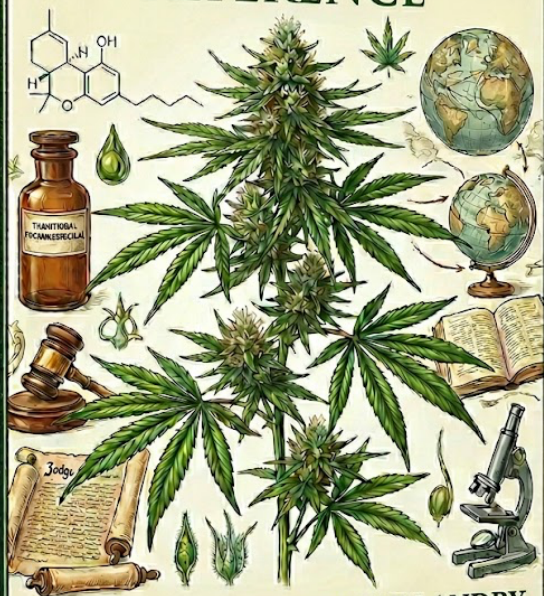


CANNABIS

AN ENCYCLOPEDIC REFERENCE



BY: MARIE-SOLEIL SESHAT LANDRY
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CANNABIS

M.-S. S. Landry

LANDRY INDUSTRIES

CANNABIS

*An Encyclopedic Reference to Marijuana,
Hemp & the Science of a Singular Plant*



Marie-Soleil Seshat Landry

LANDRY INDUSTRIES · MONCTON, NEW BRUNSWICK

CANNABIS: AN ENCYCLOPEDIC REFERENCE

An Encyclopedic Reference to Marijuana, Hemp & the Science of a Singular Plant.
First Edition, 2026.

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AN IMPORTANT NOTICE

This book is a work of synthesis and general education. It is **not** medical, legal, financial, or professional advice. Cannabis affects individuals differently, and its medical use should be discussed with a qualified clinician. Nothing here should be taken as encouragement to use a controlled substance or to act contrary to the laws of one's jurisdiction.

The law described in these pages is current to the best of the author's knowledge as of **June 2026**. Cannabis law in the United States, Canada, and elsewhere was changing rapidly during 2025–2026; readers should verify the current rules before relying on any statement of law. Market and economic figures are proprietary projections that vary by firm and report scope and are presented as estimates, not established fact.

The materials concept described as "Hempoxies v.56" (Chapter IX) is a forward-looking research hypothesis at an early stage of development. It is not a validated or commercial product, and every performance figure associated with it is a projected target pending experimental validation.

PRODUCTION NOTES

Set in Spectral (text) and Barlow (display and labels). All diagrams were drawn as original vector art in a clean schematic style. Composed in HTML and rendered to PDF. Every factual claim is referenced to a live, publicly verifiable source listed in the References.

Hemp was once called the standard fibre of the world.

— after Popular Mechanics, “New Billion-Dollar Crop,” February 1938

FRONT MATTER

Preface

Few plants have been asked to carry as many stories as *Cannabis sativa*. It has been a medicine and a menace, a wartime necessity and a criminal contraband, a humble source of rope and a frontier of advanced materials. It has been wrapped in folklore so thoroughly that the folklore is now part of the subject. A book that claims to be encyclopedic about cannabis must therefore do two jobs at once: gather what is genuinely known, and gently separate it from what is merely repeated.

This book takes its working title from a famous boast. You will often read that the cannabis plant has “**fifty thousand uses**.” It is a wonderful figure, and it is not a count. As Chapter XI explains, the slogan grew out of a 1938 magazine article that celebrated hemp as a “new billion-dollar crop” and imagined thousands of products spun from its fibre and pulp. Over the decades the number inflated in the retelling. Rather than pretend to list fifty thousand separate items, this book honours the *spirit* of that claim — the plant’s remarkable versatility — by organizing the real, documented uses into families: fibre and textiles, building materials, food, medicine, paper, plastics and composites, body care, agriculture and the environment, energy, and the speculative edge of materials science.

How this book handles the truth

Cannabis attracts strong claims from every direction, so this book sorts notable statements into three kinds, marked by coloured boxes throughout:

VERIFIED

Well-supported by peer-reviewed research, government data, or primary historical record — for example, that hemp stores carbon as it grows, or that a purified cannabis medicine reduces certain seizures.

CONTESTED

Genuinely debated among experts, where the evidence is incomplete or pulls in different directions — for example, the “entourage effect,” or the claim that the plant was first domesticated twelve thousand years ago.

MYTH

Popular but false or badly exaggerated — for example, that Henry Ford built a car out of hemp, or that the United States Declaration of Independence was written on hemp paper.

Where specialists still disagree, this book says so plainly rather than choosing a side for the sake of a tidy story. Two themes recur. The first is that cannabis is best understood today as a *single, highly variable species*, and that the familiar “indica versus sativa” vocabulary of the dispensary describes marketing categories far better than it describes biology. The second is that the science is strongest where the plant has been studied most carefully — in pharmacology and in industrial materials — and thinnest where enthusiasm has outrun evidence.

A word on sources

Every factual claim in the chapters that follow is tied to a numbered reference in the back of the book, and every reference points to a live, public source: a peer-reviewed paper, a government or United Nations document, a court record, or reporting from a credible outlet. Readers are warmly encouraged to follow those links and judge the evidence for themselves. That, in the end, is what an encyclopedia is for.

— M.-S. S. L., Moncton, New Brunswick, 2026

FRONT MATTER

How to Use This Book

The book runs in a deliberate arc, but each chapter is written to stand on its own, so you may begin wherever your curiosity points.

The shape of the book

The eleven main chapters move from the plant itself outward into human life. Chapters I and II describe the botany and chemistry — what the plant *is* and what it *makes*. Chapter III turns to the body and to medicine. Chapter IV tells the human history. Chapters V and VI cover industrial hemp and how the crop is grown. Chapter VII lays out the law as it stands in 2026, and Chapter VIII the economics. Chapter IX reaches the speculative frontier of advanced materials. Chapter X addresses safety and public health, and Chapter XI gathers the plant's many uses into a single illustrated catalogue.

Finding your way

The coloured boxes flag claims as **verified**, **contested**, or **myth**. Small bracketed numbers in the text, like the one at the end of this sentence, point to the matching entry in the References. The back matter also holds a glossary of technical terms, a timeline, comparison tables, and a directory of the agencies that govern cannabis.

ON LANGUAGE

This book uses “cannabis” for the plant and its products in general; “marijuana” for the drug-type plant grown for its psychoactive flowers; and “hemp” for the low-THC plant grown for fibre, grain, and non-intoxicating compounds. These are legal and practical distinctions, not separate species.

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CHAPTER I

The Plant

BEFORE IT WAS A MEDICINE, a crop, or a crime, cannabis was simply a weedy, fast-growing flowering plant — one of the most adaptable that human beings have ever cultivated. It grows from the tropics to the near-Arctic, tolerates poor soil, and can shoot from seed to a four-metre stalk in a single season. To understand everything else in this book, it helps to start with the organism itself: what it is, how botanists classify it, and how its body is arranged.

One species, many faces

The cannabis plant belongs to the small family *Cannabaceae*, which it shares with the hop, *Humulus* — the same plant that flavours beer, and a close enough relative that the kinship is visible in their climbing, resin-dotted flowers. For two centuries botanists argued about how many species of cannabis exist. The eighteenth-century naturalist Carl Linnaeus named a single one, *Cannabis sativa*, in 1753; a few decades later Jean-Baptiste Lamarck described a second, *Cannabis indica*, from plants grown in India. Later writers added a third, *Cannabis ruderalis*, for the small wild forms of Central Asia.

Modern systematics has largely collapsed these back into one. The weight of genetic and morphological evidence now treats cannabis as a single, enormously variable species, *Cannabis sativa*, with the various “species” better understood as ecological and cultivated forms.^[1] This matters far beyond the herbarium, because the vocabulary of the modern dispensary — “indica” for sleepy body-effects, “sativa” for an energetic head-high — borrows these old Latin names but does not track the plant’s actual ancestry.

CONTESTED

The retail labels *indica* and *sativa* are best read as marketing categories, not biological ones. Chemical analyses repeatedly find that a strain’s name is a poor predictor of what is actually in it; two products sharing a label can differ more than two with opposite labels.

ONE SPECIES, MANY NAMES

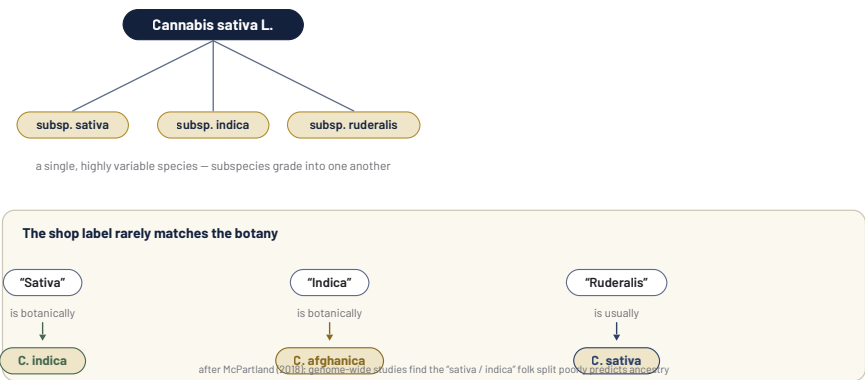


Figure 2. From three “species” to one. Historical names (*sativa*, *indica*, *ruderalis*) are now generally treated as varieties of a single species within the family Cannabaceae, alongside its relative the hop.

