational and medical cannabis laws, such as Colorado, Oregon and Washington, and those that have had medical cannabis laws for a long period of time, such as California. For example, according to the Rocky Mountain High-Intensity Drug Trafficking Area, as of June 2017, in Colorado there were 491 cannabis dispensaries, compared to 392 Starbucks and 208 McDonald’s.

## E-Commerce

E-commerce refers to the use of digital applications to enhance the cannabis shopping experience. For example, a mobile application may facilitate the comparison of cannabis products and pricing or the delivery of orders from local dispensaries. These applications are being developed by a host of market participants, ranging from software development companies to retail dispensaries. Due to federal restrictions, cannabis e-commerce transactions are currently conducted only intrastate. If and when federal restrictions change to allow interstate cannabis commerce, we expect that home-delivery and e-commerce services will increase significantly. E-commerce solutions with high consumer engagement (such as those providing reviews and price comparisons for a broad selection of products) will help retailers acquire and retain customers.



Sample E-Commerce Menus

## Distribution Services

Distribution services is emerging as a prominent subsegment of the cannabis industry; services in this subsegment include wholesale distribution of cannabis products to retailers and production intermediaries, as well as related transportation and logistics services. Historically, a high percentage of product manufacturers have sold directly to retail dispensaries, and some of those manufacturers with established “in-house” distribution channels are now leveraging their experience to offer distribution services to third-party manufacturers.

Currently, distribution activities must be conducted only intrastate, and providers of distribution services must comply with regulations related to “touching the plant,” including testing and tax-collection requirements. As laws are changed to allow more interstate and international transportation, purchasers will be able to compare products and prices on a national or international basis, and distributors who provide superior product selections and transportation logistics should have significant competitive advantage.

## Distribution Opportunities

We believe opportunities in this segment include:

**E-Commerce Distribution.** The ability to accept electronic orders and deliver cannabis products on demand represents an attractive distribution channel and growth opportunity. Companies that provide digital retail platforms for cannabis products will benefit as consumers migrate to e-commerce transactions.

**Branded and Vertically Integrated Dispensaries.** We believe that consumers will ultimately concentrate their purchases with a small group of branded dispensaries that provide a distinct, consistent and trusted retail experience and offer supporting e-commerce solutions. Dispensaries that integrate vertically to offer their own branded products should achieve superior margins on those products.

**High-profile Retail Locations.** We see an opportunity for cannabis dispensaries to attract significantly more customers by establishing storefronts in malls and other high-profile retail locations.

**“Land Grab” of Desirable Locations.** Companies able to navigate the licensing and real estate challenges required to secure and operate multiple dispensaries in desirable locations should benefit from existing high barriers to entry and capture significant market share.

## Distribution Challenges

Challenges in this segment include:

**Customer Acquisition and Retention.** Like e-commerce businesses in other industries, providers of e-commerce solutions in the cannabis industry face intense competition for customers who can easily change vendor loyalties. Companies will be challenged to minimize customer acquisition costs and retain customers.

**Restrictive and Changing Regulations.** Obtaining a state dispensary license or other type of distribution permit typically involves a multi-month application process that requires the applicant to demonstrate compliance with complex criteria. In addition to state laws and regulations, dispensaries

and other distribution intermediaries are subject to county, municipal and other local regulations that may restrict or even prohibit distribution activities. The success of any dispensary operator or distributor depends on anticipating and complying with these regulations.

**Tax Issues Related to Distribution.** States and localities that legalize cannabis are focused on the potential to generate tax revenue from the industry. Ambiguous, constantly changing and potentially burdensome taxation rules may make it difficult for dispensary operators or distributors to remain in good standing with licensing, regulatory and tax collection agencies and may negatively impact their financial results.

## Distribution Outlook

We expect dispensaries across the United States to increasingly seek to provide modern retail experiences that are supported by e-commerce applications. We also expect that the most well-run dispensaries will continue to generate significant cash flow at compelling margins. Dispensaries should be able to gain advantage by producing their own products, by developing strategic or exclusive relationships with specialty producers or by finding ways to generate customer loyalty. However, oversaturation in the number of dispensaries in certain jurisdictions, such as Colorado, has led to a very competitive environment, consolidation and moratoriums on issuing new local dispensary licenses by various municipalities.

The distribution segment is subject to some of the strictest and most frequently changing regulations applicable to the cannabis industry. While distribution opportunities may arise with changes in law, some legislation may cause significant disruption. For example, the number of dispensaries operating in the greater Los Angeles region is expected to decrease significantly in the short term as California's new cannabis regulatory agency begins its oversight and enforcement efforts in 2018.

The distribution services subsegment in the United States is still in its infancy and has experienced a number of growing pains related to a lack of well-established distribution channels. For example, a Nevada law generally requiring dispensaries to use third-party distributors proved troublesome when dispensaries sold out of product within 48 hours after legal recreational cannabis sales commenced in the state. As more distribution channels and points of contact are established, we believe that opportunities for third-party distribution services companies will increase.

In certain legalized international markets, such as Germany and Uruguay, cannabis products are sold primarily through existing pharmacy networks (Argentina plans to do the same). While cannabis-derived pharmaceuticals may ultimately be distributed the same way in the United States, we believe the future domestic distribution channels of other types of cannabis products will closely resemble those of alcohol and tobacco products.

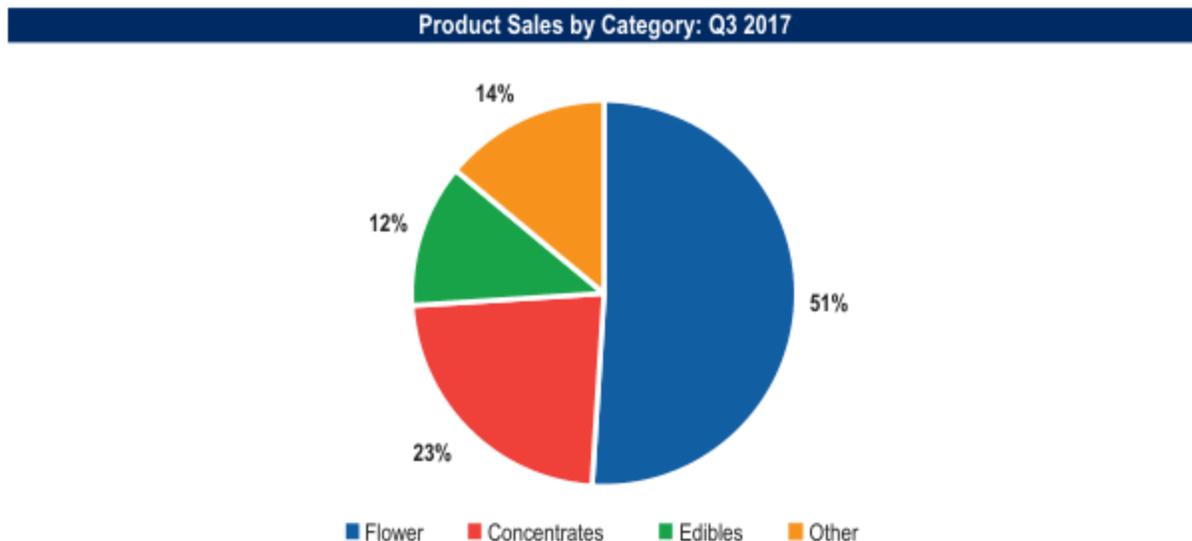
## ■ Consumer Products

Cannabis may be consumed in many different forms, which fall into three broad categories: flower, concentrates and infused products. The most popular way to consume cannabis historically has been to smoke the flower or “bud” from the cannabis plant, which can be done using a pipe, a hand-rolled cigarette (often referred to as a “joint”) or a water pipe (often referred to as a “bong”). Cannabis flower can also be vaporized and inhaled (using a product known as a “vaporizer”). The active compounds in cannabis can be extracted and concentrated into oil or waxlike substances known as concentrates. Concentrates, in turn, can either be vaporized and inhaled or infused into products known as “infused products.” Infused products may be applied topically, such as lotions and creams, or consumed orally, such as food and drinks (known as “edibles”), capsules, pills and tinctures.

When smoke or vapor from heated flower or a concentrate is inhaled, the active compounds travel directly to the central nervous system and the physiological effects typically begin within one to five minutes. When infused products are consumed orally, the active compounds are digested in the stomach and metabolized by the liver before taking effect, typically in one to two hours. Compared to inhaled products, infused products deliver a smaller relative amount of cannabinoids to the bloodstream, but they produce longer-lasting effects.

Innovative companies continue to expand the universe of cannabis products, developing brands with packaging that increasingly emphasizes education about the product’s effects and appeals to mainstream consumers. Cannabis flower is currently the most widely sold form of cannabis, but concentrates and infused products are gaining in popularity.

The following chart shows the combined relative sales by product category for Colorado, Oregon and Washington (three states with relatively mature recreational and medical cannabis markets) for the three months ended September 30, 2017.



Source: BDS Analytics

## Cannabis Flower

Cannabis flower, or “bud,” is the most popular product among cannabis consumers. Cannabis flower is usually green (although some varieties have a purple or orange hue), slightly sticky to the touch and spongy in density. The flower has a strong, pungent aroma owing primarily to the trichomes on the flowers, which contain the highest concentrations of cannabinoids and terpenes of any part of the plant.



*Branded Cannabis Flower*

There are thousands of different cannabis varieties, each with its own cannabinoid and terpene profile and corresponding aroma, flavor and potency. Leading cultivators are recognized each year in contests and ceremonies for their indica, sativa and hybrid varieties. Award-winning varieties—which are often given unique identifying names—frequently become the most in demand by consumers. Popular varieties today include “Blue Dream,” “Gelato,” “OG Kush,” “Pineapple Express” and “Sour Diesel.”

The flower of a typical cannabis variety produced for human consumption contains approximately 15% to 30% THC, approximately 0.1% to 1% CBD and nominal levels of other cannabinoids. Due to advancements in cultivation techniques, THC levels in cannabis flower available today are generally much higher than in the past.

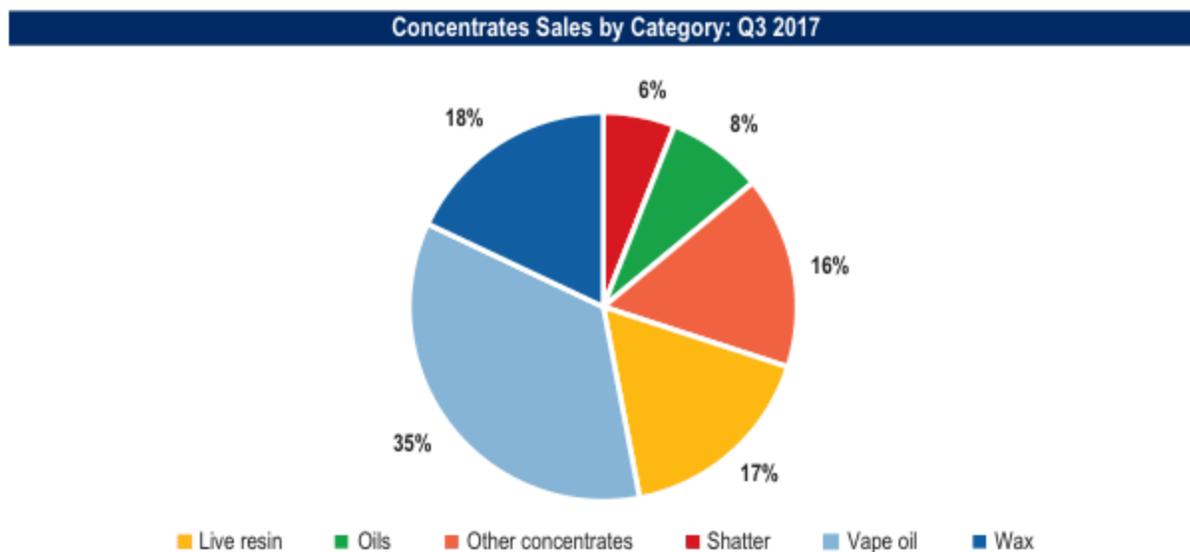
## Concentrates

Cannabis can be processed into a variety of concentrates, many of which are sold as finished products for smoking or vaporizing and some of which can be infused into other products, such as edibles and topicals. Concentrates include CO<sub>2</sub> oil, butane hash oil or “BHO,” shatter, wax, live resin, budder, kief, ice water hash and rosin.

Concentrates are quickly becoming popular for a host of reasons. Some believe vaporizing or ingesting concentrates are healthier methods of cannabis consumption than smoking plant material. Extracting cannabinoids from the cannabis plant produces higher-potency dosing (THC content can exceed 80% in concentrates), enables custom formulations and flavor profiles, and facilitates consumption that is more convenient and discreet than smoking. The concentration of specific cannabinoids varies

across cannabis varieties and even across flowers from the same plant, which limits the accuracy of laboratory tests conducted on a sample of plant material. Cannabis concentrates, however, are generally homogeneous and their active elements can be more precisely measured and reported so as to facilitate standardization of products and accurate dosing by consumers.

The following chart shows the combined relative sales by category of concentrates for Colorado, Oregon and Washington for the three months ended September 30, 2017.



Source: BDS Analytics

Concentrates are prepared with extraction techniques that fall into two general categories, solvent-based extraction and solvent-free extraction. Solvent-based extraction techniques include the use of hydrocarbon, carbon dioxide (CO<sub>2</sub>) or ethanol solutions to chemically isolate cannabinoids and other active compounds. Solvent-based extraction can be performed relatively quickly and can produce high yields and customized formulations, but requires the use of expensive equipment and skilled labor and also may leave residual solvents in the resulting concentrate. Solvent-free techniques include the use of filters, ice water or heat to physically separate parts of the cannabis plant with high cannabinoid concentrations. Generally, solvent-free extraction is inexpensive and can be performed without specialized equipment, but it is also slow and labor-intensive and it typically results in low yields.

### **Hydrocarbon Extraction**

Hydrocarbon extraction is a process whereby a hydrocarbon solvent (typically butane or propane) chemically extracts cannabinoids, terpenes and other compounds from cannabis plant matter. The solvent is then purged using heat and pressure, leaving a concentrated form of the extracted compounds. Because hydrocarbon extraction involves a risk of explosion and usually leaves behind residual solvents, regulations are becoming more restrictive in specifying where and how the process can occur and prescribing acceptable levels of residual solvents in the resulting products. Concentrates prepared through hydrocarbon extraction—including BHO, shatter and wax—are popular with some consumers because hydrocarbon extraction generally preserves terpenes and the source plant's aroma and flavor.

### **CO<sub>2</sub> Extraction**

CO<sub>2</sub> extraction is a process whereby cannabis is introduced into a system of supercritical CO<sub>2</sub> (CO<sub>2</sub> at a pressure and temperature at which it exhibits properties of both a gas and a liquid). Cannabinoids and other compounds dissolve in the supercritical CO<sub>2</sub>; pressure is released, and the CO<sub>2</sub> then evaporates, leaving a concentrated form of the dissolved compounds. CO<sub>2</sub> extraction is considered a relatively safe and clean extraction process because CO<sub>2</sub> is nonvolatile, CO<sub>2</sub> concentrates are generally free of residual solvents and CO<sub>2</sub> extraction kills mold and bacteria. CO<sub>2</sub> extraction is commonly used to produce viscous CO<sub>2</sub> oil for vaporizer cartridges and low-terpene concentrates for infused products.

### **Ethanol Extraction**

Ethanol extraction is a method used in a number of industries to extract essential oils and food flavorings from plants. When used to produce cannabis concentrates, the process involves soaking cannabis plant material in ethanol, which separates cannabinoids, terpenes and other compounds from the plant matter. The solution is then heated until the ethanol is purged to acceptable levels. Ethanol is generally much safer to use for extraction than hydrocarbons and is particularly useful for creating concentrates with “whole-plant” compound profiles that mirror the source plant. Unfortunately, ethanol also extracts certain plant compounds—particularly chlorophyll—that have undesirable aromas and flavors.

### **Solvent-Free Extraction**

Most solvent-free extraction techniques are inexpensive and do not require special training or equipment, but they also tend to produce low yields. Kief, ice water hash and rosin are examples of concentrates produced with solvent-free methods. Kief is a collection of trichomes that are separated from cannabis flower by sifting the flower with specialized filtering screens. Ice water hash is a collection of trichomes produced by stirring cannabis in ice water, filtering the mixture through a sequence of increasingly fine screens, removing the trichome collection from the finest screens and allowing it to dry. Rosin is created by heating and pressing cannabis plant material between parchment paper and collecting the concentrate that oozes onto the paper.



*Oil Concentrate (Cartridge)*



*BHO Wax*



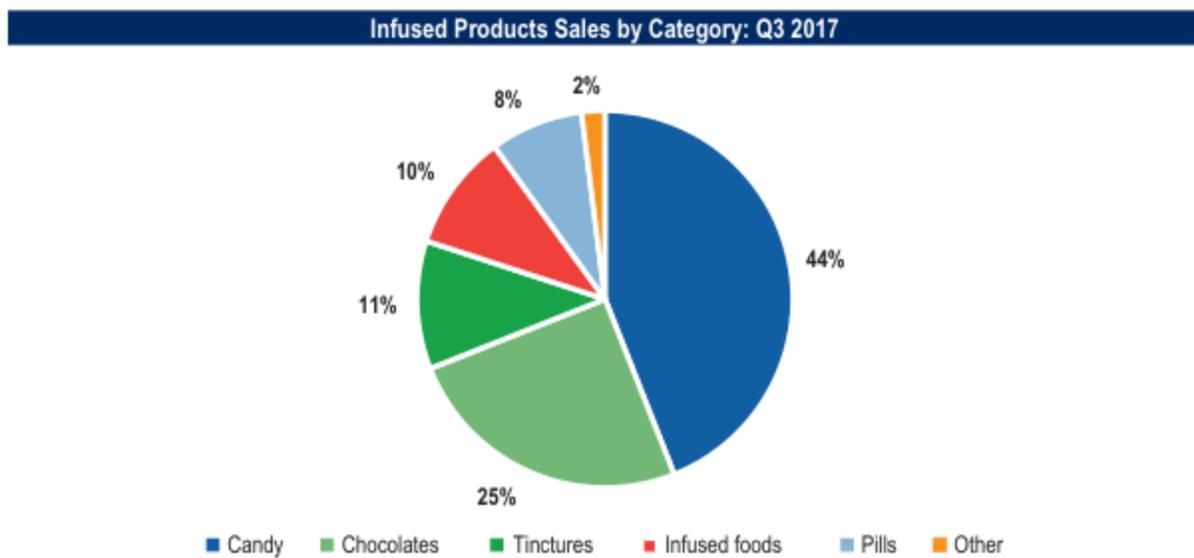
*Rosin*

### **Cannabis Concentrate Products**

### Infused Products

Infused products are ingestible products that have been infused with cannabinoids and other active compounds from the cannabis plant. There are two general categories of infused products: those consumed orally, such as foods and beverages (known as “edibles”), capsules, pills and tinctures; and those applied topically, such as lotions, balms and creams. Infused products may either be infused with concentrates (that are prepared through one of the extraction techniques discussed previously) or prepared with other infused products, such as cannabis-infused butter (a concentrate prepared by heating cannabis in butter to release the active compounds, and then filtering out the plant material).

The following chart shows the combined relative sales by category of infused products for Colorado, Oregon and Washington for the three months ended September 30, 2017.



Source: BDS Analytics

### Edibles

Popular edibles include infused candies, chocolates and beverages. The active compounds in edibles are digested and metabolized by the liver before taking effect; typically, the time from ingesting to onset of an effect is one to two hours, but the effect lasts longer than that resulting from inhaling smoke or vapor. Edibles generally deliver body-focused effects, which may be preferred by consumers seeking pain relief.



*Edibles: Chocolate, sparkling water, mints, candies, brownies, gummies*

### Capsules and Tinctures

Capsules are cannabis concentrates with various cannabinoid profiles encapsulated in a gelatin coating for easy swallowing. Capsules are digested and metabolized like edibles; typically, the time from swallowing to onset of an effect is one to two hours. Tinctures are concentrates suspended in an alcohol solution and are usually placed under the tongue using a dropper; effects generally begin within 10 to 15 minutes. Capsules and tinctures are preferred over edibles by some consumers who believe they deliver more consistent dosing than edibles.



Capsules



Tincture

### Topicals

Topicals are any form of product infused with cannabinoids and applied topically, such as lotions, balms, creams, lubricants and transdermal patches. Topicals often include noncannabis ingredients, such as essential oils or herbal extracts. They are commonly used for localized relief of muscle soreness and inflammation and for relief of headaches and cramping.



Topicals



## Vaporizers and Accessories

Smoking or vaporizing cannabis flower or concentrates is the most popular method of cannabis consumption, in part because the effects of inhaled cannabis smoke or vapor begin almost immediately. Accessories used to smoke cannabis include glass, wood or metal pipes; glass or plastic water pipes known as “bongs”; and cigarette papers used to roll “joints.” A vaporizer is a device that heats cannabis flower or concentrate to a temperature at which its active compounds boil and can be inhaled as vapor. Vaporizers are increasing in popularity faster than any other cannabis-consumption device, in some measure because vaporizing is perceived by many as a healthier method of cannabis consumption than smoking. Distinguishing features of a vaporizer include whether it vaporizes flower or concentrate, the form of the heating mechanism, or “atomizer,” power output, battery efficiency, durability, reusability (there are both refillable and disposable vaporizers) and design aesthetics. Hundreds of vaporizers are marketed, ranging from simple to complex, including handheld vaporizers that retail for \$10 to \$500 and tabletop vaporizers that retail for \$100 to more than \$1,000.

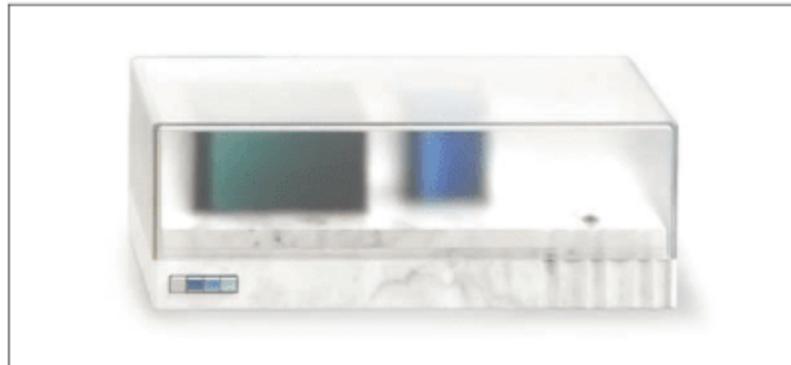


*Vaporizers*



*Cannabis Consumers Using Vaporizers*

In addition to smoking and vaporizing devices, an increasing variety of other cannabis-related accessories are available, including personal storage and transportation products. Some of these products focus on safety or discretion, such as childproof containers and smell-proof bags. Other products are designed more for style, such as vaporizer pouches and tabletop storage containers intended as decor. The market for both safety-focused accessories and style pieces is expected to grow as laws and regulations increasingly impose requirements related to storage and transportation and as taboos regarding cannabis use wane.



*Accessories*

## Pharmaceuticals

Cannabinoid-based pharmaceuticals are drugs containing cannabinoids or cannabinoid-like compounds that are either derived from natural cannabis or chemically synthesized. A handful of such drugs have been approved for use to treat certain medical conditions both in the United States and elsewhere. Examples of cannabinoid-based pharmaceuticals that have been approved for use in various countries include Marinol, Syndros, Cesamet and Sativex. Another cannabinoid-based pharmaceutical, Epidiolex, has not yet been approved but could become the first medicine derived from the cannabis plant to be approved by the U.S. Food and Drug Administration (FDA).

The drug Marinol is comprised of dronabinol (a synthetic THC) encapsulated with sesame oil in a soft gelatin capsule. Marinol has been approved by the FDA for use in treating (i) anorexia associated with weight loss in patients with AIDS and (ii) nausea and vomiting associated with cancer chemotherapy. Marinol is a Schedule III controlled substance under the U.S. Controlled Substances Act (CSA). Syndros is a drug that contains dronabinol in a liquid solution; it has been approved by the FDA for use by adults in treating the same symptoms for which Marinol has been approved. Syndros is a Schedule II controlled substance under the CSA. Forms of dronabinol have been approved for use in jurisdictions outside the United States, including Canada and Denmark.

Cesamet is a drug made up of encapsulated nabilone, a synthetic cannabinoid similar to THC. Cesamet has been approved by the FDA for use in treating nausea and vomiting associated with cancer chemotherapy. Cesamet is a Schedule II controlled substance under the CSA. Forms of nabilone have been approved for use in jurisdictions outside the United States, including Australia, Canada, Mexico and the United Kingdom.

Sativex is a mouth spray used for treatment of spasticity caused by multiple sclerosis; it includes THC and CBD derived from cannabis. Sativex was first approved for use in the United Kingdom in 2010, and has been approved for use in at least 30 countries (but not in the United States). Sativex is manufactured by U.K.-based GW Pharmaceuticals and is generally recognized as the first prescription drug in the world to include plant-based cannabinoids. The cannabis extract used in Sativex is a Schedule I controlled substance under the CSA.



Pharmaceuticals

Epidiolex is an oral formulation of cannabis-derived cannabidiol, or CBD, intended to treat severe forms of childhood epilepsy. Epidiolex has not been approved for use in any country, but the drug's manufacturer, GW Pharmaceuticals, recently submitted a New Drug Application for Epidiolex to the FDA, which is an important step toward FDA approval in the United States. If approved by the FDA, Epidiolex would be the first FDA-approved prescription drug derived from cannabis. The cannabis extract used in Epidiolex is considered to be "marijuana," a Schedule I controlled substance under the CSA. Therefore, even if Epidiolex were approved by the FDA, Epidiolex would need to be rescheduled and excepted from the "marijuana" definition before it could be lawfully prescribed in the United States.

### Consumer Products Opportunities

We believe opportunities in this segment include:

**Consumer Product Brands Focused on Health and Wellness.** We believe there is a substantial opportunity for companies to develop leading brands of cannabis-based health and wellness products. Marketing a broad line of such products under a common brand should provide a competitive advantage.

**Direct E-Commerce Distribution.** The e-commerce market for cannabis products is expected to expand and consumer awareness of product options is expected to increase, enabling more consumer product companies to sell their products directly to consumers through online purchasing platforms rather than selling only through wholesale.

**Advanced Vaporizer Functionality.** Vaporizer technology has advanced rapidly in recent years, a trend we expect to continue. In the future, vaporizers may be able to identify the composition and potency of the product being consumed, monitor consumption and dosing of the product, or reorder the product at the push of a button.

**Specialty Formulations.** We believe that scientific knowledge about the relationships between specific cannabinoid formulations and targeted health conditions will continue to improve, and markets will be created for highly specialized products developed to relieve particular symptoms.

**FDA Approval and CSA Rescheduling.** If Epidiolex is approved by the FDA and rescheduled under the CSA to permit lawful prescriptions to be written within the United States, it would be the first federally legal cannabis-derived drug in the country. Such a precedent could result in a significant increase in the use of cannabis by consumers as medicine, and it could also be followed by similar approvals in the United States for other cannabis-derived drugs.

### Consumer Products Challenges

Challenges in this segment include:

**Marketing and Customer Loyalty.** As more products become available to consumers through dispensaries and e-commerce solutions, consumer product providers may need large marketing budgets to drive product awareness and customer loyalty.

**Wholesale and Retail Distribution.** Providers of cannabis products may struggle to develop wholesale and retail distribution relationships because of the breadth of products being marketed. Providers

should seek to develop strong relationships with a large number of dispensary operators, directly or through a distributor, in order to obtain preferred shelf placement.

**FDA Approval: Risk, Time and Expense.** Assuming that cannabis-derived drugs will eventually be permitted to be sold in the United States, considerable time and expense will be spent by manufacturers to obtain FDA approval and bring approved products to market. There is no guarantee that investments of significant time and money into research, development and clinical trials will result in FDA approval of cannabis products.

**Product Liability Claims.** Companies may be exposed to various product liability claims associated with human consumption of cannabis products. Consumer claims that products cause injury or illness, include inadequate instructions for use or warnings concerning health risks, or cause possible side effects or interactions with other substances may be expensive to defend or settle.

### Consumer Products Outlook

We believe that there are significant market opportunities for well-recognized brands to develop in various categories of consumer products, particularly in flower, concentrates, edibles and vaporizers. In addition, we believe that there are opportunities for companies targeting niche applications for the pet industry. Many companies will struggle to create strong brands because the consumer products segment generally has low barriers to entry and is currently oversaturated. As the cannabis industry and legal environment develop, we expect that national brands will emerge from companies with large marketing budgets, operational scale and reputations for quality, and that large alcohol, tobacco, consumer products and pharmaceutical companies will play a larger role in this segment.

## ■ Business Solutions

The business solutions segment of the cannabis industry comprises business software, such as seed-to-sale tracking solutions, and business services, such as legal, compliance, operational consulting and financial services. Software and services providers in this segment generally do not “touch the plant” and do not require cannabis-related permits or licenses.

### Business Software

Software solutions tailored to the cannabis industry are present throughout the cannabis supply chain. Although solutions from other manufacturing and retail industries are used in the cannabis industry, industry-specific solutions are emerging as some of the most popular. Some companies provide point solutions that target bottlenecks in the supply chain, while others offer broad platforms that consolidate multiple capabilities. Industry-specific software applications exist and are being developed in the following areas: cultivation cycle management; concentrate production management; infused product manufacturing management; product testing and compliance; retail operations (including point-of-sale, inventory, tax reporting and compliance solutions); mobile, e-commerce and delivery applications; supply-chain management; customer relationship management; and management reporting and business intelligence.



*Cannabis Software Platforms*

### Business Services

The business services market includes (i) operational consulting, including facility planning, construction and security; (ii) financial services, including accounting and payment-processing services; (iii) legal, compliance and other professional advisory services; (iv) temporary and full-time staffing services; (v) real estate services; and (vi) industry events and conferences. These services are typically provided by professional services firms; some of these firms focus solely on the cannabis industry while others serve a broad range of industries.

### Business Solutions Opportunities

We believe opportunities in this segment include:

**Industry-specific Solutions.** As the cannabis industry emerges, there will be a significant market opportunity for providers of solutions tailored for the industry. Point-solution providers may be acquisition targets if larger companies enter the market in the future.

**Integrated Platforms.** We believe that integrated “seed-to-sale” solutions will be ideally positioned.

**“Big Data” Analytics.** We believe that there is an attractive opportunity to develop and license industry datasets. Such datasets should provide strategic advantages to organizations that establish substantial reach early and may also be licensed more broadly to enhance targeting, services, cross-sales and product development.

### Business Solutions Challenges

Challenges in this segment include:

**Development and Deployment Risk.** Due to the time and investment required to develop software products and the emerging nature of the cannabis industry, there is a risk that developed applications may not be effective or widely adopted. In addition, certain segments of the cannabis industry are more mature than others; this disparity may present challenges in developing solutions that support cohesive and scalable business models.

**Low Barriers to Entry.** Numerous sectors of the business services market are becoming increasingly crowded.



## Digital Media Opportunities

We believe opportunities in this segment include:

**Premium Content.** We believe that opportunities exist to establish industry-specific publications and media platforms for both the business-to-business and business-to-consumer markets that are viewed as the legitimate voices of the industry.

**Mobile Applications.** E-commerce and digital media applications are well positioned for mobile deployment within the cannabis industry. We expect a proliferation of mobile applications, even in the early stages of the industry.

**Enabling Technology.** Continued development of core and shared technology platforms remains an opportunity for digital media companies seeking to provide a better user experience. Technologies that provide targeted experiences should enable digital media companies to realize greater returns on investments.

## Digital Media Challenges

Challenges in this segment include:

**Limited Number of Advertisers.** Broad, general-market advertisers are not commonly participating in the cannabis industry due to concerns about legal compliance and mass-market perception. As a result, companies are currently competing for limited advertising revenue targeted at the cannabis-user demographic.

**Venues.** Established digital media companies—such as Facebook, Google, Twitter and Yelp—limit the activities of cannabis-focused media companies on their sites in accordance with company policies. This creates opportunities for niche publishers in the near term, but we believe that, ultimately, large media companies will view cannabis as a mainstream industry.

## Digital Media Outlook

The opportunity for cannabis-oriented digital media is substantial. We believe that companies with well-executed strategies will emerge as the recognized voices of the industry and will be relied on by consumers for a wealth of information from product recommendations to industry news. As regulatory constraints relax, we expect the currently disparate and fragmented digital media services segment to consolidate into integrated publishing, mobile and e-commerce offerings. However, as stated previously, we believe that digital media companies focused solely on the cannabis industry will eventually face considerable competition from—but may be logical acquisition targets for—traditional media companies.



## CHAPTER IV

# U.S. Legal Landscape

The legal landscape for the cannabis industry in the United States continues to be characterized by conflict between federal prohibition and the steady advance of state legalization. According to federal policy, Americans can access tobacco, alcohol and prescription drug products that kill thousands each year, but they cannot access cannabis because it is a dangerous drug with no currently accepted medical application in the United States (notwithstanding the federal government holds a U.S. patent for methods of treating diseases with cannabinoids). Meanwhile, 46 U.S. states permit some use of cannabis products as medicine by adults or children, and 8 of those states have laws that regulate cannabis like alcohol.

The U.S. cannabis industry has proven adept at navigating this federal-state conflict and is experiencing rapid growth despite it. Moreover, we believe that federal policy will move (and may already be moving) in a new direction—one that would facilitate federal approval of cannabis-derived drugs and ultimately, we believe, give rise to a regulatory and political environment in which the U.S. Congress could fully legalize both medical and recreational cannabis.

In this chapter, we summarize three categories of state cannabis laws and examine certain federal laws and policies that impact the cannabis industry, including federal laws related to drug and food regulation, banking and finance, and intellectual property. Finally, we offer our views about how the cannabis legalization trend and related developments likely lead to a federally legal U.S. cannabis industry.

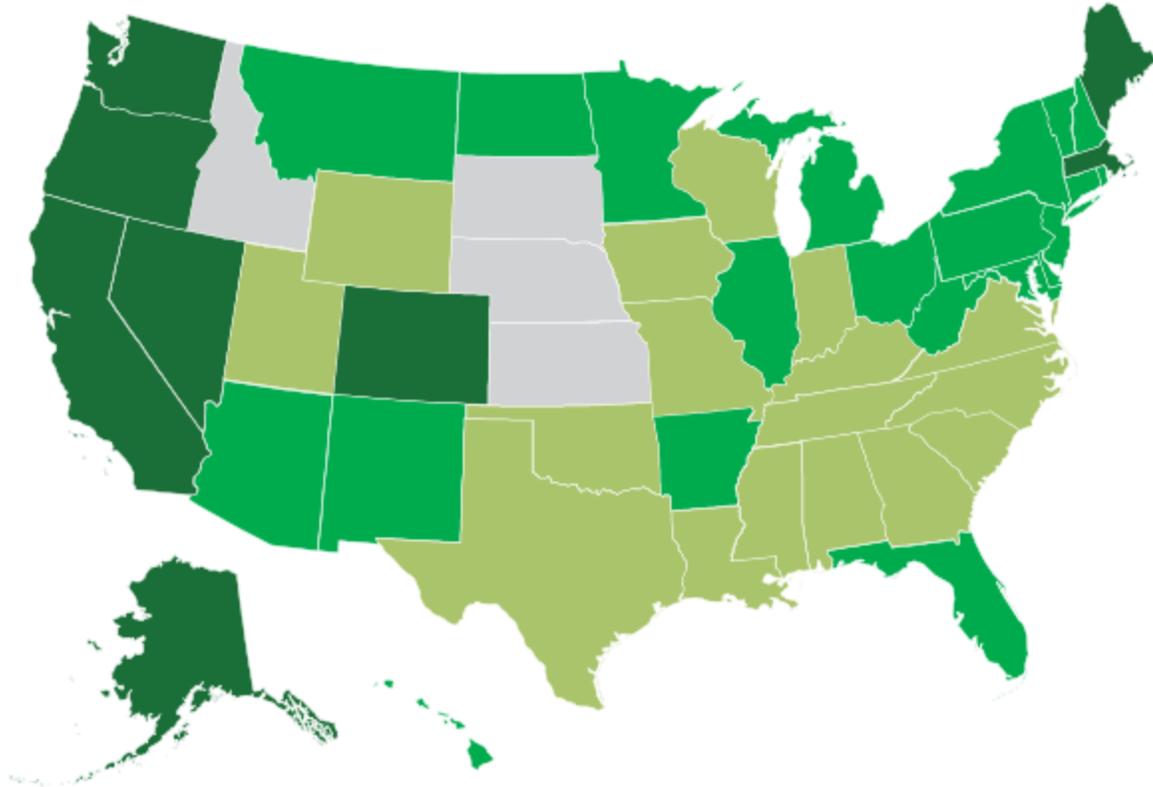
## ■ U.S. State Law

Of the 51 jurisdictions comprising the 50 U.S. states and the District of Columbia, 47 have enacted at least one law that permits the manufacturing, distribution, dispensing or possession of cannabis or concentrates. These laws fall into three general categories:

- 29 U.S. states and the District of Columbia have enacted medical cannabis laws that permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions.
- 19 U.S. states have enacted narrow CBD/limited laws that permit possession of small amounts of low-THC/high-CBD cannabis concentrates for use in treating a few serious medical conditions—in particular, severe forms of childhood epilepsy.
- 8 U.S. states have enacted recreational laws that permit the commercial production and sale of cannabis to adults for recreational and other uses.

