Research & Findings

FINLAY BIODIVERSITY * Cloverdale Farm * Aug 2025 - Apr 2026

Research Overview

Finlay Biodiversity's research focuses on restoring biological function in soil systems through field-tested regenerative practices, microbial ecology, and long-term land stewardship. Research conducted between August 2025 and April 2026 at Cloverdale Farm (Deerfield, VA) included 9 outdoor field plots and 3 indoor micro-trials. All plots were established on a common baseline - plowed, cover-cropped, and irrigated - with specific biological and amendment treatments applied to isolate the effect of each regenerative protocol.

9	3	4
Field Plots	**Indoor Micro-Trials**	**Reference Sites**
Outdoor silt-loam plots, Cloverdale Farm	LAB + forest duff enhancement	Orchard + W-2 field locations

How We Measure: Methods & Partnerships

The data in this report comes from two complementary streams of measurement: direct field monitoring conducted by the Finlay Biodiversity team, and independent laboratory analysis in partnership with Cornell University's Soil Health Lab. These are clearly distinguished throughout this report.

Finlay Biodiversity Direct Measurements	Cornell University CASH Lab (Independent)
The Finlay Biodiversity team conducts ongoing field monitoring at Cloverdale Farm on a monthly basis, with daily care and observation carried out year-round. Measurements taken directly by our team include: - Microbial biomass (MicroBiometer readings) - CO2 respiration / soil biological activity - Volumetric water content (% VWC) - Fungal:bacterial (F:B) ratios - Electrical conductivity (EC) - Soil temperature All amendments, inoculants, and regenerative protocols are designed, applied, and monitored by our team. Every intervention in the field is hands-on and team-led.	Independent soil health testing is conducted by the Cornell Soil Health Lab (Cornell University, Ithaca, NY) through their Cornell Assessment of Soil Health (CASH) program. Cornell provides validated, standardized laboratory analysis including: - Overall Soil Health Score (/100) - Organic matter content (%) - Active carbon (ppm) - ACE Soil Protein Index - Aggregate stability - Water capacity, pH, and nutrient levels The raw data used to generate the Cornell charts and tables in this report was produced directly by Cornell Soil Health Lab from samples collected at Cloverdale Farm in April 2026 (sample series CCC3141-CCC3156).

Trial Design

Nine plots were established to test a spectrum of regenerative complexity - from untreated controls through single-input approaches to multi-stack combination treatments. Three indoor micro-trials (6i, 8i, 9i) replicated the top-performing field treatments with additional Lactic Acid Bacteria (LAB) serum and Native Forest Microorganism (NFM) inoculants propagated from forest duff.

Plot	Treatment	Category	Cornell Score (CASH Lab)
Plot 1	Control - Untouched	Baseline	58.1
Plot 2	Control - Std Farming	Baseline	70.0
Plot 3	Soil Food Web (SFW)	Biology	69.6
Plot 4	Advanced Eco Ag (AEA)	Biology	74.6
Plot 5	SFW + AEA	Biology	49.0
Plot 6	Biochar & Worm Castings	Amendment	79.1 *
Plot 7	Biochar + SFW	Combination	76.0
Plot 8	Biochar + AEA	Combination	72.5
Plot 9	Biochar + SFW + AEA	Combination	72.5
Plot 6i	Biochar + Worm + LAB/NFM	Indoor	92.5
Plot 8i	Biochar + AEA + LAB/NFM	Indoor	91.6
Plot 9i	Biochar+SFW+AEA+LAB/NFM	Indoor	91.6

** Highest Cornell score among field plots. Source: Cornell CASH lab, April 2026 (CCC3141-CCC3156).*

What Went Into the Ground

Biochar (1,250 lb/plot): Stable carbon and microbial habitat. **Worm Castings (50/50 blend):** Active biology and plant-available nutrients. **SFW Compost:** Biologically complete compost - bacteria, fungi, protozoa, and nematodes. **AEA Biostimulants:** Sea Shield (fish/crab hydrolysate), Rejuvenate (molasses, seaweed, humic acids, Mg), Spectrum + Myco (live PGP bacteria and mycorrhizal fungi). **GreenCover Cover Crop:** 13-species mix - winter peas, berseem clover, cereal rye, black oats, hairy vetch, radish, chicory, and turnip.