Hemp and marijuana: a legal line, not a botanical one

The most consequential distinction in the whole subject — between “hemp” and “marijuana” — is not a difference of species at all. Both are *Cannabis sativa*. The line between them is drawn by chemistry and, ultimately, by law: how much of the intoxicating compound delta-9-tetrahydrocannabinol, or THC, the plant contains. Below a low legal threshold the same plant is “industrial hemp,” grown for fibre, grain, and non-intoxicating cannabinoids; above it, the plant is “marijuana” in the eyes of regulators. A field of hemp and a greenhouse of high-THC flower can be the same species, even close cousins, separated only by which genes are switched on and by a number written into a statute. Chapter VII traces exactly where those numbers now sit, and how dramatically they shifted in 2025 and 2026.

How the plant is built

Cannabis is typically *dioecious*: individual plants are usually either male or female, an unusual trait among crop plants. Male plants produce loose, pollen-bearing flowers and then decline; female plants produce the dense, resin-rich flower clusters — the “buds” — that carry most of the plant’s cannabinoids. Growers of high-potency flower therefore prize unpollinated females, whose seedless flowering tops (known as *sinsemilla*) keep their energy in resin rather than seed.

The resin itself is produced by tiny outgrowths called *glandular trichomes* — microscopic, mushroom-shaped stalks that crowd the surface of the flowers and nearby leaves. Inside their bulbous heads the plant manufactures and stores the sticky mixture of cannabinoids and aromatic terpenes that gives cannabis its smell, its medicinal activity, and its intoxicating power. The stalk, meanwhile, tells a completely different story. Its outer rind contains long, strong *bast* fibres — the raw material of rope, canvas, and textiles — wrapped around a woody inner core, the *hurd* or *shiv*, that is now used in building materials. A single plant thus offers two industries at once: a pharmacy in its flowers and a fibre crop in its stem.

ANATOMY OF THE PLANT

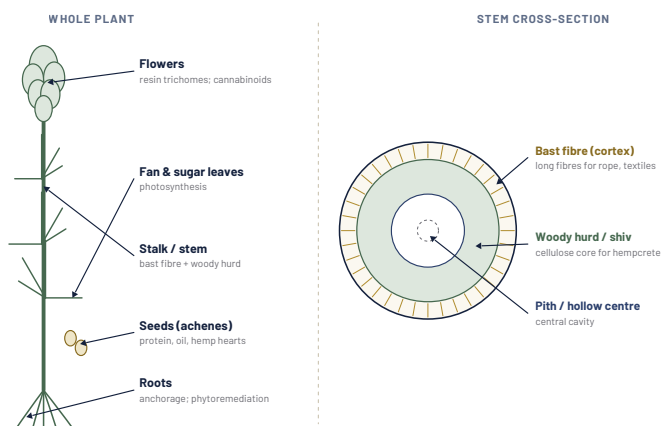


Figure 1. The plant at a glance. Left: overall form, with resin-rich female flowers, fan leaves, and the tall central stalk. Right: a stem cross-section showing the outer bast fibre and the woody inner hurd — the basis of hemp’s fibre and building-material uses.

Where it came from

Cannabis is one of humanity's oldest companions, but pinning down exactly when and where people first domesticated it has been difficult. A large genomic study published in 2021 compared cultivated and wild plants from around the world and concluded that cannabis was first domesticated in early Neolithic East Asia, with the data pointing to an origin on the order of twelve thousand years ago.^[2] The same work found that the sharp split between fibre-type and drug-type plants came much later, the product of centuries of selective breeding for different ends.

CONTESTED

The headline figure of roughly twelve thousand years is a genetic estimate, and the precise timing and location of cannabis's first domestication remain debated. What is not in serious doubt is the broad picture: an East- or Central-Asian origin and a very long human association.

From that homeland the plant travelled with people along trade and migration routes, adapting as it went. Populations grown at different latitudes diverged in how they timed their flowering to the local rhythm of daylight — a practical adaptation that still shapes how and where the crop can be grown today.^[3] How that single, well-travelled species became a chemical factory of unusual complexity is the subject of the next chapter.

CHAPTER II

The Chemistry of Cannabis

WHAT MAKES CANNABIS cannabis — its medicine, its smell, its intoxication — is a family of molecules the plant builds in the heads of its trichomes. More than a hundred of these *cannabinoids* have been catalogued, alongside a fragrant supporting cast of *terpenes*. Two cannabinoids dominate the public conversation: THC, which is intoxicating, and CBD, which is not. Understanding how the plant assembles them, and what happens when the raw plant is heated, explains a great deal about how cannabis is used.

The building blocks

Cannabinoids are not made directly in their familiar forms. The plant first produces a common precursor, *cannabigerolic acid* (CBGA), often called the “mother cannabinoid.” Dedicated enzymes then convert CBGA along separate branches into three acidic cannabinoids: tetrahydrocannabinolic acid (THCA), cannabidiolic acid (CBDA), and cannabichromenic acid (CBCA).[4] Which branch a plant favours is largely genetic, and it is precisely this genetic switch that separates a drug-type plant, rich in the THCA line, from a hemp-type plant, rich in the CBDA line.

HOW THE PLANT BUILDS CANNABINOIDS

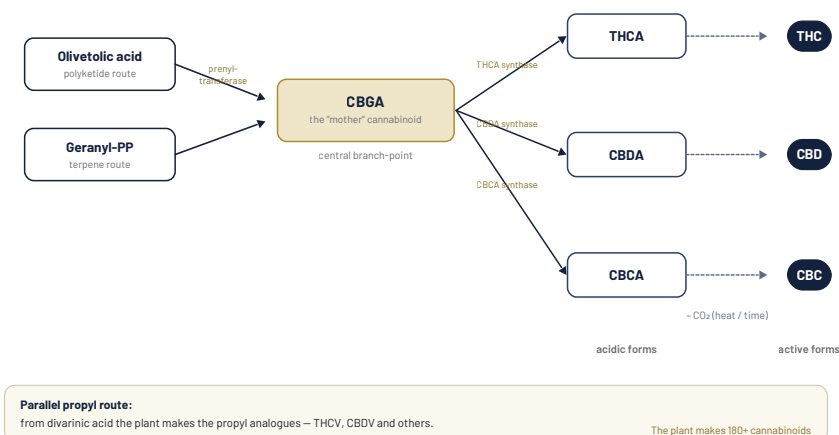


Figure 3. One precursor, three branches. The “mother cannabinoid” CBGA is converted by separate enzymes into the acidic forms THCA, CBDA, and CBCA, which lose carbon dioxide on heating to give the familiar THC, CBD, and CBC.

Why raw cannabis does not get you high

A crucial and often surprising fact follows from this chemistry: the fresh plant contains almost no THC at all. It contains THCA — the acid form — which is not appreciably intoxicating. Only when the plant material is heated does THCA shed a molecule of carbon dioxide and become active THC, a reaction called *decarboxylation*. This is why cannabis is smoked, vaporized, or gently baked before use, and why eating raw cannabis leaves produces little effect. The same heat-driven step converts CBDA to CBD. Decarboxylation is, in a sense, the invisible kitchen chemistry behind every joint and every edible.

KEY FACT

Fresh cannabis is rich in non-intoxicating acidic cannabinoids (THCA, CBDA). Heat — from a flame, a vaporizer, or an oven — converts these into the active THC and CBD. No heat, no high.

THC, CBD, and the rest

Once activated, the two headline cannabinoids behave very differently. THC is the compound responsible for the characteristic cannabis “high”: euphoria, altered perception of time, increased appetite, and, in higher doses or vulnerable people, anxiety and other adverse effects discussed in later chapters. CBD is not intoxicating and has attracted intense medical interest, most concretely as the active ingredient of an approved anti-seizure medicine. Beyond these two lie dozens of minor cannabinoids — cannabigerol (CBG), cannabinol (CBN), cannabichromene (CBC), and others — many of which are now sold as novelty products despite thin clinical evidence.

Alongside the cannabinoids, cannabis produces *terpenes*, the volatile aromatic compounds found throughout the plant kingdom that give the plant its smell — piney, citrusy, peppery, or skunky depending on the variety. The same terpenes appear in pine resin, citrus peel, and lavender. They are not unique to cannabis, but their particular blend gives each variety its signature aroma.

The “entourage effect”

A popular idea holds that cannabinoids and terpenes work better together than in isolation — that the whole plant produces an “entourage effect” greater than the sum of its purified parts. The term was popularized in a widely cited 2011 review that proposed plausible ways terpenes might modulate cannabinoid effects.^[5] It is an appealing hypothesis, and it is genuinely uncertain. More recent laboratory work testing common terpenes directly found that they did not measurably alter activation of the main cannabinoid receptor, casting doubt on the simplest version of the claim.^[6]

CONTESTED

The entourage effect is frequently asserted as established fact in marketing. The honest scientific position is that some whole-plant interactions are plausible and under study, but robust clinical proof that terpenes meaningfully change cannabinoid effects in people is still lacking.