Some states have passed more than one of these laws, and some state laws do not fall clearly into any one of these categories. Florida and Delaware have both medical cannabis and CBD/limited laws. Every state that has enacted a recreational law has also passed a medical cannabis law. A District of Columbia law that permits adults to grow and consume cannabis is often cited as a recreational law; however, we do not characterize it as such because it does not permit the commercial production and sale of cannabis. The following map of the United States shows states with medical cannabis laws, CBD/limited laws or recreational laws (a state with more than one of these laws is represented on the map by its most permissive law).

U.S. State Cannabis Laws (January 2018)



**Recreational Law**

- Alaska
- California
- Colorado
- Maine
- Massachusetts
- Nevada
- Oregon
- Washington

**No Recreational, Medical Cannabis or CBD/Limited Law**

- Idaho
- Kansas
- Nebraska
- South Dakota

**Medical Cannabis Law**

- Arizona
- Arkansas
- Connecticut
- Delaware
- Florida
- Hawaii
- Illinois
- Maryland
- Michigan
- Minnesota
- Montana
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Dakota
- Ohio
- Pennsylvania
- Rhode Island
- West Virginia
- Vermont

**CBD/Limited Law**

- Alabama
- Georgia
- Indiana
- Iowa
- Kentucky
- Louisiana
- Mississippi
- Missouri
- North Carolina
- Oklahoma
- South Carolina
- Tennessee
- Texas
- Utah
- Virginia
- Wisconsin
- Wyoming

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An exhaustive review of each jurisdiction's laws is beyond the scope of this report; instead we discuss issues commonly addressed by each category of cannabis laws.

## Medical Cannabis Laws

In 1996, California enacted the first medical cannabis law of any U.S. state, followed in the late 1990s by Alaska, Maine, Oregon and Washington. Since the beginning of 2000, 24 more states and the District of Columbia have passed medical cannabis laws that permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions.

A state medical cannabis law permits a patient, with a doctor's recommendation, to use cannabis to treat any qualifying medical condition designated by the law. It is illegal for a doctor to "prescribe" a Schedule I controlled substance under the U.S. Controlled Substances Act (CSA), so medical cannabis laws typically require a doctor's "recommendation" rather than a prescription. Some medical cannabis laws require a written recommendation, while others allow an oral recommendation. States may impose a variety of other requirements or restrictions on a doctor or patient relating to medical cannabis access, such as patient registration with a state medical cannabis registry, submission of a patient's fingerprints or prohibition of use by convicted felons or certain government employees (for example, firefighters).

The number and nature of qualifying conditions included in medical cannabis laws vary widely. Some laws designate relatively few or highly specific medical conditions, while other laws include many conditions or highly subjective conditions, such as chronic pain. Some medical cannabis laws also give doctors discretion to recommend cannabis for conditions not specifically designated. In aggregate, across all medical cannabis laws in the United States, cannabis is legally recognized as a form of therapy or medicine for more than 50 qualifying conditions. Common qualifying conditions include Alzheimer's disease, amyotrophic lateral sclerosis (ALS), anorexia, arthritis, cachexia, cancer, chronic pain, Crohn's disease, epilepsy, glaucoma, hepatitis C, HIV/AIDS, inflammation, migraine, multiple sclerosis (MS), nausea, nervous system degeneration, Parkinson's disease, post-traumatic stress disorder (PTSD) and spasms.

Some medical cannabis laws restrict the form of cannabis or the means of consumption. For example, Pennsylvania's medical cannabis law, enacted in 2016, prohibits smoking or vaporizing cannabis flower, prohibits the incorporation of cannabis into foods by anyone other than the patient or the patient's caregiver, and authorizes cannabis to be dispensed only in certain concentrated forms.

Medical cannabis laws generally permit cannabis cultivation and distribution by a state-licensed cultivator or dispensary, by a qualified patient or by a designated caregiver of the patient. A qualified patient or the patient's designated caregiver generally may grow only an amount of cannabis deemed sufficient for the patient's personal use. Some medical cannabis laws permit patients or caregivers to grow cannabis only if they cannot practically obtain it by other means. For example, certain states permit patients to grow cannabis only if they reside more than a specified distance from the nearest licensed dispensary. Some states allow qualified patients and designated caregivers to collectively or cooperatively aggregate their cultivation activities.

State-licensed cultivators and dispensaries must satisfy various licensing requirements related to health, safety and security. In states that permit or require vertical integration, a licensee may be part

of a single cultivation and dispensing enterprise. In other states, a licensed cultivator may be permitted to sell to unaffiliated licensed dispensaries or delivery services, which then retail medical cannabis to patients.

Each state has its own rules about whether medical cannabis activities may be engaged in for profit. In states where caregivers and qualified patients collectively or cooperatively aggregate their cultivation and distribution efforts, participants generally are allowed to charge amounts necessary to recover the reasonable costs associated with those activities but may not operate for profit. In states that allow licensed cannabis activities, such as cultivation and dispensing, the organizations engaged in those activities generally may seek to earn a profit.

### **CBD/Limited Laws**

From 2014 through 2017, a total of 19 U.S. states enacted CBD/limited laws that generally permit possession of small amounts of low-THC/high-CBD cannabis concentrates for use in treating a few serious medical conditions. Most of these laws limit qualifying medical conditions to severe forms of epilepsy or seizure disorders, but some laws designate a moderately broader set of conditions.

Most CBD/limited laws allow CBD use by children. Many of these laws were enacted in the context of high-profile stories about CBD treatments for children with severe seizure disorders, and the laws have been given names like Carly's Law (Alabama), Haleigh's Hope Act (Georgia) and Julian's Law (South Carolina). Charlotte's Web is a low-THC/high-CBD cannabis strain named for Charlotte Figi, a young Colorado girl whose parents treat her seizure condition with CBD oil. Her case was featured in Dr. Sanjay Gupta's popular CNN special, *Weed*.

In general, each CBD/limited law establishes a narrow legal framework for use of low-THC/high-CBD cannabis concentrates. Certain CBD/limited laws designate only one or several producers of permitted cannabis concentrates; in some cases, these producers include a state university or research institution. Other CBD/limited laws establish no legal framework for the production or distribution of permitted products and merely provide a narrow affirmative defense for state-law cannabis possession and use charges.

### **Recreational Laws**

In 2012, Colorado and Washington voters passed the first laws in the United States (and the world) to permit the commercial production and sale of cannabis to adults for recreational and other uses. Alaska and Oregon passed similar recreational laws in 2014. And in the November 2016 elections, four more states—California, Maine, Massachusetts and Nevada—passed recreational laws. (Of the five recreational laws included on November 2016 ballots, only Arizona's law did not receive voter approval.)

State recreational laws permit adults aged 21 years or older to legally purchase and use cannabis sold by state-licensed commercial businesses. There are no state residency requirements for adult consumers, and out-of-state visitors with valid proof of age may legally purchase cannabis, giving rise to "cannabis tourism" in states with extensive dispensary networks like Colorado, Oregon and Washington. Cannabis typically may not be consumed in public spaces or private establishments open to the public, such as parks and restaurants. Recreational laws also generally permit adults to cultivate a

limited number of cannabis plants (typically, 4 to 6) for personal use. (Washington is an exception, however, and makes personal cultivation a felony unless it is done by a person registered in the state's medical marijuana database.) Unlike state medical cannabis laws, which may restrict the form of cannabis products available, recreational laws permit production and sale of most common forms of cannabis products, including a wide variety of flower, concentrates and infused products.

State recreational laws designate state agencies to issue commercial cannabis licenses and regulate participants in the cannabis supply chain. Some of these agencies are newly established specifically to regulate cannabis, such as California's Bureau of Cannabis Control (BCC) or Massachusetts's Cannabis Control Commission. Others are existing state agencies (and typically oversee tax or alcohol matters), such as Nevada's Department of Taxation or Oregon's Liquor Control Commission. These agencies also may regulate state medical cannabis industries, as do Colorado's Marijuana Enforcement Division, Washington's Liquor and Cannabis Board and California's BCC.

State regulatory agencies issue separate licenses for different types of commercial cannabis activities. Common categories of licenses include cultivation, production, manufacturing, distribution, transportation, laboratory testing and retail. A state may further provide for multiple types of licenses within a category. For example, California's recreational law provides for 12 types of cultivation licenses, which vary according to factors such as the size of a cultivation facility and indoor or outdoor cultivation. Most states allow companies to hold licenses in multiple categories, thereby allowing vertically integrated cultivation, manufacturing and retail businesses. Washington is an exception—in most cases, a business is prohibited from holding licenses across categories. Even states that allow vertical integration typically prohibit the holder of a laboratory testing license from holding licenses in other categories.

State laws give significant power to counties and municipalities to impose zoning and permitting requirements that may severely restrict or prohibit cannabis activities. California requires a state-license applicant to demonstrate it has all permits, licenses and approvals required under local law, and many California cities and counties have effectively banned the recreational cannabis industry. Massachusetts allows towns that voted "No" on the state's recreational law to ban cannabis businesses through December 2019 and requires other towns that wish to prohibit cannabis businesses to do so through a local ballot initiative.

Each state has chosen to levy significant taxes on the recreational cannabis industry, and some state laws authorize local governments to levy additional cannabis-related taxes. Nevada imposes a 15% excise tax on cannabis wholesales by cultivators and a 10% excise tax on retail sales. Oregon and Massachusetts charge a state excise tax of 17% and 10.75%, respectively, and each state authorizes local governments to levy up to another 3%. Washington originally imposed a 25% excise tax on cannabis sales at each of three different points in the supply chain—grower to processor, processor to retailer and retailer to consumer—but now charges a single 37% tax on retail sales. California imposes a 15% excise tax. All state and local cannabis-specific excise taxes are in addition to normal state and local sales tax. Although the possibility of generating significant tax revenue is one reason state governments have embraced legal cannabis, some proponents of legalization argue that high tax rates will keep consumer prices high and discourage consumer transition to legalized markets.

State governments continue to adjust recreational cannabis regulations in an effort to create favorable industry conditions and address health and public safety concerns. State-licensed recreational cannabis businesses must comply with a host of requirements related to security (such as video surveillance, alarm system requirements and owner/operator criminal background checks), product diversion (particularly seed-to-sale tracking requirements), product safety and quality (including product labeling requirements and potency and contaminant testing), and general business operations (such as restrictions on advertising and compliance with energy and environmental standards).

## ■ U.S. Federal Law

Current federal law effectively prohibits all cannabis use and all commercial cannabis activity in the United States. Producing, selling and possessing cannabis are federal crimes. No cannabis-derived drug has ever been federally approved for use in treating any medical condition. Otherwise legitimate business transactions conducted by cannabis companies—and their banks, for those who can access banking services—are legally suspect. Certain intellectual property and bankruptcy protections critical to many U.S. businesses are not available to cannabis companies. Cannabis companies pay federal income tax at effective rates significantly higher than other businesses.

Despite official prohibition, federal policies and laws recently passed by the U.S. Congress have carved out a limited space in which the state-legal cannabis industry has managed to thrive. Enforcement policies published by the U.S. Department of Justice (DOJ) have unofficially invited cannabis business to proceed if certain conditions are respected. The U.S. Department of the Treasury (DOT) established reporting policies that create room for banks to service the cannabis industry. Federal budget legislation has prevented allocated funds from being used to prosecute conduct that complies with state medical cannabis laws.

Recent developments indicate that the federal government may be pursuing policies and practices that create space for cannabis research and approval of cannabis-derived drugs. In particular, the U.S. Drug Enforcement Agency (DEA) adopted a new policy in 2016 designed to increase the number of DEA-registered cannabis cultivators (there has been only one such cultivator for nearly 50 years). And the U.S. Food and Drug Administration (FDA) is reviewing a New Drug Application (NDA) submitted in October 2017 for what could be the first ever cannabis-derived pharmaceutical approved by the federal government.

The following chart shows three general areas of federal law that impact the cannabis industry—food and drug regulation, banking and finance, and intellectual property—as well as specific laws and federal policies related to each of the areas discussed later in this chapter.

Federal Laws and Policies Impacting the Cannabis Industry



**Controlled Substances Act**

The Controlled Substances Act (CSA) is a federal law enacted in 1970 that places strict legal controls on the manufacture, distribution, dispensing and possession of any controlled substance listed on one of five schedules established by the CSA. The CSA is enforced primarily by the U.S. Drug Enforcement Administration, an agency of the U.S. Department of Justice. A controlled substance may be manufactured, distributed or dispensed in accordance with the CSA only by a person properly registered

with the DEA. Any person that manufactures, distributes, dispenses or otherwise possesses a controlled substance in violation of the CSA is subject to civil and criminal penalties.

The CSA schedules are numbered I to V. Schedule I substances are subject to the strictest controls, and Schedule V substances are subject to the least restrictive controls. A controlled substance is listed on a particular schedule according to four factors:

- (i) The substance's potential for abuse.
- (ii) Whether the substance has a currently accepted medical use in treatment in the United States.
- (iii) Whether the substance is accepted as safe to use under medical supervision.
- (iv) The degree of physical and psychological dependence that may result from abuse of the substance.

Upon enactment in 1970, the CSA assigned each controlled substance to a specific schedule. The U.S. Congress may legislate a controlled substance's addition to or removal from a CSA schedule. The CSA also provides a regulatory framework for a substance to be added to or removed from a schedule; such change generally involves a recommendation by the U.S. Department of Health and Human Services (DHHS) and concurrence with that recommendation by the DEA. The U.S. Food and Drug Administration, an agency of the DHHS, is charged with making certain safety-related determinations used in DHHS scheduling recommendations.

Schedule I controlled substances are those found by the U.S. Congress or the DEA and the DHHS to have a high potential for abuse, to have no currently accepted medical use in treatment in the United States and to have a lack of accepted safety for use under medical supervision. Current Schedule I substances include marijuana, THC, heroin, ecstasy, LSD and peyote. Unlike Schedule II through Schedule V controlled substances, which can be prescribed by a doctor, the CSA does not allow prescriptions to be written for Schedule I controlled substances.

### **Marijuana**

Marijuana has been a Schedule I controlled substance since enactment of the CSA in 1970. The CSA defines "marijuana" as

all parts of the plant *Cannabis sativa L.*, whether growing or not; the seeds thereof; the resin extracted from any part of such plant; and every compound, manufacture, salt, derivative, mixture, or preparation of such plant, its seeds or resin. Such term does not include the mature stalks of such plant, fiber produced from such stalks, oil or cake made from the seeds of such plant, any other compound, manufacture, salt, derivative, mixture, or preparation of such mature stalks (except the resin extracted therefrom), fiber, oil, or cake, or the sterilized seed of such plant which is incapable of germination.

The parts and derivatives of the cannabis plant that are excluded from the CSA definition of marijuana have industrial uses and generally contain little or no THC. Non-marijuana cannabis products—commonly known as hemp products—including rope, clothing, animal feed and soap, are not subject to control under the CSA. The CSA does not restrict such non-marijuana products

from being imported into the United States. However, because the production of such non-marijuana products ordinarily involves possession of the entire cannabis plant, including parts deemed marijuana under the CSA, the CSA effectively prohibits such production in the United States without DEA registration.

### ***Tetrahydrocannabinol (THC)***

In addition to and separate from marijuana's listing on Schedule I, tetrahydrocannabinol<sup>1</sup> (THC) has been listed on Schedule I since the CSA's enactment in 1970. From 1970 until 2003, DEA regulations defined THC for purposes of its separate Schedule I listing as including only "synthetic equivalents" of the THC found in the cannabis plant. In 2003, the DEA purportedly amended this regulatory definition of THC to include both synthetic equivalents of THC and THC occurring naturally in the cannabis plant. In its 2004 holding in *Hemp Industries Association v. DEA*, the U.S. Court of Appeals for the Ninth Circuit enjoined DEA enforcement of this purported amendment and held that the THC listed separately from marijuana on Schedule I includes only synthetic THC and that any THC occurring naturally within the cannabis plant is controlled under the CSA only if it falls within the CSA definition of marijuana.

### ***Penalties for CSA Violations***

Federal penalties for violating CSA provisions regarding marijuana or THC include fines and imprisonment. CSA violations may also result in federal seizure of cash and other assets related to the violations. CSA penalties may apply to cannabis businesses that violate the CSA and also to individuals who own or operate such businesses based on attempt, accomplice, conspiracy and criminal enterprise provisions included in the CSA.

### ***New DEA Registration Policy***

For nearly 50 years, only one cannabis cultivation site in the United States has operated with the required DEA registration. The site is operated by the University of Mississippi under a contract with the National Institute on Drug Abuse to supply the country's entire stock of federally legal cannabis, which is used exclusively for research. In August 2016, the DEA announced a new policy designed to increase the number of DEA-registered cannabis cultivators and permit-registered cultivators to grow cannabis for privately funded commercial drug development projects. The DEA announcement acknowledged the increasing interest in conducting cannabis research related to commercial pursuits, and indicated that the best way to satisfy the increased demand was to increase the number of DEA-registered cultivators. The DEA has since accepted at least 25 applications for registration but has not issued any new registrations.

<sup>1</sup>CSA Schedule I uses the plural form "tetrahydrocannabinols" to describe a category of substances that includes chemical derivatives and isomers. This report adopts the more commonly used singular form, "tetrahydrocannabinol."

## U.S. Department of Justice: The Cole Memo

A memorandum published by the DOJ in August 2013 (Cole Memo) provides guidance to DOJ attorneys and federal law enforcement about prosecuting cannabis-related federal offenses. The Cole Memo asserts that marijuana is a dangerous drug, that illegal distribution of marijuana is a serious crime which provides revenue to criminal enterprises and that the DOJ is committed to enforcing marijuana-related violations of federal law. The Cole Memo also notes, however, that the DOJ is committed to using its limited investigative and prosecutorial resources to address the most significant threats in the most effective, consistent and rational way.

The Cole Memo guides DOJ attorneys and federal law enforcement to focus on the following eight enforcement priorities when considering prosecutions for marijuana-related CSA violations (and also, according to a Cole Memo update issued in February 2014, when considering prosecutions for marijuana-related violations of the federal money laundering statute, the unlicensed money transmitter statute and the Bank Secrecy Act):

1. Preventing distribution of marijuana to minors.
2. Preventing revenue from the sale of marijuana from going to criminal enterprises, gangs and cartels.
3. Preventing the diversion of marijuana from states where it is legal under state law in some form to other states.
4. Preventing state-authorized marijuana activity from being used as a cover or pretext for the trafficking of other illegal drugs or other illegal activity.
5. Preventing violence and the use of firearms in the cultivation and distribution of marijuana.
6. Preventing drugged driving and the exacerbation of other adverse public health consequences associated with marijuana use.
7. Preventing the growing of marijuana on public lands and the attendant public safety and environmental dangers posed by marijuana production on public lands.
8. Preventing marijuana possession or use on federal property.

The Cole Memo notes that whether marijuana-related conduct implicates any of these enforcement priorities should be a primary question in considering prosecution and that in states with legalized marijuana and effective regulatory systems, conduct in compliance with state law is less likely to threaten these priorities.

The Cole Memo has provided some comfort to those operating state-legal cannabis businesses that do not interfere with the enumerated enforcement priorities. However, the Cole Memo merely reflects internal guidance within the DOJ and does not create a legal defense for any violation of federal law.

During the January 2017 Senate confirmation hearings for current U.S. Attorney General Jeff Sessions, in a discussion about the enforcement priorities outlined in the Cole Memo, Mr. Sessions acknowledged the “problem of resources for the federal government” and stated that he thought some of the enforcement priorities were “truly valuable in evaluating cases,” but he also stated that he would not commit to never enforcing federal law.

## Rohrabacher-Farr Amendment

The Rohrabacher-Farr amendment, first passed by the U.S. Congress and signed into law by President Obama in 2014, prohibits the DOJ from using federal funds to prevent a state from “implementing” state laws that authorize the use, distribution, possession or cultivation of medical marijuana.

Following the amendment’s initial 2014 enactment, the DOJ indicated that it did not plan to arrest state regulators for “implementing” a state’s medical marijuana laws but would continue to prosecute individuals involved in state-law compliant medical marijuana activity because, in the DOJ’s view, the amendment did not apply to prosecutions against individuals.

The DOJ’s interpretation of the Rohrabacher-Farr amendment was rejected by a Ninth Circuit District Court in its 2015 ruling in *United States v. Marin Alliance for Medical Marijuana*, and again by the Ninth Circuit Court of Appeals in its 2016 ruling in *United States v. McIntosh*. The Ninth Circuit Court of Appeals held the Rohrabacher-Farr amendment prohibits DOJ from spending funds subject to the amendment on the prosecution of individuals who fully comply with state medical marijuana laws. The court noted a state’s “implementation” of medical marijuana laws necessarily involves “giving practical effect” to those laws, and that DOJ prosecution of individuals complying with those laws prevents the state from giving the laws practical effect.

The Rohrabacher-Farr amendment generally applies only to DOJ funds made available pursuant to the federal budget legislation in which the amendment is included, and therefore must be renewed periodically with budget legislation to remain effective. The Rohrabacher-Farr amendment was recently renewed in December 2017 as part of an emergency aid package that remains effective until mid-January 2018. (With the retirement of Representative Samuel Farr from the U.S. Congress in 2016, the Rohrabacher-Farr amendment is now also referred to as the Rohrabacher-Blumenauer amendment; we use this name elsewhere in this report.)

## Agricultural Act of 2014

The Agricultural Act of 2014 (Farm Bill) authorizes institutions of higher education and state departments of agriculture to cultivate industrial hemp, CSA controls notwithstanding, if (i) the industrial hemp is cultivated for purposes of research conducted under an agricultural pilot program or other agricultural or academic research and (ii) the cultivation is allowed under the laws of the state in which such institution of higher education or state department of agriculture is located and such research occurs.

The Farm Bill defines “industrial hemp” as the cannabis plant and any part of such plant, whether growing or not, with a THC concentration of not more than 0.3 percent on a dry weight basis. Industrial hemp, like any cannabis plant, may comprise both marijuana (as defined in the CSA) and non-marijuana. But the Farm Bill creates an exception to CSA controls on marijuana, so cultivation in accordance with the Farm Bill of marijuana that qualifies as industrial hemp does not violate the CSA.

The following table summarizes the legal relationship between marijuana (as defined in the CSA) and industrial hemp (as defined in the Farm Bill).

**U.S. Legal Relationship between Marijuana and Industrial Hemp**

	Marijuana	Non-Marijuana
	<p>Cannabis plant and all parts and derivatives <i>except</i> non-marijuana</p>	<p>Mature stalks; fiber made from mature stalks; oil or cake made from seeds; compounds, manufactures, salts, mixtures, preparations or derivatives of the foregoing parts and derivatives (<i>except</i> resin extracted from mature stalks); sterilized seeds</p>
<p><b>Non-Industrial Hemp</b></p> <p>Cannabis plant and all parts and derivatives <i>except</i> industrial hemp</p>	<ul style="list-style-type: none"> <li>• Manufacture, distribution, dispensing and possession controlled under CSA</li> <li>• No Farm Bill exception to CSA</li> </ul>	<ul style="list-style-type: none"> <li>• No CSA controls</li> <li>• Farm Bill exception to CSA moot</li> </ul>
<p><b>Industrial Hemp</b></p> <p>Cannabis plant and any part with THC concentration not more than 0.3% on a dry weight basis</p>	<ul style="list-style-type: none"> <li>• Manufacture, distribution, dispensing and possession controlled under CSA (but subject to Farm Bill exception)</li> <li>• Farm Bill exception to CSA controls: state-legal cultivation by an institution of higher education or a state department of agriculture for research</li> </ul>	<ul style="list-style-type: none"> <li>• No CSA controls</li> <li>• Farm Bill exception to CSA moot</li> </ul>

Industrial hemp can be used to produce CBD oil, an extract of the cannabis plant with a high concentration of cannabidiol (CBD) but little or no psychoactive THC. CBD oil is believed to have a range of medicinal benefits and therapeutic applications. Some have argued that the Farm Bill federally legalizes the production and sale of CBD oil. However, it is unclear whether CBD oil produced from industrial hemp is itself considered industrial hemp (the CSA defines marijuana by reference to the cannabis plant, parts of the plant and derivatives of the plant, whereas the Farm Bill exception to the CSA defines industrial hemp by reference only to the plant and parts of the plant, but does not mention derivatives). Even if CBD oil is considered industrial hemp and may be lawfully produced under the Farm Bill, only institutions of higher education and state departments of agriculture are authorized to produce it, and then only for purposes of agricultural or academic research; thus the Farm Bill likely does not create a CSA exception broad enough for large-scale commercial production and distribution of CBD oil within the United States.

**Federal Food, Drug, and Cosmetic Act**

The Federal Food, Drug, and Cosmetic Act (FD&C Act) is a federal law enacted in 1938 (and since amended multiple times) that authorizes the FDA to regulate the safety and effectiveness of drugs and medical devices and the safety of food, tobacco products and cosmetics. The FD&C Act prohibits the “adulteration or misbranding” of any drug, medical device, food, tobacco product or cosmetic (which the act generally refers to as “articles”) in interstate commerce and prohibits interstate commerce in any such adulterated or misbranded article. The FD&C Act also prohibits the “introduction or delivery for

introduction into interstate commerce” of any drug, medical device, food, tobacco product or cosmetic undertaken without the required FDA approval, permit or registration.

An article that includes cannabis or a cannabis derivative could conceivably qualify as a drug, medical device, food, tobacco product or cosmetic (or a combination). For example, a skin lubricant infused with cannabis extract and intended to relieve muscle pain may be both a cosmetic and a drug, and a prefilled device used to administer a metered dose of vaporized THC for treating nausea may be both a medical device and a drug. Industry dialogue regarding the FD&C Act and the FDA tends to focus on cannabinoid-based drugs and the potential for certain cannabis products to be regulated as food or a related category of products known as “dietary supplements,” and we expand on both topics in the following discussion.

### **Drugs**

Generally, the FD&C Act defines a “drug” as any one of the following:

- (i) Any article recognized in the official U.S. Pharmacopoeia, U.S. Homeopathic Pharmacopoeia or National Formulary.
- (ii) Any article intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease in humans or animals.
- (iii) Any article (other than food) intended to affect the structure or any function of the body of humans or animals.
- (iv) Any article intended as a component of any of the foregoing.

The FDA oversees the manufacturing of drugs by inspecting domestic and foreign manufacturing plants, by sampling drugs from retail stores, distribution warehouses and manufacturing plants and by evaluating complaints and reports of defects from consumers and health care professionals. The FD&C Act generally prohibits a company from introducing a drug into interstate commerce without the FDA having first approved the drug as safe and effective for treating a specified medical condition.

FDA approval of a drug as safe and effective for treating a specified medical condition generally involves the following steps:

- (i) The drug’s manufacturer performs laboratory and animal tests to determine how the drug works and whether it is safe enough to test on humans.
- (ii) If the manufacturer determines the drug is safe enough to test on humans, then the manufacturer submits for FDA review an Investigational New Drug (IND) application.
- (iii) Upon review of the IND application, if the FDA determines the drug is safe enough to test on humans, then the FDA approves the manufacturer to proceed with human clinical trials.
- (iv) The manufacturer performs a series of human clinical trials and submits the resulting data for FDA review in the form of a New Drug Application (NDA). Upon review of the NDA, if the FDA determines the drug’s benefits outweigh its known risks and the drug can be manufactured in a way that ensures a quality product, then the drug is approved as safe and effective for treating the specified medical condition.

A drug generally may not be marketed for treating a condition other than a condition for which the FDA has found the drug to be a safe and effective treatment; however, most FDA-approved drugs can be prescribed by doctors to treat other conditions (so-called “off-label” prescriptions).

Nonprescription or over-the-counter drugs can be marketed after receiving FDA approval through the NDA process or by conforming the drug to an existing over-the-counter “monograph” (a “recipe book” indicating acceptable ingredients, doses, formulations and labeling) established by the FDA.

### ***Cannabinoid-Based Drugs***

Several drugs containing synthetic cannabinoids or cannabinoid-like compounds have been approved by the FDA. Marinol, a drug comprised of dronabinol (a synthetic THC) encapsulated with sesame oil in a soft gelatin capsule, was approved by the FDA in 1985 for treatment of nausea and vomiting associated with cancer chemotherapy in patients who have failed to respond adequately to conventional antiemetic treatments. It was later approved, in 1992, for treatment of anorexia associated with weight loss in patients with AIDS. Syndros, a drug comprised of dronabinol in a liquid solution, was approved by the FDA in 2016 for treatment of the same symptoms for which Marinol was approved. Cesamet, a drug comprised of encapsulated nabilone (a synthetic cannabinoid similar to THC), was approved by the FDA in 1985 for treatment of nausea and vomiting associated with cancer chemotherapy in patients who have failed to respond adequately to conventional antiemetic treatments.

Each of the drugs Marinol, Syndros and Cesamet was placed on CSA Schedule II within one to two years after its initial FDA approval (Marinol and Syndros were rescheduled from Schedule I upon recommendation of the DHHS, and Cesamet’s placement on Schedule II was its initial CSA classification). Schedule II through Schedule V substances can be prescribed by a doctor, but the CSA does not permit prescriptions for Schedule I substances, so removal of an FDA-approved drug from Schedule I is required before the drug can be prescribed legally.

The FDA has not approved any drug derived from the cannabis plant. However, two such drugs, Sativex and Epidiolex (both manufactured by U.K.-based GW Pharmaceuticals), have advanced through certain stages of the FDA approval process. Sativex is a mouth spray used for treatment of spasticity caused by multiple sclerosis; it includes THC and CBD derived from cannabis. Epidiolex is an oral formulation of cannabis-derived CBD intended to treat severe forms of childhood epilepsy. Human clinical trials have been conducted with both drugs, and although an NDA has not been submitted for Sativex, an NDA for Epidiolex was submitted to the FDA in October 2017. If approved by the FDA, Epidiolex would be the first FDA-approved pharmaceutical derived from cannabis.

### ***Foods and Dietary Supplements***

Generally, the FD&C Act defines “food” as (i) any article used for food or drink for humans or animals, (ii) chewing gum, and (iii) any article used as a component of any of the foregoing. The FD&C Act defines a “dietary supplement” generally as either (i) a product intended to supplement the diet that contains certain dietary ingredients (including vitamins, minerals, herbs, botanicals, amino acids, or other substances used by humans to supplement the diet by increasing the total dietary intake) or (ii) a product intended for ingestion in tablet, capsule, powder, softgel, gelcap, or liquid form and labeled as

a dietary supplement but not represented for use as a conventional food or as a sole item of a meal or the diet. A dietary supplement generally is deemed to be a food under the FD&C Act.

The FD&C Act does not require foods or food labels to be pre-approved by the FDA, but it does give the FDA broad authority to regulate the safety of food and food labels and to prevent interstate commerce in adulterated or misbranded food. Facilities engaged in manufacturing, processing, packing or holding food for consumption in the United States are required to be registered with the FDA. The FD&C Act requires most foods to bear nutrition labeling and requires food labels that bear nutrient content claims and certain health messages to comply with specific requirements. The FDA is authorized to enforce safety and labeling regulations by conducting inspections, sampling, recalls and seizures, and by pursuing injunctions and criminal prosecutions.

### ***Cannabis-Based Foods and Dietary Supplements***

The FDA has published guidance (most recently updated in August 2017) concluding that (i) the FD&C Act does not permit foods to which THC or CBD have been added to be sold in interstate commerce and (ii) any product containing THC or CBD is not a dietary supplement. For this conclusion to be legally correct, based on the FD&C Act provisions cited by the FDA, it would need to be demonstrated that neither THC nor CBD were marketed in or as a food or as a dietary supplement before the occurrence of certain approvals and clinical investigations of drugs that include THC (e.g., Marinol) or CBD (e.g., Sativex or Epidiolex). The FDA publication does not demonstrate that neither THC nor CBD were marketed in or as a food or as a dietary supplement before such occurrences and merely states that the FDA is “not aware of any evidence that would call into question” its conclusion. The FDA’s conclusion has not been subject to any legal challenge, and it remains unresolved whether certain cannabis-based products, particularly hemp-derived CBD products, might be regulated by the FDA as foods or dietary supplements rather than as drugs.

### ***FDA Policy and Enforcement***

In December 2016, the FDA published a document titled *Botanical Drug Development; Guidance for Industry* that discusses several areas in which, due to the unique nature of botanical drugs, the FDA believes it is appropriate to apply regulatory policies that differ from those applied to nonbotanical drugs. The guidance discusses challenges inherent to botanical drugs, including challenges related to ensuring therapeutic consistency, and suggests certain steps to address those challenges. The guidance was published only months after the DEA announced a new policy designed to increase the number of DEA-registered cannabis cultivators and permit-registered cultivators to grow cannabis for privately funded commercial drug development projects. These parallel developments indicate to some that the federal government is opening a pathway to federal approval of cannabis-derived drugs.

The FDA has the legal authority under the FD&C Act and related regulations to significantly disrupt the state-legal cannabis industry in the United States. The FDA has issued warning letters during the past several years to distributors of hemp-based CBD products but has not broadly enforced federal law against the cannabis industry. A cannabis-focused publication on the FDA website states that in deciding whether to initiate federal enforcement, the FDA may consult with its federal and state

partners and consider many factors, including FDA resources and threats to public health. Beyond this statement, the FDA has not published detailed guidance about its cannabis-related enforcement priorities.

### **Bank Secrecy Act and Other Federal Laws Regarding Financial Transactions**

Financial transactions in connection with cannabis-related CSA violations may implicate federal laws other than the CSA itself, including the federal money laundering statute, the federal unlicensed money transmitter statute and the Bank Secrecy Act (BSA).

The federal money laundering statute imposes penalties on any person who conducts or attempts certain financial or monetary transactions involving the proceeds of a “continuing criminal enterprise” (a term, used in the CSA, that arguably encompasses many cannabis businesses). Violations of the federal money laundering statute may result in fines equal to twice the value of the property involved in the transaction (or \$500,000, if greater) and imprisonment for up to 20 years.

The federal unlicensed money transmitter statute makes it illegal for any person to operate or own a money transmitter business that involves the transportation or transmission of funds known to have been derived from or intended to promote or support criminal violations of the CSA. Violations of the law may result in fines and imprisonment for up to 5 years.

The BSA requires banks and other financial institutions to maintain certain records and to file certain reports deemed useful in criminal, tax or regulatory proceedings or in government intelligence and counterterrorism activities. Federal regulations under the BSA require financial institutions to file with the Financial Crimes Enforcement Network (FinCEN), a bureau of the U.S. Department of the Treasury charged with administering the BSA, a suspicious activity report (SAR) if the financial institution knows, suspects or has reason to suspect that a transaction conducted or attempted by, at or through the financial institution involves or is an attempt to disguise funds derived from illegal activity, is designed to evade BSA regulations or lacks an apparent lawful purpose. Financial institutions and their principals are subject to civil and criminal penalties for violations of the BSA.

### **U.S. Treasury Department: The FinCEN Memo**

In coordination with the February 2014 Cole Memo update, FinCEN published a memorandum (FinCEN Memo) outlining how banks and other financial institutions can, consistent with their BSA obligations, provide services to marijuana-related businesses. The FinCEN Memo directs each financial institution to consider its own business objectives and the risks associated with offering a particular product or service when considering whether to commence or continue a customer relationship with a marijuana-related business. The memorandum emphasizes the importance of due diligence and outlines a procedure for filing SARs for such businesses.

