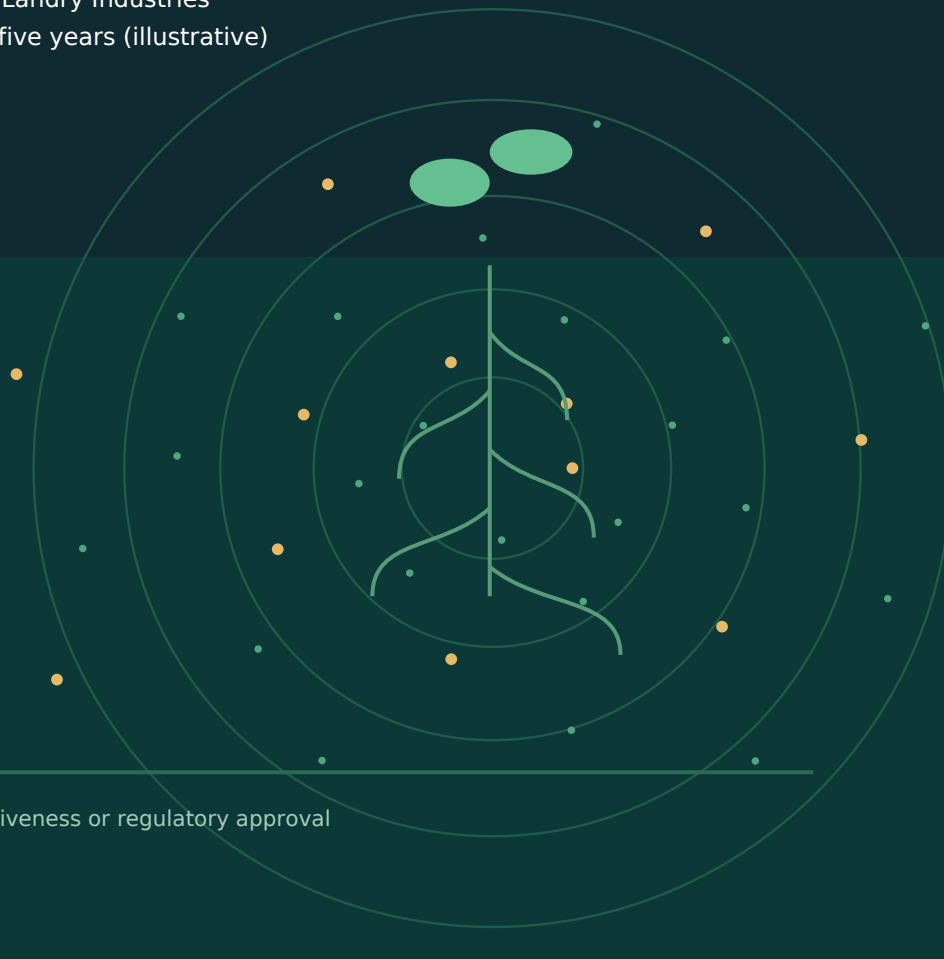
LAND REGENERATION / CANADA 2030

CANADIAN SELF-SEEDING HEMP SOIL REGENERATION RESEARCH PROGRAMME

A five-growing-season, licensed research programme to test cold-adapted autoflowering industrial hemp on degraded Canadian agricultural soils.

Programme period: 2027–2031 Proposed pilot: New Brunswick
Research status: Concept / pre-registration / regulatory review
Prepared: 12 November 2026
Proposed by: Marie-Soleil Seshat Landry, Landry Industries
Budget scenario: CAD $2.79 million over five years (illustrative)



PROGRAMME / DECISION BRIEF

01 Executive decision brief

THE INVESTMENT THESIS

Investigate whether low-THC, cold-adapted, age-triggered hemp can establish a self-renewing seed bank on already-degraded farmland, improve measurable soil condition and generate useful non-food biomass with fewer annual inputs - without establishing uncontrolled feral populations.