With the plant's chemistry in view, we can turn to the question that draws the most public interest of all: what cannabis and its compounds actually do inside the human body.

CHAPTER III

Medicine and the Body

THE REASON CANNABIS affects us at all is that the human body comes pre-equipped to respond to molecules shaped like its active compounds. We carry an internal signalling network, the *endocannabinoid system*, that THC happens to fit like a key in a lock. This chapter explains that system, surveys what cannabis-derived medicines are genuinely proven to do, and — just as importantly — sets out the real risks. It is the most medically sensitive chapter in the book, and it tries to be both useful and honest.

PLEASE NOTE

Nothing in this chapter is medical advice. Cannabis interacts with other medicines and is not safe for everyone. Anyone considering cannabis for a health condition should speak with a qualified clinician. If you are struggling with cannabis use or your mental health, support is available; a short note on finding help appears at the end of this chapter.

The body's own cannabinoids

In the late twentieth century, researchers searching for how THC works discovered that the body makes its own cannabinoid-like messengers. The first, identified in 1992, was named *anandamide*, after a Sanskrit word for bliss.^[7] Anandamide and its cousins act on a set of receptors — chiefly CB1, concentrated in the brain and nervous system, and CB2, found more in immune tissue — that together form the endocannabinoid system. This network helps regulate appetite, mood, memory, pain, and immune response. THC produces its effects by mimicking these natural messengers and switching on the same CB1 receptors, especially in the brain.

THE ENDOCANNABINOID SYSTEM

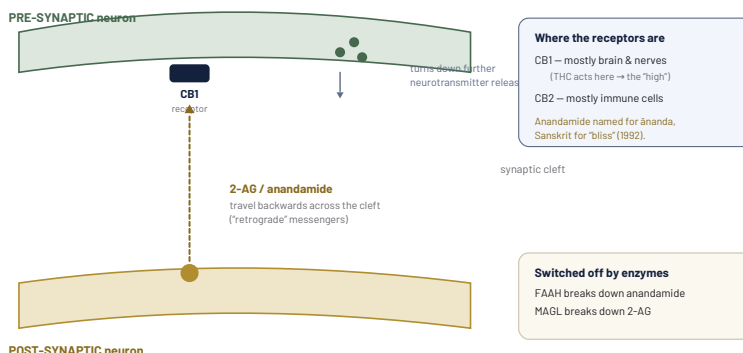


Figure 4. The endocannabinoid system. The body's own messengers act on CB1 receptors (mainly in the brain and nerves) and CB2 receptors (mainly in immune tissue). THC switches on CB1 directly; CBD acts more indirectly and is not intoxicating.

What is actually proven

Public discussion often treats cannabis as either a cure-all or a menace. The careful middle ground was mapped in 2017 by the (United States) National Academies of Sciences, Engineering, and Medicine, which reviewed thousands of studies and graded the evidence.^[8] Its conclusion was nuanced: there is *conclusive or substantial* evidence that cannabis or cannabinoids help with chronic pain in adults, with chemotherapy-induced nausea and vomiting, and with spasticity in multiple sclerosis. For many other advertised uses the evidence was found to be limited, insufficient, or absent. Cannabis is genuinely useful for some things; it is not useful for everything it is sold for.

A handful of cannabis-derived medicines have crossed the high bar of drug regulation. The clearest case is *Epidiolex*, a purified plant-derived CBD medicine. In June 2018 it became the first such drug approved by the United States Food and Drug Administration, for two rare and severe childhood epilepsies, Lennox–Gastaut syndrome and Dravet syndrome.^[9] Its approval rested on rigorous randomized trials: in a landmark study of

Lennox–Gastaut syndrome, adding CBD cut the frequency of drop seizures by about 42 percent on the higher dose, compared with roughly 17 percent on placebo.^[10]

EPIDIOLEX (CBD): DROP-SEIZURE REDUCTION

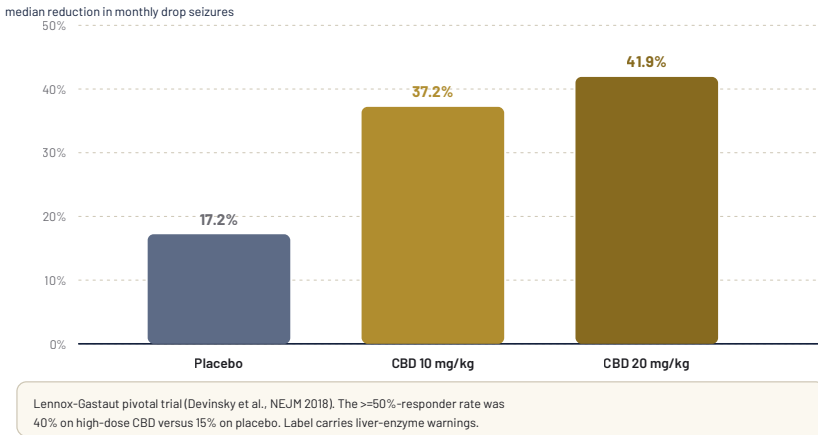


Figure 5. Evidence that meets the bar. In a randomized trial for Lennox–Gastaut syndrome, cannabidiol reduced monthly drop seizures markedly more than placebo — the kind of controlled result that underpins a drug approval.

Other approved products include *dronabinol* and *nabilone* — synthetic or semi-synthetic THC medicines long used for chemotherapy nausea and appetite loss — and *nabiximols*, a whole-plant oromucosal spray combining THC and CBD that is approved in many countries (though not, at the time of writing, by the United States) for multiple-sclerosis spasticity. These are the cases where cannabis has genuinely become medicine, in the strict regulatory sense.

The real risks

Cannabis is not harmless, and a responsible reference must say so plainly. The most serious concern involves the mind. A large multi-country study published in 2019 found that daily cannabis use was associated with markedly higher odds of a first episode of psychosis, and that daily use of high-potency cannabis — products exceeding about ten percent THC —

carried the highest risk of all, on the order of several times that of non-users.^[11] Association is not the same as proof of cause, and most people who use cannabis do not develop psychosis; but the signal is strong, consistent, and concentrated among the young and among heavy users of potent products.

CANNABIS AND PSYCHOSIS: ODDS RATIOS

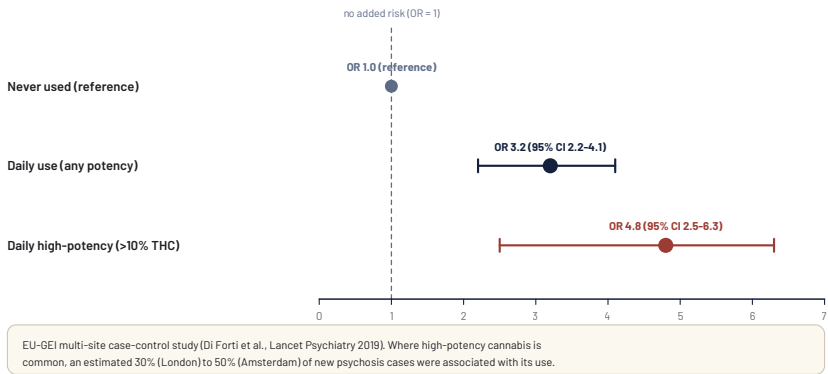


Figure 6. A risk that rises with frequency and potency. Relative to non-users, the odds of a first psychotic episode were higher for daily users and highest for daily users of high-potency cannabis. Bars show approximate odds ratios from a large European study.

Two further harms deserve naming. *Cannabis use disorder* — a clinically recognized dependence, with craving, tolerance, and difficulty cutting down — is real and affects a meaningful minority of users, particularly those who begin young or use daily.^[12] And *cannabinoid hyperemesis syndrome*, an initially baffling condition of cyclic, severe vomiting in some long-term heavy users, is now well documented; it resolves when cannabis use stops.^[13]

VERIFIED

Heavy, frequent use of high-potency cannabis carries documented risks — including a higher likelihood of psychosis, a genuine dependence syndrome, and, in some long-term users, cyclic severe vomiting. Risk concentrates in adolescents, whose brains are still developing.

None of this erases the plant's real medical value; both things are true at once. The task is to hold the benefit and the risk in the same hand. With the biology and medicine established, the book now turns from the plant to the people who have used it — a human history stretching back to the Stone Age.

FINDING HELP

If cannabis use is harming your life, or if you are worried about your mental health, you do not have to manage it alone. A family doctor, a local health service, or a confidential helpline in your country can help you find support and treatment that works.

CHAPTER IV

A Human History

FEW PLANTS HAVE shadowed human civilization as closely as cannabis. It clothed sailors, rigged ships, soothed the sick, and, in the twentieth century, became the focus of a global prohibition that is only now unwinding. This chapter follows that long arc — from Stone Age fibre to the legal earthquakes of our own decade — and pauses to retire a few cherished myths along the way.