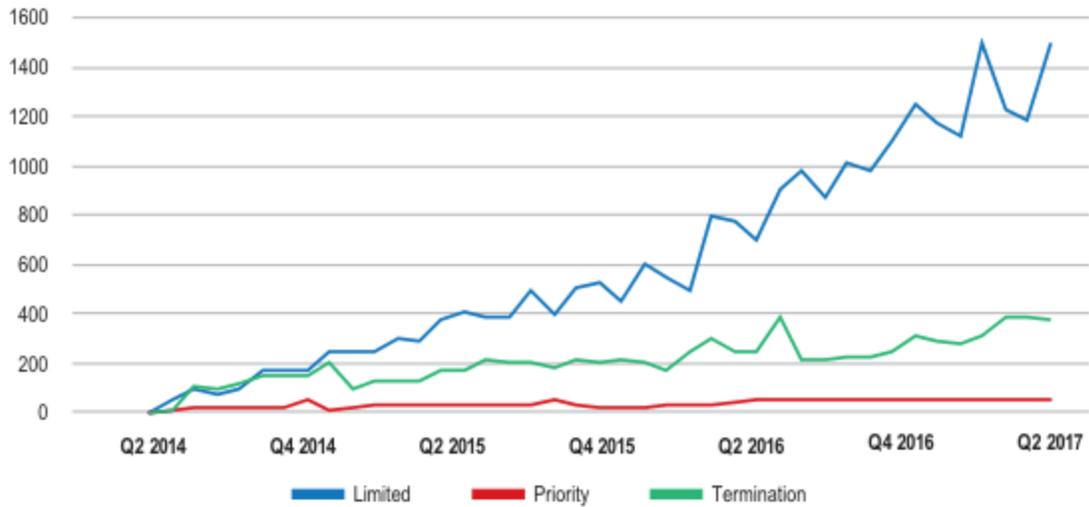
The FinCEN Memo guides financial institutions to conduct a due diligence review of a customer's business that includes an evaluation of whether the customer relationship implicates (or would implicate) any Cole Memo priority and also includes the following investigations:

1. Verifying with the appropriate state authorities whether the business is duly licensed and registered.
2. Reviewing the license application (and related documentation) submitted by the business for obtaining a state license to operate its marijuana-related business.
3. Requesting from state licensing and enforcement authorities available information about the business and related parties.
4. Developing an understanding of the normal and expected activity for the business, including the types of products to be sold and the type of customers to be served (for example, medical versus recreational customers).
5. Ongoing monitoring of publicly available sources for adverse information about the business and related parties.
6. Ongoing monitoring for suspicious activity, including for certain red flags described in the FinCEN Memo.
7. Refreshing information obtained as part of customer due diligence on a periodic basis and commensurate with the risk.

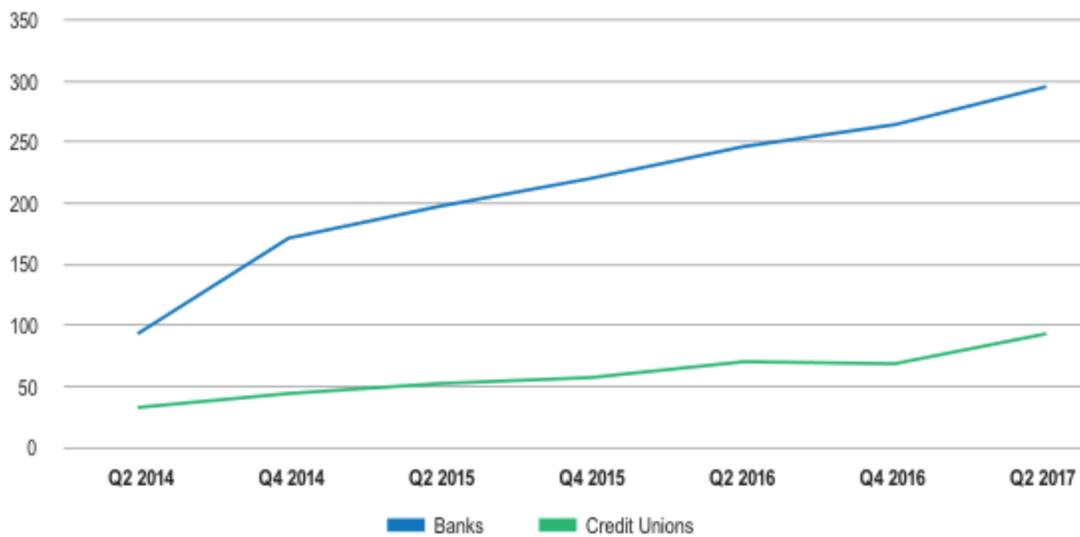
The FinCEN Memo also guides financial institutions to file various SARs with FinCEN regarding customers engaged in marijuana-related businesses. According to the memorandum, an institution should file (i) a “Marijuana Limited” SAR for each customer it believes does not violate state law or implicate any Cole Memo priority, (ii) a “Marijuana Priority” SAR for each customer it believes violates state law or implicates any Cole Memo priority, and (iii) a “Marijuana Termination” SAR if the institution decides to terminate a customer relationship in order to maintain an effective anti-money laundering compliance program. The FinCEN Memo outlines certain “red flags” that tend to indicate which type of SAR filing is appropriate; red flags include the inability of a customer to demonstrate compliance with state law or deposits of amounts of cash inconsistent with its tax returns.

FinCEN periodically publishes information about marijuana-related SAR filings made by depository institutions. From the February 2014 FinCEN Memo publication through June 30, 2017, FinCEN received a total of 33,692 marijuana-related SAR filings from a total of 390 banks and credit unions. The following graphs based on FinCEN data show the number of monthly Marijuana Limited, Marijuana Priority and Marijuana Termination SAR filings for this period and the number of banks and credit unions making such filings.

**Monthly Marijuana-Related SAR Filings**



**Depository Institutions Making Marijuana-Related SAR Filings**



Source: Financial Crimes Enforcement Network

The upward trend in the frequency of marijuana-related SAR filings, as well as the growing number of depository institutions making such filings, indicate cannabis businesses increasingly are accessing the federal banking system despite federal law.

The California State Treasurer's Cannabis Banking Working Group—a panel convened by California State Treasurer John Chiang that includes representatives from the cannabis industry and financial institutions, and government tax collection, law enforcement and regulatory agencies—issued a report in November 2017 on the cannabis industry's banking challenges. In the report, the State Treasurer's Office stated that the cannabis industry's lack of access to banking services is one of the biggest threats to the success of the state's recreational cannabis law, which is scheduled for implementation starting in January 2018. Based on the working group's findings, the State Treasurer's Office recommended the following four actions:

1. Implementation of safer, more effective, and scalable ways to handle the payment of taxes and fees in cash that minimize risks to stakeholders.
2. Development by the State of California and local governments of a data portal of compliance and regulatory data to be made available to financial institutions that bank cannabis businesses.
3. Conduct a feasibility study of a public bank or other state-backed financial institution that provides banking services to the cannabis industry.
4. Establish a multistate consortium of state government representatives and other stakeholders to pursue changes to federal law in order to remove the barriers to cannabis banking.

The State Treasurer's Office also stated it was apparent that a definitive solution to the cannabis banking quandary will remain elusive until the federal government removes cannabis from its official list of dangerous drugs or the U.S. Congress approves safe harbor legislation protecting financial institutions that serve cannabis businesses from federal penalties.

### **Federal Securities Law**

The U.S. securities markets and industry participants are regulated principally under two federal laws: the Securities Act of 1933 (Securities Act) and the Securities Exchange Act of 1934 (Exchange Act). The Securities Act regulates the offer and sale of securities by issuers, and the Exchange Act regulates securities firms, stock exchanges, reporting by publicly traded companies and investing and trading practices of investors. The Exchange Act also establishes the Securities and Exchange Commission (SEC), a federal agency charged with enforcing federal securities laws.

Federal securities laws are intended to facilitate capital formation, maintain fair and efficient markets, and protect investors. The laws are based on a philosophy of disclosure: issuers of securities generally are obligated to completely and truthfully disclose material information to investors and the market, and failure to satisfy that obligation may result in civil or criminal penalties. Information generally required to be disclosed includes audited financial statements, discussions of risks applicable to the issuer and investors in its securities, and details of conflicts of interest faced by the issuer's officers and directors.

Federal securities laws related to private offerings provide fewer investor protections than laws related to public offerings and generally assume investors in private offerings can “fend for themselves.” An issuer of securities in a private offering is not subject to the same extensive reporting requirements

as publicly traded companies, but ordinarily will market its securities using a private placement memorandum (PPM) that includes information similar to some of the information required to be disclosed by publicly traded companies. An issuer in a private placement is subject to liability under federal securities laws for misrepresentation or fraudulent statements made in a PPM or otherwise in connection with the private offering.

By all indications, federal securities laws do not prohibit companies engaged in federally illegal cannabis activities from raising capital through the issuance of securities, nor do they prohibit industry participants like stock exchanges and investment banks from performing their ordinary market functions in connection with such companies. The SEC has allowed the registration and sale of securities offered by companies engaged in federally illegal cannabis activities and the trading of those securities on multiple U.S. stock markets. Although the SEC has on occasion suspended trading in some of these securities, those suspensions generally have been due to alleged violations of securities regulations rather than unlawful cannabis activities.

A cannabis company offering or selling securities must comply with federal securities laws—like any other issuer—by making required notice or registration filings and by providing truthful material information to investors. Any discussion of risks delivered to investors, whether required by securities laws or volunteered by the issuer as part of a private offering, should include a thorough discussion of the unique risks posed by operating a cannabis business engaged in federally illegal conduct. For an example of some of these risks, refer to Chapter IX, Cannabis Industry Risk Factors.

### Federal Bankruptcy Law

Bankruptcy is a legal proceeding by which a debtor resolves its debt obligations and creditors are afforded certain rights in the debtor's assets in full or partial satisfaction of the debts owed to them. In the United States, bankruptcy is governed primarily by the Bankruptcy Reform Act of 1978 (Bankruptcy Code). Bankruptcy proceedings are conducted primarily by federal bankruptcy courts and generally involve administration of a debtor's assets either by a court-appointed trustee or by the debtor with approval and oversight of the court. Bankruptcy can be voluntary (initiated by the debtor) or involuntary (initiated by creditors). Bankruptcy provides certain rights and protections to the debtor and the creditors and is intended to fairly and finally resolve debts so the parties can pursue other affairs.

Debtors whose assets relate to federally illegal cannabis activity, as well as their creditors, generally are not eligible for bankruptcy protection for two reasons: First, federal courts refuse to appoint trustees to administer or take control of unlawful assets or business operations. Second, pursuant to an equitable doctrine known as “unclean hands,” federal courts typically decline to honor creditor claims that arise from knowingly transacting with a debtor in furtherance of unlawful activity. A federal bankruptcy court in Arizona invoked both these reasons in its 2015 decision in *In Re Medpoint Management, LLC*; details of this case follow.

Medpoint Management, LLC (Medpoint) managed the cultivation and business operations of a state-legal Arizona medical cannabis dispensary. Medpoint defaulted under various loan and consulting agreements directly related to its dispensary activities, and the four creditors under those agreements

filed a petition for involuntary bankruptcy. The bankruptcy court dismissed the petition, stating it would not assign a trustee “to administer drug tainted assets for the benefit of creditors who assumed the risk of doing business with an enterprise engaged in violations of federal law.” Federal courts in California, Oregon, Colorado and Michigan have applied the same rationale to dismiss bankruptcy proceedings involving illegal cannabis-related assets.

State law alternatives to federal bankruptcy that may be available to cannabis businesses and their creditors include an assignment for the benefit of creditors (ABC) and receivership. An ABC is a state-law process for the orderly and controlled liquidation of a debtor’s assets through a neutral, third party administrator. Receivership is a remedy whereby a court appoints a receiver to take possession of and protect property for the benefit of all concerned parties. In the state of Washington, for example, at least one medical cannabis business is reported to have successfully concluded a receivership process.

### Internal Revenue Code

The Internal Revenue Code (IRC) defines gross income to include “all income from whatever source derived”; this definition has been interpreted by the Internal Revenue Service (IRS) and the U.S. Supreme Court to include income derived from unlawful activities. Consequently, cannabis businesses that violate the CSA and other federal laws related to cannabis nonetheless must file federal income tax returns and pay federal income tax.

A business generally computes its taxable income in two steps. First, the business computes its gross income by subtracting from its gross receipts the cost of goods sold (COGS), which includes the cost of acquiring, constructing or extracting a physical product that is to be sold. The subtraction of COGS to compute gross income is premised on constitutional grounds and cannot be changed by federal statutes or IRS regulations. Second, the IRC “allows” a business to deduct from gross income all ordinary and necessary business expenses, which generally include all business expenses other than COGS, such as employee salaries, payments to contractors, marketing costs, insurance premiums, and the cost of rent and utilities. But there are exceptions to this “allowed” deduction. One such exception is provided by IRC section 280E (Section 280E).

Section 280E disallows any deduction or credit for any amount paid or incurred in carrying on a “trade or business” that consists of unlawful “trafficking” in a Schedule I or Schedule II controlled substance. Although Section 280E does not prevent a cannabis business from subtracting COGS to compute gross income, it may prevent the deduction of all other business expenses for purposes of computing taxable income. As a result of Section 280E, businesses in the cannabis industry may have effective tax rates significantly higher than other businesses subject to federal income tax.

The scope of Section 280E, as it applies to U.S. cannabis businesses, is the subject of recent and ongoing federal court cases. The U.S. Tax Court has adopted the view (a view endorsed by the U.S. Supreme Court) that a “trade or business” is any activity entered into with the dominant hope and intent of realizing a profit, and it has indicated in multiple rulings that dispensing or buying and selling marijuana involves unlawful “trafficking” in a Schedule I controlled substance.

A trade or business that consists of unlawful cannabis trafficking may comprise a separate division of a single taxpayer, as was found by the U.S. Tax Court in its 2007 decision in *Californians Helping to Alleviate Medical Problems, Inc. v. Commissioner*, in which case Section 280E does not prevent the taxpayer from deducting business expenses attributable to other lawful trades or businesses it conducts. Or, all of a taxpayer's activities may constitute a single trade or business subject to 280E even though the taxpayer conducts some lawful business transactions not involving cannabis, as was found by the U.S. Court of Appeals for the Ninth Circuit in its 2017 decision in *Canna Care, Inc. v. Commissioner*.

### Patent Act

Title 35 of the U.S. Code (Patent Act) is the federal statute that governs patents in the United States. A patent issued under the Patent Act is the right to exclude others in the United States from making, using, importing, offering for sale or selling an "invention or discovery" and, if the invention or discovery is a process, products made by that process. U.S. patents are issued by the U.S. Patent and Trademark Office (USPTO), a federal agency established by the Patent Act. A U.S. patent lasts from the date of issuance until 20 years after the date on which the application for the patent was filed with the USPTO. Patent Act remedies available to the holder of an infringed U.S. patent include damages, recovery of lost profits and recovery of legal fees.

"Inventions and discoveries" eligible for a patent under the Patent Act generally include any machine, manufacture, composition of matter, process, art or method, or any improvement thereto that is novel, useful and non-obvious. Newly developed plants, plant varieties, seeds, plant parts, plant genes or plant production processes are generally recognized as inventions or discoveries eligible for a U.S. patent if they satisfy certain criteria. The Patent Act also provides specifically for a "plant patent" that precludes others from asexually reproducing, selling or using a distinct and new variety of plant (other than a tuber) that has been invented or discovered and asexually reproduced.

The Patent Act does not expressly prohibit the issuance of U.S. patents for inventions or discoveries that are unlawful or designed to serve an unlawful purpose, and the USPTO has issued a range of cannabis-related patents. Cannabis-related inventions or discoveries for which the USPTO has issued a patent include a cannabis strain named "Ecuadorean Sativa" (U.S. Plant Patent 27,475), cannabis cultivation and processing methods (U.S. Patent 9,095,554), a vaporizer (U.S. Patent 9,220,294), THC-infused shea butter for topical application (U.S. Patent 8,425,954), a THC extraction method (U.S. Patent 6,365,416) and equipment and methods for biosynthetic production of cannabinoids (U.S. Patent 9,587,212). U.K.-based GW Pharmaceuticals holds multiple cannabis-related U.S. patents. And despite the federal government's position for purposes of the CSA that marijuana has no currently accepted medical use in treatment in the United States, the U.S. federal government itself holds a patent for methods of treating certain diseases with cannabinoids (U.S. Patent 6,630,507).

### Plant Variety Protection Act

The Plant Variety Protection Act (PVPA) establishes certain legal protections (or "breeders' rights") for the breeder of a sexually reproduced or tuber-propagated plant variety that is new, distinct, uniform and stable within the meaning of the PVPA. A breeder who so develops such a plant variety and satis-

fies other PVPA requirements may apply for and receive a certificate of plant variety protection issued by the U.S. Department of Agriculture (USDA). Such a certificate establishes a breeder's right, for a period of time and subject to certain exceptions, to exclude others from selling the variety, offering it for sale, reproducing it, importing or exporting it, or using it in producing a hybrid or different variety. A breeder's rights under the certificate last for 20 years (25 years in the case of a protected tree or vine) from the certificate's issue date.

It is not clear whether the USDA has issued any certificate of plant variety protection for a cannabis variety. The USDA website provides a searchable database of certificates issued since February 2013, as well as a schedule of crop categories for which certificates have been issued. A search of these USDA materials indicated that no certificates for varieties of cannabis, marijuana or hemp have been issued. The PVPA defines "variety" as "a plant grouping within a single botanical taxon of the lowest known rank" with certain defining and distinguishing features. Given the disagreement among botanists regarding cannabis taxonomy noted in Chapter II, Cannabis Science 101, it may be challenging to demonstrate that a cannabis variety satisfies PVPA criteria for protection.

### Trademark Act

A trademark is a word, name, symbol or device used by a person to identify and distinguish the person's goods or services from the goods and services of others and to indicate the source of the goods or services. Trademarks take many forms, including logos, slogans, symbols, colors and sounds. Under common law and through registration under state and federal statutes, a trademark owner can be afforded certain legal protections against unauthorized use of the trademark by others.

Trademark protection under federal law is provided primarily by the Trademark Act, also known as the Lanham Act, which provides for registration of trademarks with the USPTO. The holder of a federally registered trademark receives certain rights and protections under federal law, including the right to use the "®" symbol, evidence and nationwide notice of a claim of ownership, access to federal courts for dispute resolution, the ability to prevent importation of foreign goods that infringe on the trademark, and the right to recover certain statutory damages and attorneys' fees. Generally, federal registration is the most comprehensive trademark protection available in the United States.

Federal trademark registration requires "lawful" use of the trademark in commerce. Thus, trademarks used to identify, distinguish or indicate the source of cannabis or related products or services that are illegal under federal law are not eligible for federal registration. However, federal registration is available for trademarks used in connection with federally legal cannabis-related products or services, such as a recipe for food intended to be infused with cannabis or a cannabis-related clothing line.

Alternatives to federal trademark registration include protections available under common law and through registration under state trademark statutes. Common law protections vary across jurisdictions and generally extend only to geographical regions where a trademark has first been used in commerce. State trademark registration generally provides protection within the entire state but, like federal registration, may not be available for trademarks used in connection with unlawful subject matter.

## ■ The Path to Federal Legalization

We believe that cannabis will eventually become federally legal for recreational enjoyment by adults and for use in a broad range of safe drugs and therapeutic products. A wide gulf currently separates federal policy from state legalization initiatives. Both federal and state regulators lack experience with science-based regulation that allows cannabis access, but they approach this lack of experience differently. Current federal policy is slow-turning and bureaucratic; it requires rigorous scientific evidence that cannabis is safe and effective but largely prohibits the industry from developing that evidence. State legalization initiatives are experimental: they start by legalizing the cannabis industry, then task state regulators with implementing rules and safeguards as the industry builds its scientific foundation and its markets.

We believe that federal policy will move (and may already be moving) in a new direction which allows for federally approved cannabis-derived drugs. If that happens, and if several cannabis-derived drugs are federally approved, we expect the FDA and the DEA will have developed data and protocols that facilitate more rapid approval of medical cannabis products. And if that happens, these federal agencies should be able to combine their science-based regulatory practices with the best practices of state regulators to develop a comprehensive federal approach to medical and recreational cannabis.

### DEA and FDA Policy Direction

The path to federal legalization begins with understanding that current federal law, in theory, allows for the production, distribution and prescription of medical cannabis products in the United States. The DEA can register manufacturers to produce medical cannabis products in accordance with the CSA. The FDA can approve medical cannabis products for distribution in accordance with the FD&C Act. The DEA (an agency of the DOJ) and the FDA (an agency of the DHHS) together can cause medical cannabis products to be rescheduled under the CSA so that doctors legally can prescribe them. None of these regulatory actions requires a change in law. Technically, cannabis is not entirely prohibited by federal law.

But in any practical sense, cannabis is federally prohibited. For nearly 50 years, the DEA has registered only one cannabis manufacturer. The FDA has never approved a cannabis-derived drug. Because marijuana remains a Schedule I controlled substance, the lone DEA-registered cannabis manufacturer can produce cannabis only for strictly controlled research, and doctors cannot prescribe any marijuana compound or derivative as medicine. A duo of federal regulatory agencies—not federal law—prohibits lawful access to medical cannabis products; this may be changing. The DEA and the FDA appear to be exploring policies and practices that could result in the actual production, distribution and prescription of cannabis-derived drugs.

In August 2016, the DEA announced a new policy designed to increase (beyond one) the number of DEA-registered cannabis cultivators and permit-registered cultivators to grow cannabis for privately funded commercial drug development projects. The DEA has since accepted at least 25 applications for registration but has not issued any new registrations. Some observers believe the new policy initiative has stalled under the leadership of the DOJ, currently run by U.S. Attorney General Sessions. How-

ever, that the DEA recognized and responded to the demand for expanded registration is a significant development on its own, and one that we believe may signal an important redirection of DEA policy.

In October 2017, the FDA accepted GW Pharmaceuticals' New Drug Application (NDA) for the cannabis-derived drug Epidiolex. The steps required to file an NDA for any drug involve extensive coordination and data sharing between the FDA and the applicant; submission of the Epidiolex NDA is an important milestone toward FDA approval. Many observers expect that Epidiolex will be the first cannabis-derived drug approved by the FDA.

Additionally, the FDA published industry guidance on botanical drug development in December 2016, several months after the DEA announced its new registration policy. The FDA guidance discusses challenges inherent to botanical drugs, including challenges related to ensuring therapeutic consistency, and suggests certain steps to address those challenges. The FDA guidance updates and replaces similar guidance last issued in June 2004, and we believe that the timing of this update may relate to other cannabis-related developments at the FDA and the DEA.

### Federal Legalization: Predicted Developments

We predict six developments on the path to federal legalization: (1) the FDA will begin approving individual pharmaceutical-grade drugs derived from cannabis; (2) more states will adopt medical cannabis laws; (3) more states will adopt recreational laws; (4) the FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties; (5) the FDA will adopt routine approval procedures for drugs with extracts of high-THC cannabis varieties; and (6) cannabis parts and derivatives will be removed from the CSA schedules (either incrementally, starting with CBD, or all at once) and will be fully legal for medical and recreational purposes.

#### Path to Federal Legalization

1. The U.S. Food and Drug Administration will begin approving individual pharmaceutical-grade drugs derived from cannabis.
2. More states will adopt medical cannabis laws.
3. More states will adopt recreational laws.
4. The FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties.
5. The FDA will adopt routine approval procedures for drugs with extracts of high-THC cannabis varieties.
6. Cannabis parts and derivatives will be removed from the CSA schedules and will be fully legal for medical and recreational purposes.

We do not predict that these developments necessarily will occur in the order presented. We do expect some of them to develop in parallel, and none of them depends fundamentally on any other. The manner in which federal cannabis legalization actually proceeds, and the timing of any related developments, are not known to us or anyone else. Almost certainly, our predictions will prove inaccurate in some respects. States may reverse their legalization efforts. The medical efficacy of cannabis may not be proved to be significant. Cannabis may never be legalized federally. However, we believe these developments will likely be among others that lead to the federal legalization of cannabis. We expand on each of these developments in the following discussion.

### **(1) FDA Approves Cannabis-Derived Pharmaceuticals**

The FDA will approve pharmaceutical-grade drugs derived from cannabis through the NDA process. FDA approval will require manufacturers to use cannabis varieties with particular chemical profiles and to demonstrate the ability to control the chemical consistency of those varieties during manufacturing. The DEA will place a narrow characterization of each FDA-approved drug on CSA Schedule II, III, IV or V, and will issue one or more registrations to manufacture the drug and the cannabis variety used to produce the drug. The FDA will improve and refine its botanical-drug review process in general and, in particular, as it relates to cannabis-derived drugs. The FDA, the DEA and DEA-registered cannabis researchers and manufacturers will cooperate to create a federal database of (i) each cannabis variety approved for use in producing an FDA-approved drug and (ii) the manufacturing controls required by the DEA and the FDA to cultivate chemically consistent plants of the variety in accordance with the CSA and the FDA's drug approval. We refer to each cannabis variety in this database, together with its required manufacturing controls, as an "FDA-registered chemovar" (a chemovar is a plant variety characterized by its chemical content).

### **(2) More States Adopt Medical Cannabis Laws**

More states will adopt medical cannabis laws, and the number and nature of qualifying medical conditions included in such laws will expand. Scientific research will improve the ability of the state-legal medical cannabis industry to develop products that target specific medical conditions. Companies will increasingly seek to differentiate such medical product offerings from recreational cannabis products. State regulators and industry leaders will seek to standardize testing, labeling and quality control procedures particular to medical cannabis products and adopt cannabis-variety recognition and manufacturing practices consistent with those for FDA-registered chemovars.

### **(3) More States Adopt Recreational Laws**

More states will adopt recreational laws, typically after medical cannabis has been legalized for some period of time. States will establish agencies to comprehensively regulate both recreational and medical cannabis; some regulatory standards will apply across both categories but, increasingly, regulations will develop specific to each category. State regulators will learn from the recreational cannabis experience of other states and will seek to standardize regulations that allow adults to responsibly enjoy cannabis while protecting the health and safety of the general public. Recreational cannabis regulations will resemble federal and state alcohol and tobacco regulations, addressing issues such as product potency and warning labels, and restrictions on advertising and packaging that appeal to minors.

#### **(4) FDA Routinely Approves CBD Drugs**

The FDA will adopt procedures for the routine approval of drugs that contain extracts of certain low-THC/high-CBD FDA-registered chemovars. The new procedures will involve development of a low-THC cannabis drug monograph that resembles in some ways the FDA monographs for over-the-counter drugs. The monograph will address formulation, dosing and labeling requirements. The FDA-registered chemovars included in the monograph will be rescheduled by the DEA to Schedule II, III, IV or V in order to relax DEA registration requirements for manufacturing; however, the chemovars themselves (particularly their flowers) will not be approved for use by the FDA, and only drugs produced from extracts in accordance with the monograph will receive routine FDA approval.

#### **(5) FDA Routinely Approves THC Drugs**

Relying on experience with the low-THC cannabis drug monograph and a growing database of FDA-registered chemovars, the FDA will adopt procedures for the routine approval of drugs that contain extracts of certain high-THC FDA-registered chemovars. The procedures will parallel in many ways those used in the low-THC monograph procedure, and likely will incorporate additional safeguards related to THC content. The FDA-registered chemovars included in the high-THC monograph will be rescheduled by the DEA, but cannabis flower from those rescheduled chemovars will not be approved for use by the FDA.

#### **(6) Federal Government Legalizes Cannabis**

Parts and derivatives of the cannabis plant will be removed from the CSA schedules. This could occur incrementally, starting with CBD (which could be removed by amending the definition of marijuana to exclude CBD) and followed later by the rest of the plant (including THC). Or all parts and derivatives of the plant could be de-scheduled at the same time. There will be three general categories of legal cannabis products: (i) FDA-approved drugs, which will continue to be developed and approved through the NDA and other processes; (ii) “therapeutic” cannabis products, which may be limited to CBD concentrates and infused products if CBD is de-scheduled first, but which eventually will include smokable flower (including high-THC flower) and most forms of cannabis, and which will be permitted to make limited health-related claims but will not be approved by the FDA as safe and effective for treating any specified medical condition; and (iii) recreational products, which also may be limited to CBD products initially, but which eventually will include a broad range of high-THC flower, concentrates and infused products. The DEA will still require registration of cannabis and CBD manufacturers if CBD is de-scheduled first, but once the entire cannabis plant is de-scheduled, a new federal cannabis agency will be established to regulate medical and recreational cannabis in cooperation with the FDA and state regulators. The new agency will adopt the DEA’s institutional framework for controlling the manufacture of chemovars used in FDA-approved drugs and the most successful state strategies for regulating recreational cannabis, such as potency limits, labeling requirements and restrictions on marketing to minors.

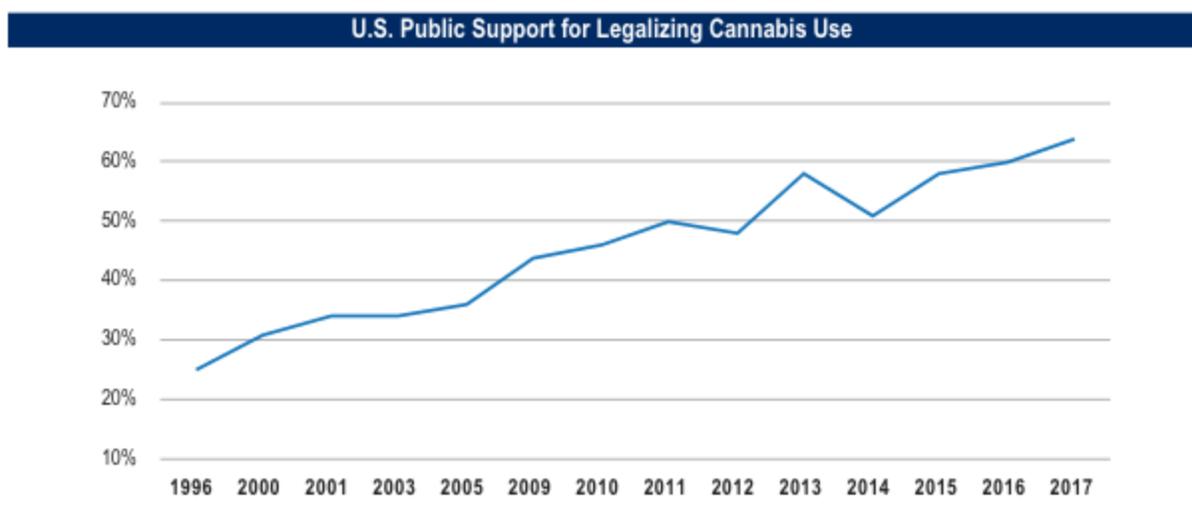
## Outlook

Development (1) does not require any change in federal law or radical departure from prior federal policy, but merely requires a redirection of FDA and DEA policies and practices. Developments (2) and (3) also do not require a fundamental change in federal law. In this sense, developments (1)–(3) largely reflect incremental developments within the existing legal environment. For example, eight state legislatures are expected in 2018 to introduce ballot measures or explore regulatory frameworks for recreational cannabis (Arizona, Delaware, Florida, Michigan, New Jersey, Ohio, Rhode Island and Vermont). Three other states (Missouri, Oklahoma and Wyoming) are expected to enact medical cannabis laws in 2018. And as discussed previously, many observers expect that in 2018, the FDA will approve a cannabis-derived pharmaceutical for the first time.

Developments (4)–(6) require more fundamental changes in federal laws and policies. We do not expect developments (4), (5) or (6) to occur during the current presidential term, but we believe that there is a reasonable chance development (4) could begin within the next five years and development (5) could occur within two years thereafter. In total, we believe it could take up to 10 years or more before the federal legalization process reaches development (6) and cannabis becomes fully legal under federal law.

We believe that cannabis will become federally legal when American voters demand it. Developments (1)–(5) are not required precursors to federal legalization, and either the U.S. Congress or the DEA could initiate development (6) at any time. We believe that either the Congress or the DEA is more likely to take such a step in an environment where developments (1)–(5) have progressed, but there are signs that pressure from American voters may be mounting for the federal government to act more quickly.

According to Gallup, the percentage of Americans who support legalization of cannabis use has increased significantly over the past two decades, and 64% of Americans today believe cannabis use should be legal. We expect that, eventually, federal policy will align with the attitudes of a majority of American voters. The following graph shows the percentage of Americans who answered “Yes” to Gallup when asked whether use of marijuana should be made legal.



Source: Gallup. Data is shown for each year that such data was provided by Gallup since 1995.



## CHAPTER V

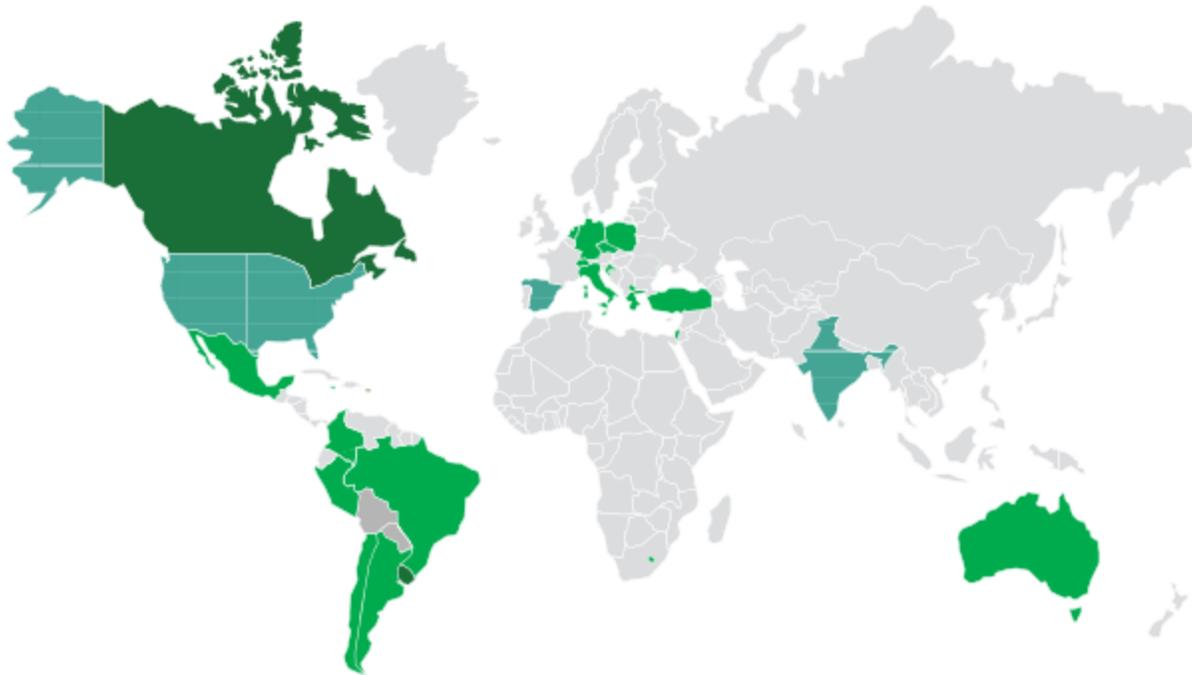
# Global Cannabis Regulation

### ■ Global Cannabis Legalization Momentum

Cannabis legalization is gaining momentum around the world, offering global opportunities for cannabis companies and related businesses. This momentum is driven primarily by the increasing recognition that cannabis may have a range of legitimate medicinal benefits and therapeutic applications. At least 20 countries now have medical laws that facilitate patient access to cannabis or concentrates for treating specified medical conditions. Notable countries with such medical laws include Australia, Canada, Colombia and Germany; countries without such laws include China, Japan, Russia and the United States. (Contrary to U.S. federal law, 29 states, encompassing 62% of the U.S. population, permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions.) While the merits of medical cannabis are currently driving legalization, we believe that—like Uruguay and numerous U.S. states—other countries will ultimately enact legislation permitting the production, sale and use of recreational cannabis. (Canada is widely expected to do so in mid-2018.)

