

River Refugium Project (RRP)

CERNUNNOS FOUNDATION BRIGHT MEADOW GROUP

Systems Analysis and Solutions Consulting

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| **RIVER REFUGIUM PROJECT** Cernunnos Foundation Bright Meadow Group |
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Abstract This glossary defines all essential terms, processes, and concepts used throughout the RRP whitepaper series. It is written for clarity, precision, and broad accessibility while maintaining technical accuracy. Audience: policymakers, community members, investors, tribal officials, and non-engineers encountering RRP documentation for the first time.

A. Core System Concepts

River Refugium Project (RRP)

A modular environmental engineering system that cleans nutrient-rich river water, produces usable biomass, generates carbon-negative materials, and supports economic development – all while publishing open, real-time environmental data.

Node

A full RRP installation, typically built on 100 acres, containing greenhouses, biofiltration systems, routing grids, thermochemical processors (Model A only), and support systems.

Grow Unit

The modular production cell of an RRP node – one complete set of 13 production greenhouses, one evaporation greenhouse, biofiltration train, cistern, routing grid, and biomass preparation module. A 100-acre node contains 14–15 grow units.

Pilot Unit

A single full-scale grow unit deployed to demonstrate system functionality and – critically – to generate the yield, uptake, and performance data that calibrates the financial model for all subsequent nodes. The pilot is not a prototype. It is a measurement instrument.

Model A / Model B

Model A: an integrated node with an on-site HTC/HTL thermochemical processing plant. Model B: a distributed biological node that harvests and transports biomass to a regional Model A hub for processing. The hub-and-spoke cluster – one Model A hub plus 5–10 Model B satellites – is the standard operating configuration.

B. Water & Hydrology

Nutrient Load

The concentration of nitrogen, phosphorus, and organic material carried by river water. High nutrient load equals ideal RRP feedstock.

Suspended Solids (TSS)

Particles floating in water, including organic matter, soil, and silt. The RRP captures these as biomass input.

Hydraulic Residence Time (HRT)

The average time water spends in a treatment stage. Longer HRT generally means

more complete nutrient processing.

Confluence

Where two rivers meet. Confluences are nutrient-dense and ideal for RRP node placement.

C. Biological **&**** Greenhouse Terms**

Biomass

Organic material grown in the RRP greenhouses – algae, aquatic plants, fibrous grasses. Used for fuel, materials, carbon storage, and industrial pathways.

Routing Grid

The PLC-controlled system of pipes and valves that directs different nutrient concentrations to the greenhouses that can best utilize them.

Modular Slot Framework

The financial modeling structure that treats each greenhouse as a standardized production slot with defined biomass output and nutrient uptake parameters, regardless of which specific crop fills it. Allows consistent projections across all deployment scenarios pending pilot data.

D. Thermochemical **&**** Energy Terms**

HTC (Hydrothermal Carbonization)

A process that converts wet biomass into hydrochar at 180–250°C and 2–10 MPa. Outputs: solid hydrochar, nutrient-rich aqueous phase, and off-gases.

HTL (Hydrothermal Liquefaction)

A higher-temperature process (280–370°C, 10–25 MPa) that converts wet biomass into bio-oil. Preferred for high-lipid feedstocks such as algae.

Hydrochar

Carbon-rich solid output of HTC. Functions as a soil amendment, filtration medium, activated carbon precursor, and carbon-sequestration instrument generating carbon credits.

Thermal Loop

The cycle that captures waste heat from HTC/HTL reactors and reuses it to warm greenhouses. No external heating or cooling energy is purchased under normal operating conditions.

E. Environmental **&**** Regulatory Terms**

Gulf Hypoxia Zone

A large area in the Gulf of Mexico with insufficient oxygen to support marine life, caused by excess nutrients from the Mississippi River Basin. The RRP reduces upstream nutrient loads contributing to this zone.

Nutrient Trading Credits

Environmental credits issued for reducing nitrogen or phosphorus pollution in a watershed. The dominant revenue line in the RRP operating model. Performance-based and verified by open sensor data.

Carbon Credits

Financial credits for reducing or sequestering carbon emissions. RRP generates these from hydrochar permanence, energy-efficiency improvements, and avoided downstream hypoxia emissions.

SCADA / PLC

SCADA (Supervisory Control and Data Acquisition): the digital oversight system monitoring pumps, valves, sensors, and reactors. PLC (Programmable Logic Controller): industrial control computers running automated processes and safety protocols within the RRP.

F. Financial Terms

EBITDA

Earnings Before Interest, Taxes, Depreciation, and Amortization. The operating profitability measure used to evaluate RRP node performance before capital structure effects.

Stress Test / Operating Model / Best Case

The three financial scenarios used in the RRP Economic Analysis Version 2.0. Stress Test uses floor-market prices and reduced operating capacity. Operating Model uses mid-market prices and the industrial build specification. Best Case uses premium prices, year-round operation, and optimal conditions.

Provisional (▀)

Figures marked ▀ throughout the RRP document series are provisional academic proxies – sourced from peer-reviewed literature for individual species – pending replacement by measured values from RRP pilot operations. The financial model is built to update automatically when pilot data replaces these estimates.

Notes

Citations follow Chicago Notes-Bibliography style. Internal Bright Meadow Group / Cernunnos Foundation documents are cited by document title and year. Figures marked ▀ are provisional academic proxies pending replacement by RRP pilot data per RRP8.

- **1. ***Bright Meadow Group, *****Master Glossary for Policymakers **&** Non-Engineers.***** RRP Document Series, Version 1.0, 2025.*

- **2. ***Bright Meadow Group, *****RRP Document Series,***** Version 2.0. CF/BMG, 01 April 2026.*