Ancient roots

The archaeological trail is deep. Cannabis fibre and seed turn up at Neolithic sites across Asia, and the plant was valued early for both cloth and ritual. At the Yanghai cemetery in north-western China, archaeologists recovered a remarkably preserved cache of cannabis from a roughly 2,700-year-old burial, its chemistry suggesting the plant was selected for psychoactive use.^[15] Higher in the Pamir mountains, wooden braziers from the Jirzankal cemetery, dated to around 500 BCE, bore chemical traces showing that mourners burned high-THC cannabis — some of the earliest clear evidence of cannabis smoked for its effects.^[14]

From these Asian beginnings the plant spread west and south along trade routes, carried by its usefulness. Archaeobotanical evidence traces hemp's movement across Eurasia over millennia, reaching Europe and becoming, in time, one of the indispensable industrial crops of the pre-industrial world.^[16]

A TIMELINE OF CANNABIS

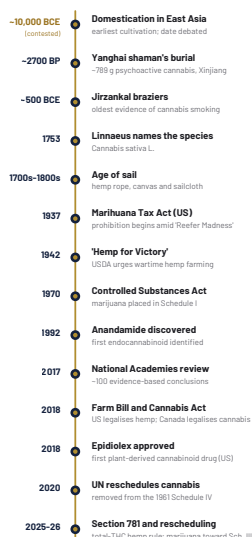


Figure 7. A long companionship. Selected milestones in the human history of cannabis, from Neolithic fibre and ancient ritual use through the age of sail to the prohibition era and the legal reforms of the 2010s and 2020s.

The age of sail

For centuries, sea power ran on hemp. Its long, strong, salt-resistant bast fibre was the premier material for ship's rope and for canvas sails — indeed the word *canvas* descends from *cannabis*. A large sailing warship required tens of tonnes of hemp cordage, and naval powers treated a secure hemp supply as a matter of national security. The same fibre made workaday cloth, sacking, and paper. For the better part of human history, hemp was simply infrastructure.

Prohibition

The twentieth century reversed the plant's fortunes. In the United States, the Marihuana Tax Act of 1937 imposed crippling restrictions that effectively ended both drug and industrial cannabis. A brief wartime exception proved the rule: when Japanese conquests cut off imported fibre, the

United States Department of Agriculture urged farmers to grow hemp for the war effort in a 1942 film, *Hemp for Victory* — a document so at odds with later policy that its very existence was for a time officially doubted.^[18] After the war, prohibition resumed and hardened, culminating in the Controlled Substances Act of 1970, which placed marijuana in the most restrictive category, Schedule I, where the recreational form largely remained for half a century. Chapter VII picks up the dramatic recent unwinding of that framework.

Three persistent myths

Cannabis history is unusually rich in attractive falsehoods, repeated so often they feel true. Three deserve direct correction.

MYTH

Henry Ford built a car from hemp. Ford's company did unveil an experimental plastic-bodied "Soybean Car" in 1941, built on a tubular steel frame with panels made from a soybean-based plastic. It was a soy showcase, not a hemp car; the "hemp" version is a later embellishment.^[19]

MYTH

The United States Declaration of Independence was written on hemp paper. The engrossed Declaration was written on parchment — treated animal skin — not on paper of any kind. Hemp paper existed and was widely used, but not for that document.

MYTH

"Fifty thousand uses." This famous figure, explored in Chapter XI, is folklore inflated from a 1938 magazine article. The plant is genuinely versatile, but the number is a slogan, not a tally.

Clearing away the myths leaves the real and impressive story intact: a plant woven into the material life of civilization. The next chapter examines that material side directly — the fibre, the food, and the building blocks.

CHAPTER V

The Fibre and the Field

STRIP AWAY THE CONTROVERSY and cannabis is, at heart, an industrial crop of extraordinary range. The hemp form — grown for stalk and seed rather than for intoxication — yields fibre, food, building material, and feedstock for plastics and fuel. This chapter surveys the plant’s material uses, the ones that lie behind the “thousands of products” boast. They are real, they are documented, and several are genuinely impressive.

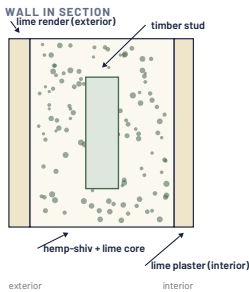
Fibre, textiles, and paper

The plant’s outer *bast* fibres remain its classic product: long and strong, they make rope, canvas, sacking, and increasingly fine textiles, often blended with cotton or linen. Compared with cotton, hemp is typically far less thirsty and needs fewer pesticides, which is much of its modern environmental appeal. The woody inner core, once treated as waste, is now used for animal bedding, mulch, and — most importantly — building materials. Hemp also makes excellent paper, and did so for centuries; the limiting factor today is not the fibre but the economics of retooling an industry built around wood pulp.

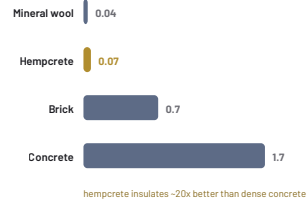
Hempcrete and building

One of the most promising modern uses combines the woody hurd with a lime binder to make *hempcrete*, a lightweight bio-composite used as insulating infill in walls. Hempcrete is not load-bearing — it fills a structural frame rather than replacing it — but it insulates well, manages moisture, and resists fire and pests. Its headline virtue is climate-related: because the hemp locks away carbon dioxide absorbed while growing, and the lime slowly reabsorbs more as it cures, well-designed hempcrete walls can store more carbon than their manufacture emits.^[21]

HEMPCRETE: A CARBON-STORING WALL



THERMAL CONDUCTIVITY (W/m-K) lower = insulates better



Carbon balance:

growing hemp draws down roughly 8-15 t CO₂ per hectare: the shiv locks that carbon into the wall while the lime binder slowly re-absorbs CO₂ as it cures - so a finished wall can be carbon-negative over its life.

Figure 8. Building with the stalk. Hempcrete – hemp hurd bound with lime – fills a structural frame as insulating, breathable, fire-resistant infill, and can be carbon-storing over its life cycle.

VERIFIED

Hemp is an effective carbon sink while growing, drawing down substantial carbon dioxide per hectare, and hempcrete can be carbon-negative over its life cycle when the stored carbon outweighs production emissions.^[22]

Food from the seed

Hemp *seed* is a genuine nutritional success story, entirely separate from the plant's cannabinoids. Shelled hemp seeds ("hemp hearts") are rich in easily digestible protein and in polyunsaturated fats with a favourable balance of omega-6 to omega-3 fatty acids; the seed oil is prized for the same reason. ^[20] Hemp seed contains only trace cannabinoids and is not intoxicating. It appears today as seeds, oil, protein powder, and milk — an ordinary, healthy food that happens to come from a famously controversial plant.

Plastics, fuel, and the field

Hemp fibre can reinforce bioplastics and composite panels, lending strength at low weight; the automotive industry already uses natural-fibre composites, including hemp, in some interior parts. The seed oil and the plant's biomass can in principle be converted into biodiesel and other biofuels, though here economics and energy balance, not chemistry, set the limits. In the field itself, hemp grows quickly, shades out weeds, and can draw certain contaminants from soil — a process called *phytoremediation* — though plants used to clean polluted ground are not then fit for food or medicine.

These material uses are the documented backbone of hemp's versatility. But turning the plant into any of them begins in the soil, with the unglamorous craft of growing it well — the subject of the next chapter.

CHAPTER VI

Growing the Plant

EVERY PRODUCT IN this book begins as a seed in the ground. How cannabis is grown depends entirely on what it is grown for: rope and hempcrete demand tall, crowded stalks; seed demands room to set grain; high-cannabinoid flower demands space, light, and unpollinated female plants. This chapter surveys the agronomy that links the botany of Chapter I to the industries of Chapter V.

Reading the light

Cannabis is, for the most part, a *short-day* plant: shortening late-summer days trigger most varieties to switch from leafy growth into flowering. This single fact governs the grower's calendar. It also explains why varieties bred near the equator behave differently from those bred at high latitudes, where the season is short and the daylight rhythm extreme — an adaptation written into the plant's genetics over its long migration.^[3] Indoor growers exploit the same biology directly, flipping their lamps to a shorter daily cycle to bring plants into flower on command. A class of “autoflowering” varieties, derived from the hardy wild *ruderalis* forms, sidesteps the light cue and flowers with age instead.

Three crops, three methods

The same species is farmed in strikingly different ways depending on the goal. Grown for *fibre*, hemp is sown densely so the plants grow tall and slender with long, unbranched stalks; it is then cut and left to *ret* — a controlled partial rotting that loosens the bast fibre from the core. Grown for *grain*, it is spaced more generously and harvested for seed. Grown for *cannabinoids*, plants are given still more room, often started as cuttings (clones)

to guarantee they are female, and the prized seedless flower is achieved by keeping pollen-shedding males well away.

KEY FACT

The plant's use dictates its farming. Fibre hemp is crowded and tall; grain hemp is spaced for seed; drug-type cannabis is grown for unpollinated female flowers. One species, three quite different fields.

A hardy but demanding crop

Hemp has a deserved reputation for toughness — it germinates readily, grows fast, and shades out many weeds, reducing the need for herbicides. But a high-quality crop is still demanding. Fibre and seed hemp reward good soil and adequate nitrogen; cannabinoid crops are managed almost horticulturally, with close attention to light, nutrients, airflow, and the timing of harvest, since cannabinoid and terpene content peak within a narrow window. Across all types, the same molecules that interest pharmacists — and regulators — are monitored closely, because a fibre or seed crop that drifts above the legal THC threshold can be condemned as a drug crop regardless of the farmer's intent.