The following world map illustrates select countries that (i) have enacted medical laws that facilitate patient access to cannabis or concentrates for treating specified medical conditions, (ii) have enacted recreational laws that permit the commercial production and sale of cannabis to adults for recreational and other uses, or (iii) include a state or province that has a cannabis law or policy in conflict with federal law.

Select Countries with Legalized Cannabis Access (January 2018)



**Medical Law**

- |           |                |         |             |             |
|-----------|----------------|---------|-------------|-------------|
| Argentina | Colombia       | Greece  | Lesotho     | Peru        |
| Australia | Croatia        | Israel  | Macedonia   | Poland      |
| Brazil    | Czech Republic | Italy   | Mexico      | Switzerland |
| Chile     | Germany        | Jamaica | Netherlands | Turkey      |

**Recreational Law**

- Canada<sup>1</sup>
- Uruguay<sup>2</sup>

**State/Province Conflict with Federal Law**

- India
- Spain
- United States

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<sup>1</sup>Canada currently has a medical law. Assumes Canada enacts a proposed recreational law in mid-2018.

<sup>2</sup>Uruguay has both a medical law and a recreational law.

International partnerships and business plans are being formed as countries increasingly allow importation and exportation of cannabis products and more companies recognize the global potential of the cannabis industry. Canadian companies are cultivating cannabis in South America and supplying markets in Europe, Australian companies are forming research partnerships with producers in Israel, and European companies are securing cannabis-related patents in the United States. And, as discussed in more detail in Chapter VII, Capital Markets for Cannabis Companies, more cross-border investment activity is taking place as industry participants position for the expected further opening of global cannabis markets.

Despite the growing recognition of the potential medical value of cannabis, the current legalization momentum and the increasingly international scope of cannabis business, the movement of products and flow of capital required for a truly global industry continue to be inhibited by incongruous laws, regulations and international treaties. For example, concerns about violating U.S. federal banking and anti-money laundering regulations have caused certain U.S. banks to refuse to be connected to the cannabis industry, avoiding even indirect association with cannabis activity that is legal where conducted. In one instance, a number of U.S. banks threatened to cease business with certain Uruguayan banks that serviced pharmacies legally distributing recreational cannabis within Uruguay. In turn, those Uruguayan banks effectively forced the pharmacies to stop participating in Uruguay's cannabis market. (In a similar way, lack of access to the U.S. federal banking system continues to inhibit growth of the domestic cannabis industry.) Until the largest economies in the world more fully embrace cannabis, we must stop short of calling cannabis a truly global industry. However, we believe that the legalization momentum will continue worldwide.

## ■ United Nations Conventions

International regulation of cannabis, cannabis derivatives and many other narcotic, psychotropic and similar substances is addressed primarily by three international treaties (Conventions) adopted through the United Nations (UN) between 1961 and 1988.

The Single Convention on Narcotic Drugs of 1961 (1961 Convention) addresses regulation of the cannabis plant, the coca flower and the opium poppy; certain of their derivatives (such as hashish, cocaine and heroin, respectively); and any other substance found in accordance with the 1961 Convention to be “liable to similar abuse and productive of similar ill effects.” The 1961 Convention establishes four schedules of substances subject to increasingly strict controls in the following order: Schedule III, Schedule II, Schedule I and Schedule IV. Schedule IV substances (the most strictly controlled) are those Schedule I substances found to be particularly liable to abuse and to produce ill effects and for which such liability is not offset by substantial therapeutic advantages. Cannabis, cannabis resin, and extracts and tinctures of cannabis are included on Schedule I; cannabis and cannabis resin are also included on Schedule IV.

The Convention on Psychotropic Substances of 1971 (1971 Convention) addresses regulation of certain “psychotropic” substances, which the Convention recognizes generally as substances that may stimulate or depress the central nervous system causing “hallucinations or disturbances in motor func-

tion or thinking or behaviour [sic] or perception or mood,” that may produce “a state of dependence” and that are subject to abuse “so as to constitute a public health and social problem warranting the placing of the substance under international control.” Substances addressed by the 1971 Convention include THC, barbiturates, amphetamines and psychedelics such as LSD. The 1971 Convention establishes four schedules of substances subject to increasingly strict controls in the following order: Schedule IV, Schedule III, Schedule II and Schedule I. Schedule I includes THC and certain of its isomers and stereochemical variants. Schedule II includes dronabinol (a synthetic THC) and its stereochemical variants.

The United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988 (Traffic Convention) establishes additional tools for enforcing provisions of the 1961 and 1971 Conventions. The Traffic Convention provides for international cooperation in arresting and prosecuting illicit traffickers of substances scheduled under the 1961 and 1971 Conventions and in disrupting their financial and distribution networks through extradition, anti-money laundering practices, asset forfeiture and other methods.

Generally, the Conventions contemplate that the manufacture, export, import, distribution, use and possession of scheduled substances should be allowed only for medical and scientific purposes under legal authority and that penalties, including criminal penalties, should apply to those who engage in such activities for other purposes or outside legal authority. Countries participating in the Conventions are generally required to enact laws and regulations that carry out the provisions of the Conventions, which may require them to establish dedicated regulatory agencies, track and report physical inventories as well as production and revenue data, implement and enforce labeling requirements and quality control procedures, restrict use of substances to those holding medical prescriptions and impose criminal penalties for violations. Currently, more than 180 countries are party to each Convention.

Amending schedules under the 1961 and 1971 Conventions generally involves participation of three UN-related bodies: (1) the Economic and Social Council (ECOSOC), one of the six main organs of the UN established under the UN charter in 1945; (2) the Commission on Narcotic Drugs (CND), itself a subsidiary body of the ECOSOC that assists the ECOSOC in supervising the application of international drug control treaties; and (3) the World Health Organization (WHO), an autonomous intergovernmental organization that collaborates with the UN and other organizations on global health matters. A schedule amendment may be initiated by the WHO or by any country participating in the applicable Convention, and generally requires approval of the CND, which approval may be subject to further review and approval by the ECOSOC. Notably, because regulations applicable to cannabis and certain derivatives are included in the body of the 1961 Convention (and not just in its schedules), merely removing cannabis and its derivatives from the schedules under the 1961 Convention would not entirely remove cannabis from that Convention’s regulatory framework.

### **Recent Developments Related to the UN Conventions**

Global support for the prohibitionist policies of the Conventions is waning, and a growing chorus of world leaders is calling for new policies for cannabis and other substances to be based on public health concerns rather than criminalization.

In 2012, the presidents of Colombia, Guatemala and Mexico requested the UN to focus its next special session on drugs on policy reform rather than on a mere progress review and continuation of the same policies. In 2014, the Global Commission on Drug Policy—represented by former UN Secretary-General Kofi Annan and the former presidents of Brazil, Chile, Colombia, Mexico, Poland, Portugal and Switzerland—called for an end to the criminalization of drug use and possession and for the responsible legal regulation of psychoactive substances.

A UN General Assembly Special Session (UNGASS) on drugs was originally scheduled for 2019, but was accelerated to April 2016 as a result of a proposal sponsored by Mexico and cosponsored by 95 other countries. The general assembly is the primary policy body of the United Nations, and one in which all UN member states have equal representation. Given this broad representation and the growing support for decriminalization, many expected the 2016 UNGASS on drugs to result in significant changes in policy. In an open letter delivered to UN Secretary-General Ban Ki-moon on the eve of the session, former presidents or prime ministers of Brazil, Cape Verde, Chile, Colombia, Greece, Hungary, Mexico, the Netherlands, Nigeria, Poland and Switzerland joined with high-profile scholars, celebrities, clergy, business leaders, elected officials and others in pressing the Secretary-General to call for reform of prohibitionist drug control policies. Those supporting reform were disappointed when the UN General Assembly adopted a resolution reaffirming its “commitment to the goals and objectives” of the three Conventions.

Despite the lack of an immediate and fundamental shift away from the prohibitionist policies of the Conventions, other steps are being taken that may result in relaxed cannabis controls within the existing Conventions framework. A committee of the WHO tasked with making drug control recommendations to the CND on behalf of the WHO—the Expert Committee on Drug Dependence (ECDD)—recognized an increase in medical cannabis use and the emergence of cannabis-related pharmaceuticals, and in November 2016 requested that the WHO prepare “pre-review” materials for cannabis, for the specific cannabis derivatives scheduled under the 1961 and 1971 Conventions, and for cannabidiol, or CBD. These pre-review materials are preliminary analyses considered by the ECDD to determine if more in-depth “critical reviews” should be undertaken by the ECDD.

The WHO presented the requested CBD pre-review materials at a November 2017 ECDD meeting. The CBD materials indicate that CBD exhibits no effects indicative of any abuse or dependence potential in humans, and that there is no evidence of any public health-related problems associated with the use of pure CBD. The outstanding pre-reviews related to cannabis and specific derivatives are expected in early 2018. The ECDD recommended that the pre-review materials be evaluated at a specific cannabis-focused ECDD meeting to be held no later than June 2018. The requested pre-reviews represent the first ever scientific guidance on cannabis to be issued within the framework of the Conventions. If the pre-reviews lead to critical reviews, such reviews could ultimately result in a WHO-initiated rescheduling of substances under the 1961 and 1971 Conventions.

## ■ Global Legal Developments

Nations around the world have recently passed or are considering enacting an array of measures decriminalizing cannabis, legalizing it for medical use or, in a few cases, legalizing it for recreational use in contravention of the UN Conventions. The following discussion summarizes recent legal developments related to cannabis across different regions.

### United States

Despite marijuana and THC being Schedule I controlled substances under the CSA—which, practically speaking, makes almost all manufacture, distribution, dispensing and possession of cannabis in the United States a federal crime—29 U.S. states and the District of Columbia have enacted medical cannabis laws that permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions, and 8 of those same states have enacted recreational laws that permit the commercial production and sale of cannabis to adults for recreational and other uses. And 19 U.S. states (including 2 with medical cannabis laws) have passed narrow CBD/limited laws that permit possession of small amounts of low-THC/high-CBD cannabis concentrates for use in treating a few serious medical conditions—in particular, severe forms of childhood epilepsy. A majority of Americans now live in states that permit the production and possession of cannabis or concentrates for use in treating a broad range of qualifying medical conditions, and polls show that a majority of Americans believe cannabis use should be legal. For a more thorough discussion of U.S. state and federal law, see Chapter IV, U.S. Legal Landscape.

### Canada

Canada's Controlled Drugs and Substances Act (CDSA) was enacted in 1996 and currently serves as the country's implementing legislation under the UN Conventions. The CDSA establishes eight schedules of "controlled substances" and imposes civil and criminal penalties for production, trafficking, importing, exporting and possession of those controlled substances in violation of the CDSA. Cannabis, cannabis preparations and derivatives, and certain cannabinoids, including THC and CBD, are Schedule II substances under the CDSA. Those who commit CDSA violations related to Schedule II substances are subject to fines and imprisonment.

In a 2000 decision by the Court of Appeal for Ontario, the court held that certain criminal prohibitions under the CDSA related to cannabis were unconstitutional because they did not include a constitutionally acceptable medical exemption. Following this constitutional holding and acting within the framework of the CDSA, which allows for the issuance of regulations and exemptions thereunder, Canada issued a sequence of three medical marijuana regulations discussed below.

The Marihuana [sic] Medical Access Regulations (MMAR), issued in 2001, permitted individuals with the authorization of their health care practitioners to grow their own cannabis plants for medical purposes, to designate someone to grow cannabis for them or to purchase dry cannabis flower from Health Canada (the government agency charged with administering Canada's medical cannabis regulations). The MMAR was successfully challenged on constitutional grounds and eventually replaced

in 2013 by the Marihuana [sic] Medical Program Regulations (MMPR). The MMPR created a regulatory framework under which individuals with a medical need could obtain dry cannabis flower from licensed commercial producers. Like the MMAR before it, the MMPR was held unconstitutional and was eventually replaced, this time in August 2016, by the currently effective Access to Cannabis for Medical Purposes Regulations (ACMPR).

The ACMPR permits businesses licensed by Health Canada to commercially produce and distribute cannabis flower, cannabis oil and cannabis starter materials, such as plants and seeds, to individuals with a medical recommendation from an authorized health care practitioner. The ACMPR also allows such individuals to produce a limited amount of cannabis for their own medical purposes, or to designate another person (which may include Health Canada) to produce it for them. The ACMPR sets forth a comprehensive licensing and regulatory regime that addresses security of licensed production facilities, import and export permits, quality control measures and labeling requirements, and imposes limits on the amount of cannabis that can be produced and possessed by an individual.

In April 2017, a proposed recreational law was introduced in the Canadian parliament; this legislation would allow adults to purchase cannabis from federally licensed producers and to possess and share cannabis with other adults. The proposed Cannabis Act would authorize the Canadian government to issue regulations for the administration and enforcement of the act and to issue licenses and permits authorizing the importation, exportation, production, testing, packaging, labeling, sending, delivery, transportation, sale, possession or disposal of cannabis and cannabis products. The Cannabis Act would authorize Canadian provinces and territories to regulate the distribution and retail sale of cannabis within their jurisdictions, and all individuals and entities, including federally licensed businesses, would be required to comply with those local regulations as well as federal laws.

Unlike the ACMPR, which is a set of medical cannabis regulations issued within the framework of Canada's CDSA, the Cannabis Act would amend the CDSA and related criminal and other statutes to facilitate the recreational law in Canada. The proposed Cannabis Act is widely expected to be approved in some form by the Canadian parliament by mid-2018. If approved, Canada would be the largest country in the world to legalize recreational cannabis on a national level.

## Latin America and the Caribbean

During the past five years, Latin American and Caribbean nations (and Puerto Rico, a U.S. territory) have taken significant legal measures that increase access to cannabis for medical purposes, permit recreational cannabis use and relax criminal prohibitions.

In 2013, Uruguay became the first nation in the world to legalize and regulate the commercial production and sale of cannabis to adults for recreational and other uses. The Uruguayan law authorizes licensed producers to grow cannabis for sale, through licensed pharmacies, to Uruguayan citizens and permanent residents who have registered with the government; the law also permits individuals to grow up to six cannabis plants per year and to form small clubs that may grow up to 99 plants per year. Cannabis sales through licensed pharmacies commenced in 2017.

In 2015, Colombia approved a legal framework for the cultivation, processing and sale of cannabis extracts and related products for scientific and medical purposes. The Colombian framework provides

for the issuance of separate licenses for cultivation and processing. It also contemplates that permits will be available under Colombia's export laws for the export of lawful cannabis products to jurisdictions where importation is legal. Colombia issued the first processing license in 2016 and the first cultivation license in 2017.

In 2017, Argentina enacted regulations permitting the use of cannabis oil and other derivatives either by qualifying patients or for scientific and medical research. Under the new legislation, the government will oversee cultivation and production of cannabis and its derivatives for research purposes and for patient consumption, establish a national registry of qualifying patients and make cannabis products available to those patients, free of charge. The government expects to import cannabis supplies until they can be produced domestically.

Other Latin American nations that have taken recent steps to increase medical cannabis access include Chile, Brazil, Mexico and Peru. In 2015, Chile changed its laws to allow medical cannabis use by patients and to authorize the sale of cannabis-based medicines through pharmacies. In 2016, Brazil approved a resolution authorizing the prescription and importation of cannabis products, including THC and CBD, for use in treating certain qualifying medical conditions. In June 2017, Mexico enacted a law directing its Ministry of Health to prepare regulations for the research, production and medicinal use of "pharmacological derivatives" of cannabis. In November 2017, Peru adopted a bill legalizing the production, commercialization and importation of cannabis oil to be used for medical purposes.

In the Caribbean region, Puerto Rico, the Cayman Islands and Jamaica have taken measures to decriminalize cannabis or increase access for medical use. In 2015, the governor of Puerto Rico signed an executive order that legalized use of cannabis derivatives (but not cannabis flower) for medical purposes. Jamaica passed a law in 2015 that decriminalizes possession of small amounts of cannabis, permits an individual to cultivate no more than five cannabis plants, establishes a medical cannabis regulatory agency and allows tourists with foreign medical cannabis prescriptions to purchase small amounts of cannabis. A 2016 law enacted in the Cayman Islands legalized the use of cannabis extracts for medical purposes and authorized the creation of import regulations and the sale through licensed pharmacies.

### **Australia and New Zealand**

Australia amended its Narcotic Drugs Act in 2016 to authorize a regulated medical cannabis industry in the country. The amendment establishes licenses to cultivate cannabis, produce cannabis resin and other products for medicinal purposes, manufacture medicinal cannabis products and conduct cannabis research. A license-holder is required to secure a permit that places conditions on the license and identifies specific activities allowed within the scope of the license. Cannabis products for medicinal use that are either legally manufactured in Australia or legally imported can be prescribed to qualifying medical patients. The amendment defines medicinal cannabis products broadly as a product that includes, or is produced from, any part of the cannabis plant and is intended for the purpose of "curing, or alleviating the symptoms of a disease, ailment or injury."

New Zealand's Misuse of Drugs Act generally makes the importation, cultivation, distribution, possession and use of cannabis illegal. However, in September 2017, New Zealand's Health Ministry lifted certain restrictions so that doctors may now prescribe approved CBD products. (Previously, patients in need of CBD products were required to apply directly to the Health Ministry, and approval was granted on a case-by-case basis.) In December 2017, New Zealand introduced legislation for a medical law that would amend the Misuse of Drugs Act to permit domestic production of medical cannabis products and their use by people with terminal illness or chronic pain.

## Europe

The European Union provides no coordinated legal framework for cannabis and, historically, European countries generally have prohibited its production and sale, but have also decriminalized or tolerated possession of small amounts.

In some European countries, personal use exceptions to criminal prosecution have been used to carve out visible distribution models. In the Netherlands, for example, Amsterdam is famous for its coffee-shop cannabis sales, even though the suppliers of cannabis to those coffee shops generally operate illegally. And in Spain, despite a federal prohibition on the sale of cannabis, court decisions and laws permitting cultivation for personal consumption have served to justify the country's hundreds of private cannabis clubs.

To date, no European country has implemented a recreational law comparable to those in Uruguay and some U.S. states and expected in Canada. However, starting with the Netherlands in 2003, a number of European countries have enacted medical laws that facilitate patient access to cannabis or concentrates, through importation or domestic production, for treating specified medical conditions.

Italy has allowed medical cannabis use since 2013 under a law that requires cannabis to be sold through authorized pharmacies to patients with a valid prescription.

Croatia legalized the limited use of medical cannabis products in 2015. Under the law, doctors may prescribe cannabis ointments, teas and other extracts to patients with a qualifying health condition, including tumors, AIDS, multiple sclerosis and child epilepsy. Smoking or vaporizing cannabis flower is not allowed under the law. In 2016, Croatia received a shipment of medical cannabis products from a Canadian producer, marking the first time a North American company legally shipped cannabis products containing THC and CBD into the European Union.

A German law that took effect in 2017 legalizes the use of medical cannabis products prescribed for patients with serious illnesses, including multiple sclerosis, chronic pain, epilepsy and chemotherapy-induced nausea and lack of appetite. The law provides a framework for the regulation of suppliers under which the government has already issued import licenses to Canadian and Dutch firms and is finalizing an approval process for the issuance of domestic production licenses.

A 2017 Polish law permits patients to obtain medical cannabis products, including flower, extracts and tinctures, through pharmacies if they have both a physician's medical authorization and permission from a regional pharmaceutical inspector. The qualifying conditions eligible for medical cannabis include chronic pain, chemotherapy-induced nausea, multiple sclerosis, spasticity and treatment-resistant epilepsy. Cannabis products must be imported into Poland because the law does not permit cannabis cultivation within the country.

Greece announced in 2017 that the use of cannabis extracts would be permitted for patients who obtain a doctor's recommendation and are diagnosed with chronic pain, neuropathic pain, chemotherapy-induced nausea, certain eating disorders and cancer.

In the United Kingdom, the Misuse of Drugs Act 1971 (Drugs Act) generally prohibits the manufacture, supply and possession of any "controlled drug," including cannabis and cannabis resin, without a license issued by the Home Office, a ministerial department of the U.K. government. There is no exception to this general Drugs Act prohibition that would facilitate patient access to cannabis or concentrates for treating specified medical conditions. However, within the Drugs Act framework, the Home Office has issued to U.K.-based GW Pharmaceuticals licenses to cultivate, possess and supply cannabis for medical research and for commercial purposes. GW Pharmaceuticals produces Sativex, a mouth spray that contains cannabis-derived THC and CBD and is used for treatment of spasticity caused by multiple sclerosis. Sativex is generally recognized as the first prescription drug in the world to include plant-based cannabinoids. It was first approved for use in the U.K. in 2010 and has been approved for use in at least 30 countries (but not in the United States).

### **Middle East, Asia and Africa**

Throughout the Middle East, Asia and Africa, cannabis cultivation, sale and possession generally remain prohibited and punishable as criminal offenses. Only a handful of countries from these regions have enacted laws that decriminalize possession of small amounts of cannabis for personal use or facilitate patient access to cannabis or concentrates for treating specified medical conditions.

In 2017, particular sections of South Africa's Drugs and Drug Trafficking Act, which prohibit cultivation, possession and personal use of cannabis on private property, were declared unconstitutional. During the same year, Lesotho (an enclave surrounded entirely by South Africa) granted a license to a pharmaceutical company to grow, process and sell cannabis for medicinal use or scientific purposes.

In Israel, the country's Dangerous Drug Ordinance generally criminalizes the manufacture, possession and use of cannabis. However, medical cannabis in smokable and other forms has been legal since the 1990s for patients with a range of serious medical conditions, including multiple sclerosis, Crohn's disease, cancer and post-traumatic stress disorder, and the country is widely recognized as a global leader in medical cannabis research and cultivation. Under Israel's medical cannabis rules, the Ministry of Health can issue permits for the production, distribution and use of medical cannabis products. Patients must first obtain a doctor's recommendation and submit it to the ministry in order to receive a medical cannabis use permit. In August 2017, the Israeli Ministries of Health and Finance announced that licensed producers and distributors of medical cannabis would become eligible, for the first time, for permits to export medical cannabis to jurisdictions where it is legal to import.

## ■ Global Outlook

While the medical potential of cannabis is driving an initial wave of legalization, we believe countries will eventually legalize the commercial production and sale of cannabis to adults for recreational use. In this regard, 2018 will be an important year, with the expected approval of the recreational Cannabis Act in Canada and the implementation of California's new recreational law. In Canada, we may observe for the first time the implementation of a large-scale national recreational law. Similarly, as the most populous U.S. state and one of the world's largest economies, California's recreational cannabis rollout will be a bellwether for the global cannabis industry. The successes, failures and lessons learned in Canada and California will have significant impacts on the cannabis industry worldwide.

In our view, the course taken by the U.S. federal government will impact the global cannabis industry more than any other factor. If the U.S. federal government were to change its current practice and aggressively enforce existing federal cannabis laws, we would expect a corresponding dampening of the industry worldwide. If the status quo were to continue in the United States, we would expect the current global legalization trend to continue, particularly in Europe, South America and Africa. And if federal prohibition in the United States ends, we expect a surge in cannabis legalization worldwide.



## CHAPTER VI

# U.S. and International Cannabis Market Estimates

### ■ Global Market Overview

Cannabis is the most widely cultivated, produced, trafficked and consumed drug worldwide, according to the United Nations Office on Drugs and Crime (UNODC). In 2003, the UNODC estimated that the global illegal cannabis market was \$113 billion, with 160 million consumers. The UNODC continues to estimate the number of cannabis users worldwide and recently estimated that 183 million people globally between the ages of 15 and 64, or more than 4% of this age group, consumed cannabis in 2015.

In 2010, the RAND Corporation (RAND) estimated that the U.S. illegal cannabis market was \$40 billion. Adjusting this estimate solely for inflation and population growth, the U.S. illegal market would now be approximately \$48 billion.

Both the UNODC and RAND acknowledge the challenges inherent in studying an illegal consumer market, and both allow significant room for error in their estimates. However approximate, their estimates make clear that there is significant global demand for cannabis. Less clear is how quickly illegal markets will transition to legal markets, as well as the extent to which legalization may increase overall demand.

### The Legal Cannabis Market: Key Growth Drivers

We believe that numerous factors will increase consumer penetration rates and the overall size of the legal cannabis market. Such factors include the following.

**U.S. Federal Legalization.** We believe it is a question of when, not if, cannabis becomes federally legal. We predict six developments on the path to federal legalization: (1) the FDA will begin approving individual pharmaceutical-grade drugs derived from cannabis; (2) more states will adopt medical cannabis laws; (3) more states will adopt recreational laws; (4) the FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties; (5) the FDA will adopt

routine approval procedures for drugs with extracts of high-THC cannabis varieties; and (6) cannabis parts and derivatives will be removed from the CSA schedules (either incrementally, starting with CBD, or all at once) and will be fully legal for medical and recreational purposes. (We expand on these predicted developments in Chapter IV, U.S. Legal Landscape.) We believe that federal legalization will trigger rapid growth in the U.S. market, propelled by interstate commerce, access to the federal banking system and acceleration of the cannabis-derived pharmaceuticals market. A change in the federal status of cannabis in the United States will not only drive U.S. market growth, but should provide a significant catalyst to the market worldwide.

***Increasing Awareness of the Medical Efficacy of Cannabis.*** In aggregate, across all U.S. state laws, cannabis is legally recognized as a form of therapy or medicine for more than 50 medical conditions. In addition, at least 20 countries have medical laws that facilitate patient access to cannabis or concentrates for treating specified medical conditions. We believe that countries and U.S. states will continue to adopt and enhance legal frameworks for the medicinal use of cannabis products. In addition, we believe that many more cannabis consumers will emerge as research on cannabis increasingly demonstrates its medical efficacy and as more therapeutic products are developed and brought to market.

***Increasing Recreational Legalization.*** Most laws facilitating access to cannabis, both in U.S. states and abroad, are medical laws. However, Uruguay and eight U.S. states have enacted recreational laws permitting the commercial production and sale of cannabis to adults for recreational and other uses (and Canada is widely expected to do so in mid-2018). In the handful of jurisdictions that started with medical laws and later adopted recreational laws—particularly in Colorado, Washington and Oregon—adoption of recreational laws has led to significant growth in overall market size and a rapid increase in the percentage of the market represented by recreational consumers. We expect 2018 will be a watershed year for the recreational market, with the implementation of California's new recreational law and the expected approval and implementation of Canada's recreational law. If these laws stimulate demand, as expected, and are otherwise viewed as successful, we expect more U.S. states and additional countries to follow suit with similar laws.

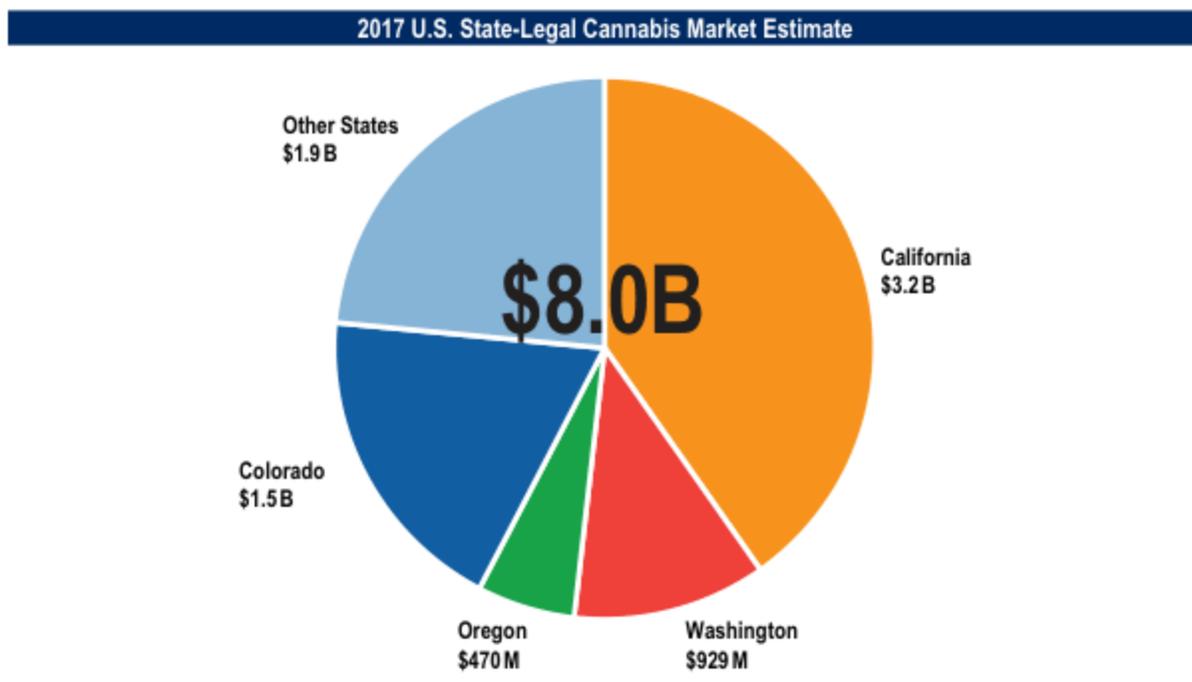
***Broadening Range of Cannabis Consumer Products.*** Product innovation and advancements in cannabis varieties, concentrates, infused products, vaporizing technology and cannabis-derived pharmaceutical products will drive consumer adoption and spending. Cannabis consumer product companies will seek to differentiate their products through marketing, distribution, packaging, selection, quality and pricing. We believe that product differentiation and availability will be more prevalent in legal cannabis markets and will drive consumer transition from illegal to legal markets.

***Declining Prices in U.S. State-Legal Cannabis Markets.*** The supply of cannabis has increased considerably with expanded state legalization in the United States. This increase has started to dampen retail and wholesale prices in various markets. As prices decline, we are starting to see closer price parity between state-legal and illegal markets (in the United States, cannabis is generally priced lower in illegal markets than in state-legal markets). Lower retail prices in state-legal markets should accelerate consumer transition from illegal to state-legal markets and drive increased overall penetration rates. However, state and local taxes will continue to impact pricing for cannabis products in state-legal cannabis markets.

## ■ U.S. State-Legal Cannabis Market

More than 97% of the U.S. population lives in a state or district (District of Columbia) with at least one law that permits the manufacturing, distribution, dispensing or possession of cannabis or concentrates. As described in more detail in Chapter IV, U.S. Legal Landscape, most of these laws are medical laws, and only eight states have enacted recreational laws. While the overall state-legal market has grown significantly, the addressable market has been constrained due to the lack of access to purely recreational consumers and the sometimes-narrow scope of medical conditions that qualify a patient to access medical cannabis.

We estimate that the 2017 U.S. state-legal cannabis market was \$8.0 billion, with more than four million consumers. The breakdown of this estimate by state is shown in the following chart.



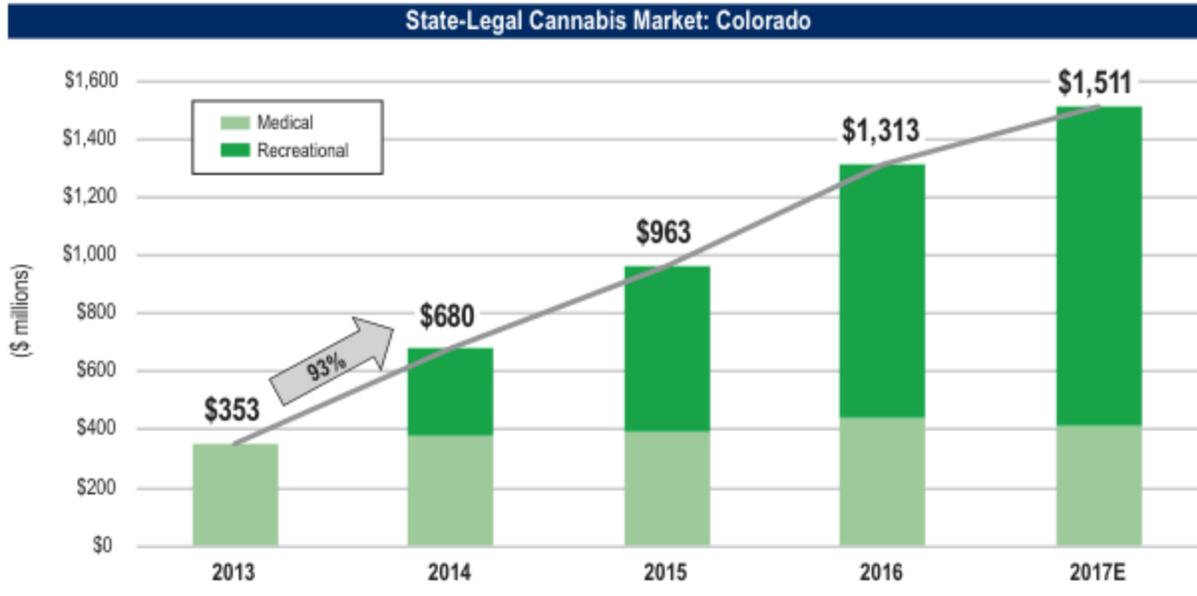
Source: Ackrell Capital

## Recreational Sales as a Key Market Driver

Of the eight states that have enacted recreational laws, all had previously implemented medical laws. As shown in the following graphs for the three largest states to implement recreational laws, implementation of a recreational law significantly expanded the overall size of the legalized cannabis market, doubling the size of the market in each of these states in the first full calendar year after implementation. In addition, the percentage of the total market attributable to recreational consumers increased quickly. This indicates significant, pent-up consumer demand for legal cannabis in the United States, and we expect a significant increase in the size of the overall state-legal market as more states implement recreational laws.

**Colorado**

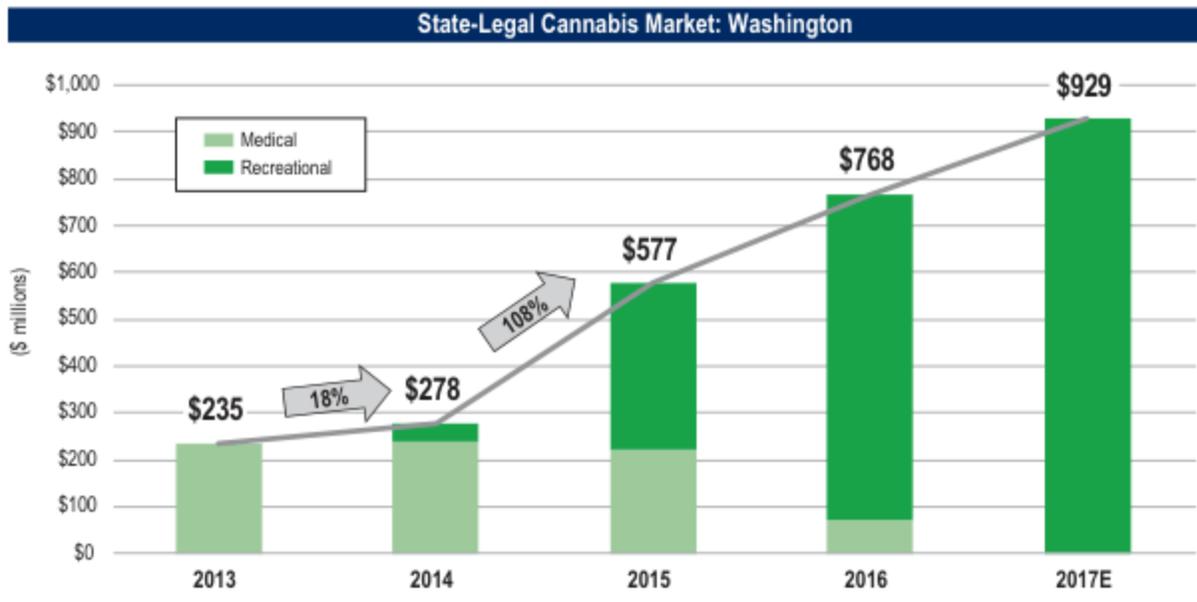
Colorado implemented a medical law in 2000 and a recreational law in 2014. The following graph shows the impact of Colorado’s recreational law on the overall market in the state.



