RIVER REFUGIUM PROJECT

Watershed-Scale Nutrient Recovery Infrastructure

APPENDIX E

Field Documentation Kit

Protocol and blank forms for operator-run model tests

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Companion to RRP0003 — Consolidated Technical Whitepaper, Version 3.0
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ABSTRACT

This kit exists because undocumented results are anecdotes and documented results are data. Data collected across a range of operators, water bodies, system configurations, and geographies is how a field hypothesis becomes a defensible body of evidence.

The River Refugium Project proposes that aquaponic grow systems, traditionally used for food production in clean water, can be run against polluted inputs to extract nutrients biologically, produce harvestable biomass, and return measurably cleaner water to the source. Paired with thermochemical processing, that biomass becomes a recoverable resource rather than a disposal problem.

The theory is grounded and the process chemistry is established. What is needed is field data from real operators working with real dirty water. This kit provides the minimum structure required for results to be comparable across sites.

Version 3.0 adds Form D, a Feed Qualification and Disposition Record, and adds a refugium configuration block to Form A. Both changes follow from the source-water tier requirement in Section 7.4.2 of the whitepaper: no material grown on unqualified water should enter a feed pathway, and the record that establishes qualification has to exist before the harvest does.

1. Why This Kit Exists

Annual federal hypoxia measurement is currently the only instrument reading the condition of the Gulf. It is a good instrument and it has no independent counterpart that could disagree with it.

Field data submitted by independent operators is a second sensor on the watershed. That is the strongest argument for this kit, and it is why the framework treats it as verification infrastructure rather than as public engagement material. The same principle governs the facility's internal instrumentation: a single source reporting a value is an unverified value, regardless of how good the source is.

Use this kit as printed or adapt it to your tools. The format matters less than the consistency of what you measure and the honesty of what you record.

2. What to Document and Why

Form A — System Configuration Record

Completed once per site. Captures what you built, what your water source is, what you planted, and how the system is arranged. This is the context layer; without it, water quality data has no frame of reference.

Update Form A if the system changes significantly — a settling chamber added, species switched, flow rate changed — and mark the date of the change. A system that evolves over a season is not a problem. Undocumented evolution is.

Form B — Water Quality Monitoring Log

Completed repeatedly through the operating season, weekly at minimum during active operation, one form per monitoring location. The three standard locations are SRC (the source water body itself), IN (where water enters your system), and OUT (where processed water exits).

Comparing SRC to OUT over time is the primary evidence of system performance. Comparing IN to OUT isolates what your grow system contributed independent of changes in the source water body.

Core parameters are non-negotiable. Supplemental parameters are collected where resources allow. A basic aquaponic test kit handles most core parameters; lab submission for total nitrogen, total phosphorus, biological oxygen demand, and any contaminant-specific parameters is worth the cost at baseline, midpoint, and season end.

Form C — Biomass Harvest and Disposition Record

Completed at every harvest event. A harvest event is any deliberate removal of biological material — thinning, pruning, algae skimming, solids removal — not only full crop pulls.

Wet weight is sufficient. Dry weight, if you have a scale and a drying method, adds significant value. The disposition column tracks what happened to the material, and it matters because it establishes the resource recovery pathway, which is the economic half of the argument.

Form D — Feed Qualification and Disposition Record

New in Version 3.0. Completed for any harvest that is being considered for animal feed, whether livestock, poultry, or aquaculture, including your own animals.

This form exists because feed is the one output where a documentation failure can injure something. Duckweed and algae concentrate metals — that is the same property that makes them useful for cleanup. Forage grown on high-nitrate water can accumulate nitrate at levels that are dangerous to ruminants while the crop looks entirely healthy.

> **The rule this form encodes**
>
> Qualification is a property of the water source, not of the harvest. A single clean laboratory result does not upgrade a degraded source, because contamination in runoff is intermittent and one sample taken on a good day proves very little.
>
> If you cannot establish a source tier with documentation, the harvest is not feed. It can go to compost, to fiber, to thermochemical processing, or to disposal. Those are all legitimate outcomes and none of them require a lab result you do not have.

3. Establishing a Baseline

Before running water through your system, measure what you have. Baseline readings from the source water body, taken before any operation, are the most important data in the entire dataset. Without them improvement cannot be demonstrated, only described.

- Take three readings from the source water body on separate days, at least one week apart, before startup.
- Record them on Form B with location code SRC, clearly marked as pre-operation baseline.

- Photograph the water body at baseline — surface appearance, color, visible algae, and note any odor events in the log.

If the water body has prior treatment history — algaecide, aeration, dredging — note it on Form A and in the baseline readings. Prior treatment does not disqualify a site. It just needs to be in the record.

4. Minimum Viable Test Configuration

You do not need an elaborate system to generate useful data.

- A pump drawing from the target water body.
- A grow bed, floating raft channel, or plant channel stocked with fast-growing species appropriate to the nutrient loading — water hyacinth, duckweed, and water lettuce for high-nutrient conditions; standard aquaponic crops for moderate inputs.
- A return flow path, back to the water body or to a collection tank.
- A consistent measurement routine using the Form B parameters.