And it is that threshold — the legal line first met in Chapter I — that has lately become the most turbulent part of the whole subject. The next chapter turns to the law.

CHAPTER VII

Cannabis and the Law

NO PART OF the cannabis story moves faster than the law, and the years 2025 and 2026 brought some of the most consequential changes in a century. This chapter sets out the legal landscape as it stands in mid-2026, in three arenas: the United States, Canada, and the international system. Law changes; readers should treat what follows as a snapshot, accurate to the date of writing, and verify the current position before relying on it.

PLEASE NOTE

This chapter is information, not legal advice, and the law described here is current only as of mid-2026 and may since have changed. Cannabis law varies sharply by country and, within federal systems, by state or province. Always check the law where you actually are.

The United States: two upheavals at once

For decades the American picture was simple to state if not to defend: marijuana sat in Schedule I of the Controlled Substances Act, the category reserved for drugs deemed to have no accepted medical use, even as a majority of states built their own legal medical and recreational markets in open tension with federal law. By 2026 two separate federal upheavals had broken that long stalemate — one for marijuana, one for hemp.

Marijuana: a partial move to Schedule III

The first upheaval was a long-awaited rescheduling. Following an executive order in December 2025, the Acting Attorney General issued a final order in April 2026 that moved two specific categories — marijuana-derived drug products approved by the Food and Drug Administration, and marijuana dispensed under state-licensed medical programmes — out of Schedule I and into the far less restrictive Schedule III, effective in late April 2026.^[26]

[27] The practical significance is large: Schedule III status relieves state-legal medical operators of a punitive tax provision, known as Section 280E, that had barred ordinary business deductions, and it eases research.

KEY FACT

As of mid-2026, the United States has moved FDA-approved and state-licensed *medical* marijuana to Schedule III. Purely *recreational* marijuana remains in Schedule I pending the outcome of a further expedited administrative hearing.

Crucially, the move was partial. Recreational marijuana — cannabis outside an approved drug or a state medical programme — remained in Schedule I, with its fate hanging on a further expedited administrative hearing under way as this book went to press.[27] The United States thus entered a peculiar interim in which the very same plant could be Schedule III or Schedule I depending on how it was sold.

Hemp: the closing of the “loophole”

The second upheaval ran in the opposite direction. The 2018 Farm Bill had legalized hemp by defining it as cannabis containing no more than 0.3 percent delta-9 THC by dry weight — a definition that inadvertently opened a vast market in intoxicating hemp-derived products, from delta-8 THC to high-dose THCA flower, that were technically “hemp” on paper. In November 2025 Congress closed that gap. A spending law redefined hemp by its *total* THC, including THCA and other similarly intoxicating cannabinoids, and capped finished consumer products at a very low quantity of total THC per container, while excluding synthesized cannabinoids.[23] [24]

The effect is sweeping. Industry analysts estimated that the overwhelming majority of the hemp-derived cannabinoid products then on the market would become non-compliant once the new rule takes effect, after a transition period running into late 2026.[25] A cluster of reform bills was introduced almost immediately to soften, delay, or rework the change, and the situation remained fluid. The lesson for the reader is the recurring one

of this chapter: in cannabis law, today’s settled rule is often tomorrow’s contested one.

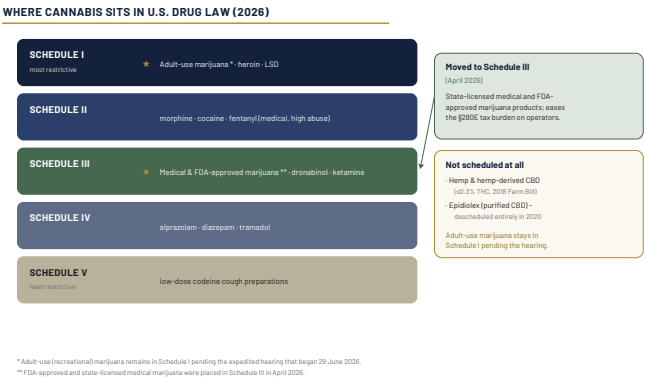


Figure 9. The American drug schedules. State-licensed medical and FDA-approved marijuana moved to Schedule III in 2026; recreational marijuana remained in Schedule I pending further proceedings. Hemp is regulated separately, not on this ladder.

Canada: a settled federal framework

Canada offers a striking contrast in stability. With the *Cannabis Act* of 2018, Canada became one of the first major economies to legalize and regulate recreational cannabis nationwide, creating a licensed system for production and sale alongside controls on potency, packaging, and access by young people.^[28] Industrial hemp is governed by its own regulations under the same parent legislation, which set out licensing and the permitted low-THC threshold for hemp crops.^[29] Where the United States spent the 2020s in turbulent transition, Canada largely administered a framework already in place — a useful reminder that legalization, once settled, can become ordinary regulation.

The international system

Above national law sits the United Nations drug-control framework, anchored in the 1961 Single Convention. For sixty years cannabis sat in that treaty’s strictest category alongside heroin. In December 2020 the Commission on Narcotic Drugs voted narrowly to remove cannabis and

cannabis resin from the most restrictive Schedule IV of the 1961 Convention — a symbolic acknowledgement of its medical value, though cannabis remained controlled.^[30] The vote did not legalize anything by itself, but it loosened a long-frozen international consensus and gave reform-minded governments more room to act.

Law sets the boundaries of the cannabis economy; within those boundaries, a large and fast-moving industry has grown up. The next chapter turns to the business.

CHAPTER VIII

The Business of Cannabis

WHEREVER CANNABIS HAS been legalized, an industry has rushed to fill the space — cultivation, processing, retail, and a sprawling trade in hemp goods. The numbers are large but should be read with care, because market figures are estimates produced by competing analysts using different definitions. This chapter sketches the economic shape of the plant's commerce and flags honestly where the figures are soft.

ON THE NUMBERS

Market sizes and forecasts in this chapter are analyst estimates, not audited facts. Different firms define the market differently and reach different totals. Treat them as orders of magnitude, and note the firm and base year for each.

Two markets, not one

It helps to separate two distinct economies. The first is *legal cannabis* — medical and adult-use marijuana sold through licensed channels. By one widely cited estimate the global legal cannabis market was worth on the order of seventy billion US dollars in 2024 and was projected to grow several-fold over the following decade.^[31] The second is *industrial hemp* — fibre, seed, and hurd for textiles, food, and building materials — a smaller but expanding market valued in the single-digit billions and likewise forecast to multiply.^[32]

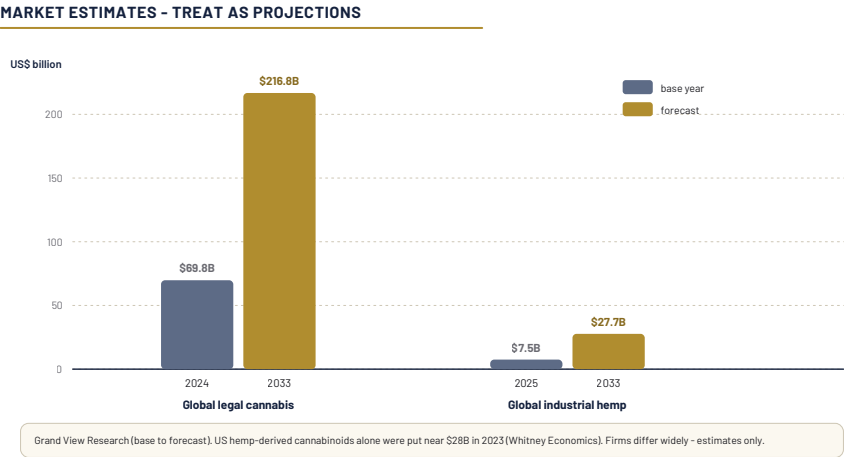


Figure 10. Two economies, both growing. Illustrative analyst estimates for the legal cannabis and industrial hemp markets, current versus forecast. Figures are estimates and vary considerably between sources.

The cannabinoid wild card

Straddling the two sits a third, more turbulent business: hemp-derived cannabinoid products. Born from the 2018 Farm Bill’s definition, this market grew explosively in the United States, with some analysts putting its annual sales in the tens of billions of dollars — rivalling the licensed marijuana market itself.^[33] It is precisely this market that the 2025 legal changes described in the previous chapter threaten to upend, a vivid illustration of how a regulatory definition can create — and then erase — an entire industry almost overnight.

The economics of a young industry

Legal cannabis is, in business terms, an immature and lumpy market. Producers have repeatedly swung from shortage to glut as new capacity comes online, pushing wholesale prices down. Heavy regulation, banking restrictions, and, in the United States, the long shadow of the Section 280E tax provision squeezed margins for years; the 2026 rescheduling of medical marijuana is expected to ease that particular burden. Hemp, for its part,

depends less on the drug economy and more on competing with established materials — cotton, wood pulp, concrete, conventional plastics — where it must win on cost and performance, not novelty. The plant's most futuristic commercial promise lies in exactly that contest, at the frontier of advanced materials, which is where the book turns next.