Trial Establishment Timeline

Aug 15	Plow all 9 plots
Aug 19-20	Amend: Biochar 1,250 lb + Catalyst 300 lb
Aug 20	Till to incorporate amendments
Aug 21	Burndown (Plot 2): Roundup + 2,4-D
Aug 25	AEA Foliar: Sea Shield + Rejuvenate + Spectrum
Aug 26	Cover Crop: 10 lb/plot + 13-species mix
Sep 2-6	Water (0.75") + subsoil rip

Microbial Biomass Results

> Finlay Biodiversity team measurement (MicroBiometer), April 2026

MicroBiometer readings across all trials in April 2026 confirm a dramatic recovery of soil biology from baseline. Initial degraded plots began at 41-68 ug/g. Within approximately one year, every experimental plot exceeded 550 ug/g - the threshold indicative of a biologically active soil system.

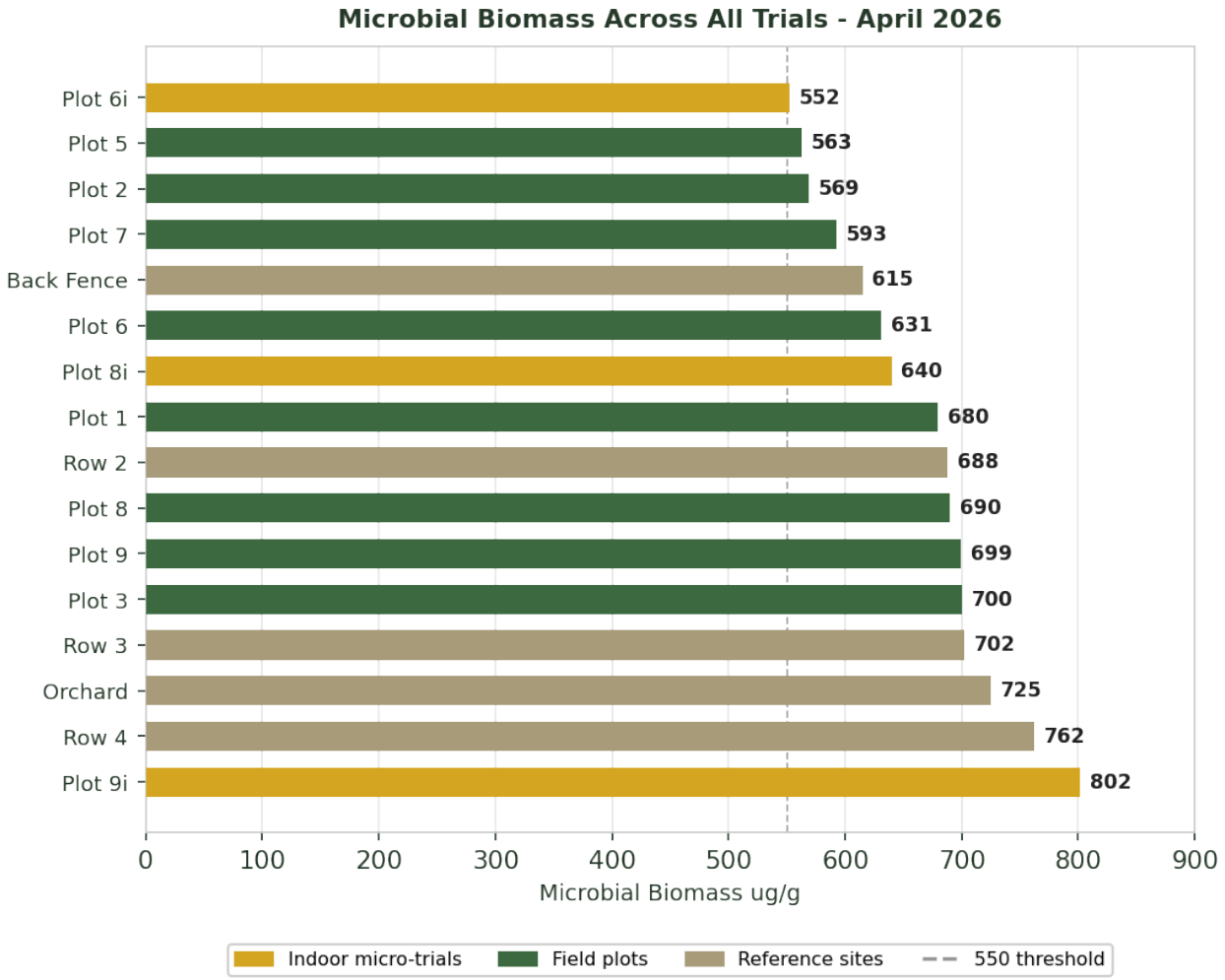

Figure 1. Microbial Biomass (ug/g), April 2026. Dashed line = 550 ug/g threshold. Starting biomass 2025: 41-68 ug/g. Finlay Biodiversity team measurement.