Canada has a credible research starting point: Health Canada lists an approved cultivar called SLV1D Auto for the 2026 growing season; CFIA documents the seed dormancy, wild seed-shattering and escape potential of cannabis; and Agriculture and Agri-Food Canada identifies soil organic carbon and erosion risk as central land-health indicators. [01, 05, 08, 09]

The central scientific risk is equally clear: cannabis often prefers fertile, well-drained soils. A plant able to reseed in a cold region is not necessarily able to restore nutrient-depleted soil. The programme tests that distinction rather than assuming it away. [07, 08, 17]

What this programme will establish

- Feasibility: winter seed survival, volunteer emergence, seed set before killing frost and five-year persistence.
- Restoration effect: soil-carbon stocks, aggregation, infiltration, erosion exposure, nutrients, microbial indicators and plant-community recovery.
- Value proposition: net establishment cost, energy use, life-cycle emissions and safely usable carbon-rich fibre / stem feedstocks.
- Governance: written authorization for any deliberately permitted reseeding, a monitored seed-escape boundary and a stop-work protocol.

NO PRODUCTION CLAIMS

This is a proposed research programme, not a completed study. No pilot site, university partnership, cultivar supply, licence, grant, seed-release authorization, carbon credit or remediation outcome is represented as secured.

Programme architecture

Workstream	Lead question	Primary result
WP1 / Genetics	Can approved lines flower and set viable seed in Atlantic Canadian conditions?	Phenology, THC, seed viability
WP2 / Field systems	Does licensed self-reseeding reduce annual establishment inputs?	Volunteer establishment per year
WP3 / Soil recovery	Does hemp outperform passive recovery and conventional alternatives?	Measured soil health / carbon
WP4 / Ecology	Can seed escape and gene flow remain acceptably controlled?	Escape and pollen audit
WP5 / Materials	Is clean biomass suitable for safe non-food products?	Material quality and LCA

02 Evidence and historical context

Historical precedent is limited but relevant. Soviet-era cultivation and the description of wild Russian cannabis forms show that cultivation, adaptation and feral persistence can coexist. They do not establish that Soviet authorities intentionally regenerated depleted soils with self-seeding hemp, nor that all Russian feral plants descended from deliberate state plantings. [17, 18]

The common term Cannabis ruderalis refers to a historically proposed taxon within a debated cannabis classification. Autoflowering (day-neutral / weakly photoperiod-dependent flowering) is a phenotype to confirm under experimental conditions - not a guarantee attached to every wild Russian plant. [17, 18]

What is established: the CFIA identifies wild cannabis seed dormancy, irregular germination, natural dispersal and cross-pollination potential. These traits make a field investigation defensible and containment indispensable. [05]

What remains unproven: persistence of a specified modern, compliant hemp genotype on impoverished Atlantic soils; positive net carbon balance; superiority to native restoration; and legal permission for recurrent self-sown generations under a normal commercial hemp licence. [02, 03, 04, 05, 07]

Evidence grading applied throughout

Grade	Interpretation	Example
A / documented	Directly established by regulator or published work	Pedigreed seed requirements; hemp seed dormancy
B / plausible	Consistent with research, context dependent	Five-year volunteer persistence on suitable soils
C / hypothesis	Requires randomized trial evidence	Lower costs AND improved SOC from self-reseeding

03 Objectives, hypotheses and success conditions

Primary research question: Can licensed, low-THC, age-triggered industrial hemp create a self-renewing, locally controllable seed bank on degraded but non-contaminated Canadian farmland, with better net soil and cost outcomes than conventional land-restoration options?

Pre-registered, falsifiable hypotheses

- H1 / Persistence: a monitored self-seeding treatment can produce an established spring stand in at least two consecutive post-introduction seasons without deliberate reseeding.
- H2 / Agronomic equivalence: by years 3–5, volunteer hemp stand density and usable biomass are not meaningfully inferior to an annually seeded hemp comparator, based on a margin set before data lock.
- H3 / Restoration: the hemp-based systems improve at least one primary soil-health endpoint against passive recovery, and do not materially underperform an appropriate native-plant restoration treatment.
- H4 / Safety: no confirmed non-compliant plants, unmanaged seed escape into protected land, unapproved biomass disposal or material product contamination.
- H5 / Economics: measured reduced seeding / tillage costs outweigh losses in productivity and added containment, testing and oversight expense.

Critical design guardrail: threshold values for economic non-inferiority, soil-carbon minimum detectable effect and acceptable escape frequency will be pre-registered after baseline variance and regulatory input. A statistically insignificant difference must not be labelled a success.

04 Site selection and programme boundary

The initial pilot is limited to already-disturbed private agricultural land in New Brunswick. A national programme could later replicate findings across Atlantic, Prairie and northern-climate zones under separate local approvals.