CHAPTER IX

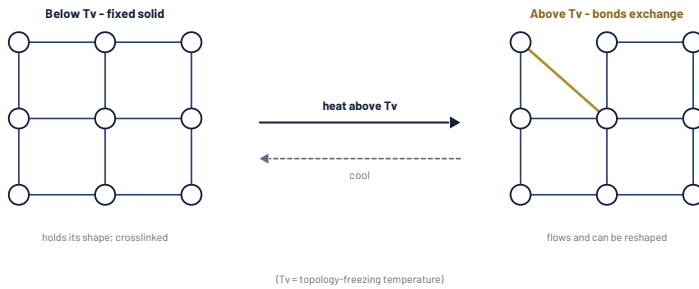
The Materials Frontier

AT THE FAR EDGE of the cannabis story, well beyond anything sold today, lies a research frontier: using the plant's oils and fibres to build a new class of recyclable plastics. This chapter explains that frontier and then examines one specific, forward-looking proposal — the *Hempoxies* concept — with the clearest possible warning that it is a research hypothesis, not a product on a shelf. The honesty this book applies to folklore must apply equally to speculation, including its own.

Vitrimers: plastics that can be rebuilt

Conventional plastics fall into two camps. *Thermoplastics* melt and can be remoulded, but tend to be weaker; *thermosets* are strong and heat-resistant but, once cured, cannot be melted or reshaped — they can only be discarded. In 2011 a group of French chemists introduced a third category they called *vitrimers*: networked plastics that hold their shape like a thermoset, yet can be softened and reshaped like glass when heated, because their internal bonds can quietly swap partners at high temperature.^[34] The promise is a material that is both durable and, in principle, repairable and recyclable.

HOW A VITRIMER WORKS



Zinc-acetate-catalysed transesterification lets the crosslinks swap partners. The total number of bonds stays constant – so the material can be reshaped and recycled, yet it never fully melts.

Figure 11. The vitrimer idea. Unlike a permanently cross-linked thermoset, a vitrimer's network bonds can exchange partners above a characteristic temperature, letting the material be reshaped and recycled while staying strong in use.

A natural next question is whether such materials can be made from plants rather than petroleum. Plant oils can be chemically modified — for example by *epoxidation* — into reactive building blocks for exactly these kinds of networks, and epoxidized vegetable oils are an active area of green-materials research.^[35] Hemp seed oil is a plausible candidate feed-stock, and hemp fibre an obvious reinforcement. This is the soil in which the Hempoxies concept is planted.

The Hempoxies concept – a research hypothesis

SPECULATIVE – NOT YET VALIDATED

Hempoxies is a forward-looking research concept at a very early stage (broadly, “technology readiness level” 1-2: basic principles and concept only). It is not a commercial product, and the performance figures associated with it are *projected targets*, not measured results. Nothing here should be read as a claim that such a material currently exists or performs as hoped.

With that warning firmly in place, the concept can be described. *Hempoxies* proposes a bio-based vitrimer — more precisely a covalent adaptable net-

work — built largely from hemp. The envisioned recipe combines epoxidized hemp seed oil with a bio-derived reactive diluent (furfuryl glycidyl ether), cured with citric acid and catalysed by a zinc salt (zinc acetate) of the kind shown to drive the bond-exchange chemistry in the original vitrimer work — all reinforced with hemp fibre. The aspiration is a strong, lightweight, plant-derived composite that, unlike a conventional thermoset, could be reshaped, repaired, and recycled at end of life.

HEMPOXIES v.56 – A PROPOSED BIO-VITRIMER (CONCEPT)

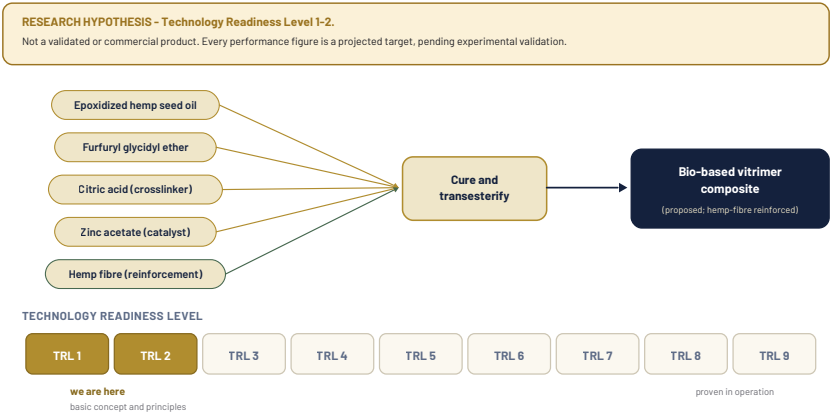


Figure 12. A concept, clearly labelled. The proposed Hempoxies inputs — epoxidized hemp seed oil, a bio-derived diluent, a citric-acid hardener, a zinc catalyst, and hemp fibre — and the technology-readiness scale on which the idea presently sits near the very bottom.

Why include a speculative concept in an encyclopedia at all? Because the plant’s future may matter as much as its past, and because ideas like this one show where hemp’s material story could go. But a reference work earns trust precisely by labelling the speculative as speculative. Hempoxies belongs here as a clearly marked research direction — one hypothesis among the many real, proven uses catalogued elsewhere in this book — and not as an accomplished fact. The chapters that follow return to firmer ground: the public-health realities of a plant in wide use, and a closing reckoning with the “fifty thousand uses” that gave this book its title.

CHAPTER X

Safety and Public Health

AS CANNABIS BECOMES legal across more of the world, it shifts from a criminal-justice question to a public-health one. The relevant question is no longer simply whether people use cannabis, but how to reduce the harm among those who do. This chapter gathers the practical safety picture: who is most at risk, how potency and method matter, and what sensible caution looks like. It revisits, in plainer and more personal terms, the medical risks set out in Chapter III.

PLEASE NOTE

This chapter discusses risks and harm reduction; it is not medical advice and not an endorsement of use. If you are worried about your own or someone else's cannabis use or mental health, a clinician or a confidential helpline in your country can help.

The developing brain

The single clearest message in cannabis public health concerns the young. The adolescent brain continues developing into the mid-twenties, and the evidence for harm — including the raised risk of psychosis and of developing a dependence — falls hardest on those who begin in their teens.^{[11][12]} This is the firmest ground on which to recommend caution: delaying first use, and avoiding regular use during adolescence, is the most protective single step a person can take.

Potency and method

Two features of modern cannabis sharpen its risks. The first is *potency*: legal and illegal markets alike have drifted toward high-THC flower and toward concentrates that can approach pure THC, far stronger than the

cannabis of earlier generations, and higher potency tracks higher risk of both acute harm and psychosis.^[11] The second is *method*. Smoking delivers effects within minutes, making it easier to gauge a dose, but burns plant matter and irritates the lungs. Edibles avoid the smoke but act slowly and unpredictably — the classic cause of an alarming over-dose is an impatient user who takes a second edible before the first has worked.

HARM-REDUCTION BASICS

If using at all: prefer lower-potency products; with edibles, “start low and go slow” and wait at least two hours before re-dosing; never mix with driving; keep products locked away from children and pets; and be especially cautious if young, pregnant, or personally or family-prone to psychosis.

Driving and acute effects

Cannabis impairs the coordination, reaction time, and judgement that safe driving requires, and driving while impaired by cannabis is both dangerous and, in most places, illegal. Unlike alcohol, cannabis has no simple, universally agreed roadside measure of impairment, which complicates enforcement but does nothing to lessen the underlying danger. Acutely, an over-large dose — most often from edibles — can cause intense anxiety, panic, a racing heart, and vomiting; deeply unpleasant, rarely physically dangerous in an otherwise healthy adult, and best treated with a calm, safe place and time.

Dependence, contaminants, and accidental poisoning

A meaningful minority of regular users develop cannabis use disorder, with genuine withdrawal — irritability, sleep trouble, loss of appetite — on stopping.^[12] Product quality is its own concern: cannabis can carry pesticide residues, moulds, heavy metals drawn from soil, or, in illicit concentrates, residual solvents, which is much of the public-health case for a regulated, tested market over an unregulated one. Finally, legalization has

brought a rise in *accidental poisoning* of young children who mistake cannabis edibles for ordinary sweets — a powerful, concrete reason to store all cannabis products locked and out of reach.

Seen whole, the public-health picture is neither the harmlessness of advocacy nor the menace of prohibition propaganda. It is an ordinary adult intoxicant with real but manageable risks, sharpest for the young and the heavy user. That balanced spirit carries into the final chapter, which returns at last to the slogan on the cover.

CHAPTER XI

The “Fifty Thousand Uses”: A Catalogue

THIS BOOK TAKES its title from a boast that deserves, at last, a straight answer. You will often read that cannabis has “fifty thousand uses.” Where does the number come from, is it true, and what are the plant’s genuine uses? This closing chapter traces the slogan to its source, explains why the figure should not be taken literally, and then does the more honest thing: it lays out a categorized catalogue of the plant’s real, documented uses.

Where the number came from

The slogan’s ancestor appeared in February 1938, when *Popular Mechanics* magazine ran an enthusiastic article headlined “New Billion-Dollar Crop,” predicting that newly mechanized hemp processing would feed thousands of manufactured products from the plant’s fibre and woody pulp.^[17] The piece spoke of many thousands of possible products; in the decades of re-telling that followed, the figure drifted upward and hardened into the round “fifty thousand” so often repeated today. It was always an estimate of *potential* products from an enthusiastic booster, never a verified inventory.