Source: Ackrell Capital

**Washington**

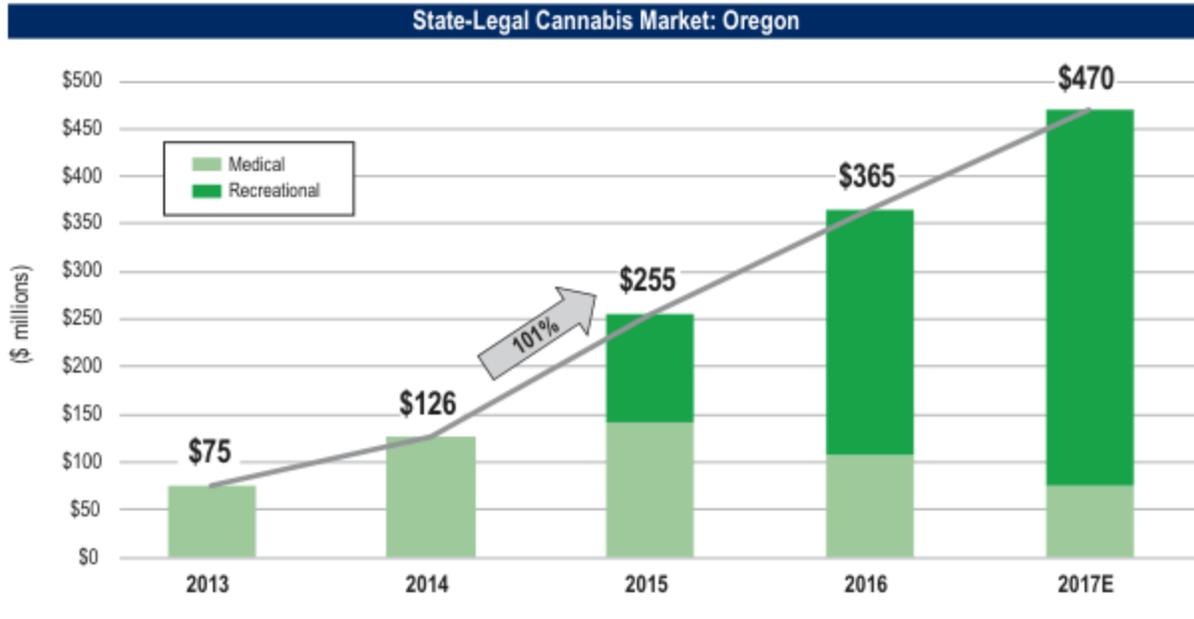
Washington implemented a medical law in 1998 and a recreational law in July 2014, and folded its medical law into its recreational law in 2017. The following graph shows the impact of these laws on the overall market in the state.



Source: Ackrell Capital

**Oregon**

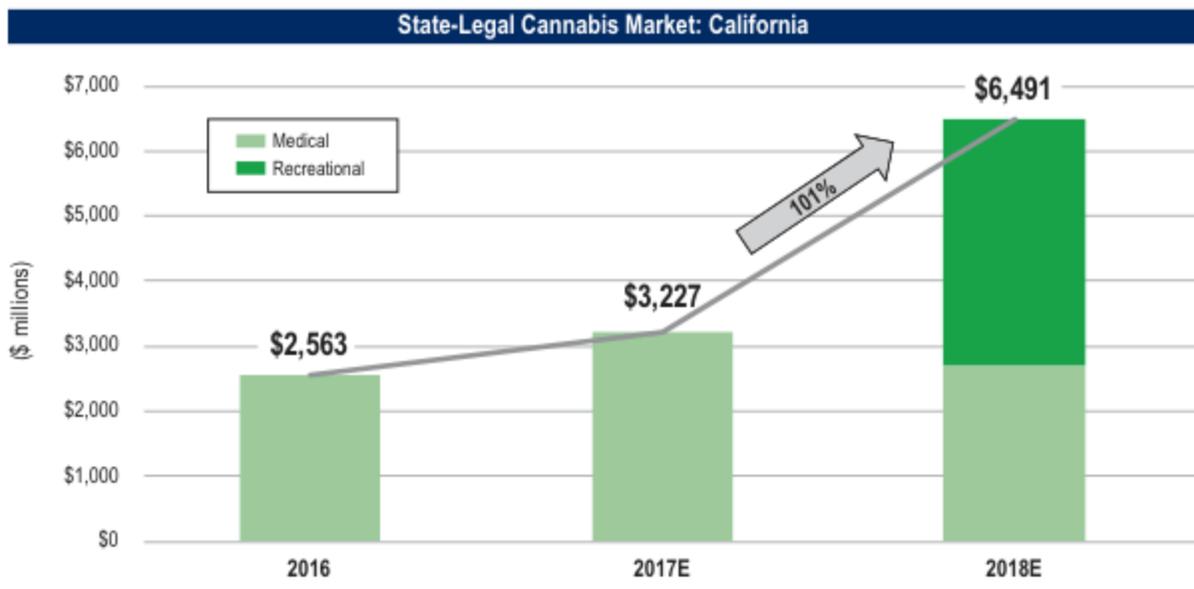
Oregon implemented a medical law in 1998 and a recreational law in 2015. The following graph shows the impact of Oregon’s recreational law on the overall market in the state.



Source: Ackrell Capital

**California**

In 1996, California became the first U.S. state to implement a medical law. In November 2016, the state enacted a recreational law, the implementation of which is scheduled to begin in January 2018. The following graph shows the impact that California’s recreational law is expected to have on the overall market in the state.



Source: Ackrell Capital

## ■ U.S. Legalized Cannabis Market Forecast

### Forecast Methodology

The cannabis industry is driven by consumers, similar to other highly regulated industries such as alcohol, tobacco and pharmaceuticals. Consequently, our methodology for forecasting the U.S. legalized cannabis market is based primarily on the following factors: (i) the number of eligible U.S. consumers, grouped by age; (ii) the penetration rate for each consumer age group; and (iii) the average monthly spending for each consumer age group.

We believe that the variable which will most impact the future size of the U.S. legalized cannabis market is the federal legalization process. How and when federal legalization occurs will impact other primary drivers of the market, including the number of eligible consumers, penetration rates and consumer spending. We predict six developments relating to federal legalization: (1) the FDA will begin approving individual pharmaceutical-grade drugs derived from cannabis; (2) more states will adopt medical cannabis laws; (3) more states will adopt recreational laws; (4) the FDA will adopt routine approval procedures for drugs with extracts of low-THC/high-CBD cannabis varieties; (5) the FDA will adopt routine approval procedures for drugs with extracts of high-THC cannabis varieties; and (6) cannabis parts and derivatives will be removed from the CSA schedules (either incrementally, starting with CBD, or all at once) and will be fully legal for medical and recreational purposes. (We expand on these predicted developments in Chapter IV, U.S. Legal Landscape.)

We do not predict that these developments necessarily will occur in the order presented. We do expect some of them to develop in parallel, and none of them depends fundamentally on any other. For example, Congress could cause development (6) at any time by passing legislation that removes cannabis from the CSA schedules and establishes a national framework for recreational and medical cannabis regulation. Developments (1) through (3) largely reflect incremental developments within the existing legal environment. We do not expect developments (4), (5) or (6) to occur during the current presidential term, but we believe that there is a reasonable chance development (4) could begin within the next five years and development (5) could occur within two years thereafter. In total, we believe that it could take up to 10 years or more before the federal legalization process reaches development (6) and cannabis becomes fully legal under federal law. For our analysis, we assume (i) development (4) begins in 2023, (ii) development (5) follows two years thereafter and (iii) development (6) occurs by 2027 and cannabis becomes fully legal in the United States. (The reader is cautioned that cannabis may never be legalized federally in the United States.)

### *Eligible U.S. Consumers*

We used U.S. Census data to identify the number of people in the United States aged 21 years or older. While some therapeutic applications of cannabis are targeted at people under 21 years of age, we excluded this group of consumers from our estimates. We assumed a nominal annual growth rate for the U.S. population. With more than 97% of the U.S. population currently living in a state or district with at least one law that permits the manufacturing, distribution, dispensing or possession of cannabis or concentrates, we view the potential pool of eligible consumers to be virtually the entire U.S. adult population.

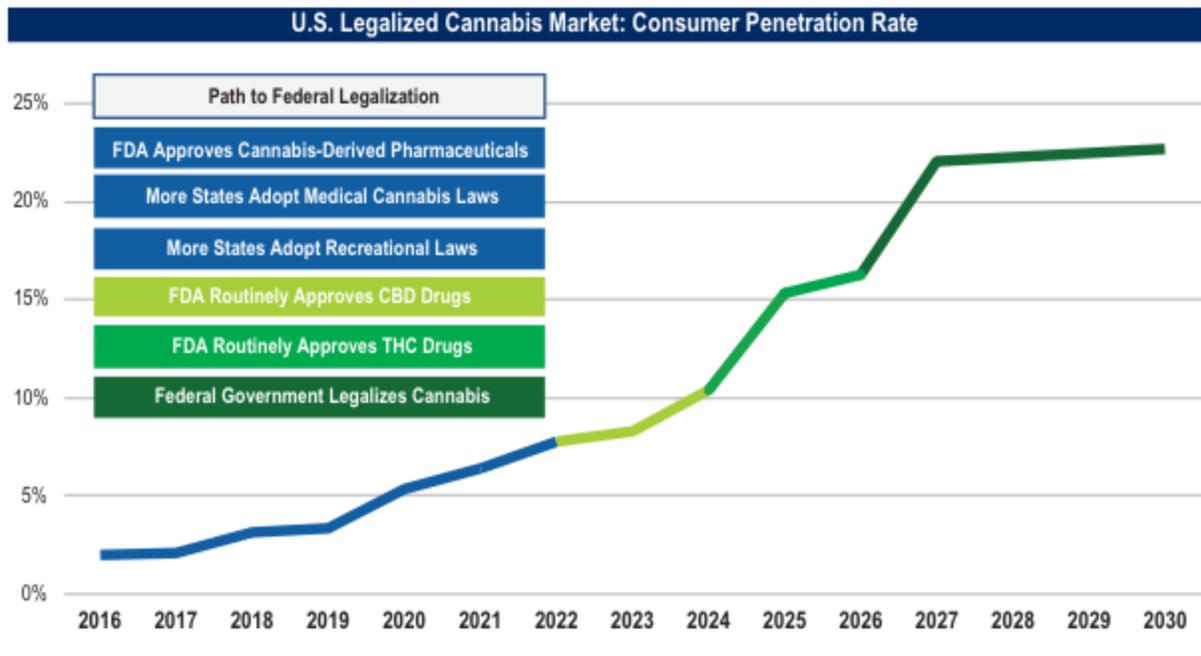
### **Consumer Penetration Rates**

We assigned current and prospective consumer penetration rates to each state based on our assessment of whether legal consumer access to cannabis in the state should be characterized as “limited,” “moderate” or “broad.” This assessment was based in part on (i) the nature of the cannabis laws in each state and (ii) the extent of the cannabis dispensary network in each state. We assigned a specific penetration rate to each age group, with the 21–29 age group having the highest and the 70+ age group having the lowest.

Consumer penetration rates are significantly affected by the available channels for legal access to cannabis. States that have only medical laws typically have lower penetration rates than states having both medical and recreational laws because the qualifying-condition requirement of medical laws precludes many potential consumers. Similarly, penetration rates are impacted by the widely varying number and nature of qualifying medical conditions designated by medical laws. States that designate many conditions or highly subjective conditions such as “chronic pain” tend to have higher penetration rates than states that designate relatively few or highly specific conditions.

Penetration rates also are affected by the reach of a state’s cannabis dispensary network. Some states have extensive dispensary networks that provide convenient access to cannabis for most consumers. Other states have a limited number of dispensaries or networks that reach only urban areas; restricted networks can be the result of factors such as the amount of time a state has permitted legal cannabis access and the prevalence of county and municipal laws restricting (or in some cases, completely banning) dispensary operations.

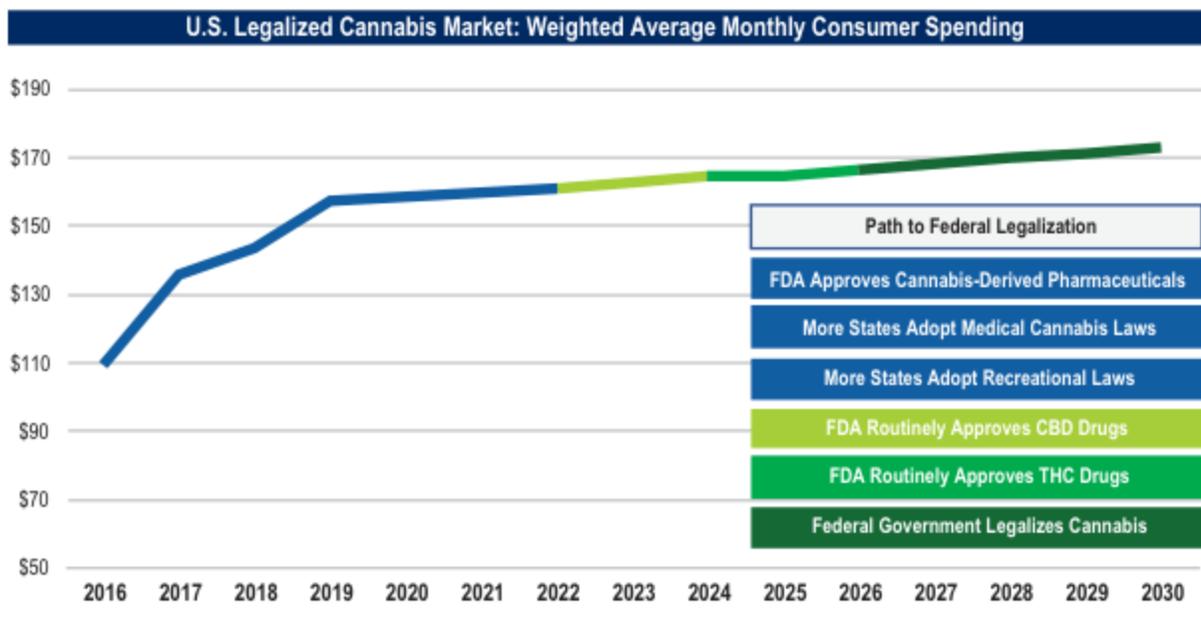
Prior to federal legalization, we expect U.S. penetration rates to increase as states implement new medical and recreational laws and expand the scope of qualifying medical conditions under existing medical laws, and as the FDA begins approving pharmaceutical-grade drugs derived from cannabis. Although we believe penetration rates in states with recreational laws and robust dispensary networks may fairly represent penetration rates after federal legalization, penetration rates may increase further as the medical efficacy of cannabis becomes better understood and negative perceptions of cannabis diminish. Following federal legalization, we believe penetration rates may ultimately be as high as (or higher than) those in other consumer-driven industries, such as alcohol, tobacco and pharmaceuticals. The consumer penetration rates used in our analysis are as follows.



Source: Ackrell Capital

### Monthly Cannabis Spending

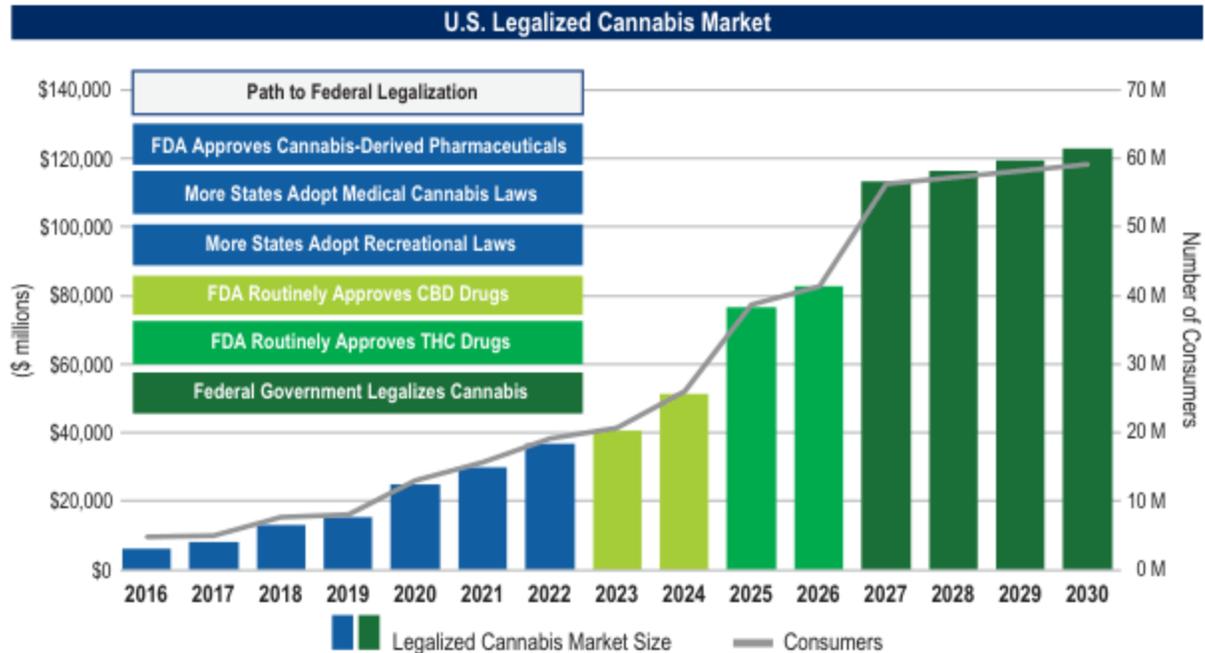
We estimated average monthly spending on cannabis using data provided by dispensaries in states with recreational laws. We then assigned spending levels (low, moderate and heavy) to each age group of eligible consumers by state. The resulting weighted averages of monthly consumer spending used in our analysis are as follows.



Source: Ackrell Capital

### U.S. Legalized Cannabis Market Estimates

Based on our assumptions and methodology, we believe that the U.S. legalized cannabis market will ultimately exceed \$100 billion annually, with more than 50 million consumers. As shown in the following graph, we believe these levels will be reached after the federal government legalizes cannabis.



Source: Ackrell Capital. Assumes cannabis will be legalized federally by 2027. Cannabis may never be legalized federally in the United States.

Because penetration rate and average monthly spending assumptions significantly affect our forecast, we illustrate this impact with the following sensitivity analysis, which shows the estimated market size in 2030 using a range of penetration rates and monthly spending averages.

(\$ millions)		Average Monthly Consumer Spending				
		\$100	\$125	\$150	\$175	\$200
Adult Population Penetration Rate	5%	\$13,954	\$17,442	\$20,930	\$24,419	\$27,907
	10%	27,907	34,884	41,861	48,838	55,814
	15%	41,861	52,326	62,791	73,256	83,722
	20%	55,814	69,768	83,722	97,675	111,629
	25%	69,768	87,210	104,652	122,094	139,536
	30%	83,722	104,652	125,582	146,513	167,443
	35%	97,675	122,094	146,513	170,932	195,350

Source: Ackrell Capital

### Methodology and Estimates: Industry Comparisons

To evaluate our methodology and results, we compare estimated values from our model with values for the same parameters in markets for certain other stimulants and pharmaceuticals. We believe that this comparison is useful because cannabis is used recreationally in much the same way alcohol, coffee and tobacco are used, and because cannabis may be an alternative to pharmaceuticals currently used to treat a range of medical conditions. The following table compares the estimated penetration rate, average monthly consumer spending and U.S. retail market size for a number of common stimulants and pharmaceutical categories.

Comparison between Cannabis and Common Stimulants and Substances						
	Alcohol	Coffee	Tobacco	Painkillers	Anti-depressants	Cannabis (Future)
Primary Usage	Recreational	Recreational	Recreational	Medicinal	Medicinal	Recreational / Medicinal
Adult Penetration %	50%	50%	17%	40%	25%	20%
Monthly Consumer Spending	\$45 to \$200	\$80 to \$100	\$40 to \$80	\$50 to \$200	\$50 to \$100	\$50 to \$500
U.S. Retail Market Size	\$200B	\$35B	\$100B	\$300B	\$60B	\$100B

Source: Ackrell Capital

This comparison demonstrates that our U.S. legalized cannabis market estimates are in line with U.S. retail markets for alcohol, coffee, tobacco, and pharmaceutical painkillers and antidepressants.

## ■ International Legal Cannabis Market Forecast

As previously discussed, cannabis is the most widely consumed drug worldwide: an estimated 183 million people between the ages of 15 and 64 consumed cannabis in 2017. Cannabis legalization is gaining momentum around the world. At least 20 countries now have medical laws that facilitate patient access to cannabis or concentrates for treating specified medical conditions. Select countries with such laws include Australia, Canada, Colombia and Germany; countries without such laws include China, Japan, Russia and the United States. While the merits of medical cannabis are currently driving legalization, we believe that—like Uruguay and numerous U.S. states—other countries will ultimately enact and implement recreational laws.

Canada's legal cannabis market (presently limited to medical cannabis) is currently the largest federally legal cannabis market in the world, estimated at \$1.5 billion in 2017. We anticipate that Canada will enact and implement its proposed recreational Cannabis Act in mid-2018 and that implementation will significantly expand the size of Canada's overall market.

### International Market Size Estimate Methodology

Similar to the methodology for our U.S. estimates, the primary factors for our international legal cannabis market estimates are the estimated number of eligible consumers, penetration rates and monthly spending. Of course, these and other factors affecting market size vary considerably across continents and regions because each country has its own unique market characteristics, including laws, culture, religions, consumer preferences and disposable income.

We do not attempt to estimate the timing of legal changes that affect consumer penetration rates. Rather, we estimate the size of potential international markets at maturity when penetration rates have stabilized. The time required for markets in particular countries to reach maturity will vary widely and, like the U.S. market, could be 10 years or more.

To estimate average monthly consumer spending, we analyzed a country's per capita average monthly income and assumed a certain percentage was spent on cannabis products. The resulting estimates of monthly spending in developed countries differs vastly from that in developing countries.

### International Market Size Estimates

Our estimates for the international legal cannabis market include estimates for select countries with medical or recreational laws and certain countries we believe may develop into legal markets for cannabis in the foreseeable future. The following table lists each identified country, ranked by Gross Domestic Product (GDP), with its estimated adult population, monthly cannabis consumer spending and potential market value.

Emerging and Anticipated International Legal Cannabis Markets				
Country	GDP Rank	2017 Estimated Adult Population (in millions)	Projected Monthly Consumer Spending (\$)	Potential Market Value (\$ millions)
<b>Select Countries with Medical or Recreational Laws</b>				
Germany	4	59.0	\$78 – \$155	\$16,518
Brazil	8	150.5	16 – 31	8,524
Italy	9	42.5	56 – 112	8,599
Canada	10	26.6	78 – 155	7,453
Australia	13	12.2	97 – 194	4,268
Mexico	16	92.9	16 – 32	5,380
Turkey	17	58.3	20 – 40	4,178
Netherlands	18	12.2	82 – 165	3,632
Switzerland	20	5.8	145 – 289	2,999
Argentina	21	23.0	21 – 43	1,766
Poland	24	27.4	23 – 45	2,223
Israel	32	5.8	64 – 129	1,336
Colombia	37	35.3	11 – 22	1,429
Chile	44	13.0	24 – 48	1,124
Peru	48	23.0	11 – 21	878
Czech Republic	51	7.9	31 – 62	890
Greece	52	7.9	34 – 67	962
Uruguay	78	2.2	27 – 54	211
Croatia	84	2.9	22 – 43	223
Jamaica	120	2.2	8 – 17	65
Macedonia	132	1.4	9 – 18	46
Lesotho	163	1.4	2 – 4	11
<b>Certain Additional Countries</b>				
United Kingdom	5	47.5	75 – 151	12,908
India	6	964.1	3 – 6	10,379
France	7	48.2	69 – 139	12,040
Spain	14	33.1	49 – 98	5,841
Sweden	23	7.2	97 – 194	2,520
South Africa	35	40.3	10 – 20	1,416
Portugal	49	7.2	35 – 71	916
<b>Midpoint Weighted Average</b>			<b>\$28</b>	<b>Total</b>
				<b>\$118,735</b>

Source: Ackrell Capital

The projected market value for each country shown in the preceding table is calculated assuming a 20% penetration rate and the midpoint of the projected average monthly spending range. Because each country's penetration rate and monthly spending will vary considerably and are difficult to predict, we

illustrate the impact of varying these factors with the following sensitivity analysis, which shows the estimated market size at maturity using a range of penetration rates and monthly spending weighted averages.

International Legal Cannabis Market Size: Sensitivity Analysis						
(\$ millions)		Weighted Average Monthly Consumer Spending				
		\$10	\$20	\$30	\$40	\$50
Adult Population Penetration Rate	5%	\$ 10,606	\$ 21,211	\$ 31,817	\$ 42,422	\$ 53,028
	10%	21,211	42,422	63,634	84,845	106,056
	15%	31,817	63,634	95,450	127,267	159,084
	20%	42,422	84,845	127,267	169,690	212,112
	25%	53,028	106,056	159,084	212,112	265,140
	30%	63,634	127,267	190,901	254,534	318,168
	35%	74,239	148,478	222,718	296,957	371,196

Source: Ackrell Capital

Based on the preceding assumptions and methodology, we believe that the international legal cannabis market for select countries with medical or recreational laws and certain countries we believe may develop into legal markets for cannabis has the potential to exceed \$200 billion within the next 10 to 15 years. And as discussed earlier in this chapter, we forecast the U.S. legal cannabis market to reach more than \$100 billion in this same period. Together, these two forecasts indicate a global legal cannabis market in the foreseeable future of more than \$300 billion.

In our view, most countries located in Asia will take the longest to enact and implement cannabis access laws; therefore, we have not included the markets in countries such as China, with a population of 1.4 billion people, or Japan, with the third highest GDP in the world, in our global market estimate. If cannabis legalization continues in the United States and the rest of the world as we anticipate, we believe that many countries in Asia will ultimately follow suit. If and when that occurs, the size of the global legal cannabis market will increase significantly and, we believe, may ultimately exceed \$500 billion annually.

As discussed on page 175, readers are cautioned to not place undue reliance on our opinions, predictions or estimates. Almost certainly, our opinions, predictions and estimates will prove inaccurate in some respects. A number of factors could cause actual results or events to differ materially from those indicated by our opinions, predictions and estimates. U.S. states and countries abroad may reverse their cannabis legalization efforts. The medical efficacy of cannabis may not prove to be significant. Cannabis may never be legalized federally in the United States. Certain factors affecting the cannabis industry are discussed in more detail in Chapter IX, Cannabis Industry Risk Factors.



## CHAPTER VII

# Capital Markets for Cannabis Companies

### ■ Capital Markets Overview

Hundreds, if not thousands, of cannabis-related companies are seeking to raise capital—thus presenting investment opportunities for sophisticated investors who want to participate in the cannabis industry. Investors have their choice of investing in the more than 300 publicly traded cannabis-related companies, or in the significant number of private companies raising capital. Investors may also choose among stock markets (both within the United States and internationally), type of security (equity versus debt) and type of company (companies across all segments of the industry are raising capital).

It is important to note, however, that most of the cannabis-related companies that are raising capital—even publicly traded companies—are in early stages of development, have de minimis revenue and are not profitable. More than 85% of the publicly traded cannabis-related companies have annual revenue of less than \$5 million, and less than 5% have annual revenue greater than \$25 million.

Most investors in the cannabis industry today are retail or individual investors. While an increasing number of family office and strategic investors are now participating in the cannabis industry, we believe that many institutional investors (most notably the traditional venture capital and private equity communities) will not invest in the industry until more companies in the industry mature and the legal environment becomes more favorable.

Cannabis-related companies raised more than \$2.0 billion in the public and private markets in 2017; however, except for a few transactions of notable size, many of the financings were small (less than \$5 million), which provides further evidence that the capital markets are being driven primarily by retail investors. Without traditional institutional investor support, a funding gap exists in the industry: companies are seeking to raise more capital than investors are willing or able to provide. We believe that this is especially true in the private markets, where many companies struggle to raise financing.

We share the belief held by many that, ultimately, established companies from analogous industries—alcohol, pharmaceutical, tobacco and consumer products—will enter the cannabis industry

through minority investment, by acquisition or otherwise. Examples of the emergence of such strategic investors include Constellation Brands, Inc.'s (NYSE: STZ) approximately \$190 million investment in Canopy Growth Corporation (TSX: WEED) and the more than \$400 million spent by The Scotts Miracle-Gro Company (NYSE: SMG) to acquire soil, fertilizer, hydroponic equipment and lighting companies that are supplying the cannabis industry. These types of transactions help support the valuation levels in the industry and, to an extent, validate investors' enthusiasm for the industry.

The stock price performance and valuations of cannabis-related companies continue to be robust, irrespective of the aforementioned funding gap. In general, we believe that valuations in both the public and private markets are being driven more by investors' expectations for the future growth of the cannabis industry than by individual company fundamentals. Similarly, especially in the over-the-counter stock market in the United States—where most of the public cannabis-related companies are traded—stock price fluctuations and valuations tend to be heavily influenced by the illiquidity in most stocks and the trading strategies of those involved. Overall, we believe that the capital markets for the cannabis industry will become more efficient and rational over time as we expect increased participation from institutional and strategic investors.

## ■ Public Capital Markets

More than 300 cannabis-related companies are traded on one or more stock markets in the United States, Canada and other international locations. Although these companies are publicly traded, most are in early stages of development, have de minimis revenue and are not profitable. We use the term “cannabis-related” to include companies that participate solely in the cannabis industry and those that participate in the cannabis industry in addition to other industries or markets.

The ability of companies to access capital markets is dependent largely on the legal landscape for cannabis in a particular country. For example, the capital markets in countries such as Canada, Australia, Germany and Israel (countries that have a more permissive legal framework for cannabis) have been receptive to cannabis-related companies, while the reception by capital markets in the United States has been more varied.

In evaluating publicly traded companies, an investor should be cognizant of where the company is traded, as there are significant differences across the various exchanges and markets with respect to listing requirements, liquidity, independent research and types of investors. Many cannabis-related companies are traded on more than one market in order to attract additional investors and facilitate trading in multiple jurisdictions. However, we believe that it is instructive to evaluate a company based on the primary market on which it trades (We determine a company's primary market based on a number of factors, including stock price history, trading volume and availability of estimates.)

In the United States, a limited number of cannabis-related companies are traded on the Nasdaq Stock Market (Nasdaq), the New York Stock Exchange (NYSE) and the NYSE American (NYSE American), the NYSE's market for small to mid-size capitalization companies. In addition, more than 200 cannabis-related companies are traded on the over-the-counter stock market (OTC). Nasdaq and

the NYSE are two of the largest and most recognized stock exchanges in the world, with stringent listing, trading and corporate governance requirements. Conversely, the OTC has much less stringent requirements; as a result, most publicly traded cannabis-related companies are traded on the OTC.

In Canada, cannabis-related companies are traded on the Toronto Stock Exchange (TSX), the TSX Venture Exchange (TSXV), which is an affiliate of the TSX, and the Canadian Securities Exchange (CSE). The TSX is one of the world's largest stock exchanges and, similar to Nasdaq and the NYSE, has stringent listing, trading and corporate governance requirements. The TSXV focuses on companies with small market capitalization and has less stringent listing requirements than the TSX. The CSE is focused on micro capitalization and emerging growth companies, and it has the least stringent listing requirements of the primary Canadian exchanges. In order to be listed on either the TSX or the TSXV, a company is required to be in compliance with Canada's Access to Cannabis for Medical Purposes Regulations (ACMPR) and all applicable laws in jurisdictions within which it operates. (Operations of listed companies are restricted in jurisdictions, such as the United States, where cannabis is federally prohibited.) Unlike the TSX and TSXV, the CSE has allowed companies listed on its exchange to invest in, acquire and otherwise operate cannabis-related businesses in the United States.

The following table provides a summary of the cannabis-related companies traded on U.S., Canadian and Australian stock markets. As stated previously, many cannabis-related companies are traded on more than one market to attract additional investors and facilitate trading in multiple jurisdictions. For example, most companies traded on the Canadian markets are also traded on the OTC.

#### Summary of Publicly Traded Cannabis-Related Companies

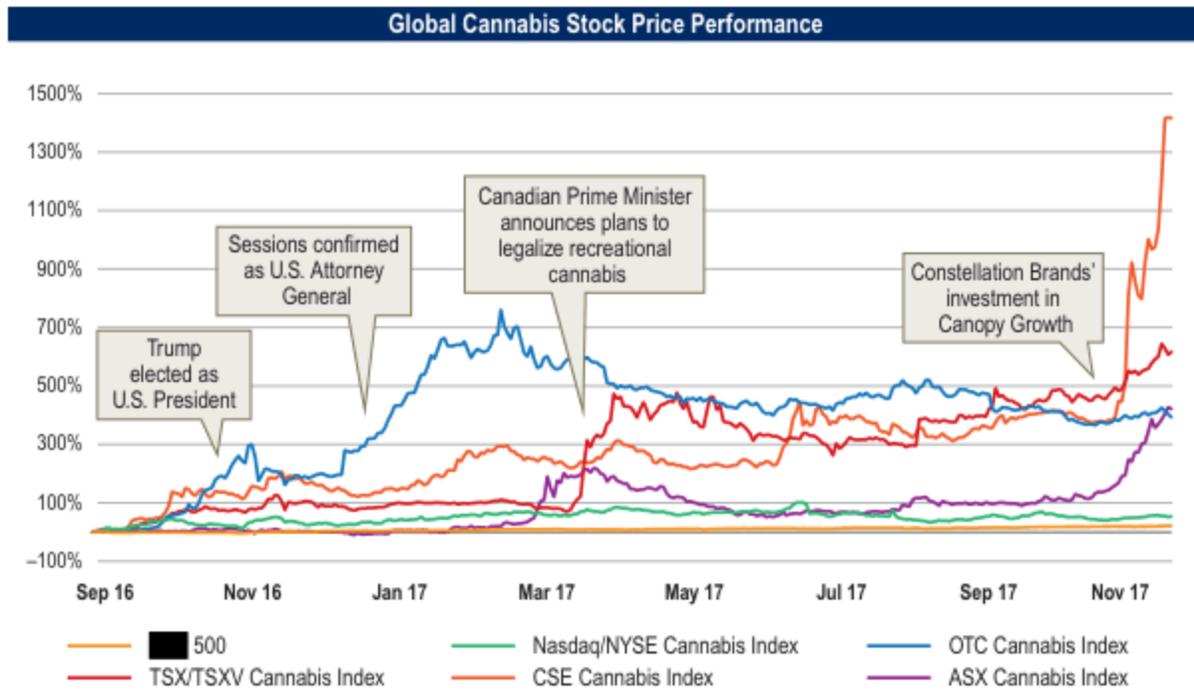
(As of November 30, 2017)

	Number of Companies	Average (\$U.S. millions)					
		Market Value	Enterprise Value	Cash	Debt	LTM Revenue	LTM EBITDA
Nasdaq	4	\$1,033.6	\$884.5	\$153.6	\$4.5	\$44.0	-\$81.1
NYSE	1	63.5	41.3	22.2	0.0	4.6	-1.2
NYSE American	2	152.1	145.7	7.8	1.4	7.3	-6.5
OTC	212	46.3	65.5	5.7	25.0	14.0	0.2
<b>United States</b>	<b>219</b>	<b>\$65.5</b>	<b>\$81.2</b>	<b>\$8.5</b>	<b>\$24.3</b>	<b>\$14.5</b>	<b>-\$1.4</b>
Toronto Stock Exchange (TSX)	6	\$1,361.5	\$1,311.4	\$71.0	\$20.8	\$26.6	\$0.8
TSX Venture Exchange (TSXV)	20	131.5	123.9	10.8	3.3	1.2	-3.5
Canadian Securities Exchange (CSE)	41	72.6	72.0	2.0	1.4	1.8	-2.8
<b>Canada</b>	<b>67</b>	<b>\$210.6</b>	<b>\$203.3</b>	<b>\$11.1</b>	<b>\$3.8</b>	<b>\$4.0</b>	<b>-\$2.2</b>
Australian Securities Exchange (ASX)	14	\$85.3	\$80.1	\$5.9	\$0.7	\$0.9	-\$2.1
<b>Australia</b>	<b>14</b>	<b>\$85.3</b>	<b>\$80.1</b>	<b>\$5.9</b>	<b>\$0.7</b>	<b>\$0.9</b>	<b>-\$2.1</b>

Source: ■ Global Market Intelligence. Companies that are traded on more than one market are included in their primary market as determined by ■ Global Market Intelligence, based on stock price history, trading volume and availability of estimates. Enterprise Value is defined as Market Value plus Debt minus Cash and Cash Equivalents. LTM is Last Twelve Months. EBITDA is defined as Earnings Before Interest, Taxes, Depreciation and Amortization.