Three proposed field-site strata

Stratum	Entry condition	Priority measurement
A / Low organic matter	Former cropland with documented lower-than-local-reference SOC and workable drainage	Carbon stocks and soil structure
B / Eroded ground	Previously cultivated land with exposed / unstable topsoil, outside streams and wetlands	Cover, runoff and aggregate stability
C / Nutrient-depleted	Agricultural field with mapped nutrient limitation but no severe toxic contamination	Establishment without high fertilizer demand

Site admission requires owner agreement, a soil survey, historic land-use screen, baseline contamination assessment, ecological risk survey, nearby hemp/cannabis producer consultation and regulator-approved seed containment. Avoid intact native habitats, protected land, wetlands, peatlands and riparian buffers. [05, 11, 12]

SEPARATE CONTAMINATION TRACK

Heavy-metal or PFAS sites should not be combined with the general field plots. Use a separate, permitted contained greenhouse / mesocosm work package with professional site characterization, chain-of-custody samples and hazardous-material pathways. Hemp uptake and metal partitioning differ substantially by cultivar and contaminant. [11, 12, 13, 14, 15]

05 Five-treatment experimental design

Design target: 3 sites × 4 randomized blocks × 5 treatments = 60 plots. Indicative planted footprint: 60 plots × 100 m² = 0.60 hectares excluding berms, containment, pollen and seed buffers, access lanes and sampling margins. These are preliminary figures; the final layout must be revised by biostatisticians and regulators.

Arm	Treatment	Rationale
T0	Passive recovery: no deliberate sowing; monitor natural regrowth	Document business-as-usual trajectory
T1	Regionally appropriate native / perennial restoration seed mix	Ecological benchmark, not a token control
T2	Approved, annually sown pedigree industrial hemp	Conventional agricultural comparator
T3	Approved initial hemp establishment; intentionally allow local self-seeding ONLY if explicitly authorized	Experimental regenerative seed bank
T4	Hemp plus selected locally appropriate perennial cover, according to permitted trial design	Mixed cover, recovery and exit strategy

If T3 self-reseeding receives no written regulatory clearance, substitute a contained germination/seed-bank module; do not silently treat volunteer hemp as legal annual seed planting. T4 is likewise conditional on approved protocols. Buffer and pollen controls may require a split-site design rather than neighbouring plots. [01, 02, 03, 04, 05]



06 Work packages and field protocols

WP1 / Germplasm and phenology

- Start from pedigreed and approved hemp seed under the specific licence; screen candidate cultivars against latitude, photoperiod, seed production, stem biomass and THC compliance. The 2026 approved list includes Finola, Finola2 and SLV1D Auto - these names alone do not establish desired performance in New Brunswick. [01, 02]

- Record emergence date, 50% flowering, pollen shed, female seed maturity, first killing frost and viable seed mass per unit area. Use a controlled long-day comparison to confirm the degree of autoflowering.
- Assay mandated cannabinoids with accredited methods at required points; all non-compliant material managed under the applicable licensing direction.

WP2 / Seed bank and winter survival

- Prior to winter: use permanent quadrats and a mapped soil-core grid to measure naturally shed seed, seed depth distribution, seed viability and retained crop residues.
- After thaw: census volunteer seedlings weekly during emergence; distinguish germination from later seed dispersal using marked seed rain, seasonal seed traps and, where justified, genetic fingerprinting.
- Quantify stand survival, self-replenishment, seedling location relative to plot edge and dormancy carryover after each winter. Track at least two reseeding generations.

WP3 / Soil restoration

- Collect baseline and annual (same season) soil samples at fixed 0–15 cm and 15–30 cm depth intervals, including bulk density. Compare soil organic carbon by equivalent soil mass, not concentration alone.
- Measure pH, plant-available N/P/K, EC, infiltration, wet aggregate stability, compaction, plant cover, runoff/erosion indicators and microbial respiration as resources allow. [08, 09, 10]
- Account for harvested carbon removals; leaving roots and residues in place is not equivalent to permanent carbon sequestration. Quantify machinery energy, added amendments and N_2O where feasible.

WP4 / Ecological and compliance surveillance

- Survey seed escape on concentric boundary transects and likely water/bird dispersal routes; GPS-log volunteer hemp and remove unauthorized plants under approved response plans.
- Document pollen release, distance to commercial hemp/cannabis producers and potential cross-pollination. CFIA notes crossbreeding among Cannabis sativa plants. [05]
- Use an ecologist to monitor native-plant recruitment and weed-community shifts and to determine whether hemp is delaying the desired long-term habitat trajectory.