MYTH (AS A LITERAL COUNT)

“Fifty thousand uses” is advocacy folklore, not a tally. It descends from a 1938 magazine’s optimistic estimate of thousands of potential hemp products and inflated over time. The plant is genuinely versatile — but no one has ever counted fifty thousand distinct uses.

The honest version

Strip away the inflated number and something real remains: a single plant that yields fibre, food, medicine, fuel, and building material, with a frontier in advanced composites. The right way to honour the “fifty thousand uses” claim is not to invent a list of that length, but to organize the genuine uses documented throughout this book into clear families. The diagram opposite does exactly that, tracing each part of the plant — flower, seed, bast fibre, and woody hurd — to the families of products it supports.

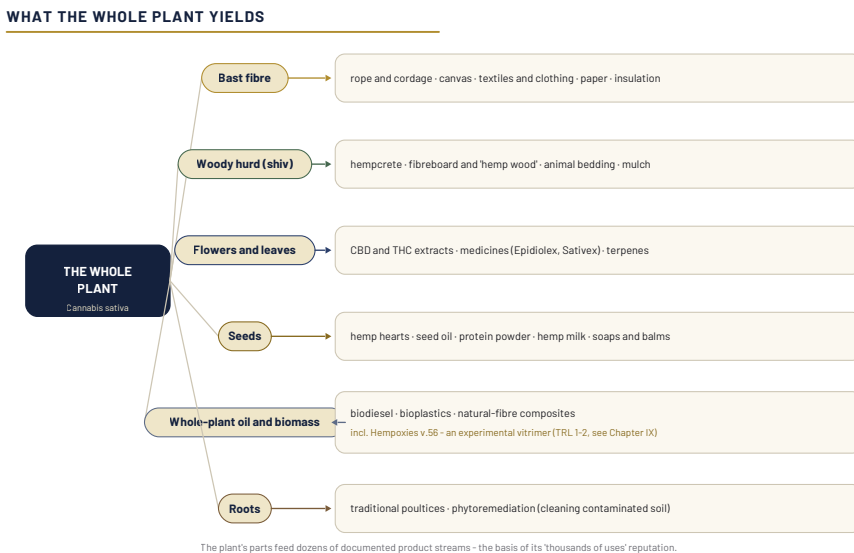


Figure 13. The real catalogue. From four parts of one plant flow the documented use-families: medicines and cannabinoids from the flower; food and oil from the seed; textiles, rope, and paper from the bast fibre; building materials, bedding, and composites from the woody hurd — with bio-based materials as the speculative frontier.

A catalogue of documented uses

Gathering the threads of the whole book, the plant’s verified and well-attested uses fall into roughly ten families. The list below is deliberately honest: it counts in the dozens, not the tens of thousands, and each entry rests on the evidence presented in earlier chapters.

1. Medicine. Approved cannabis-derived drugs for rare epilepsies (purified CBD), for chemotherapy nausea and appetite loss (THC medicines), and for multiple-sclerosis spasticity (a THC–CBD spray); and uses with substantial evidence including chronic pain.[8]

2. Food. Hemp seeds, hemp-seed oil, hemp protein, and hemp milk — a nutritious food rich in digestible protein and well-balanced fats, with only trace cannabinoids.[20]

3. Textiles and rope. Strong bast fibre for cordage, canvas, sackage, and woven cloth — the plant’s oldest industrial role, and a lower-water alternative to cotton.

4. Paper. Pulp for paper and board, used historically for centuries and still technically viable.

5. Building materials. Hempcrete insulating infill, hemp-fibre insulation batts, and hemp-based boards — breathable, fire-resistant, and potentially carbon-storing.[21]

6. Plastics and composites. Hemp-fibre-reinforced bioplastics and composite panels, already used in some automotive and consumer parts, lending strength at low weight.

7. Body care. Hemp-seed oil in soaps, lotions, and cosmetics, and CBD in a large (and loosely regulated) range of topical products.

8. Agriculture and the environment. A fast-growing rotation and cover crop that suppresses weeds, plus phytoremediation — using the plant to draw certain contaminants from soil.

9. Energy. Biodiesel from the seed oil and biomass-derived fuels — chemically feasible, though limited by economics rather than by the plant.

10. Recreational and ritual use. The intoxicant and ceremonial uses, ancient and modern, that drove much of the plant’s history and most of its law.

And beyond these ten, the speculative frontier of Chapter IX: bio-based recyclable composites such as the Hempoxies concept, included honestly as a research direction rather than an achieved use.

THE HONEST ANSWER

Does cannabis have fifty thousand uses? No — not as a literal count. Is it one of the most versatile plants ever cultivated, with documented uses across medicine, food, textiles, building, and beyond? Yes. The truth is smaller than the slogan and more impressive for being real.

That is a fitting place to end. An encyclopedia’s task is not to make a plant sound more wondrous than it is, but to show clearly what it actually is — and cannabis, seen plainly, needs no exaggeration.

APPENDIX

Glossary

A BRIEF GUIDE to the recurring terms of this book, in plain language.

Bast fibre

The long, strong fibre from the outer rind of the hemp stalk, used for rope, canvas, and cloth.

Cannabinoid

A member of the family of compounds, such as THC and CBD, that the cannabis plant produces and that act on the body's cannabinoid receptors.

CBD (cannabidiol)

A major, non-intoxicating cannabinoid; the active ingredient of an approved anti-seizure medicine.

CBGA (cannabigerolic acid)

The “mother cannabinoid” precursor from which THCA, CBDA, and CBCA are made.

Covalent adaptable network (CAN)

A class of polymer network whose chemical bonds can rearrange under a stimulus such as heat; vitrimers are one type.

Decarboxylation

The heat-driven reaction that converts the plant's acidic cannabinoids (THCA, CBDA) into active THC and CBD.

Dioecious

Having separate male and female plants, as cannabis usually does.

Endocannabinoid system

The body's own network of cannabinoid messengers and receptors (CB1 and CB2) that THC mimics.

Entourage effect

The contested idea that cannabis compounds work better in combination than in isolation.

Hemp

Cannabis grown for fibre, seed, or non-intoxicating cannabinoids, legally defined by a low THC content.

Hempcrete

An insulating, non-load-bearing building material made from the woody hemp core (hurd) bound with lime.

Hurd (shiv)

The woody inner core of the hemp stalk, used in hempcrete, bedding, and boards.

Marijuana

Cannabis grown for its intoxicating flowers, legally defined by a THC content above the hemp threshold.

Phytoremediation

Using plants to draw contaminants out of soil; hemp can serve this role.

Schedule (drug)

A legal category ranking a controlled substance by its perceived risk and medical value; Schedule I is the most restrictive in the United States.

Sinsemilla

Seedless cannabis flower, produced by keeping female plants unpollinated.

Terpene

A volatile aromatic compound, found throughout the plant kingdom, that gives cannabis its smell.

THC (delta-9-tetrahydrocannabinol)

The principal intoxicating compound of cannabis.

Thermoset

A plastic that, once cured, cannot be melted or reshaped — strong but not reprocessible.

Trichome

A tiny glandular outgrowth on the flowers and leaves where cannabis makes and stores its resin.

Vitrimer

A plastic that holds its shape like a thermoset but can be reshaped and recycled when heated, because its network bonds can swap partners.

APPENDIX

A Timeline of Cannabis

THE PLANT’S LONG companionship with humanity, gathered in one view. Dates for the most ancient events are approximate and, in places, debated; the modern legal milestones are firm.



Figure 7(reprised). Milestones from Neolithic fibre and ancient ritual use through the age of sail, the twentieth-century prohibition, and the legal reforms of the 2010s and 2020s.

APPENDIX

Comparison Tables

A **SET OF** at-a-glance comparisons drawn from the chapters. Where a cell describes a relative tendency rather than a precise figure, it is meant as a general guide, not a laboratory value.

Hemp fibre versus cotton

Property	Hemp	Cotton
Water demand	Generally low	Generally high
Pesticide need	Low	Often high
Fibre strength	Very high	Moderate
Softness (untreated)	Coarser	Softer
Typical biomass yield	High, fast-growing	Moderate

Relative tendencies; exact values depend on variety, climate, and farming practice.

Hempcrete versus conventional concrete

Property	Hempcrete	Concrete
Structural role	Non-load-bearing infill	Load-bearing
Insulation	Good (insulating)	Poor
Weight	Light	Heavy
Carbon over life cycle	Can be net-negative	High embodied carbon
Moisture handling	Breathable	Largely impermeable

Major cannabinoids at a glance

Cannabinoid		Intoxicat- ing?	Notable for
THC	(delta-9-THC)	Yes	The principal “high”; appetite, euphoria
CBD		No	Approved epilepsy medicine; wide consumer use
CBG		No	Minor cannabinoid; precursor-derived
CBN		Mildly	Forms as THC ages; marketed for sleep
CBC		No	Minor cannabinoid under study
THCA / CBDA		No	Raw-plant acids; become THC / CBD on heating

Common terpenes and where else they occur

Terpene	Typical aroma	Also found in
Myrcene	Earthy, musky	Mango, hops
Limonene	Citrus	Citrus peel
Pinene	Pine	Pine resin, rosemary
Linalool	Floral	Lavender
Caryophyllene	Peppery	Black pepper, cloves
Terpinolene	Fresh, herbal	Nutmeg, tea tree

Hemp seed: nutritional highlights

Separate from any cannabinoid, hemp seed is a nutritious food. Documented highlights include a complete protein containing all the essential amino acids, a high content of polyunsaturated fats with a favourable balance of omega-6 to omega-3 fatty acids (often near a 3-to-1 ratio), and

useful amounts of minerals such as magnesium and iron — all with only trace cannabinoids.^[20]

APPENDIX

Key Organizations & Agencies

THE BODIES THAT research, regulate, or report on cannabis, and the role each plays in the story told here.