### Stock Price Performance of Publicly Traded Cannabis-Related Companies

The following chart shows the stock price performance of publicly traded cannabis-related companies since September 30, 2016. As shown in the chart, the stock price performance of cannabis-related companies trading on Canadian markets received a boost from the announcement of the proposed recreational cannabis legislation in Canada by Prime Minister Justin Trudeau and, more recently, from Constellation Brands' investment in Canopy Growth. Similarly, the continuing positive price performance of cannabis-related companies trading on U.S. markets has not been slowed by the election of Donald Trump as President and the selection of Jeff Sessions as Attorney General of the United States (two events that were viewed by many as potentially having a negative impact on the U.S. cannabis industry).

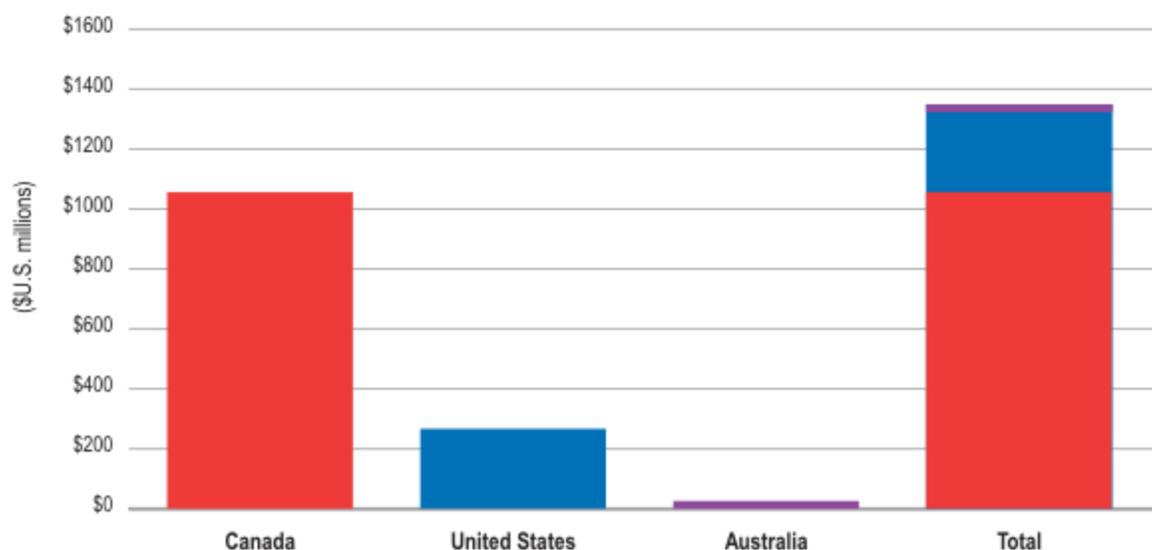


Source: 500 Global Market Intelligence

### Capital Raised by Publicly Traded Cannabis-Related Companies

The following table shows the amount of capital (equity and debt) raised by cannabis-related companies traded on the U.S., Canadian and Australian stock markets in the twelve months ended September 30, 2017. While more than \$1.3 billion was raised, the data indicates that relatively few companies were able to raise capital, given the aggregate number of publicly traded cannabis-related companies, and the amount raised per transaction was small, supporting the assertion that the market is still driven primarily by retail investors.

**Capital Raised by Publicly Traded Cannabis-Related Companies (LTM ended September 30, 2017)**



<b>Amount Raised</b>	\$1056	\$268	\$26	\$1350
<b>Number of Deals</b>	60	15	3	78
<b>Average Deal Size</b>	\$18	\$18	\$9	\$17

Source: Global Market Intelligence. In December 2017, a \$317 million financing was completed by GW Pharmaceuticals (Nasdaq: GWPH), but the transaction occurred outside the date range of the analysis. Due to the size of the transaction, it is worth noting here.

## ■ Public Capital Markets: United States

As of November 30, 2017, four cannabis-related companies were trading on Nasdaq (all in the pharmaceutical industry and focused on receiving FDA approval for selected cannabinoid applications), one was trading on the NYSE (a real estate investment trust, or REIT, focused on the acquisition and management of properties leased to state-licensed operators for their regulated medical-use cannabis facilities), two were trading on the NYSE American (both in the pharmaceutical industry) and more than 200 cannabis-related companies were trading on the OTC.

Most of the companies trading on the OTC (i) are “penny” stocks that trade at less than \$5.00 per share, (ii) have limited trading volume and liquidity, (iii) have significant price volatility, and (iv) have little or no institutional investor support. The U.S. Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA) have historically expressed concerns regarding the “penny” stock industry in general and both have issued alerts to warn investors about potential scams associated with purported cannabis-related stocks. In addition, the SEC has initiated actions against numerous purported cannabis-related companies and executives for fraud, insider trading, stock manipulation and other activities.

The following table provides a summary of cannabis-related companies traded on the U.S. stock markets.

**Summary of U.S. Publicly Traded Cannabis-Related Companies**

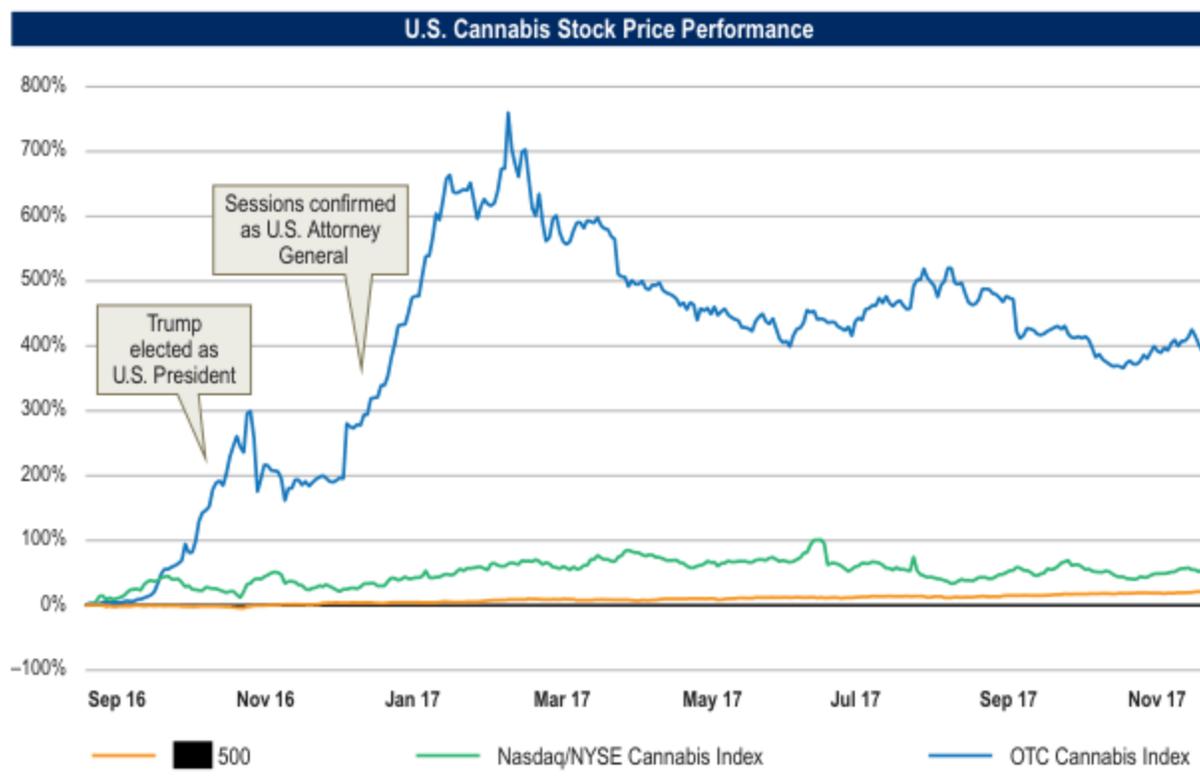
(As of November 30, 2017)

	Number of Companies	Average (\$U.S. millions)					
		Market Value	Enterprise Value	Cash	Debt	LTM Revenue	LTM EBITDA
Nasdaq	4	\$1,033.6	\$884.5	\$153.6	\$4.5	\$44.0	-\$81.1
NYSE	1	63.5	41.3	22.2	0.0	4.6	-1.2
NYSE American	2	152.1	145.7	7.8	1.4	7.3	-6.5
OTC	212	46.3	65.5	5.7	25.0	14.0	0.2
<b>United States</b>	<b>219</b>	<b>\$65.5</b>	<b>\$81.2</b>	<b>\$8.5</b>	<b>\$24.3</b>	<b>\$14.5</b>	<b>-\$1.4</b>

Source: Global Market Intelligence. Companies that are traded on more than one market are included in their primary market as determined by Global Market Intelligence, based on stock price history, trading volume and availability of estimates. Enterprise Value is defined as Market Value plus Debt minus Cash and Cash Equivalents. LTM is Last Twelve Months. EBITDA is defined as Earnings Before Interest, Taxes, Depreciation and Amortization.

**Stock Price Performance of U.S. Publicly Traded Cannabis-Related Companies**

The following chart shows the stock price performance of selected publicly traded cannabis-related companies in the United States since September 30, 2016. As shown in this chart, the election of Donald Trump as President and the selection of Jeff Sessions as Attorney General of the United States have not slowed the continuing positive price performance of cannabis-related companies trading on U.S. markets.

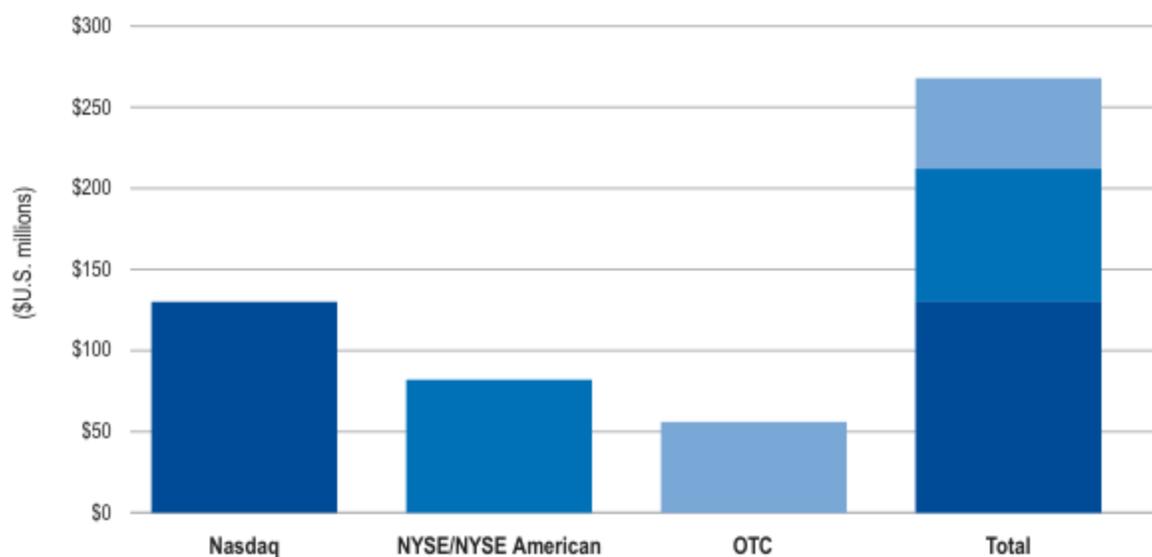


Source: Global Market Intelligence

### Capital Raised by U.S. Publicly Traded Cannabis-Related Companies

The following table shows the amount of capital (equity and debt) raised by cannabis-related companies traded on U.S. stock markets in the twelve months ended September 30, 2017. Although more than 200 cannabis-related companies were traded on the OTC during this period, the data indicates that very few raised meaningful capital.

**Capital Raised by U.S. Publicly Traded Cannabis-Related Companies (LTM ended September 30, 2017)**



<b>Amount Raised</b>	\$130	\$82	\$56	\$268
<b>Number of Deals</b>	2	2	11	15
<b>Average Deal Size</b>	\$65	\$41	\$5	\$18

Source: Global Market Intelligence. In December 2017, a \$317 million financing was completed by GW Pharmaceuticals (Nasdaq: GWPH), but the transaction occurred outside the date range of the analysis. Due to the size of the transaction, it is worth noting here.

### Financial Data and Trading Multiples of U.S. Publicly Traded Cannabis-Related Companies

The following tables show selected financial and trading information of cannabis-related companies that are publicly traded on U.S. markets. As the tables indicate, with few exceptions, these companies have little to no revenue and are not profitable. Consequently, most trading multiples are not meaningful and the companies tend to trade more on expectations for the overall cannabis industry than on specific company fundamentals (especially for those companies traded on the OTC).

Nasdaq

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples		Forward Revenue Multiples		Forward EBITDA Multiples	
								Revenue	EBITDA	2018	2019	2018	2019
Cara Therapeutics, Inc.	NasdaqGM:CARA	\$12.45	56.3%	\$406.0	\$303.0	\$0.9	-\$65.8	NM	NM	NM	86.1x	NM	NM
GW Pharmaceuticals plc	NasdaqGM:GWPH	124.49	9.1%	3,153.2	2,847.7	11.0	-191.6	NM	NM	NM	11.4	NM	NM
INSYS Therapeutics, Inc.	NasdaqGM:INSY	5.30	64.7%	388.6	266.9	164.1	-35.6	1.6x	NM	1.7x	1.4	NM	6.4x
Zynerba Pharmaceuticals, Inc.	NasdaqGM:ZYNE	13.77	46.9%	186.6	120.4	0.0	-31.2	NM	NM	NM	NM	NM	NM
		<b>Median</b>	<b>51.6%</b>	<b>\$397.3</b>	<b>\$285.0</b>	<b>\$6.0</b>	<b>-\$50.7</b>	<b>1.6x</b>	<b>NM</b>	<b>1.7x</b>	<b>11.4x</b>	<b>NM</b>	<b>6.4x</b>

New York Stock Exchange and NYSE American

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples		Forward Revenue Multiples		Forward EBITDA Multiples	
								Revenue	EBITDA	2018	2019	2018	2019
22nd Century Group, Inc.	AMEX:XXII	\$2.33	33.4%	\$287.9	\$273.2	\$14.0	-\$11.3	19.5x	NM	12.7x	10.7x	NM	NM
India Globalization Capital, Inc.	AMEX:IGC	0.58	27.6%	16.3	18.2	0.6	-1.6	28.8	NM	NA	NA	NA	NA
Innovative Industrial Properties, Inc.	NYSE:IIPR	18.15	11.5%	63.5	41.3	4.6	-1.2	9.0	NM	2.4	1.3	3.7x	1.6x
		<b>Median</b>	<b>27.6%</b>	<b>\$63.5</b>	<b>\$41.3</b>	<b>\$4.6</b>	<b>-\$1.6</b>	<b>19.5x</b>	<b>NM</b>	<b>7.6x</b>	<b>6.0x</b>	<b>3.7x</b>	<b>1.6x</b>

Ancillary

Constellation Brands, Inc.	NYSE:STZ	\$217.59	4.2%	\$42,572.2	\$51,393.3	\$7,458.5	\$2,709.3	6.9x	19.0x	6.7x	6.3x	18.3x	16.6x
The Scotts Miracle-Gro Company	NYSE:SMG	98.90	3.5%	5,689.7	6,969.0	2,642.1	500.0	2.6	13.9	2.5	2.4	12.9	12.0
		<b>Median</b>	<b>3.9%</b>	<b>\$24,131.0</b>	<b>\$29,181.2</b>	<b>\$5,050.3</b>	<b>\$1,604.7</b>	<b>4.8x</b>	<b>16.5x</b>	<b>4.6x</b>	<b>4.3x</b>	<b>15.6x</b>	<b>14.3x</b>

Source: Global Market Intelligence. Not Meaningful (NM) used for negative multiples, and for revenue multiples greater than 100.0x and EBITDA multiples greater than 50.0x. Not Available (NA) used for information that is not available. Enterprise Value is defined as Market Value plus Debt minus Cash and Cash Equivalents. LTM is Last Twelve Months. EBITDA is defined as Earnings Before Interest, Taxes, Depreciation and Amortization.

**Over The Counter (Market Value Greater than \$25 million)**

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples	
								Revenue	EBITDA
Abatis Bioceuticals Corp.	OTCQB:ATTBF	\$0.22	20.2%	\$39.5	\$38.8	\$0.0	-\$3.6	NM	NM
American Cannabis Company, Inc.	OTCQB:AMMJ	0.75	40.5%	38.6	36.7	2.9	0.3	12.7x	NM
AmeriCann, Inc.	OTCQB:ACAN	2.03	63.1%	39.3	42.4	0.0	-1.8	NM	NM
Amfil Technologies, Inc.	OTCPK:AMFE	0.15	36.1%	99.7	99.9	0.2	NA	NM	NM
AXIM Biotechnologies, Inc.	OTCQB:AXIM	7.02	64.6%	382.8	387.5	0.0	-2.9	NM	NM
Cannabics Pharmaceuticals Inc.	OTCQB:CNBX	1.02	86.6%	120.7	117.3	0.0	-1.8	NM	NM
Cannabis Leaf, Inc.	OTCPK:PCFP	0.97	61.2%	48.8	48.9	0.0	NA	NM	NM
Cannabis Sativa, Inc.	OTCQB:CBDS	3.95	58.4%	83.8	83.5	0.1	-6.4	NM	NM
Cannabis Science, Inc.	OTCPK:CBIS	0.06	56.3%	155.4	158.1	0.0	-9.6	NM	NM
Cannabix Technologies Inc.	OTCPK:BLOZF	1.19	37.4%	103.0	100.5	0.0	NA	NM	NM
CannaGrow Holdings, Inc	OTCPK:CGRW	0.99	57.0%	100.3	102.7	1.7	-1.4	62.0	NM
Corix Bioscience, Inc.	OTCQB:CXBS	1.19	45.9%	29.6	29.6	0.0	NA	NM	NM
Earth Science Tech, Inc.	OTCPK:ETST	0.81	79.5%	32.0	31.9	0.4	NA	74.1	NM
Evergreen-Agra Global	OTCQB:EGRN	1.00	85.7%	26.4	26.4	0.0	-0.4	NM	NM
GB Sciences, Inc.	OTCQB:GBLX	0.24	56.4%	31.3	37.0	0.2	-10.3	NM	NM
General Cannabis Corp.	OTCQB:CANN	1.65	51.6%	37.1	39.5	0.1	-7.4	NM	NM
Green Spirit Industries Inc.	OTCPK:GSRX	5.75	77.0%	172.6	172.6	0.0	NA	NM	NM
GrowGeneration Corp.	OTCQX:GRWG	2.50	13.8%	41.1	39.3	13.1	-1.2	3.0	NM
Helix TCS, Inc.	OTCPK:HLIX	3.00	76.9%	85.9	86.7	3.5	-3.0	24.9	NM
Hemp Tech Corporation	OTCPK:HTCO	1.82	83.9%	100.7	101.7	0.0	-0.5	NM	NM
iAnthus Capital Holdings, Inc.	OTCQB:ITHU.F	1.64	39.1%	61.7	74.3	0.1	NA	NM	NM
Kush Bottles, Inc.	OTCQB:KSHB	2.84	20.2%	170.4	170.2	18.8	0.8	9.1	NM
Leafbuyer Technologies, Inc.	OTCPK:LBUY	1.04	72.8%	39.9	39.8	0.9	NA	42.5	NM
Lexaria Bioscience Corp.	OTCQB:LXRP	0.82	18.8%	56.9	54.4	0.1	-1.8	NM	NM
Lifestyle Delivery Systems Inc	OTCQB:LDSY.F	0.50	25.6%	46.0	44.6	0.7	-5.1	65.3	NM
Marijuana Company of America	OTCPK:MCOA	0.03	76.8%	54.6	55.0	0.0	-21.9	NM	NM
MariMed Inc.	OTCQB:MRMD	0.70	16.3%	119.8	119.8	0.0	NA	NM	NM
mCig, Inc.	OTCQB:MCIG	0.17	66.1%	68.5	67.0	7.7	1.2	8.7	NM
Medical Marijuana, Inc.	OTCPK:MJNA	0.10	55.1%	307.1	317.7	8.0	-3.9	39.7	NM
Medicine Man Technologies, Inc.	OTCQB:MDCL	1.79	43.2%	39.2	39.0	2.4	-5.5	16.2	NM
OWC Pharmaceutical Research	OTCQB:OWCP	0.48	85.2%	70.1	69.0	0.1	-4.7	NM	NM
PharmaCyte Biotech, Inc.	OTCQB:PMCB	0.05	71.6%	46.7	42.4	0.0	NA	NM	NM
Player's Network, Inc.	OTCQB:PNTV	0.08	66.1%	45.0	45.9	0.2	-4.7	NM	NM
Praetorian Property, Inc.	OTCPK:PRRE	0.52	75.8%	81.1	93.5	14.1	NA	6.6	NM
SanSal Wellness Holdings, Inc.	OTCPK:SSWH	0.95	29.6%	55.9	57.4	0.6	-1.5	NM	NM
Stony Hill Corp.	OTCPK:STNY	2.50	50.0%	39.0	38.8	0.2	NA	NM	NM
Suma Inc.	OTCQB:SRNA	0.15	35.5%	29.6	28.3	6.9	-3.3	4.1	NM
Terra Tech Corp.	OTCQX:TRTC	0.20	42.1%	178.2	173.6	31.9	-18.6	5.4	NM
THC Therapeutics, Inc.	OTCPK:THCT	0.34	60.6%	39.7	39.7	0.0	0.0	NM	NM
The Tinley Beverage Company	OTCPK:QRSR.F	0.56	15.2%	41.4	38.8	0.1	NA	NM	NM
United Cannabis Corporation	OTCQB:CNAB	0.78	69.0%	46.7	46.0	0.5	NA	99.2	NM
Vitality Biopharma, Inc.	OTCQB:VBIO	1.85	56.4%	42.7	41.9	0.1	-4.3	NM	NM
WEED, Inc.	OTCPK:BUDZ	2.79	44.8%	279.0	278.5	0.0	-5.2	NM	NM
WOWI, Inc.	OTCPK:WOWU	1.65	67.0%	53.6	54.7	0.0	-26.0	NM	NM
<b>Median</b>			<b>56.4%</b>	<b>\$54.1</b>	<b>\$54.5</b>	<b>\$0.1</b>	<b>-\$3.4</b>	<b>16.2x</b>	<b>NM</b>

## Comparison of U.S. Stock Markets

U.S. stock markets vary significantly in terms of their financial, liquidity and corporate governance requirements. Most U.S. publicly traded cannabis-related companies trade on the OTC due to its less stringent requirements, as compared to Nasdaq and the NYSE. The following chart provides a comparison of Nasdaq, the NYSE and the OTC.

		U.S. Stock Market Comparison		
		Nasdaq	NYSE	OTC
<b>Market Tiers</b>		Nasdaq Global Select Market Nasdaq Global Market Nasdaq Capital Market	NYSE NYSE American	OTCQX OTCQB OTCPink
<b>Number of Listed Companies</b>	<b>Total</b>	3,200+	2,800+	10,300+
	<b>Cannabis-related</b>	4	3	212
<b>Market Value<sup>1</sup></b>	<b>Total</b>	\$11.3 trillion	\$29.6 trillion	\$247.7 billion
	<b>Median</b>	\$334.0 million	\$1.5 billion	\$0.5 million
<b>Listing or Trading Requirements</b>		Must meet financial and liquidity criteria under at least one category of Standards. Criteria include: Stockholders' Equity, Market Capitalization, Operating History, Net Income, Amount of Publicly Held Shares and Number of Shareholders.	Must meet financial and liquidity criteria under at least one category of Standards. Criteria include: Stockholders' Equity, Market Capitalization, Pre-tax Income, Amount of Publicly Held Shares and Number of Shareholders.	OTCQX: Must meet minimum financial and liquidity criteria  OTCQB and OTCPink: No financial and liquidity criteria
<b>Minimum Share Price</b>		Nasdaq Global Select Market: \$4.00 Nasdaq Global Market: \$4.00 Nasdaq Capital Market: \$2.00	NYSE: \$4.00 NYSE American: \$2.00	OTCQX: \$0.10 OTCQB: \$0.01 OTCPink: None
<b>Corporate Governance Requirements</b>		<ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee and compensation committee</li> <li>• Majority of independent directors</li> </ul>	<ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee and compensation committee</li> <li>• Majority of independent directors</li> </ul>	OTCQX and OTCQB: <ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee</li> <li>• Two independent directors</li> </ul> OTCPink: No requirements
<b>Reporting Requirements</b>		Required to file quarterly and annual reports	Required to file quarterly and annual reports	Not required to make regular filings
<b>Registration Requirements</b>		Required to register with the SEC	Required to register with the SEC	Not required to register with the SEC

<sup>1</sup>Source: Global Market Intelligence

## ■ Public Capital Markets: Canada

As of November 30, 2017, six cannabis-related companies were trading on the TSX, 20 were trading on the TSXV and 41 were trading on the CSE. Most of the publicly traded cannabis-related companies in Canada are licensed producers under Canada's Access to Cannabis for Medical Purposes Regulations, which allow a company to produce and sell medical cannabis products in Canada. A number of companies traded on the CSE also have cannabis-related operations in the United States. The following table provides a summary of cannabis-related companies traded on Canadian stock markets.

Summary of Canadian Publicly Traded Cannabis-Related Companies

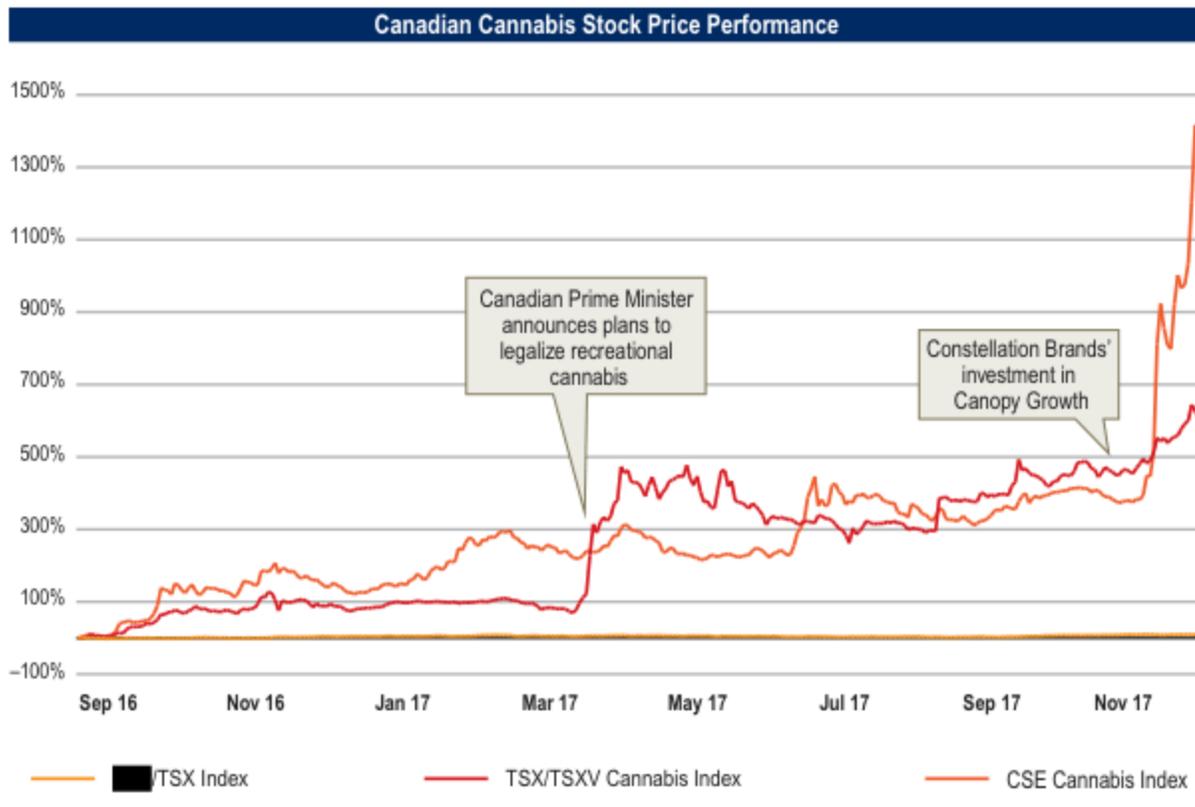
(As of November 30, 2017)

	Number of Companies	Average (\$U.S. millions)					
		Market Value	Enterprise Value	Cash	Debt	LTM Revenue	LTM EBITDA
Toronto Stock Exchange (TSX)	6	\$1,361.5	\$1,311.4	\$71.0	\$20.8	\$26.6	\$0.8
TSX Venture Exchange (TSXV)	20	131.5	123.9	10.8	3.3	1.2	-3.5
Canadian Securities Exchange (CSE)	41	72.6	72.0	2.0	1.4	1.8	-2.8
<b>Canada</b>	<b>67</b>	<b>\$210.6</b>	<b>\$203.3</b>	<b>\$11.1</b>	<b>\$3.8</b>	<b>\$4.0</b>	<b>-\$2.2</b>

Source: ■ Global Market Intelligence. Companies that are traded on more than one market are included in their primary market as determined by ■ Global Market Intelligence, based on stock price history, trading volume and availability of estimates. Enterprise Value is defined as Market Value plus Debt minus Cash and Cash Equivalents. LTM is Last Twelve Months. EBITDA is defined as Earnings Before Interest, Taxes, Depreciation and Amortization.

### Stock Price Performance of Canadian Publicly Traded Cannabis-Related Companies

The following chart shows the stock price performance of selected publicly traded cannabis-related companies in Canada since September 30, 2016. The chart indicates that the stock price performance of cannabis-related companies trading on Canadian markets received a boost from the announcement of the proposed recreational cannabis legislation in Canada by Prime Minister Justin Trudeau and, more recently, from Constellation Brands' investment in Canopy Growth.



### Capital Raised by Canadian Publicly Traded Cannabis-Related Companies

The following table shows the amount of capital (equity and debt) raised by cannabis-related companies traded on Canadian stock markets in the twelve months ended September 30, 2017.

**Capital Raised by Canadian Publicly Traded Cannabis-Related Companies (LTM ended September 30, 2017)**



<b>Amount Raised</b>	\$403	\$334	\$319	\$1056
<b>Number of Deals</b>	11	21	28	60
<b>Average Deal Size</b>	\$37	\$16	\$11	\$18

Source:  Global Market Intelligence

### Financial Data and Trading Multiples of Canadian Publicly Traded Cannabis-Related Companies

The following tables show selected financial and trading information of cannabis-related companies that are publicly traded on Canadian markets.

## Toronto Stock Exchange

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples		Forward Revenue Multiples		Forward EBITDA Multiples	
								Revenue	EBITDA	2018	2019	2018	2019
Aphria Inc.	TSX:APH	\$8.91	9.9%	\$1,350.2	\$1,281.7	\$17.7	\$3.8	72.4x	NM	37.7x	9.9x	NM	27.5x
Aurora Cannabis Inc.	TSX:ACB	6.21	7.6%	2,483.5	2,406.8	18.6	-4.7	NM	NM	48.6	13.6	NM	30.4
CanniMed Therapeutics Inc.	TSX:CMED	15.15	10.9%	347.8	315.8	12.0	2.0	26.3	NM	10.6	5.4	48.5x	13.3
Canopy Growth Corporation	TSX:WEED	14.30	15.1%	2,720.6	2,641.7	46.3	1.9	57.1	NM	39.7	11.7	NM	NM
MedReleaf Corp.	TSX:LEAF	12.66	13.7%	1,146.2	1,094.8	32.9	9.7	33.3	NM	30.8	9.4	NM	27.0
Neptune Technologies & Bioresources Inc.	TSX:NEPT	1.54	15.0%	120.8	127.4	32.4	3.7	3.9	NM	6.0	4.3	NM	NM
<b>Median</b>			<b>12.3%</b>	<b>\$1,248.2</b>	<b>\$1,188.3</b>	<b>\$25.5</b>	<b>-\$0.1</b>	<b>33.3x</b>	<b>NM</b>	<b>34.2x</b>	<b>9.6x</b>	<b>48.5x</b>	<b>27.3x</b>

## TSX Venture Exchange

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples		Forward Revenue Multiples		Forward EBITDA Multiples	
								Revenue	EBITDA	2018	2019	2018	2019
ABCann Global Corporation	TSXV:ABCN	\$1.13	19.9%	\$152.7	\$129.7	\$0.7	-\$8.7	NM	NM	11.2x	2.6x	NM	9.2x
Cannabis Wheaton Income	TSXV:CBW	0.68	56.5%	157.2	157.0	0.1	-6.2	NM	NM	NA	NA	NA	NA
Cronos Group Inc.	TSXV:MJN	3.38	9.0%	503.2	494.0	2.3	2.5	NM	NM	16.1	5.8	NM	17.6
Delta 9 Cannabis Inc.	TSXV:NINE	2.37	23.8%	143.9	145.5	0.4	-1.7	NM	NM	NA	NA	NA	NA
Emblem Corp.	TSXV:EMC	1.26	64.6%	117.1	108.0	1.8	-7.5	59.4x	NM	10.5	2.0	NA	5.6
Emerald Health Therapeutics	TSXV:EMH	2.27	4.6%	213.8	195.6	0.6	-4.3	NM	NM	46.6	NA	NA	NA
Harvest One Cannabis Inc.	TSXV:HVST	0.71	18.6%	63.7	54.1	0.2	-4.5	NM	NM	17.0	1.8	NA	9.2
Hempool Food and Fiber Inc.	TSXV:HEMP	1.66	31.6%	77.5	77.4	4.7	-1.3	16.5	NM	NA	NA	NA	NA
ICC International Cannabis	TSXV:ICC	0.76	44.3%	104.6	102.5	0.1	-4.5	NM	NM	6.4	1.1	NM	4.0
Invictus MD Strategies Corp.	TSXV:IMH	1.12	33.6%	89.6	66.7	1.8	-10.3	37.6	NM	27.3	3.6	NM	13.3
LGC Capital Ltd.	TSXV:LG	0.29	24.0%	79.6	76.6	0.0	-1.7	NM	NM	NA	NA	NA	NA
Maple Leaf Green World Inc.	TSXV:MGW	0.46	24.4%	67.3	64.2	0.4	-1.1	NM	NM	NA	NA	NA	NA
National Access Clinic Corp.	TSXV:NAC	0.40	30.1%	24.0	25.0	0.7	-2.4	36.7	NM	NA	NA	NA	NA
Naturally Splendid Enter.	TSXV:NSP	0.21	45.0%	20.4	20.9	1.9	-4.3	10.9	NM	NA	NA	NA	NA
Newstrike Resources Ltd.	TSXV:HIP	0.39	16.7%	151.1	152.1	0.0	-0.3	NM	NM	NA	NA	NA	NA
Organigram Holdings Inc.	TSXV:OGI	2.61	15.7%	277.4	244.2	4.0	-5.2	60.7	NM	9.7	3.4	46.5x	12.6
Tetra Bio-Pharma Inc.	TSXV:TBP	0.54	14.8%	63.6	62.0	0.0	-3.9	NM	NM	NA	NA	NA	NA
The Hydrothecary Corp.	TSXV:THCX	1.92	17.7%	149.8	133.3	3.3	-0.6	40.7	NM	15.8	3.6	NM	29.8
Viridium Pacific Group Ltd.	TSXV:VIR	1.09	15.2%	49.5	48.6	0.0	-0.1	NM	NM	NA	NA	NA	NA
WeedMD Inc.	TSXV:WMD	1.69	12.8%	123.2	121.0	0.5	-3.1	NM	NM	9.9	2.3	NM	8.6
<b>Median</b>			<b>21.6%</b>	<b>\$110.8</b>	<b>\$105.3</b>	<b>\$0.5</b>	<b>-\$2.0</b>	<b>37.6x</b>	<b>NM</b>	<b>13.5x</b>	<b>2.6x</b>	<b>46.5x</b>	<b>9.2x</b>

Source: Global Market Intelligence. Not Meaningful (NM) used for negative multiples, and for revenue multiples greater than 100.0x and EBITDA multiples greater than 50.0x. Not Available (NA) used for information that is not available. Enterprise Value is defined as Market Value plus Debt minus Cash and Cash Equivalents. LTM is Last Twelve Months. EBITDA is defined as Earnings Before Interest, Taxes, Depreciation and Amortization.