WP5 / Non-food materials and process engineering

- Separate roots, stalks, leaves and seeds; assay contaminants before any material reuse. From clean, authorized biomass evaluate fibre, biochar and candidate hemp-derived carbon feedstocks.
- Potential industrial pathway: materials R&D through the Hempoxies research platform, which evaluates candidate formulations and processes rather than representing one validated material.
- Apply cradle-to-gate life-cycle assessment including cultivation, input manufacturing, harvest, transport, thermal conversion, energy consumption and residues. Do not claim carbon-negative outputs without audited mass and carbon balances. [14, 15]

07 Measurement architecture

Domain	Core indicator	Frequency / unit
Seed bank	Viable seeds, dormancy, spring volunteers	Pre-winter and spring; seeds/m², plants/m²
Phenology	Flowering, seed maturity, frost	Weekly; days / degree-days
Soil carbon	SOC stock by equivalent soil mass	Baseline, years 2, 3, 5; Mg C/ha
Soil function	Infiltration, stability, bulk density	Annual; mm/h, stability index, Mg/m³
Nutrients	Mineral N, available P/K, pH	Baseline + annual; lab-specific units
Ecology	Native diversity, escapes, pollen exposure	Twice annually + incident logging
Biomass	Dry mass and component chemistry	Harvest; t dry matter/ha
Economics	All direct + oversight inputs	Annual; CAD/ha/season
Climate	Net lifecycle GHG balance	Annual + 5-year total; kg CO2e/ha

Core analytic rule: Report site-specific changes and uncertainty intervals; treat plot as the randomized experimental unit. Repeated measurements within a plot are not independent replications. Use mixed models with fixed treatment × year effects and site/block random effects, with baseline-adjusted analyses and preplanned multiple-testing correction.

For soil carbon, physical stock measurements and transparent stock calculations matter more than early-year percentage changes. Five years may be insufficient to detect small sequestration differences; clearly report confidence limits, detection power and any need for continued observation. [08, 10]

Open science and data integrity

- Version the analysis plan before first treatment assignment, with clear primary / secondary endpoints and explicit exclusion criteria.
- Use blinded sample IDs for laboratories, GPS-controlled survey logs, replicate field blanks, duplicate core samples and accredited contaminant assays.
- Publish anonymized plot-level data, codebooks, statistical scripts, methods deviations and negative results under lawful and privacy-protective conditions.

08 Regulatory, environmental and ethical framework

This proposal is not a statement of authorization to plant. Industrial hemp is governed by federal cannabis legislation; Canadian regulations require approved cultivars and pedigree seed for ordinary cultivation other than plant breeding. The treatment in which licensed plants are allowed to drop seed and regrow requires written, project-specific interpretation and authorization from Health Canada before field implementation. [01, 02, 03, 04, 06]

Gate	Required decision / control
Federal / Health Canada	Licence class and authorized activities, planting purpose, approved seed, self-seeding / volunteer handling, testing, disposition and recordkeeping
CFIA / seed	Pedigree status and authorized seed handling; any proposed breeding activity separately approved
Province / NB	Land access, environmental survey, containment and provincial review; contaminated sites under NB rules
Local / adjacent users	Municipal review as applicable, neighbour outreach, pollen and seed-escape controls
Material handling	Written chain-of-custody, approved transport, segregation and disposal for contaminated or non-compliant biomass

Health Canada’s 2026 guide explicitly identifies agronomic soil and rotation research as a possible industrial-hemp-licensed activity, but other analytic or experimental activities may need a different licence. Applicability depends on precisely what is being done. [02]

No trial should proceed on a regulated contaminated site without the appropriate New Brunswick site-professional assessment and remedial pathway. New Brunswick’s contaminated-site programme incorporates assessment, remediation, risk assessment, monitoring and closure requirements. [11, 12]

STOP-WORK / REMOVAL TRIGGERS

Stop new planting and notify the responsible officers if licensing ceases, THC or seed-handling requirements are breached, unapproved escape is confirmed, ecological impacts exceed the regulator-agreed threshold, flood/runoff threatens movement offsite, or contaminant handling fails. Apply documented containment and remediation; record all incidents.