U.S. Drug Enforcement Administration (DEA)

Administers the Controlled Substances Act and its drug schedules; the agency through which marijuana's 2026 rescheduling was carried out.

U.S. Food and Drug Administration (FDA)

Approves medicines and regulates food and consumer products; approved the first plant-derived CBD drug in 2018 and oversees hemp-derived product rules.

U.S. Department of Agriculture (USDA)

Oversees hemp as an agricultural crop; produced the 1942 film *Hemp for Victory*.

Health Canada

Administers Canada's Cannabis Act and Industrial Hemp Regulations, licensing producers and setting product rules.

United Nations Office on Drugs and Crime (UNODC) & Commission on Narcotic Drugs (CND)

Steward the international drug-control treaties; the CND voted in 2020 to reclassify cannabis under the 1961 Single Convention.

World Health Organization (WHO)

Its Expert Committee on Drug Dependence reviews the science of cannabis and recommends international scheduling.

National Academies of Sciences, Engineering, and Medicine (U.S.)

Independent expert body whose 2017 report graded the evidence on cannabis health effects.

BACK MATTER

References

Numbered in order of first citation. Every entry points to a live, public source — a peer-reviewed paper (linked by its permanent DOI), a government or United Nations document, a primary historical record, or reporting from a credible outlet. Web addresses were verified current as of mid-2026.

1. McPartland, J. M. (2018). Cannabis systematics at the levels of family, genus, and species. *Cannabis and Cannabinoid Research*, 3(1). <https://doi.org/10.1089/can.2018.0039>
2. Ren, G., et al. (2021). Large-scale whole-genome resequencing unravels the domestication history of *Cannabis sativa*. *Science Advances*, 7(29), eabg2286. <https://doi.org/10.1126/sciadv.abg2286>
3. Photoperiodic and latitudinal adaptation of flowering in *Cannabis sativa* (2018). *Frontiers in Plant Science*, 9, 1876. <https://doi.org/10.3389/fpls.2018.01876>
4. The biosynthesis of the cannabinoids: a review (2021). *Journal of Cannabis Research*, 3. <https://doi.org/10.1186/s42238-021-00062-4>
5. Russo, E. B. (2011). Taming THC: potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. *British Journal of Pharmacology*, 163(7). <https://doi.org/10.1111/j.1476-5381.2011.01238.x>
6. Santiago, M., et al. (2019). Absence of entourage: terpenoids commonly found in *Cannabis sativa* do not modulate the functional activity of THC at human cannabinoid receptors. *Cannabis and Cannabinoid Research*. <https://doi.org/10.1089/can.2019.0016>
7. Devane, W. A., et al. (1992). Isolation and structure of a brain constituent that binds the cannabinoid receptor. *Science*, 258(5090). <https://doi.org/10.1126/science.1470919>
8. National Academies of Sciences, Engineering, and Medicine (2017). *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*. <https://doi.org/10.17226/24625>
9. U.S. Food and Drug Administration (2018). FDA approves first drug comprised of an active ingredient derived from marijuana to treat rare, severe forms of epilepsy. [fda.gov](https://www.fda.gov)

10. Devinsky, O., et al. (2018). Effect of cannabidiol on drop seizures in the Lennox-Gastaut syndrome. *New England Journal of Medicine*, 378(20). <https://doi.org/10.1056/NEJMoa1714631>
11. Di Forti, M., et al. (2019). The contribution of cannabis use to variation in the incidence of psychotic disorder across Europe (EU-GEI). *The Lancet Psychiatry*, 6(5). [https://doi.org/10.1016/S2215-0366\(19\)30048-3](https://doi.org/10.1016/S2215-0366(19)30048-3)
12. Connor, J. P., et al. (2021). Cannabis use and cannabis use disorder. *Nature Reviews Disease Primers*, 7. <https://doi.org/10.1038/s41572-021-00247-4>
13. Sorensen, C. J., et al. (2017). Cannabinoid hyperemesis syndrome: diagnosis, pathophysiology, and treatment — a systematic review. *Journal of Medical Toxicology*, 13(1). <https://doi.org/10.1007/s13181-016-0595-z>
14. Ren, M., et al. (2019). The origins of cannabis smoking: chemical residue evidence from the first millennium BCE in the Pamirs. *Science Advances*, 5(6), eaaw1391. <https://doi.org/10.1126/sciadv.aaw1391>
15. Russo, E. B., et al. (2008). Phytochemical and genetic analyses of ancient cannabis from Central Asia. *Journal of Experimental Botany*, 59(15). <https://doi.org/10.1093/jxb/ern260>
16. McPartland, J. M., Hegman, W., & Long, T. (2019). Cannabis in Asia: its center of origin and early cultivation. *Vegetation History and Archaeobotany*, 28. <https://doi.org/10.1007/s00334-019-00731-8>
17. New billion-dollar crop (1938). *Popular Mechanics*, February 1938. votehemp.com
18. U.S. Department of Agriculture (1942). *Hemp for Victory* (film). archive.org
19. The Henry Ford. Soybean car. thehenryford.org
20. Callaway, J. C. (2004). Hempseed as a nutritional resource: an overview. *Euphytica*, 140. <https://doi.org/10.1007/s10681-004-4811-6>
21. Arehart, J. H., Nelson, W. S., & Srubar, W. V. (2021). On the carbon storage potential of hemp-lime concrete (hempcrete) in buildings. *Journal of Cleaner Production*, 266. <https://doi.org/10.1016/j.jclepro.2020.123951>
22. Shah, D. (2021, interview). Hemp could be a carbon-negative material of the future. *Dezeen*, 30 June 2021. dezeen.com
23. U.S. Congress. H.R. 5371, 119th Congress (Public Law 119-37). congress.gov
24. Arnold & Porter (2025). Major changes to federal regulation of hemp-derived products. arnoldporter.com
25. Perkins Coie (2025). Shutdown legislation brings new hemp rules. perkinscoie.com

26. Gibson Dunn (2026). DEA downschedules state-medical marijuana and FDA-approved marijuana drug products to Schedule III. [gibsondunn.com](https://www.gibsondunn.com)
27. U.S. Federal Register (2026). Schedule III rescheduling final order and expedited hearing notices (91 Fed. Reg. 22777). [federalregister.gov](https://www.federalregister.gov)
28. Parliament of Canada (2018). Cannabis Act, S.C. 2018, c. 16. laws-lois.justice.gc.ca
29. Government of Canada (2018). Industrial Hemp Regulations, SOR/2018-145. laws-lois.justice.gc.ca
30. United Nations (2020). UN commission reclassifies cannabis, yet still considered harmful. *UN News*, 2 December 2020. news.un.org
31. Grand View Research (2024). Legal cannabis market size, share & trends analysis report. [grandviewresearch.com](https://www.grandviewresearch.com)
32. Grand View Research. Industrial hemp market size, share & trends analysis report. [grandviewresearch.com](https://www.grandviewresearch.com)
33. Whitney Economics. U.S. hemp-derived cannabinoid market reports. [whitneyeconomics.com](https://www.whitneyeconomics.com)
34. Montarnal, D., Capelot, M., Tournilhac, F., & Leibler, L. (2011). Silica-like malleable materials from permanent organic networks. *Science*, 334(6058). <https://doi.org/10.1126/science.1212648>
35. Reinhardt, M., et al. (2022). Epoxidized vegetable oils as bio-based building blocks for covalent adaptable networks. *Macromolecular Materials and Engineering*. <https://doi.org/10.1002/mame.202200455>

BACK MATTER

About the Author & Colophon

THIS BOOK WAS written and produced by Marie-Soleil Seshat Landry under the Landry Industries imprint in Moncton, New Brunswick, Canada. The author is an independent open-source intelligence researcher and publisher whose work spans investigative dossiers, policy analysis, and applied-materials research. Publications appear under ORCID 0009-0008-5027-3337.

On method

This volume was assembled on the principle that a reference work earns trust by separating what is known from what is merely repeated. Every factual claim is tied to a numbered source in the References, and each source points to a live, public document. Claims are marked throughout as *verified*, *contested*, or *myth*, and the book's own speculative material — chiefly the Hempoxies materials concept — is labelled as a research hypothesis rather than an established result. Where experts disagree, the book says so.

Colophon

The text is set in Spectral, a serif type designed for screen and print reading, with headings and labels in Barlow. The book's diagrams were drawn as vector figures in a clean, schematic style and rendered together with the text through an automated typesetting pipeline that converts a structured source document directly into this paginated PDF. The palette of navy and gold follows the Landry Industries house style.

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