802 ug/g	550+	41-68
Peak - Plot 9i (Indoor) Biochar+SFW+AEA+LAB/NFM	All plots exceeded this by April 2026	Starting biomass (Aug 2025) Degraded plots pre-treatment

The indoor micro-trials confirm that LAB serum and Native Forest Microorganisms accelerate soil food web recovery beyond what field amendments alone achieve. Plot 9i (indoor) reached 802 ug/g - 15% above field Plot 9 (699 ug/g) with identical base treatments. This gap provides the biological roadmap for the 55-acre W-2 field expansion.

Cornell Soil Health Assessment - April 2026

> Cornell University CASH Lab - independent standardized analysis, sample series CCC3141-CCC3156

Independent soil health testing was performed by the Cornell Soil Health Lab (Cornell University) using their standardized CASH protocol. Soil samples were collected from Cloverdale Farm in April 2026 (sample series CCC3141-CCC3156) and submitted for analysis covering physical, biological, and chemical soil health indicators.

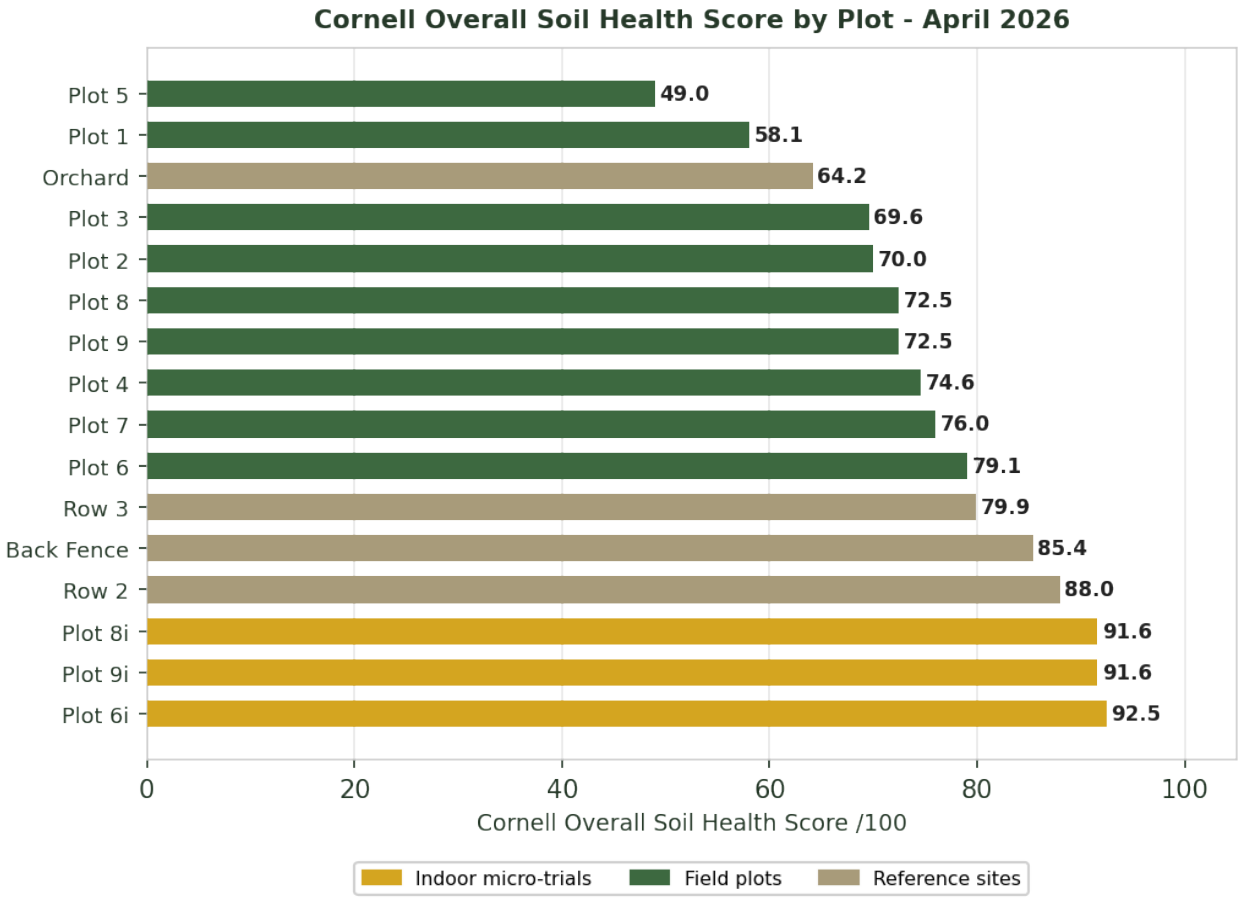

Figure 2. Cornell Overall Soil Health Score /100 by plot, April 2026. Cornell CASH Lab.