09 Decision gates, milestones and kill criteria

Window	Evidence milestone	Go / adapt / stop decision
Q1–Q2 2027	Design, soil surveys, plant and site permits, written self-sowing determination	NO field work without approvals; use contained alternative
2027 season	Baseline, initial pedigree crop, phenology and seed maturity	Stop a cultivar line if seeds cannot mature or compliance fails
2028 season	First volunteer cohort, first full soil follow-up	Adapt if emergence weak or escape controls inadequate
2029 season	Second volunteer cohort, midterm cost + ecology analysis	Promote only lines with reproducible, localized persistence
2030 season	Site resilience, soil trajectory and material pilot	Discard claims unsupported by net carbon accounting
2031 season	Final controlled comparison, economic case, independent review	Scale, redesign or terminate on evidence

Preliminary project success decision (not a marketing promise)

- At least two consecutive post-establishment years show reproducible volunteer emergence, with economically useful stands relative to annually planted hemp.
- No unresolved legal or ecological containment incident, and an approved end-of-trial eradication / restoration plan.
- At least one defensible improvement in measured soil function relative to passive recovery, with no material loss against the native-restoration comparator.
- Five-year cost and GHG assessment improves upon the annually seeded treatment after all direct, compliance and monitoring costs are included.

If self-sowing persists but soil quality does not improve, the scientific result is persistence without demonstrated rehabilitation. If the plant improves soil but creates unacceptable escape risks, it is not deployable. Negative outcomes are publishable outputs.

10 Illustrative financial plan

The cost model below is a concept-stage estimate in Canadian dollars, not a contractor quote, awarded funding or an audited project budget. It assumes three New Brunswick pilot sites, repeated laboratory work, technical oversight and five years of staff effort. A leaner feasibility phase can precede full funding.

Cost centre	Five-year CAD	Basis / assumption
Personnel and coordination	$1,250,000	PI time, field teams, ecology, statistician, technician

Cost centre	Five-year CAD	Basis / assumption
Soil, chemistry and laboratory	$420,000	Soil, cannabinoid, contaminants, quality control
Sites, access and field equipment	$300,000	Leases/compensation, fencing, instruments, field operations
Seed bank, genetics and germplasm	$210,000	Pedigreed material, phenology, seed viability, genotyping
Containment and environmental assurance	$190,000	Pollen/escape monitoring, response, site professionals
Data, LCA, dissemination	$180,000	Storage, methods, peer review, stakeholder workshops
Management reserve / indirect buffer	$240,000	Risk, procurement variation, administrative charges
TOTAL	$2,790,000	Illustrative ceiling; subject to refinement

Cash-flow scenario

2027	2028	2029	2030	2031	Total
$400k	$520k	$570k	$630k	$670k	$2,790k

The split-stage finance model is preferable: Phase A (2027) funds licensing, baseline selection and one-year establishment; Phase B (2028–2031) proceeds only after feasibility and regulatory evidence. No expenditure should be predicated on future environmental credit revenue.

11 Implementation partners and funding pathways

Partners are proposed outreach targets, not confirmed collaborators. The programme should seek an eligible university/college lead, farm cooperators, soil scientists, agronomists, environmental specialists, analytical chemists and Indigenous and community participants where relevant.

Candidate	Possible contribution	Qualification
New Brunswick Living Lab	Farmer co-design, climate-smart comparison and local site knowledge	Existing living lab; participation not promised
Atlantic research institution	Experimental design, field stations, soil and biology labs	Seek formal institutional agreement
Agriculture and Agri-Food Canada	Technical alignment, soil-health methodologies and regional expertise	Programme access / support to be checked

Candidate	Possible contribution	Qualification
Health Canada / CFIA	Regulatory pre-submission and seed/biosafety consultation	Regulators, not implied partners
New Brunswick government	Agricultural innovation and contaminated-land guidance	Eligibility and programme conditions to verify
Materials laboratories	Contaminant assays, fibre and carbon characterization	Separate testing contracts and data rights

Potential funding exploration: ResearchNB and New Brunswick agricultural innovation programmes; cooperative R&D with licensed producers; industry-sponsored sample analysis. Existing Agricultural Climate Solutions - Living Labs supports relevant methodologies, but its application intake is closed, so it must not be advertised as an open new grant. [19, 20, 21, 22, 23]

First conversations should establish a named scientific principal investigator, landholder consent, Health Canada interpretation, preliminary power analysis, and independent ecological review - before a national announcement or requests for seed donations.