Canadian Securities Exchange

(\$U.S. millions, except stock price)

Company	Ticker	Stock Price 11/30/17	% Below 52-Week High	Market Value	Enterprise Value (EV)	LTM Revenue	LTM EBITDA	LTM EV Multiples		Forward Revenue Multiples		Forward EBITDA Multiples	
								Revenue	EBITDA	2018	2019	2018	2019
Alliance Growers Corp.	CSE:ACG	\$0.16	20.0%	\$6.9	\$6.8	\$0.0	\$0.0	NM	NM	5.0x	0.3x	NM	0.8x
Alternate Health Corp.	CSE:AHG	1.52	78.0%	79.3	76.6	10.3	-6.4	7.4x	NM	NA	NA	NA	NA
Beleave Inc.	CSE:BE	1.38	37.5%	44.8	44.1	0.0	-8.8	NM	NM	11.4	NA	NM	NA
Canada House Wellness Group Inc.	CSE:CHV	0.29	43.3%	35.6	36.3	4.4	-4.1	8.2	NM	NA	NA	NA	NA
CannaRoyalty Corp.	CSE:CRZ	2.28	41.2%	96.9	96.3	2.2	-8.6	44.2	NM	3.1	1.8	17.0x	8.1
CannTrust Holdings Inc.	CSE:TRST	5.43	12.5%	471.8	466.3	12.6	5.2	36.9	NM	9.0	5.5	31.8	20.6
DOJA Cannabis Company Limited	CSE:DOJA	1.06	8.7%	16.2	16.0	0.0	-0.1	NM	NM	NA	NA	NA	NA
Eviانا Health Corporation	CSE:EHC	1.09	30.0%	16.7	17.2	0.0	0.0	NM	NM	NA	NA	NA	NA
Friday Night Inc.	CSE:TGIF	0.39	13.8%	60.3	61.2	0.8	-1.9	74.3	NM	NA	NA	NA	NA
Future Farm Technologies Inc.	CSE:FFT	0.37	23.8%	37.2	37.7	0.3	-7.5	NM	NM	NA	NA	NA	NA
International Cannabrand Inc.	CSE:JUJU.A	0.18	20.5%	1.8	2.4	0.2	-1.2	14.8	NM	NA	NA	NA	NA
Global Cannabis Applications Corp.	CSE:APP	0.26	20.9%	10.5	10.7	0.0	-1.1	NM	NM	NA	NA	NA	NA
Global Hemp Group Inc.	CSE:GHG	0.09	17.2%	14.3	14.4	0.0	0.0	NM	NM	NA	NA	NA	NA
Golden Leaf Holdings Ltd.	CSE:GLH	0.27	36.4%	110.1	115.5	7.9	-10.6	14.6	NM	NA	NA	NA	NA
HealthSpace Data Systems Ltd.	CSE:HS	0.08	23.1%	8.7	9.8	1.9	-1.5	5.1	NM	NA	NA	NA	NA
High Hampton Holdings Corp.	CSE:HC	0.30	22.0%	3.8	3.7	0.0	-0.3	NM	NM	NA	NA	NA	NA
InMed Pharmaceuticals Inc.	CSE:IN	0.52	30.2%	67.5	62.7	0.0	-4.6	NM	NM	NA	NA	NA	NA
Isodiol International Inc.	CSE:ISOL	1.14	18.8%	251.2	250.7	14.2	0.6	17.6	NM	NA	NA	NA	NA
Kaneh Bosm BioTechnology Inc.	CSE:KBB	0.06	37.5%	0.8	0.7	0.0	0.0	NM	NM	NA	NA	NA	NA
Liberty Health Sciences Inc.	CSE:LHS	1.33	33.2%	377.5	377.5	0.0	0.0	NM	NM	NA	NA	NA	NA
Liberty Leaf Holdings Ltd.	CSE:LIB	0.21	11.5%	20.2	19.7	0.0	-1.9	NM	NM	NA	NA	NA	NA
Lifestyle Delivery Systems Inc	CSE:LDS	0.50	26.4%	46.0	44.6	0.7	-5.1	65.3	NM	NA	NA	NA	NA
Lotus Ventures Inc.	CSE:J	0.40	16.1%	17.8	17.7	0.0	-0.5	NM	NM	NA	NA	NA	NA
Marapham Ventures Inc.	CSE:MDM	0.76	44.6%	71.4	69.8	0.4	-3.6	NM	NM	NA	NA	NA	NA
Maricann Group Inc.	CSE:MARI	1.76	15.9%	162.7	162.2	3.1	-14.3	52.9	NM	9.8	2.0	NM	5.8
Matica Enterprises Inc.	CSE:MMJ	0.25	5.8%	57.1	56.0	0.0	-1.8	NM	NM	NA	NA	NA	NA
MPX Bioceutical Corporation	CSE:MPX	0.39	51.5%	100.7	108.0	10.6	-3.5	10.2	NM	5.2	2.9	NM	12.3
MYM Nutraceuticals Inc.	CSE:MYM	2.15	7.7%	200.8	200.4	0.3	-0.9	NM	NM	NA	NA	NA	NA
Platinex Inc.	CSE:PTX	0.10	28.9%	9.9	9.8	0.0	-0.7	NM	NM	NA	NA	NA	NA
PUF Ventures Inc.	CSE:PUF	0.79	11.3%	41.2	39.6	0.0	-1.2	NM	NM	NA	NA	NA	NA
Quadron Cannatech Corporation	CSE:QCC	0.19	44.4%	10.7	10.0	1.7	-0.7	6.0	NM	NA	NA	NA	NA
Quinsam Capital Corporation	CSE:QCA	0.34	24.1%	15.0	12.8	0.0	0.1	NM	NM	NA	NA	NA	NA
Ravenquest Biomed Inc.	CSE:RVT	0.03	47.1%	1.0	1.1	0.0	-0.2	NM	NM	NA	NA	NA	NA
Supreme Pharmaceuticals Inc.	CSE:SL	1.06	33.2%	219.3	202.5	1.2	-13.4	NM	NM	16.6	2.5	NM	7.8
TerrAscend Corp.	CSE:TER	1.33	13.6%	61.9	61.0	0.0	-4.3	NM	NM	NA	NA	NA	NA
THC Biomed Intl Ltd.	CSE:THC	0.59	33.9%	65.4	66.8	0.0	-1.2	NM	NM	NA	NA	NA	NA
True Leaf Medicine International Ltd.	CSE:MJ	0.69	9.2%	46.4	45.9	0.8	-2.4	56.9	NM	NA	NA	NA	NA
Valens Groworks Corp.	CSE:VGW	0.85	33.9%	52.0	51.8	0.0	-3.4	NM	NM	NA	NA	NA	NA
Veritas Pharma Inc.	CSE:VRT	0.69	5.3%	28.5	27.8	0.0	-2.4	NM	NM	NA	NA	NA	NA
Vodis Pharmaceuticals Inc.	CSE:VP	0.30	61.0%	9.2	10.7	0.0	-3.6	NM	NM	NA	NA	NA	NA
Wildflower Marijuana Inc.	CSE:SUN	0.52	46.0%	27.5	27.4	0.2	-0.8	NM	NM	NA	NA	NA	NA
<b>Median</b>			<b>24.1%</b>	<b>\$41.2</b>	<b>\$39.6</b>	<b>\$0.0</b>	<b>-\$1.5</b>	<b>16.2x</b>	<b>NM</b>	<b>9.0x</b>	<b>2.2x</b>	<b>24.4x</b>	<b>8.0x</b>

## Comparison of Canadian Stock Markets

Similar to stock markets in the United States, Canadian stock markets vary significantly in terms of their financial, liquidity and corporate governance requirements. Most Canadian publicly traded cannabis-related companies trade on the CSE due to its less stringent requirements, as compared to the TSX and TSXV. More than 10% of the companies traded on the CSE are cannabis-related companies. The following chart provides a comparison of the TSX, TSXV and CSE.

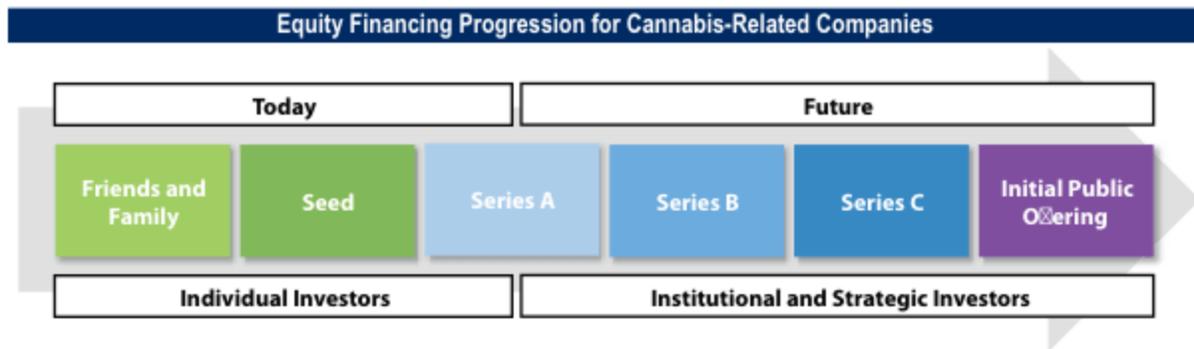
		Canadian Stock Market Comparison		
		Toronto Stock Exchange (TSX)	TSX Venture Exchange (TSXV)	Canadian Securities Exchange (CSE)
Number of Listed Companies	Total	1487	1791	337
	Cannabis-related	6	20	41
Market Value <sup>1</sup>	Total (\$U.S.)	\$2.0 trillion	\$33.7 billion	\$6.2 billion
	Median (\$U.S.)	\$282.6 million	\$5.0 million	\$6.1 million
Listing or Trading Requirements		Must meet financial and liquidity criteria determined by a company's industry. Criteria include: Earnings, Revenue, Cash Flow, Net Tangible Assets, Adequate Working Capital, Cash, Market Capitalization, Amount of Publicly Held Shares and Number of Shareholders.	Must meet financial and liquidity criteria determined by a company's industry. Criteria include: Net Tangible Assets, Revenue, Adequate Working Capital, Property, Operating History, Amount of Publicly Held Shares and Number of Shareholders.	Must meet financial and liquidity criteria determined by a company's industry and whether the company is an operating company. Criteria include: Revenue, Assets, Amount of Publicly Held Shares and Number of Shareholders.
Corporate Governance Requirements		<ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee</li> <li>• Two independent directors</li> </ul>	<ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee</li> <li>• Two independent directors</li> </ul>	<ul style="list-style-type: none"> <li>• Annual audit</li> <li>• Audit committee</li> </ul>
Reporting Requirements		Required to file quarterly and annual reports	Required to file quarterly and annual reports	Required to file quarterly and annual reports

<sup>1</sup>Source: Global Market Intelligence

## ■ Private Capital Markets

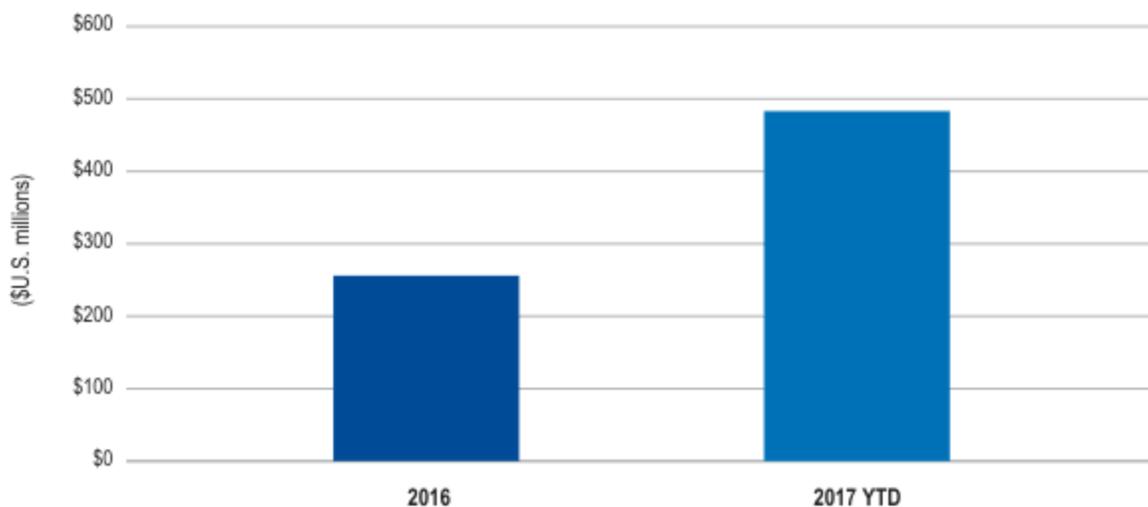
The cannabis industry today is replete with early-stage private companies seeking to raise capital. This capital, whether equity or debt, may be available from (i) “friends and family,” (ii) more formalized groups and networks of “angel” investors, (iii) family offices, (iv) dedicated cannabis investment funds (currently few in number, but growing), and (v) strategic investors. However, because of the legal considerations, traditional institutional investors—most notably the venture capital and private equity communities—continue to be mostly absent from the market.

As with most early-stage companies in other industries, many emerging cannabis-related companies are trying to follow the typical progression of raising equity capital, as illustrated in the following chart.



The following table provides a summary of the reported capital (equity and debt) raised by private cannabis-related companies in 2016 and year to date through November 30, 2017. While the table indicates that significant capital is available in the private markets, we believe that the dearth of accessible institutional capital makes it challenging for many companies to raise subsequent rounds of financing after successfully securing their start-up capital. In addition, the amount raised per transaction is small and there have been very few announced financings of meaningful size by private companies. While we believe that the data is informative, it is challenging to get accurate and comprehensive data for the number and dollar amount of transactions that occur in private markets within the cannabis industry because of the number of transactions that are not reported.

## Total Capital Raised by Private Cannabis-Related Companies Globally



<b>Amount Raised</b>	\$256	\$483
<b>Number of Deals</b>	65	102
<b>Average Deal Size</b>	\$4	\$5

Source: Ackrell Capital

The following table shows the scarcity of large transactions announced by private cannabis-related companies for the year to date through November 30, 2017.

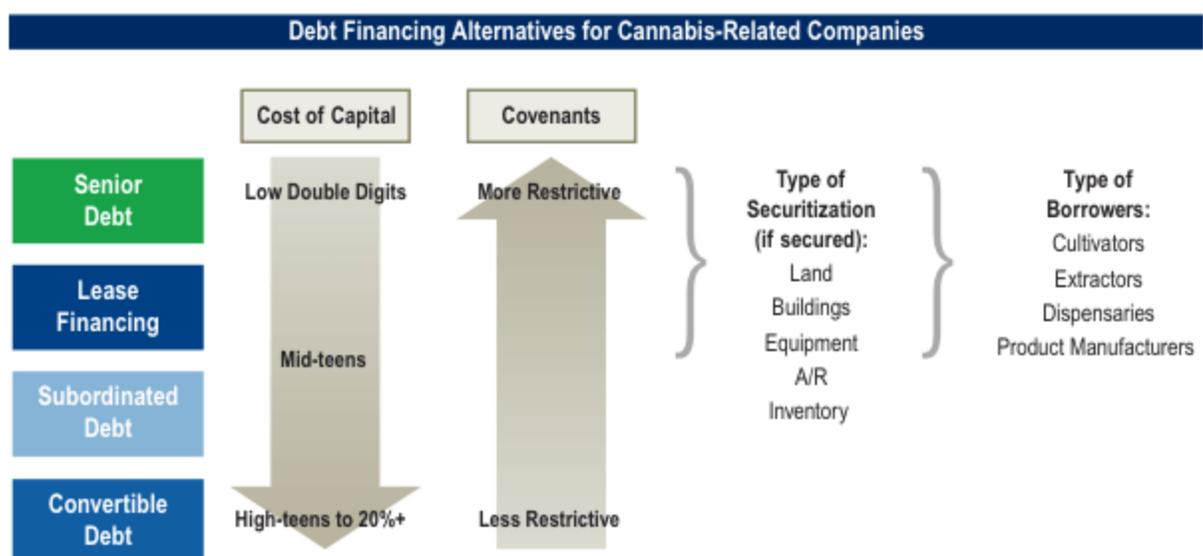
## Selected Financings by Private Cannabis-Related Companies (YTD through November 30, 2017)

(\$U.S. millions)

Issuer	Amount	Date
düber Technologies Inc.	\$50.0	September 2017
Eaze Solutions, Inc.	27.0	September 2017
Surterra Holdings LLC	13.4	September 2017
Teewinot Life Sciences Corporation	12.3	April 2017
Hound Labs, Inc.	8.1	May 2017
iUNU, Inc.	6.3	August 2017
Green Leaf Medical, LLC	5.9	June 2017
RX Green Solutions LLC	5.3	July 2017
River Collective	5.0	April 2017
Greene Fox Enterprises	5.0	May 2017

In addition, an increasing number of direct lenders are participating in the private debt markets for cannabis-related companies. These lenders represent an important capital source for the industry, as typical forms of debt capital, such as bank financing, remain unavailable to most companies. As in other industries, debt financing is typically available only to those companies having meaningful cash flow or tangible assets to secure the debt. While the number of lenders is increasing, there is still a relative scarcity of debt capital available to the cannabis industry, which can lead to a higher debt cost of capital of 200–500 basis points or more for cannabis-related companies, as compared to companies in other industries.

The following chart illustrates the type of debt that may be available to cannabis-related companies, representative terms of such debt, and the types of companies that may be able to access debt in the private markets.



## ■ Final Thoughts

As stated previously, valuations and stock price fluctuations in the cannabis industry continue to be driven more by expectations for the cannabis industry in general than by individual company fundamentals. Today, in the public markets, trading volumes are too low, trading prices are too volatile and operating histories are too limited to place any reliance on current valuation levels in the cannabis industry. We believe that this dynamic will continue until cannabis-related companies have matured and start to realize meaningful revenue, profitability and other financial metrics that will allow investors to evaluate companies within the industry by more traditional methodology.

It is still too early to know how the cannabis industry or its sectors will be valued in the future. It may come to pass that companies in the cannabis industry are valued comparably to public companies in industries with similar characteristics, such as the alcohol, tobacco, pharmaceutical and consumer

products industries, especially as companies from those industries look to enter the cannabis industry, through acquisition or by other means.

As demonstrated by the more than \$2.0 billion raised by publicly traded and private cannabis-related companies in 2017, capital continues to be available to support the growth of the industry. In the public markets, we believe that Canadian stock markets will continue to be the most receptive globally (until more progress is made in the United States toward federal legalization of cannabis).

Overview of Canadian and U.S. Stock Markets					
	Canada			United States	
					
	Toronto Stock Exchange (TSX)	TSX Venture Exchange (TSXV)	Canadian Securities Exchange (CSE)	Nasdaq/NYSE	OTC
Summary	Largest exchange in Canada and one of world's largest	Affiliate of the TSX for smaller capitalization companies	Perceived as the "OTC" of the Canadian markets by many investors	Largest and most recognized stock exchanges in the world	Negative reputation with many investors and regulators
Benefits	High volume of trading and liquidity; brand recognition; strong institutional support	Possible uplisting to the TSX; better brand than the CSE	Receptive to companies with U.S. cannabis operations; very few listing requirements	High volume of trading and liquidity; brand recognition; strong institutional support	Possible uplisting to other markets; very few requirements to trade
Issues	Not receptive to companies that violate U.S. federal law	Not receptive to companies that violate U.S. federal law; limited liquidity for small issues	Limited trading volume and liquidity; significant price fluctuations; limited institutional support	Stringent listing requirements	Limited trading volume and liquidity; significant price fluctuations; limited institutional support
Outlook	Expected to continue to attract the largest Canadian companies in the cannabis industry	Viable exchange for smaller Canadian companies with no cannabis operations in the United States	Viable exchange for smaller Canadian companies with cannabis operations in the United States	With few exceptions, cannabis companies will not be able to list while federal prohibition continues	Cannabis companies will continue to trade on the OTC despite the limited benefits

Although capital continues to be available for select issuers in both the public and private markets, we believe that the cannabis industry will continue to face a large funding gap for the foreseeable future, driven by the lack of institutional investors. However, we believe a growing number of retail, institutional and family office investors will support the industry in 2018 and beyond.

## CHAPTER VIII

# Top 100

# Private Cannabis Companies 2018

In this chapter, we present our current list of the Top 100 Private Cannabis Companies. Our determination to include companies on the list is subjective, and the list is intended to be a cross-section of the types of companies in the cannabis industry. Our list comprises privately held companies, primarily U.S. companies, companies we believe have a strong reputation or position in their market segments and companies pursuing a line of business we consider promising. We intend to update our list periodically, and we expect it may change significantly over time.

Most companies on our list are in early stages of development, and many will need to raise capital to succeed. Raising capital for early-stage companies in any industry is extremely challenging. Early-stage cannabis companies seeking capital face the same challenges as early-stage companies in other industries but must also address challenges unique to the cannabis industry. Although we hope the companies on our list ultimately succeed, we expect some will go out of business for any number of reasons, including lack of access to capital.

Inclusion in our list does not represent an investment recommendation or endorsement of any particular company or product. We have made investments in and conducted investment banking and other services for companies included in the *Top 100 Private Cannabis Companies 2018* list, and may do so in the future. Readers should be aware that we may have a conflict of interest that could affect the objectivity of our decision to include a company in the list. For additional disclosures and disclaimers, see page 175.

## Top 100 Private Cannabis Companies 2018

AEssenseGrows	Défoncé	Jetty Extracts	River Collective
Ample Organics	Dixie Elixirs	Kikoko	Rubicon Organics
Apeks Supercritical	Dosist	KIVA Confections	S2S Development
The Apothecarium	Eaze Solutions	Korova	SC Laboratories
Auntie Dolores	Eel River Organics	LeafLink	Scrubbed
Baker Technologies	Elemental Wellness	Leafly	SPARC
BAS Research	Euflora	Level Blends	Spectrum King
BDS Analytics	Evolve Therapeutics	LivWell Enlightened Health	Steep Hill Labs
Beboe	Evuxe Laboratories	Lunchbox Alchemy	StickyGuide
Berkeley Patients Group	Flow Kana	Mary's Medicinals	Strainz
BioTrackTHC	Flowhub	Meadow	Teewinot Life Sciences
Bloom Farms	FunkSac	Merry Jane	Tikun Olam
Brewbudz	Garden State Dispensary	MiNDFUL	Treez
Bud and Bloom	GFarmaLabs	MJ Freeway	Trellis
Calyx Brands	Gold Coast Extracts	MJardin	Trulieve
Cannabis Reports	Green Dot Labs	MM Acquisition Co.	Utopia Farms
CannaCraft	Green Flower Media	Native Roots	VapeWorld
CannaKorp	Green Rush	New Vansterdam	Vapexhale
Colorado Harvest Company	The Green Solution	Northwest Cannabis Solutions	VCC Brands
Columbia Care	Harborside Health Center	NWT Holdings (Firefly)	Vuber
Confident Cannabis	Harvest	Organa Brands	Wana Brands
Cultivation Technologies	Headset	PAX Labs	Web Joint
Cura Cannabis Solutions	HelloMD	PharmaCielo	Weedguide
CW Analytical	Humboldt Legends	PRØHBTD Media	Weedmaps
Deep Cell	Incense Specialties	Qind	Wellness Connection of Maine

**AEssenseGrows** **Sunnyvale, California**  
[REDACTED]

AEssenseGrows is a producer of modular aeroponic systems for cannabis cultivation. The company develops full-scale cultivation systems equipped with software, automation and monitoring capabilities. Such systems enable cultivators to deliver nutrients to the plant more efficiently, and thus generate higher-yielding output than conventional cultivation systems.

**Ample Organics** **Toronto, Ontario**  
[REDACTED]

Ample Organics is a software developer for cannabis cultivators. The company offers a system to track all aspects of the cannabis cultivation business. The company's products enable medical cannabis producers in Canada to comply with Canadian law.

**Apeks Supercritical****Johnstown, Ohio**  
[REDACTED]

Apeks Supercritical is a provider of botanical oil extraction systems that utilize subcritical and supercritical CO<sub>2</sub> gas as a solvent. The company's fully automated systems range from a 1-liter benchtop system to a 40-liter production system. These systems provide consistent extraction results for the production of cannabis concentrates.

**The Apothecarium****San Francisco, California**  
[REDACTED]

The Apothecarium is an operator of recreational and medicinal cannabis dispensaries. The company offers cannabis flower, concentrates, edibles and accessories throughout its locations in California and Nevada.



## Auntie Dolores

Oakland, California

Auntie Dolores is a producer of branded cannabis-infused edibles. The company produces a variety of edibles, including pretzels, biscuits, brownies, cookies, corn and nuts. The company's products are sold directly to cannabis consumers and through cannabis dispensaries in California.



## BAS Research

Berkeley, California

BAS Research is a cannabis research and manufacturing company. The company provides its clients with bulk cannabis oil, cannabis-oil extraction consulting services, contract manufacturing and fulfillment.



## Baker Technologies

Denver, Colorado

Baker Technologies provides a customer relationship management platform for cannabis dispensaries and brands. The company provides messaging, loyalty programs and online ordering features to enable cannabis dispensaries to attract and retain cannabis consumers.



## BDS Analytics

Boulder, Colorado

BDS Analytics is a provider of data analytics solutions to the cannabis industry. The company tracks data from point-of-sale systems to provide insight into consumer buying patterns. The company sells its solutions to a wide range of customers.

**Beboe****Los Angeles, California**  
[REDACTED]

Beboe is a producer of branded cannabis products. The company's cannabis oil vaporizers and cannabis-infused edibles are available in dispensaries throughout California.

**Berkeley Patients Group****Berkeley, California**  
[REDACTED]

Berkeley Patients Group is an operator of a cannabis dispensary. The company retails a broad variety of cannabis products, including flower, pre-rolls, concentrates, edibles, topicals, seeds and accessories. It also operates an online e-commerce portal and offers a limited same-day delivery service to patients in Berkeley, California and the surrounding area.

**BioTrackTHC****Ft. Lauderdale, Florida**  
[REDACTED]

BioTrackTHC is a provider of compliance and business management software for the retail cannabis industry. The company's software platform is designed for inventory and sales management to track the seed-to-sale process and is used by recreational and medicinal dispensaries, cultivators and state governments.

**Bloom Farms****San Francisco, California**  
[REDACTED]

Bloom Farms is a producer of branded cannabis products, including cannabis oil and flower. The company's products are available in dispensaries throughout California.



### Brewbudz

San Diego, California  
www.brewbudz.us

Brewbudz is a manufacturer of branded cannabis-infused products. The company develops cannabis-infused coffee, tea and cocoa pods that can be used in Keurig® systems. Its products are available in select dispensaries in Nevada.



### Bud and Bloom

Santa Ana, California

Bud and Bloom is the operator of a cannabis dispensary. The company offers cannabis flower, concentrates, edibles and accessories and sells these products at its Santa Ana location.



### Calyx Brands

Oakland, California

Calyx Brands is a cannabis distribution company. The company engages in the distribution, transportation and marketing of cannabis products.



### Cannabis Reports

Berkeley, California

Cannabis Reports is a publisher of industry data for cannabis users and business owners. The company offers news, studies, product information and dispensary information.

**CannaCraft**

Santa Rosa, California

CannaCraft is a producer of branded strain-specific cannabis concentrates and cannabis-infused edibles. The company provides a range of high-THC products, including concentrate cartridges, oils, softgels, sprays and straws. It focuses on providing concentrates of the most popular cannabis flower strains. Products are sold through cannabis dispensaries in California. The company manufactures its products under the AbsoluteXtracts, Care By Design and Satori brands.

**Colorado  
Harvest Company**

Denver, Colorado

Colorado Harvest Company is an operator of recreational and medicinal cannabis dispensaries and cultivation facilities. The company's three dispensary locations retail flower, concentrates and edibles. It also operates an indoor hydroponic grow facility.

**CannaKorp**

Boston, Massachusetts

CannaKorp is a manufacturer of branded cannabis consumer products. The company produces the CannaCloud, a tabletop vaporizer system utilizing single-use cannabis-infused pods.

**Columbia Care**

New York, New York

Columbia Care is an operator of medical cannabis dispensaries and cultivation facilities. The company operates 27 medical dispensaries across 9 states and the District of Columbia under several brands, including Columbia Care, Curative Health, Patriot Care and SWC Arizona.

## Confident Cannabis



Palo Alto, California  
[REDACTED]

Confident Cannabis is a cannabis lab-testing and analytics company. The company allows users to view the results of their product testing and analytics in an online platform. Its technology can be integrated into dispensary websites.

## Cultivation Technologies



Coachella, CA  
[REDACTED]

Cultivation Technologies provides infrastructure, genetics, technology and branding to the legal cannabis industry. The company is building a campus for the development of pharmaceutical-grade cannabis products.

## Cura Cannabis Solutions



Portland, Oregon  
[REDACTED]

Cura Cannabis Solutions is a provider of cannabis concentrates. The company offers cannabis distillates and oils to consumers and edibles manufacturers. Its products are available in dispensaries throughout California, Nevada and Oregon.

## CW Analytical



Oakland, California  
[REDACTED]

CW Analytical is a cannabis lab-testing company that tests cannabis and cannabis-based products for potency, pesticides and microbiology. The company also consults with dispensaries and edibles manufacturers to provide best practices for product handling and product labeling.



## Deep Cell

Seattle, Washington  
[www.deepcell.industries](http://www.deepcell.industries)

Deep Cell is a synthetic biology and cannabis intellectual property holding company. The company provides licenses to companies who wish to produce Deep Cell's cannabis-infused sugar. Its products are available from Deep Cell licensees.



## Défoncé

Oakland, California  
[REDACTED]

Défoncé is a producer of branded cannabis-infused products, primarily focusing on chocolate-based edibles. The company offers a wide range of chocolate-bar flavors that are available in dispensaries located throughout California.



## Dixie Elixirs

Denver, Colorado  
[REDACTED]

Dixie Elixirs is a producer of branded cannabis-infused edibles. The company produces a wide range of products, including chocolate-based edibles, beverages, capsules, mints, energy shots, topicals and disposable vaporizer pens. The company's products are sold in many dispensaries throughout California and Colorado.



## Dosist

Los Angeles, California  
[REDACTED]

Dosist is a producer of cannabis vaporizers. The company develops pre-filled cannabis vaporizers that are designed to provide consumers with a specific mood. The company's products are available in dispensaries located throughout California.

**Eaze Solutions****San Francisco, California**  
[REDACTED]

Eaze Solutions is a developer and provider of an on-demand cannabis delivery-service application that enables consumers to order cannabis products via mobile devices. The company's mobile application allows users to access a daily menu of cannabis products for purchase and direct-to-consumer delivery.

**Eel River Organics****Sacramento, California**  
[REDACTED]

Eel River Organics is a producer of branded cannabis products from Humboldt County, California. The company offers cannabis flower, concentrates, vaporizer cartridges and cultivation equipment. Its products are available in select California dispensaries.

**Elemental  
Wellness****San Jose, California**  
[REDACTED]

Elemental Wellness is an operator of a cannabis dispensary and wellness center in San Jose, California. The company offers a range of cannabis flower, concentrates and edibles, as well as delivery services and a range of wellness classes.

**Eufloa****Denver, Colorado**  
[REDACTED]

Eufloa is an operator of four recreational cannabis dispensaries in Colorado. The company's locations sell flower, pre-rolls, concentrates, topicals, seeds, vaporizers and branded accessories. The company also cultivates numerous cannabis strains in its own grow facility.

**Evolve  
Therapeutics****San Francisco, California**  
[REDACTED]

Evolve Therapeutics is a biopharmaceutical company focused on the research and manufacture of cannabinoid-based medications. The company produces a variety of cannabis products that are available in dispensaries located throughout California.

**Evoxe  
Laboratories****Oakland, California**  
[REDACTED]

Evoxe Laboratories is a producer of cannabis vaporizers. The company develops pre-filled cannabis vaporizers that are designed to provide consumers with a specific mood. The company's products are available in dispensaries throughout California.

**Flow Kana****San Francisco, California**  
[REDACTED]

Flow Kana is a producer of cannabis flower. The company owns property in Mendocino County, where it plans to partner with small cultivators to create an institute for cannabis manufacturing, education and leisure.

**Flowhub****Denver, Colorado**  
[www.flowhub.co](http://www.flowhub.co)

Flowhub is a provider of inventory management software for the cannabis industry. The company provides software to aid cultivators and dispensary operators in tracking their business from seed to sale. The software is designed to aid customers in compliance.

## FunkSac



Denver, Colorado  
[REDACTED]

FunkSac is a provider of compliant packaging solutions for the medicinal and recreational cannabis industry. The company has a comprehensive product line manufactured with FDA-approved material and eco-friendly cannabis packaging solutions that are highly secure. FunkSac retails its products to cultivators, dispensaries and edibles manufacturers.

## GFarmaLabs



Anaheim, California  
[REDACTED]

GFarmaLabs is a producer of branded cannabis, cannabis-infused edibles, cannabis concentrates and vaporizer accessories. The company produces pre-rolls, beverages, chocolate-based edibles, honey, concentrate cartridges and injectors. GFarmaLabs sells its products through dispensaries in California and Washington. Its products are marketed as being produced from "100% indoor flower."

## Garden State Dispensary



Woodbridge, New Jersey  
[REDACTED]

Garden State Dispensary is a medicinal cannabis dispensary located in New Jersey. The company produces its own medical cannabis and offers a patient research and counseling program.

## Gold Coast Extracts



Los Angeles, California  
[REDACTED]

Gold Coast Extracts is an extraction consultant and producer of branded cannabis concentrates. The company provides extraction consulting services to cultivators and concentrates producers. It also produces an award-winning line of branded cannabis concentrates in shatter and wax form. The company's products are sold in dispensaries throughout California.

**Green Dot Labs****Boulder, Colorado**  
██████████

Green Dot Labs is a cultivation and extraction company that provides branded concentrates to consumers. The company operates an indoor hydrocarbon extraction facility and utilizes proprietary cannabis-flower genetics to produce whole-plant extracts. The company's products are available in dispensaries throughout Colorado.

**Green Flower Media****Ventura, California**  
██████████

Green Flower Media is a digital media company operating a website that offers cannabis industry information. The company offers online classes to customers who are interested in learning about all things cannabis-related. The company's website also offers informational live streams from industry professionals.

**Green Rush****San Mateo, California**  
██████████

Green Rush provides an online medical cannabis delivery service. The company offers a range of cannabis flower, concentrates, edibles, tinctures and accessories. It has partnered with hundreds of cannabis dispensaries in California, Colorado, Nevada, New York and Michigan.

**The Green Solution****Denver, Colorado**  
██████████

The Green Solution is an operator of medicinal and recreational cannabis dispensaries. The company's 15 locations retail flower, pre-rolls, concentrates, edibles, topicals, seeds, vaporizers and branded accessories. The company also produces its own line of branded concentrates and edibles.

## Harborside Health Center



Oakland, California

Harborside Health Center operates cannabis dispensaries. The company's two locations retail flower, pre-rolls, concentrates, edibles, seeds, topicals and accessories. The company sources cannabis-flower products from local cultivators.

## Headset



Seattle, Washington  
[www.headset.io](http://www.headset.io)

Headset is a data analytics company for businesses within the cannabis industry. The company offers a SaaS product that tracks market data, business intelligence and retailer-direct data with clients located in states where cannabis has been legalized.

## Harvest



San Francisco, California

Harvest is an operator of cannabis dispensaries. In addition to offering a full range of cannabis products, the company's dispensaries also serve as smoking lounges. The company has two locations in San Francisco.

## HelloMD



San Francisco, California

HelloMD provides a digital healthcare platform. The company provides prescriptions for medicinal-cannabis patients via online, live video consultations. The company also provides a dispensary locator and cannabis product reviews.

**Humboldt  
Legends**Trinidad, California  
[REDACTED]

Humboldt Legends is a producer of cannabis flower products sourced from Humboldt County, California. The company offers cannabis flower in eighths and pre-rolls. The company's products are available in dispensaries throughout California.