Key Indicators by Plot

Plot	Treatment	Org. Mat. %	Active C	Protein	Agg. Stab.	pH	Score
Plot 1	Control - Untouched	3.02	412	6.2	44.9	5.69	58.1
Plot 2	Control - Std Farming	3.19	557	5.9	49.2	6.11	70.0
Plot 3	Soil Food Web (SFW)	3.31	520	6.8	45.5	6.06	69.6
Plot 4	Advanced Eco Ag (AEA)	3.44	555	9.3	43.7	5.97	74.6
Plot 5	SFW + AEA	2.66	399	5.2	34.1	6.10	49.0
Plot 6	Biochar & Worm Castings	3.86	596	8.2	50.1	6.29	79.1
Plot 7	Biochar + SFW	3.36	568	7.4	51.7	6.16	76.0
Plot 8	Biochar + AEA	3.64	653	7.9	39.1	6.38	72.5
Plot 9	Biochar + SFW + AEA	3.80	645	7.6	33.9	6.24	72.5

Green cells = highest value in column. Cornell CASH lab, April 2026.

Biological Activity: Team-Measured Field Indicators

> All data on this page: Finlay Biodiversity team direct measurements (field instruments), April 2026

CO2 burst (respiration), volumetric water content (% VWC), and fungal:bacterial (F:B) ratios are measured directly by the Finlay Biodiversity team using field instruments as part of monthly monitoring. Together they paint a picture of metabolic activity, structural moisture capacity, and biological maturity across all research plots - independent of the Cornell laboratory analysis.

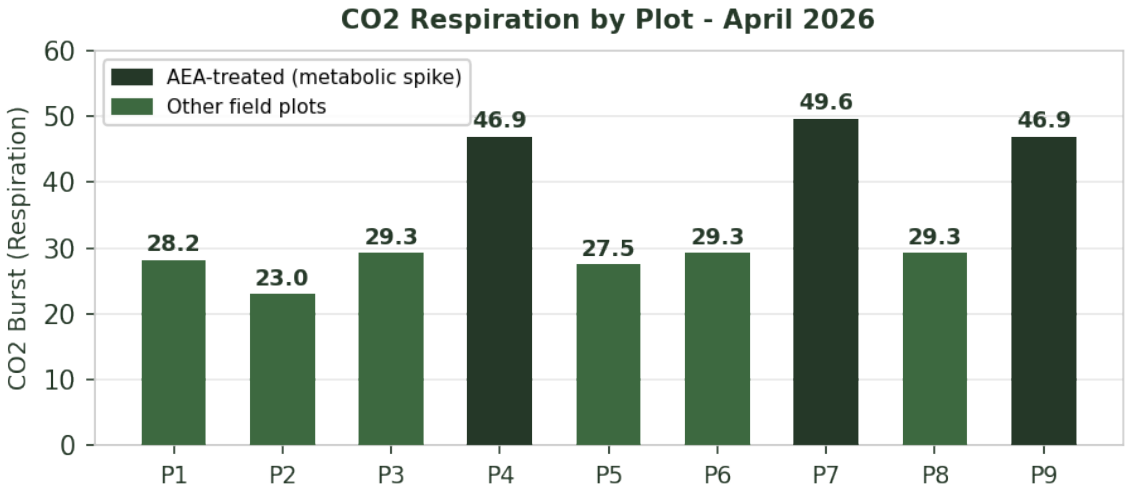

Figure 3. CO2 Respiration by field plot, April 2026. AEA-treated plots (P4, P7, P9) show highest metabolic activity. Finlay Biodiversity team measurement.

All Plots: Team-Measured Indicators - April 2026

Plot	Treatment	Biomass ug/g	F:B Ratio	CO2 Burst	% VWC
Plot 1	Control - Untouched	680	0.3:1	28.2	8.77%
Plot 2	Standard Farming	569	0.3:1	23.0	12.30%
Plot 3	Soil Food Web (SFW)	700	0.3:1	29.3	12.57%
Plot 4	AEA Protocols	618	0.3:1	46.9	9.20%
Plot 5	SFW + AEA	563	0.2:1	27.5	10.67%
Plot 6	Biochar + Worm Castings	631	0.3:1	29.3	13.97%
Plot 7	Biochar + SFW	593	0.2:1	49.6	11.57%
Plot 8	Biochar + AEA	690	0.4:1	29.3	13.77%
Plot 9	Biochar + SFW + AEA	699	0.3:1	46.9	11.87%
INDOOR MICRO-TRIALS (+ LAB Serum & Forest Duff NFM)					
Plot 6i	Biochar + Worm + LAB/NFM	552	0.3:1	32.6	10.9%
Plot 8i	Biochar + AEA + LAB/NFM	640	0.1:1	43.9	20.0%
Plot 9i	Biochar+SFW+AEA+LAB/NFM	802	0.3:1	21.7	27.5%