12 Risks, trade-offs and response

Risk	Likelihood / impact*	Primary response
Self-reseeding disallowed	High / Critical	Pre-application; parallel contained trial
Low fertility prevents seed set	High / High	Select defined degraded strata; compare amendments transparently
Escape / cross-pollination	Medium / Critical	Isolation, monitoring, removal authority, grower notification
SOC change too small to detect	High / Medium	Equivalent-mass stocks, power analysis, longer follow-up
THC threshold exceeded	Variable / Critical	Scheduled accredited assays and disposition plan
Contaminated biomass reused	Medium / Critical	Segregation, chemistry QA and no-product-release rule
Native recovery harmed	Variable / High	Native comparator and adaptive termination
Carbon claims overstated	High / High	Independent LCA and mass balance

*Qualitative screening estimates for planning only; not empirically derived probabilities.

PROJECT EXIT REQUIREMENT

At the end of each field licence, plot restoration and volunteer monitoring continue for the period specified by regulators and the site environmental plan. A successful seed-bank experiment must also demonstrate that the seed bank can be managed or eliminated when required.

13 Deliverables, reproducibility and communication

- D1 / 2027: preregistered experimental protocol, site eligibility criteria, regulator correspondence, baseline dataset and QA plan.
- D2 / 2028: first-year emergence / survival technical report, phenology and seed-bank dataset, independently reviewed safety log.
- D3 / 2029: mid-term agronomic, ecological and economic comparative report; peer-review preprint as appropriate.
- D4 / 2030: clean-biomass process feasibility, contaminant partitioning report, independent preliminary life-cycle assessment.
- D5 / 2031: five-growing-season data release, publication manuscripts, cost model, regulatory options paper and scale / no-scale recommendation.

Use a public version label on every release: Draft / Working Hypothesis / Field Protocol / Data Release / Peer-reviewed Study. Keep negative findings and revisions accessible. All material-technology claims must identify the tested formulation, batch and measured property; do not label the Hempoxies research platform itself as a single material.

Appendix A Core field standard operating procedures

A1 / Site selection and baseline

- Obtain landowner consent and licensing documentation; georeference plots; record prior land use and all soil applications in the preceding five years when available.
- Use an independently reviewed contaminant screen to exclude unsafe field sites. Photograph plot condition and map slope, runoff paths and nearby habitat.
- Sample standardized depths, measure initial bulk density, record sampling moisture and document the laboratory method, detection limit and chain-of-custody form.

A2 / Seed and planting

- Verify seed lot pedigree, cultivar identity, chain of custody and the applicable crop year approved list prior to any sowing. Preserve original seed tags.
- Randomize treatment plots before seed arrives. Measure soil temperature, antecedent rainfall, planted mass, measured viability and equipment calibration.
- For licensed self-seeding treatments, record all seed rain and volunteer events. If the relevant permission is absent, no deliberate field reseeding treatment occurs.

A3 / Phenology and winter surveillance

- Count emergence in permanent quadrats weekly until stand stabilization. Document frost dates from on-site loggers and nearest verified weather station.
- Collect representative mature seed under authorized procedures; run germination and viability assays in managed facilities; record dormancy response and storage.

- After snowmelt, repeat same-position quadrat counts; separately record seedlings outside approved boundaries and immediate response actions.

A4 / Soil and runoff

- Collect seasonal cores at consistent times; include bulk density and coarse fragment correction; report soil carbon on an equivalent-mass basis.
- Use field infiltrometers and standardized aggregate stability assessments; adjust sampling plans for texture and soil moisture.
- Report erosion as measured/estimated using site observations and accepted tools; avoid inferring erosion prevention from plant height alone.

A5 / Contaminant and biomass controls

- Sample roots/stems/leaves/seed independently where contamination studies are authorized; report per-organ contaminant loading.
- No material from contaminated soil is marketed as feed, food, cosmetics, fertilizer, soil amendment or a safe composite precursor without comprehensive compliance assessment.
- Thermal conversion can redistribute contaminants among gas, condensate, char and captured residues; treat all streams as requiring characterization. [14, 15]

Appendix B Proposed pre-application questions for regulators

Submit a concise written technical description to Health Canada’s Industrial Hemp Unit and seek project-specific determination before financing field implementation. The following questions require authoritative answers, not assumptions.