Extensions that meaningfully improve data quality: a settling chamber upstream of the grow beds, which isolates biological uptake from simple settling; a biofilter zone using mature media, biochar, or ceramic rings; a second-stage polishing bed; a greenhouse enclosure for temperature stability; and an algae cultivation stage if you intend to pursue thermochemical processing.

A system that runs one full season with weekly readings at three points and a complete harvest record is worth more than a sophisticated system with incomplete records.

5. Containment — Read Before Stocking

This section is not optional and it applies at any scale, including a single tank in a backyard.

- Confirm the legal status of every species before you stock it. Several excellent nutrient-stripping plants — water hyacinth among them — are prohibited in some states and are the reason those prohibitions exist.
- Screen your inlet and outlet. If your system connects to a natural water body, nothing living should be able to travel that path in either direction.
- Never release shutdown biomass into any waterway. Compost it, dry it, feed it, freeze it, or dispose of it — and record which on Form C.
- If your source water carries industrial or mining contamination, treat every harvest as contaminated until a lab says otherwise, and do not feed it to anything.

6. Submitting Data

Submission is voluntary. You own what you collect. Nothing is required in exchange for using this kit.

- Send completed forms, scanned or photographed, to robert@brightmeadowgroup.com.
- Indicate whether you want your name and location included, anonymized, or withheld.
- Include Form A with every submission — water quality data without configuration context cannot be usefully aggregated.

- Partial season data is accepted. An incomplete season beats no submission.

Aggregated results are published under open access terms. Individual datasets are not published without operator consent. Your methodology, your findings, and your failures are all useful.

FORM A — System Configuration Record

Complete once per site. Update if configuration changes significantly. Attach photographs.

Operator and Site Information

Operator name / organization	Individual, farm name, institution, or association
Contact email	
Site name / identifier	Short code used on all logs for this site
Site location	County, state — no street address required
Date system established	MM/DD/YYYY
Reporting period	e.g. June–September 2026

Water Source

Water body type	Farm pond / retention pond / lagoon / stream reach / constructed wetland / other
Approximate surface area	e.g. 0.25 acre, 2,000 sq ft
Estimated volume	e.g. 500,000 gallons — estimate acceptable
Primary nutrient sources	Livestock runoff / lawn fertilizer / crop runoff / stormwater / unknown
Known contaminants of concern	Nitrogen / phosphorus / coliform / heavy metals / algal toxins / other
Industrial or mining influence	None known / suspected / confirmed — describe
Prior treatment history	Algaecide / aeration / dredging / none / unknown
Additional site notes	

Grow System Configuration

System type	Deep water culture / media bed / NFT / floating raft / surface channel / hybrid
System footprint	e.g. 4 × 8 ft bed, two channels 12 ft each
System volume held	e.g. 150 gallons
Flow rate from source	Gallons per hour — measured or estimated
Recirculating or flow-through	Recirculating to source / flow-through to collection / hybrid
Enclosure	Greenhouse / low tunnel / open outdoor / indoor under lights
Biofilter present	Yes / No — if yes, describe media
Settling chamber present	Yes / No — if yes, describe
Secondary polishing stage	Yes / No — if yes, describe
Algae cultivation stage	Yes / No — if yes, species and method
System diagram reference	

Refugium Configuration — New in Version 3.0

A refugium is a calm, managed stage between raw intake and production whose job is to stabilize and condition water rather than to clean it or grow a crop. Complete this block if your system has any such stage, including a simple settling and holding tank that is stocked or planted.

Refugium present	Yes / No — if No, skip this block and note it on Form D
Position in flow	Before grow beds (primary) / after grow beds (secondary) / both
Type	Open pond / lined basin / tank / channel / constructed wetland cell
Volume	Gallons
Residence time	Hours or days water spends in this stage — estimate acceptable
Aeration	None / passive / diffused / waterfall or cascade
Substrate or media	Bare / gravel / river rock / mixed media — describe
Stocked organisms	Daphnia / snails / mussels / minnows / none — list all
Planted species	Emergent, floating, submerged — list all
Screened inlet and outlet	Yes / No — required if connected to natural water
Conditioning purpose	Solids settling / biological stabilization / thermal buffer / live feed / other
Notes	

Plant Species Roster

Species / common name	Grow zone or location	Date introduced	Notes

Thermochemical Processing — Complete If Applicable

Processing pathway planned	HTC (hydrochar) / HTL (bio-crude) / both / none at this time
Method or equipment	On-site reactor / third-party processor / university lab / none
Target biomass inputs	Algae / aquatic plants / harvested solids / mixed
Notes or constraints	

FORM B — Water Quality Monitoring Log

One sheet per monitoring location. Label each sheet with site ID and location code.