**Incense  
Specialties**

#THISTHINGRIPS®

Lake Worth, Florida  
[REDACTED]

Incense Specialties is a producer of cannabis vaporizers. The company designs and manufactures a line of vaporizer pens under the brand name "This Thing Rips." The company's products are available in more than 4,000 points of sale across the United States and Canada.

**Jetty Extracts**Oakland, California  
[REDACTED]

Jetty Extracts is a producer of cannabis vaporizers and cannabis concentrates. The company develops pre-filled cannabis vaporizers, cartridges and wax that offer the consumer formulations of both THC and CBD. The company's products are available in dispensaries throughout California.

**Kikoko**San Francisco, California  
[REDACTED]

Kikoko is a producer of branded cannabis-infused teas. The company offers a range of THC and CBD teas. Kikoko products are available in select California dispensaries.

**KIVA  
Confections**

San Leandro, California  
[REDACTED]

KIVA Confections is a producer of branded cannabis-infused edibles. The company's award-winning products are sold through cannabis dispensaries in California and Colorado.

**Korova**

Oakland, California  
[REDACTED]

Korova is a producer of branded cannabis-infused edibles. The company offers a selection of cannabis-infused cookies and brownies at varying potencies. The company's products are available in dispensaries located in California, Arizona and Nevada.

**LeafLink**

New York, New York  
[REDACTED]

LeafLink provides a software platform to facilitate e-commerce B2B sales, CRM and order fulfillment tracking of products for cannabis brands and dispensaries.

**Leafly**

Seattle, Washington  
[REDACTED]

Leafly is a digital media company. Its online directory and content platform for cannabis consumers provides information about locations of dispensaries, news pertaining to the cannabis industry and the effects of different cannabis strains.

**Level Blends**

San Francisco, California  
[REDACTED]

Level Blends is a producer of branded cannabis concentrates. The company utilizes a proprietary extraction process to produce a line of branded concentrates for use in vaporizers. The company's products are available in dispensaries throughout California.

**Lunchbox  
Alchemy**

Bend, Oregon  
[REDACTED]

Lunchbox Alchemy is a producer of branded cannabis-infused edibles and cannabis concentrates. The company produces cannabis-infused candies and macaroons, concentrate cartridges and ethanol tinctures. Its products are available in dispensaries throughout Oregon.

**LivWell  
Enlightened Health**

Denver, Colorado  
[REDACTED]

LivWell Enlightened Health is an operator of medicinal and recreational cannabis dispensaries and cultivation facilities. The company operates 15 retail locations in Colorado and Oregon and sells flower, pre-rolls, concentrates, edibles, topicals and branded accessories. It also operates an indoor cultivation facility and is recognized as the largest cannabis-sector employer in Colorado.

**Mary's Medicinals**

Denver, CO  
[REDACTED]

Mary's Medicinals is a producer of branded cannabis concentrates. The company provides a range of transdermal patches and pens, topicals and powders featuring cannabinoid-based concentrates. The company's award-winning products deliver cannabinoids, including THC and CBD as well as THCA, CBN and CBC.

## Meadow



San Francisco, California  
[REDACTED]

Meadow is a developer and provider of an on-demand cannabis delivery-service application for dispensaries. The company markets online and mobile-ordering applications for dispensaries. The web and mobile applications allow users to access a menu of cannabis products for purchase and direct-to-consumer delivery through dispensaries.

## Merry Jane



Los Angeles, California  
[REDACTED]

Merry Jane is a digital media company focused on the cannabis industry. The company's website provides commentary on recent events, pop culture, business, politics and health-related news. The company provides strain reviews and information, as well as a dispensary locator.

## MiNDFUL



Denver, Colorado  
[www.bemindful.today](http://www.bemindful.today)

MiNDFUL is an operator of recreational and medicinal cannabis dispensaries. The company operates five retail locations in Colorado and a single location in Illinois. The company sells flower, concentrates, edibles, topicals and branded accessories.

## MJ Freeway



Denver, Colorado  
[REDACTED]

MJ Freeway is a provider of enterprise management software for the cannabis industry. The company's core solution is a software platform for inventory and sales management to track the seed-to-sale process in compliance with state requirements. The software is used by recreational and medicinal dispensaries, infused-product manufacturers and cultivators.

## MJardin



Denver, Colorado  
[REDACTED]

MJardin is a provider of cannabis cultivation management services. The company offers facility design, inventory tracking, and management and operational consulting services. The company's services are available in states having medical or recreational laws.

## MM Acquisition Co.



Los Angeles, California

MM Acquisition Co. is a provider of turnkey real estate services and business services to cannabis cultivators and dispensary operators in California. The company operates in three business segments: Property Leasing Business, Services Business and Other Related Businesses.

## Native Roots



Denver, Colorado  
[REDACTED]

Native Roots is an operator of medicinal and recreational cannabis dispensaries and cultivation facilities. The company operates 21 dispensaries and retails flower, pre-rolls, concentrates, edibles and vaporizer accessories. The company also sells a line of branded hash-oil concentrates under the "Native Roots Extracts" brand. It operates an indoor cultivation facility and has won numerous industry awards for the operation.

## New Vansterdam



Vancouver, Washington  
[REDACTED]

New Vansterdam is an operator of a cannabis dispensary in Washington. The company offers a selection of cannabis flower, concentrates, edibles and topicals. It also offers online ordering.

## Northwest Cannabis Solutions



Olympia, Washington  
██████████

Northwest Cannabis Solutions is a manufacturer of white-label cannabis products. The company offers cannabis flower cultivation, extraction and infused edibles. It supplies dispensaries throughout Washington.

## NWT Holdings (Firefly)



San Francisco, California  
██████████

NWT Holdings is a vaporizer technology company. The company designs and manufactures branded convective-heating vaporizers under the "Firefly" brand. Its portable vaporizer is designed for use with concentrates and flower.

## Organa Brands



Denver, Colorado  
██████████

Organa Brands is a manufacturer and distributor of cannabis products and vaporizers. The company manufactures and retails its products under the Organa Labs, O.penVAPE, Bakked, Magic Buzz and District Edibles brands. The company's products are distributed through 1,200 dispensaries across ten states.

## PAX Labs



San Francisco, California  
██████████

PAX Labs is a vaporizer technology company that designs and manufactures branded vaporizers that use conductive heating. The company's portable vaporizers are designed for use with concentrates and flower.



**PharmaCielo**  
Rionegro, Colombia

PharmaCielo is an emerging global supplier of naturally grown and processed, standardized medicinal-grade cannabis extracts. The company holds the first cannabis-processing license issued under the legal framework of Colombia's cannabis laws and has one of the largest cultivation platforms in the cannabis industry, with more than 14.6 million square feet of company-owned or contracted open-air greenhouses in Colombia, South America.



**PRØHBTÐ Media**  
Los Angeles, California

PRØHBTÐ Media is a vertically integrated digital media company. The company provides digital agency services to cannabis brands, maintains a cannabis-related art, music, video, fashion, travel and lifestyle website and develops original media content focused on the cannabis industry.



**Qind**  
San Francisco, California

Qind is a producer and distributor of branded cannabis products, including flower, concentrates, edibles and other infused products. The company sells directly to consumers through in-home events, e-commerce and next-day home delivery. The company also provides educational materials and content to its customers through its social network.



**River Collective**  
Sacramento, California

River Collective is a distribution company for branded cannabis products. The company partners with businesses throughout California that produce cannabis flower, concentrates and edibles.

**Rubicon Organics****Bellingham, Washington**  
[REDACTED]

Rubicon Organics is a licensed cannabis cultivator specializing in the growing, processing, packaging and marketing of cannabis. The company is developing greenhouses in Washington and California.

**S2S Development****San Francisco, California**  
[REDACTED]

S2S Development is a contract manufacturer and distributor of cannabis products. The company provides manufacturing, co-packing, testing and distribution services to cannabis companies.

**SC Laboratories****Santa Cruz, California**  
[REDACTED]

SC Laboratories is a cannabis lab-testing company. The company tests cannabis and cannabis-based products for potency, pesticides and microbiology, adhering to FDA and other guidelines in its testing. The company also provides consulting services to cultivators, dispensaries and producers of cannabis-infused edibles to implement industry best practices.

**Scrubbed****San Francisco, California**  
[www.scrubbed.net](http://www.scrubbed.net)

Scrubbed is an outsourced bookkeeping, accounting and tax firm serving the cannabis industry. The company has a dedicated cannabis practice that provides clients with comprehensive turnkey accounting and tax solutions.

## SPARC



San Francisco, California

SPARC operates three cannabis dispensaries. It also provides lab-testing services. In addition to the company's dispensary locations, the company provides a direct-to-consumer delivery service for flower, pre-rolls, concentrates, edibles, seeds and accessories. The company performs in-house testing of its products and operates its own cultivation facility.

## Spectrum King



Canoga Park, California

Spectrum King is a producer of cannabis grow lights and accessories. The company offers a range of full-spectrum LED grow lights and grow tents. Its products are available through a network of international distributors.

## Steep Hill Labs



Berkeley, California

Steep Hill Labs is a cannabis lab-testing company that tests cannabis and cannabis-based products for potency, pesticides and microbiology. The company has developed QuantaCann2™, an in-field cannabis-testing technology system; GenKit™, a male cannabis-plant identification system; and Strain Fingerprint™, a graphical depiction of a strain's most common cannabinoids. The company has locations or licensees nationwide.

## StickyGuide



Los Angeles, California

StickyGuide is a digital media company that operates an online content and directory site focused on cannabis consumers. The company's website provides detailed cannabis-strain information as well as reviews. The company also provides a dispensary locator. The website maintains an active member base and an online user-generated content forum.

## Strainz



Las Vegas, Nevada

Strainz is a cannabis-brand management company. The company partners with producers to create cannabis oil cartridges and tinctures. Its products are available in dispensaries located in Colorado, Nevada and Washington.

## Teewinot Life Sciences



Tampa, Florida

Teewinot Life Sciences is a pharmaceutical company focused on the biosynthetic production of cannabinoids. The company has developed processes for cannabinoid formulations intended for cannabinoid-based human therapies.

## Tikun Olam



Safed, Israel

[www.tikun-olam.info](http://www.tikun-olam.info)

Tikun Olam produces and supplies cannabis in Israel. The company cultivates medical cannabis strains, conducts research and educates patients on the use of medical cannabis. It conducts business in Israel, Canada, Australia and the United States.

## Treez



Fremont, California

[www.treez.io](http://www.treez.io)

Treez is a software company that has developed an enterprise resource-management platform for cannabis dispensaries. The company provides software and services to support all aspects of operations in dispensaries located throughout a number of states.

**Trellis****Oakland, California**  
[REDACTED]

Trellis provides inventory-management software for the cannabis industry. The company provides software to aid cultivators, producers and dispensary operators in tracking their business from seed to sale. The software is designed to aid customers in compliance.

**Trulieve****Quincy, Florida**  
[REDACTED]

Trulieve is an operator of medical cannabis dispensaries in Florida, offering a selection of concentrates in the form of capsules, syringes, tinctures and vaporizers. The company also maintains its own cannabis cultivation facility.

**Utopia Farms****Santa Cruz, California**  
[www.utopiafarms.org](http://www.utopiafarms.org)

Utopia Farms is a producer of branded cannabis products. The company produces cannabis flower, concentrates and cannabis-infused macaroons that are available in dispensaries throughout California.

**VapeWorld****Boca Raton, Florida**  
[REDACTED]

VapeWorld operates an online e-commerce website dedicated to cannabis accessories. Vaporizers from leading manufacturers, as well as parts and accessories, are available on its website. The company also provides consumers with online content about vaping.



## Vapexhale

San Francisco, California  
[REDACTED]

Vapexhale is a vaporizer technology company that designs and manufactures branded vaporizers that use conductive heating. The company develops tabletop and portable vaporizers that are designed for use with concentrates and flower.



## VCC Brands

Los Angeles, California  
[REDACTED]

VCC Brands is a manufacturer of branded cannabis-infused products. The company offers cannabis-infused beverages, cookies, chocolates, teas, honeys, cooking oils and tinctures. Its products are available in dispensaries located throughout California and Washington.



## Vuber

Seattle, Washington  
[REDACTED]

Vuber is a manufacturer of cannabis vaporizers. The company designs and markets cannabis vaporizers and vaporizer accessories that are available in retail stores and dispensaries in Washington and Oregon. The company's products are also available online.



## Wana Brands

Boulder, Colorado  
[REDACTED]

Wana Brands is a producer of cannabis-infused products, including cannabis-infused candies and capsules. Its products are available in dispensaries in Colorado, Oregon and Nevada.

**Web Joint****Los Angeles, California**  
[REDACTED]

Web Joint is an online technology software-as-a-service company. The company provides software for dispensaries to manage point-of-sale transactions, online ordering and delivery management. The software integrates with a dispensary's website for a white-labeled software solution.

**Weedguide****San Diego, California**  
[REDACTED]

Weedguide is a digital media company that operates a cannabis-centric search engine and an informational website about recreational and medical cannabis. The site offers a collection of articles, videos, products, dispensary locations, recipes and strain information.

**Weedmaps****Orange County, California**  
[REDACTED]

Weedmaps is a digital media company that operates an online networking and content directory site. The company allows users to locate and view reviews of local cannabis dispensaries, as well as user-generated strain reviews.

**Wellness  
Connection of Maine****Portland, Maine**  
[www.mainewellness.org](http://www.mainewellness.org)

Wellness Connection of Maine is an operator of medical cannabis dispensaries in Maine. The company offers a selection of cannabis flower, concentrates, edibles and recipes.



## CHAPTER IX

# Cannabis Industry Risk Factors

Companies in the cannabis industry are subject to many risks. The realization of one or more of these risks could have a material adverse effect on the business and results of operations of a company and on its lenders, investors and principals. The following discussion highlights some, but not all, of these risks.

### Risks Related to U.S. Federal Law

- The manufacture, distribution, dispensing and possession of cannabis are strictly controlled under the Controlled Substances Act (CSA), irrespective of whether such activities comply with applicable state law. Financial transactions in connection with cannabis-related violations of the CSA may violate other federal laws. Individuals and businesses—including the principals, employees, directors, agents, lenders and investors of such businesses—that violate the CSA or such other laws are subject to fines, asset seizure and imprisonment under federal law.
- Federal statutes and policies that currently restrict or deprioritize enforcement of certain CSA violations related to cannabis are subject to expiration, rescission and other changes. There can be no assurance that in the future the federal government will not strictly and aggressively enforce cannabis-related CSA provisions.
- If CSA controls applicable to cannabis are relaxed or repealed in the future, other federal laws and regulations governing the production, distribution and marketing of products for human consumption, such as the Federal Food, Drug, and Cosmetic Act, may be more strictly enforced by the federal government in relation to the cannabis industry.
- CSA controls and federal enforcement priorities applicable to cannabis both preclude interstate commerce in cannabis and cannabis products. As a result, it can be costly or impractical for companies in the cannabis industry to operate in multiple states and to gain economies of scale through centralized operations.

- Federal income tax law precludes a business that “consists of trafficking in” cannabis or cannabis products from deducting certain operating expenses in determining its federal income tax. As a result, businesses in the cannabis industry may have effective tax rates significantly higher than other businesses subject to federal income tax, may owe tax on taxable income that is not actual economic income generated by the business and may have tax liabilities in amounts that exceed cash reserves.
- Because of CSA controls on cannabis and federal laws applicable to banks and other financial institutions, companies in the cannabis industry may not be able to open or maintain bank accounts or access products and services of traditional financial institutions, such as credit facilities, payment processing and insurance coverage. A lack of access to banking and other traditional financial products and services increases the time, effort and expense related to ongoing operations and increases risks associated with cash transactions and the use of alternative products and services.
- Trademarks used by companies to identify, distinguish or indicate the source of cannabis or related products or services that are illegal under federal law are not eligible for registration under federal trademark law, which is generally recognized as the most comprehensive trademark protection available in the United States. Alternative means of protecting such trademarks may not be available or may provide protections inferior to the protection provided by federal registration.
- Protections afforded under federal bankruptcy law generally are not available to companies whose assets consist of federally illegal cannabis products or proceeds therefrom or to the creditors of such companies.
- The federal government may pursue legal action against a state related to the state’s cannabis laws, which may result in significant changes to the state’s legal landscape as it relates to cannabis and may materially and adversely affect cannabis businesses in the state.
- Cannabis companies outside the United States whose business plans anticipate eventual access to U.S. markets face uncertainty as to the timing or nature of changes in federal law that would allow importation of cannabis products into the country.

### **Risks Related to U.S. State and Local Laws**

- State laws and regulations that legalize or decriminalize cannabis and related activities are relatively new and may change significantly or be reversed. The extent and nature of any such changes are not foreseeable and may force cannabis companies to materially alter their business models, suffer material losses or cease operations entirely.
- State and local laws may limit the number of cannabis businesses in the state or in a particular locality, restrict the nature of such businesses (for example, by prohibiting for-profit cannabis businesses) or place restrictions on the persons permitted to own or operate such businesses.
- Many state and local jurisdictions support legalizing or decriminalizing cannabis activities primarily for the potential to generate tax revenue, and there is significant public pressure to impose a heavy tax burden on those participating in the cannabis industry. State and local governments may impose significant taxes on commercial cannabis activity and may do so unpredictably.

- There is currently a lack of broad interstate reciprocity with respect to cannabis laws.
- Even in states where cannabis is legal under state law, local jurisdictions may impose bans or restrictions that materially interfere with or effectively prevent the operation of cannabis businesses within their boundaries.

### **Risks Related to the Manufacture and Sale of Cannabis Products**

- Cannabis companies are exposed to various product liability claims associated with human consumption of cannabis products, including claims that products cause injury, illness, possible side effects or interactions with other substances, or that products include inadequate instructions for use or warnings concerning health risks.
- Cannabis companies may be subject to product recalls for a variety of reasons, including product defects, such as contamination. Such recalls may result in financial burdens and reputational harm and may subject cannabis companies to increased regulatory scrutiny.
- Consumer perception of cannabis products can be significantly influenced by scientific research or findings, regulatory investigations, litigation, media attention and other publicity regarding the consumption of cannabis. Any unfavorable developments in these areas could have a material adverse effect on the demand for cannabis products in general or on the products or prospects of a particular company.

### **Risks Related to Early-Stage Cannabis Companies**

- Most cannabis companies are in early stages of development and have limited operational history, so it is difficult to accurately predict and forecast their business operations. Many cannabis companies will fail.
- The success of many early-stage cannabis companies is premised on receiving and maintaining the licenses, permits and regulatory approvals required for their proposed cannabis activities. Many of such companies will not receive or maintain such licenses, permits and approvals or may be able to do so only at significant expense.
- Cannabis companies' access to the capital required to grow and to finance ongoing operations involves challenges particular to the industry's uncertain and rapidly evolving legal landscape. Many early-stage companies in the cannabis industry will not be able to obtain the requisite capital or will run out of capital prior to reaching profitability.
- Early-stage cannabis companies may experience unexpected problems in the areas of product development and quality, manufacturing, marketing and general management, which, in some cases, cannot be adequately solved. Companies may also be subject to product pricing and cost pressures and to claims of intellectual property infringement.

## Other Risks to Companies in the Cannabis Industry

- The cannabis industry is extremely competitive in most segments, with certain companies having unique competitive advantages such as greater capital resources, first-mover advantage, more scalable business models and greater brand recognition.
- To date, the research conducted on cannabinoid-derived pharmaceuticals and other cannabis-based therapies is limited. There is no assurance that cannabinoid-derived pharmaceuticals or other medical products will prove effective in treating medical conditions or achieve broad market acceptance.
- Given the emerging nature of the cannabis industry, there is a scarcity of qualified personnel with deep industry experience and significant competition for such qualified personnel. Many cannabis companies may not be successful in attracting, training, integrating, motivating or retaining qualified management teams and other personnel.
- Cannabis is an agricultural product. The occurrence of diseases, insects, pests, mold and other infestations and severe adverse environmental conditions, such as fire, drought, hail, flood or frost, is unpredictable, may have a potentially devastating impact on agricultural production of cannabis and may otherwise adversely affect the supply of cannabis.
- The cannabis industry is particularly vulnerable to rapidly changing technology, government regulation and relatively high risks of obsolescence caused by scientific and technological advances. The success of cannabis companies will depend in part on their ability to anticipate market, legal, technological and other trends in the industry. Many cannabis companies will fail to accurately identify or predict industry trends.
- Cannabis laws and regulations in jurisdictions outside the United States vary widely and, in some cases, are as complex, contradictory and rapidly changing as those within the United States. Cannabis companies operating outside the country's borders are subject to risks related to the unsettled legal environment applicable to cannabis.
- Due to federal controls on cannabis within the United States and similar restrictions in many jurisdictions outside the country, there is a significant black market for cannabis products. Government-regulated cannabis businesses face competition from black market participants and are subject to different market forces than those of the black market.

## CHAPTER X

# Glossary of Terms

**Ackrell Capital, LLC** a leading independent investment bank focused on the cannabis industry

**ACMPR** Canada's Access to Cannabis for Medical Purposes Regulations

**Aeroponics** a method of growing plants whereby the roots hang suspended in a nutritional aerosol solution

**Bankruptcy Code** Bankruptcy Reform Act of 1978

**BHO** Butane hash oil. *See* Hash oil

**Bong** a device used to smoke cannabis flower via a water chamber through which the smoke passes prior to inhalation; commonly made of glass or plastic

**BSA** Bank Secrecy Act

**Bud** a slang term for cannabis flower

**Cannabichromene (CBC)** a nonpsychoactive cannabinoid believed to have several medicinal benefits, including analgesic, antibacterial, anticancer, antidepressant, antifungal, anti-inflammatory and anti-insomnia

**Cannabidiol (CBD)** a nonpsychoactive cannabinoid believed to have wide-ranging medicinal benefits and therapeutic applications; the second most abundant cannabinoid in cannabis

**Cannabidiolic acid (CBDA)** a nonpsychoactive cannabinoid believed to have several medicinal benefits, including anticancer, antiemetic and anti-inflammatory; the precursor to cannabidiol (CBD)

**Cannabigerol (CBG)** a nonpsychoactive cannabinoid believed to have several medicinal benefits and therapeutic applications; may partially counteract the psychoactive effect of THC and decrease anxiety and muscle tension

**Cannabigerolic acid (CBGA)** a nonpsychoactive cannabinoid that is a precursor to all other cannabinoids, including THC, CBD, CBC and CBG

**Cannabinoid** a class of chemical compounds present in cannabis that act on cannabinoid receptors in cells in the human nervous and immune systems

**Cannabinol (CBN)** a cannabinoid derived from THC degradation; shown to produce some psychoactive effects and believed to have several medicinal benefits, including analgesic, antibacterial, anticonvulsive, anti-inflammatory and anti-insomnia

**Cannabis** a genus of flowering plant consumed for therapeutic, medicinal, social or spiritual purposes and used to produce goods such as rope, paper, clothing and soap; includes three principal cannabis species: *Cannabis sativa*, *Cannabis indica* and *Cannabis ruderalis*

**CBC** See Cannabichromene

**CBD** See Cannabidiol

**CBDA** See Cannabidiolic acid

**CBG** See Cannabigerol

**CBGA** See Cannabigerolic acid

**CBN** See Cannabinol

**CDSA** Canada's Controlled Drugs and Substances Act

**Chemovar** a plant variety characterized by its chemical content

**Clone** an asexually reproduced cannabis plant genetically identical to the plant from which it was produced

**CND** Commission on Narcotic Drugs, a subsidiary body of the United Nation's ECOSOC that assists the ECOSOC in supervising the application of international drug control treaties

**Cole Memo** a memorandum published by the DOJ that provides guidance to DOJ attorneys and federal law enforcement about prosecuting cannabis-related federal offenses

**Concentrates** a category of consumer cannabis products; any number of concentrated forms of the active compounds in cannabis; typically an oil or waxlike substance

**Conventions** three international treaties adopted through the United Nations between 1961 and 1988 that address international regulation of cannabis, cannabis derivatives and many other narcotic, psychotropic and similar substances (The Single Convention on Narcotic Drugs of 1961; The Convention on Psychotropic Substances of 1971; and The United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988)

**Crumble** a form of wax concentrate

**CSA** Controlled Substances Act

**CSE** Canadian Securities Exchange

**Curing** a phase of the cannabis cultivation process during which dried cannabis flower undergoes controlled fermentation to develop the flower's aroma, taste and cannabinoid composition

**Dab** a potent concentrated form of the psychoactive cannabinoid THC

**DEA** U.S. Drug Enforcement Agency, an agency of the U.S. Department of Justice

**Delta-9-Tetrahydrocannabinolic acid (THCA)** a nonpsychoactive cannabinoid found abundantly in raw flower; precursor to THC; decarboxylates into THC through the application of intense heat

**DHHS** U.S. Department of Health and Human Services

**DOJ** U.S. Department of Justice

**DOT** U.S. Department of the Treasury

**Dronabinol** a form of chemically synthesized THC included in certain FDA-approved pharmaceuticals; a Schedule II or Schedule III controlled substance under the CSA, depending on its preparation

**Drying** a part of the harvesting phase of cannabis cultivation during which plants are dried; typically occurs at room temperature in a dark space

**ECDD** Expert Committee on Drug Dependence; a committee of the World Health Organization (WHO) tasked with making drug control recommendations to the CND on behalf of the WHO

**ECOSOC** Economic and Social Council, one of the six main organs of the United Nations established under the United Nations charter in 1945

**Edible** a food- or drink-based infused product intended for oral consumption; commonly baked goods, flavored drinks or candies

**Endocannabinoid** cannabinoids created naturally by the human body

**Exchange Act** Securities Exchange Act of 1934

**Extraction** a process for extracting active compounds from the cannabis plant; extraction techniques fall into two general categories, solvent-based extraction and solvent-free extraction

**Farm Bill** Agricultural Act of 2014

**FDA** U.S. Food and Drug Administration, an agency of the DHHS

**FD&C Act** Federal Food, Drug, and Cosmetic Act

**FinCEN** Financial Crimes Enforcement Network, a bureau of the DOT

**FinCEN Memo** a memorandum published by FinCEN outlining how banks and other financial institutions can, consistent with their BSA obligations, provide services to marijuana-related businesses

**Flower** the flower of the cannabis plant, also known as “bud”; the highest concentration of active compounds present in cannabis are found in the flowers of unpollinated female cannabis plants; smoking flower is the most popular method of cannabis consumption

**Ganja** a popular name for cannabis

**Germination** the process by which a dormant seed begins to sprout and grow into a seedling

**Hash oil** a concentrate prepared through extraction using a butane solvent; also known as hashish oil, butane hash or honey oil (BHO), cannabis oil or liquid cannabis

**Hashish (hash)** a concentrate made up of compressed or purified trichomes

**Hemp** the fiber produced from the stalks of the cannabis plant, which can be used to produce goods such as rope, paper and clothing; also refers to varieties of cannabis cultivated to produce industrial hemp products

**HID lamp** a high-intensity discharge lamp; a category of lamp used for indoor cannabis cultivation

**Hit** a slang term for one inhalation from a cannabis smoking device or vaporizer

**Homeostasis** a process by which biological systems tend to maintain internal stability, or balance

**Human endocannabinoid system** a system of nervous and immune system receptors involved in regulating health and physiological functions within the human body

**Hybrid** a cannabis variety that is a genetic cross of two or more different cannabis species or varieties produced through sexual reproduction

**Hydroponics** a method of growing plants whereby the roots grow in a nutrient-rich sand, gravel or liquid growth medium

**Indica** one of three principal cannabis species; indica plants tend to be short and bushy

**Infused products** a category of consumer cannabis products; ingestible products that have been infused with cannabinoids and other active compounds from the cannabis plant

**IRC** Internal Revenue Code

**IRS** Internal Revenue Service

**Joint** a hand-rolled cannabis cigarette

**Kief** a concentrate composed of trichomes that are separated from the cannabis flower by sifting the flower with specialized filtering screens

**LED** a light-emitting diode; a category of lamp used for indoor cannabis cultivation

**Marijuana** a slang term for dried cannabis flower; a legal term for certain parts and derivatives of the cannabis plant defined in the CSA

**MAUCRSA** California's Medicinal and Adult Use Cannabis Regulation and Safety Act

**Nabilone** a form of chemically synthesized cannabinoid similar to THC included in an FDA-approved pharmaceutical; a Schedule II controlled substance under the CSA

**Nasdaq** Nasdaq Stock Market

**NDA** New Drug Application; an application submitted by a drug manufacturer to the FDA for approval of a drug

**NYSE** New York Stock Exchange

**Oil** a category of viscous cannabis concentrates

**OTC** over-the-counter stock market

**Pipe** a device used to smoke cannabis flower; commonly made of glass, wood or metal

**PPM** a private placement memorandum; used by issuers of securities in private offerings to market securities

**PVPA** Plant Variety Protection Act

**Ruderalis** one of three principal cannabis species; ruderalis plants are shaggy and the shortest of the three species

**SAR** Suspicious Activity Report; required to be filed by financial institutions with FinCEN regarding customers engaged in marijuana-related businesses

**Sativa** one of three principal cannabis species; sativa plants are generally tall, thin and wispy

**SEC** U.S. Securities and Exchange Commission

**Section 280E** Internal Revenue Code section 280E

**Securities Act** Securities Act of 1933

**Shatter** a concentrate prepared through solvent-based extraction; typically has an amber-glass transparency

**Strain** another term for a cannabis plant variety

**Terpene** a class of organic compounds present in cannabis and many other plants; responsible for a plant's aroma and flavor; believed to have wide-ranging therapeutic applications

**Tetrahydrocannabinol (THC)** delta-9-tetrahydrocannabinol and certain chemical variants, including delta-8-tetrahydrocannabinol; the psychoactive compound in cannabis primarily responsible for the euphoric feeling of being "high"; the most abundant cannabinoid in cannabis; believed to have wide-ranging medicinal benefits and therapeutic applications

**THC** See Tetrahydrocannabinol

**THCA** See Delta-9-Tetrahydrocannabinolic acid

**Tincture** a concentrate suspended in an alcohol solution; usually placed under the tongue using a dropper (sublingual application)

**Topical** an infused product intended for topical application; typically a lotion, balm, cream, lubricant or transdermal patch

**Trichome** a crystalline or hairlike component that secretes cannabinoids, terpenes and other compounds; generally occur all over the cannabis plant, but found in highest concentration on the flower

**TSX** Toronto Stock Exchange

**TSXV** TSX Venture Exchange

**UN** United Nations

**UNGASS** United Nations General Assembly Special Session

**UNODC** United Nations Office on Drugs and Crime

**USDA** U.S. Department of Agriculture

**USPTO** U.S. Patent and Trademark Office

**Vaporizer** a device that heats cannabis flower or concentrate to a temperature at which its active compounds boil and can be inhaled as vapor

**Variety** a plant grouping within a single botanical taxon of the lowest known rank (species) with defining characteristics that distinguish it from any other plant grouping within such rank

**Wax** a category of cannabis concentrates; refers to the softer, opaque oils that have lost their transparency after extraction

**Weed** a slang term for dried cannabis flower

**WHO** World Health Organization, an autonomous intergovernmental organization that collaborates with the United Nations and other organizations on global health matters

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## Ackrell Capital Cannabis Team

**Mike Ackrell**Founder  
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Mike Ackrell founded Ackrell Capital in 2003. Previously, Mr. Ackrell was the Head of ABN AMRO's U.S. Technology Investment Banking Group and the Head of Investment Banking at WR Hambrecht+Co. He also was a Senior Vice President in the Technology Investment Banking Group of Donaldson, Lufkin & Jenrette, where he began his investment banking career in 1988. Mr. Ackrell has completed more than 150 financing transactions, including more than 50 initial public offerings, and more than 100 ████████ transactions, totaling more than \$15 billion in value. He serves on the Board of Directors of a number of companies, including American Giant, Scrubbed and Vator.tv. Mr. Ackrell holds a B.S. in Economics, summa cum laude, with majors in Finance and Accounting, from the Wharton School of the University of Pennsylvania.

**Tim Coxon**General Counsel  
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Tim Coxon joined Ackrell Capital in 2017 after serving as the firm's legal counsel for more than five years. Previously, Mr. Coxon was a corporate finance attorney in Silicon Valley focused on venture capital fund formation, early stage company financings, mergers and acquisitions and related areas of tax and securities law. He has advised dozens of VC firms on fund and management-level structuring and portfolio company investment transactions, and has advised private companies in ████████ transactions valued at more than \$1.5 billion. Mr. Coxon also has worked as a consultant performing financial and economic analysis for use in corporate litigation and regulatory matters, and taught college level mathematics for more than 13 years, including 7 years as an adjunct statistics professor for the ████████ program at Santa Clara University. Mr. Coxon holds a ██████ from the Santa Clara University School of Law, an ██████ in Mathematics from San Francisco State University, and a B.A. in Mathematics from the University of Texas at Austin.

**Bryan Castillo**Partner  
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Bryan Castillo joined Ackrell Capital in 2015. Previously, Mr. Castillo served as an adviser to governments on economic and foreign policy. He has more than 10 years of investment banking experience focused primarily on cross-border transactions spanning Asia, Europe and the Middle East. Mr. Castillo has experience in a number of industries, including agriculture, cleantech, consumer, energy, media, real estate and technology. He has advised on more than 50 financing transactions, primarily with state-owned enterprises and private companies. Mr. Castillo works closely with several family offices on private equity and venture capital investments. Mr. Castillo holds a B.S. in Economics from the Pennsylvania State University.

**Jeff Mathews**Partner  
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Jeff Mathews joined Ackrell Capital in 2015. Previously, Mr. Mathews was a Director with Seven Hills Group, a boutique investment bank focused on middle-market technology companies. He has more than 15 years of investment banking experience and was also an Associate in the Technology Investment Banking Groups at Deutsche Bank and Lehman Brothers. He has advised on a broad range of financings and ████████ transactions across a variety of technology industries totaling more than \$10 billion in value. Mr. Mathews holds a B.A. in Economics from the University of Chicago.

# ACKRELL CAPITAL

## THE GREEN FIELD 2018

### Production

#### Cultivation

#### Production Equipment and Supplies

#### Production and Testing Services

### Distribution

#### Dispensaries

#### E-Commerce

#### Distribution Services

# ACKRELL CAPITAL

## THE GREEN FIELD 2018

### Consumer Products

#### Flower and Concentrates



#### Infused Products



#### Vaporizers and Accessories



#### Pharmaceuticals



### Business Solutions



### Digital Media



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# ACKRELL CAPITAL

## TOP 100 PRIVATE CANNABIS COMPANIES 2018

AEssenceGrows	Défoncé	Jetty Extracts	River Collective
Ample Organics	Dixie Elixirs	Kikoko	Rubicon Organics
Apeks Supercritical	Dosist	KIVA Confections	S2S Development
The Apothecarium	Eaze Solutions	Korova	SC Laboratories
Auntie Dolores	Eel River Organics	LeafLink	Scrubbed
Baker Technologies	Elemental Wellness	Leafly	SPARC
BAS Research	Eufloa	Level Blends	Spectrum King
BDS Analytics	Evolve Therapeutics	LivWell Enlightened Health	Steep Hill Labs
Beboe	Evoxe Laboratories	Lunchbox Alchemy	StickyGuide
Berkeley Patients Group	Flow Kana	Mary's Medicinals	Strainz
BioTrackTHC	Flowhub	Meadow	Teewinot Life Sciences
Bloom Farms	FunkSac	Merry Jane	Tikun Olam
Brewbudz	Garden State Dispensary	MiNDFUL	Treez
Bud and Bloom	GFarmaLabs	MJ Freeway	Trellis
Calyx Brands	Gold Coast Extracts	MJardin	Trulieve
Cannabis Reports	Green Dot Labs	MM Acquisition Co.	Utopia Farms
CannaCraft	Green Flower Media	Native Roots	VapeWorld
CannaKorp	Green Rush	New Vansterdam	Vapexhale
Colorado Harvest Company	The Green Solution	Northwest Cannabis Solutions	VCC Brands
Columbia Care	Harborside Health Center	NWT Holdings (Firefly)	Vuber
Confident Cannabis	Harvest	Organa Brands	Wana Brands
Cultivation Technologies	Headset	PAX Labs	Web Joint
Cura Cannabis Solutions	HelloMD	PharmaCielo	Weedguide
CW Analytical	Humboldt Legends	PRØHBT Media	Weedmaps
Deep Cell	Incense Specialties	Qind	Wellness Connection of Maine

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