- 1. Under which licence and conditions can a research plot deliberately allow an approved hemp crop to deposit viable seed and produce volunteer generations in subsequent years?
- 2. How does section 26 pedigree-seed sowing apply to natural volunteer emergence that the researcher intentionally studies? Is separate plant-breeder or research authorization needed?
- 3. What notifications, THC testing schedule, perimeter conditions, crop termination and chain-of-custody rules would govern each experimental cohort?
- 4. Can the programme conduct controlled dormancy / seed-bank assays, and if so under what laboratory and transport conditions?
- 5. What additional authorizations apply to mixed-treatment plots, contaminated-soil mesocosms or processing of flowering heads and other plant fractions?
- 6. Which records and remediation steps are required if progeny spread outside an authorized site or exceed compliance limits?

For contaminated-land modules, separately consult New Brunswick’s Department of Environment and Local Government and qualified site professionals regarding assessment, exposure control, sampling and disposal before obtaining soils or trialling plants. [11, 12]

SOURCE APPENDIX / VERIFIED LINKS

Selected references and primary sources

Evidence was reviewed for this proposal on 12 November 2026. Links below point to primary regulators, peer-reviewed papers, university-based materials or official programme pages. Citations do not imply institutional endorsement.

[01] Health Canada. List of Approved Cultivars for the 2026 growing season (including SLV1D Auto). Open source

[02] Health Canada. Industrial hemp licensing application guide (2026 edition). Open source

[03] Justice Canada. Industrial Hemp Regulations, section 26: pedigreed status of approved cultivars. Open source

[04] Justice Canada. Industrial Hemp Regulations, section 27: cultivation site notification requirements. Open source

[05] Canadian Food Inspection Agency. The Biology of Cannabis sativa L. (BIO2020-02): seed dormancy, dispersal, gene flow. Open source

[06] Canadian Food Inspection Agency. Regulation of industrial hemp seed. Open source

[07] Ontario Ministry of Agriculture. Growing industrial hemp in Ontario: soils, fertility, agronomy and limitations. Open source

[08] Agriculture and Agri-Food Canada. Soil organic matter indicator and Canadian cropland degradation risk. Open source

[09] Agriculture and Agri-Food Canada. Soil erosion risk indicator. Open source

[10] Agriculture and Agri-Food Canada. Agri-environmental indicators: soil cover, organic matter, erosion and biodiversity. Open source

[11] Government of New Brunswick. Contaminated Sites Program and ministerial protocols. Open source

[12] Government of New Brunswick. Contaminated Sites Regulation 2024-57. Open source

[13] Ansari, O. & De Prato, L. (2026). Current knowledge on phytoremediation potential of industrial hemp for PFAS and heavy-metal soils. Remediation. DOI: 10.1002/rem.70059. Open source

[14] Guo, Y. et al. (2024). Industrial hemp can utilize and remediate soil strongly contaminated with Cu, As, Cd and Pb by phytoattenuation. Chemosphere 358:142199. Open source

[15] Thermochimica Acta (2024). Pyrolysis of industrial hemp biomass from contaminated soil phytoremediation: contaminant partition and biochar processing. Open source

[16] PLOS One (2025). Species distribution of Cannabis sativa: past, present and future. Open source

[17] PLOS One (2025). Historical Russian ruderalis descriptions and cannabis habitats (same taxonomy paper; contextual source). Open source

[18] Genome (2023). Genomics-based taxonomy to clarify cannabis classification. Open source

[19] Agriculture and Agri-Food Canada. Agricultural Climate Solutions - Living Labs; New Brunswick and other regional nodes. Open source

[20] Living Lab New Brunswick. Existing farm climate-smart research network and goals. Open source

[21] Agriculture and Agri-Food Canada. ACS Living Labs programme intake status: closed to new applications. Open source

[22] Government of New Brunswick. Agricultural programmes and Enabling Agricultural Research and Innovation pathways. Open source

[23] ResearchNB. Agriculture impact and provincial research funding opportunities (eligibility / dates subject to change). Open source

[24] Agriculture and Agri-Food Canada. Agricultural Climate Solutions overview; programme distinctions. Open source

[25] Canadian government publications. 2026 AAFC Soil Organic Matter Indicator report bibliographic record. Open source

NOTES ON ATTRIBUTION AND SCOPE

Concept origin and programme framing: Marie-Soleil Seshat Landry / Landry Industries. The experimental design and budgets in this document are proposed planning specifications, not results. A suitably qualified research institution should independently review, preregister, license and supervise any implementation.