Site ID		Monitoring location	
Location code	SRC = source | IN = intake | OUT = outflow | OTHER	Tester name	
Test kit / meter used		Date range	

Parameter	Unit	Method	S1	S2	S3	S4	S5	S6	S7	S8
CORE — REQUIRED										
Total Nitrogen	mg/L	Lab or strip								
Total Phosphorus	mg/L	Lab or strip								
Ammonia-N	mg/L	Kit / meter								
Nitrate-N	mg/L	Kit / meter								
Dissolved Oxygen	mg/L	DO meter								
pH	—	Meter / strip								
Turbidity	NTU / cm	Secchi / meter								
Chlorophyll-a	µg/L or 1–5	Kit / visual								
BOD (5-day)	mg/L	Lab								
SUPPLEMENTAL — IF ABLE										
Total Coliform	CFU/100mL	Lab								
Conductivity / TDS	µS/cm	Meter								
Temperature	°C	Meter								
Heavy metals screen	µg/L	Lab								
Cyanotoxin	µg/L	Strip / lab								
Other: _____										

Sample dates — record for each column:

S1	S2	S3	S4	S5	S6	S7	S8

Anomaly and event notes — date plus description:

FORM C — Biomass Harvest and Disposition Record

Log every harvest event, including partial harvests and thinning.

Site ID		Reporting period	
Operator		System type	

Disposition codes: HTC = carbonization | HTL = liquefaction | COM = composted | DRIED = dried and stored | FEED = animal feed (complete Form D) | DISC = discarded | SOLD = sold or transferred | LAB = sent to lab

Date	Zone	Species / material	Wet wt	Dry wt	Disposition	Notes

Thermochemical processing record — complete if HTC or HTL was performed:

Batch date	Process	Input wt	Output wt / yield	Output type	Disposition of output

Batch date	Process	Input wt	Output wt / yield	Output type	Disposition of output

Season-end summary — what worked, what did not, what you would change, and whether you will submit this dataset:

FORM D — Feed Qualification and Disposition Record

Complete for any harvest considered for animal feed, including your own animals. New in Version 3.0.

Complete this form before feeding, not after

The purpose of this record is to force the qualification question to be answered while the material is still in your hands and the decision is still reversible.

If any line in Section 2 cannot be answered with documentation, the correct outcome is that the material is not fed. Route it to compost, fiber, thermochemical processing, or disposal, record that on Form C, and note the reason here.

1. Batch Identification

Site ID	
Harvest date(s)	
Species / material	
Approximate quantity	Wet weight
Corresponding Form C entry	Date and row reference

2. Source Water Qualification

Qualification is a property of the water source, not of this harvest.

Source water body	
Refugium conditioning stage present	Yes / No — if No, material does not qualify as feed
Conditioning residence time	Hours or days
Known industrial or mining influence upstream	None known / suspected / confirmed
Livestock or human waste influence	None known / suspected / confirmed
Assigned source tier	Tier I (qualified) / Tier II (conditional) / Tier III (not for feed)
Basis for tier assignment	Describe the documentation supporting this, not the intention
Date of tier assignment	

3. Contaminant Screening

Analyte	Result	Unit	Date tested	Lab / method

Analyte	Result	Unit	Date tested	Lab / method

Recommended minimum screen where any doubt exists: cadmium, lead, arsenic, chromium, mercury, selenium. Add nitrate in plant tissue for any forage intended for ruminants — this is the screen most often skipped and the one most likely to injure an animal.

4. Nitrate Assessment — Forage for Ruminants

Crop is forage intended for ruminants	Yes / No — if No, skip to Section 5
Source water nitrate at time of growth	mg/L
Tissue nitrate tested	Yes / No — result and unit
Position in treatment train	Before denitrification / after denitrification / unknown
Assessment	Safe to feed / feed with dilution / do not feed

5. Disposition Decision

Decision	Approved for feed / rejected for feed / held pending results
If approved — animal class	Poultry / ruminant / swine / aquaculture / other
If approved — inclusion rate	Percent of ration
If rejected — actual destination	Compost / fiber / thermochemical / disposal / other
Reason for decision	
Decision made by	Name and date

6. Post-Feeding Observation

Complete if material was fed. Absence of a problem is data and should be recorded as deliberately as a problem would be.

Date	Animal class	Observation	Action taken

Notes

Citations follow Chicago Notes-Bibliography style. Internal Cernunnos Foundation and Bright Meadow Group documents are cited by title and year. Figures marked ⚑ are provisional academic proxies pending replacement by measured pilot values.

1. *Bright Meadow Group, "RRP0003 — Consolidated Technical Whitepaper," Version 3.0, §7.4.2 and §10. CF/BMG, August 2026. Source-water tier requirement and duplicate measurement protocol.*

2. *Bright Meadow Group, "The Water Is Filthy. Prove the Fix." Bright Meadow Group, 2026. Originating article for this kit.*

3. *Standard Methods for the Examination of Water and Wastewater (APHA/AWWA/WEF). Analytical reference for Form B parameters.*

4. *National Oceanic and Atmospheric Administration, annual Gulf of Mexico hypoxic zone measurement series. Referenced in Section 1.*

5. *Extension literature on nitrate poisoning in ruminants; consult your state agricultural extension service for local threshold guidance. ⚑ Provisional — thresholds vary by animal class, ration, and adaptation.*