Green cells = highest value in column for that section. Plot 8 leads field plots in F:B ratio (0.4:1). Plot 9i's lower CO2 (21.7 vs field Plot 9's 46.9) signals a more mature, stable community - biomass accumulation phase rather than rapid colonization. Plot 8i F:B (0.1:1) reflects active

bacterial-to-fungal transition still in progress.

Key Findings

1

Biology Built Up Across Every Plot

Microbial biomass rose in all nine field plots from August 2025 to April 2026. Several plots quadrupled - Plot 3 went from 41 ug/g to 700 ug/g. The shared cover crop and irrigation baseline lifted living biology across the board before treatment effects diverged. By April 2026, every plot exceeded 550 ug/g.

2

Biochar & Worm Castings Topped Field Soil Health

Biochar & Worm Castings (Plot 6) led all field plots with the highest Cornell score (79.1) and highest organic matter (3.86%). Plot 8 (Biochar + AEA) recorded the highest active carbon at 653 ppm and the best fungal:bacterial ratio (0.4:1) among field plots. Plot 4 (AEA) had the best protein index at 9.3. Amendment and combination treatments consistently outperformed single-biology-only approaches.

3

Indoor Trials Confirmed LAB and Forest Duff Accelerate Recovery

Plot 9i reached 802 ug/g - 15% above field Plot 9 (699 ug/g) with identical base treatments plus LAB serum and Native Forest Microorganisms. Notably, Plot 9i's CO2 respiration is lower (21.7) than field Plot 9 (46.9) - not because it is less active, but because the community has matured beyond the initial flush of activity into stable biomass accumulation. LAB acts as a welcoming crew for complex biology; forest duff mycelium creates fungal networks within biochar pores.

4

Biochar Improved Moisture Retention and Structural Stability

Plots receiving 1,250 lbs of biochar (Plots 6, 7, 8, 9) consistently showed moisture retention of 11.5-14.0% VWC versus Plot 4 (AEA only) at 9.2%. The untouched control (Plot 1) retained just 8.77% - lowest of all plots. Biochar acts as a microbial skyscraper, providing surface area for biology while holding moisture against drought.

5

AEA Amendments Drove Metabolic Activity

AEA-treated plots (Plots 4, 7, 8, 9 - Sea Shield + Rejuvenate + Spectrum) showed CO2 respiration of 46.9-49.6 - roughly double the standard farming control (23.0). The energy substrates in AEA products allow soil biology to multiply and cycle nutrients rapidly. AEA provides the paycheck that allows compost biology to reproduce.

6

W-2 Field Is Ready for Biological Upgrade

The 55-acre W-2 heritage rye field already shows microbial biomass of 615-762 ug/g - comparable to the 5-acre research plots. High respiration rates in Row 2 and Row 3 (up to 65.7) indicate an active but bacterially-dominated system mineralizing organic matter faster than it can be retained. Stable carbon input (biochar) and fungal inoculation are the priority interventions to lock in these gains.

Scaling Beyond the Research Plots

Current work is expanding from the 5-acre research system into broader implementation planning, including a 55-acre heritage rye transition field (W-2) at Cloverdale Farm. All field implementation, amendment application, and ongoing monitoring is carried out by the Finlay Biodiversity team.

W-2 Field Baseline - 55-Acre Heritage Rye Site

> Finlay Biodiversity team measurement, April 2026

The 55-acre W-2 field shows a variable baseline across sampling locations. Biomass levels (615-762 ug/g) are already comparable to the research plots. However, extremely high respiration in Row 2 and Row 3 (up to 65.7) combined with lower moisture in some areas indicates a bacterially-dominated system rapidly mineralizing organic matter without sufficient stable carbon to retain nutrients. Goal: stabilize through heritage rye and fungal inoculation.

Location	Biomass (ug/g)	F:B Ratio	CO2 Burst	% VWC
Back Fence	615	0.2:1	41.8	24.33%
Row 2	688	0.4:1	59.2	21.30%
Row 3	702	0.3:1	65.7	13.77%
Row 4	762	0.4:1	-	15.50%

Orchard Baseline - Perennial Reference Site

> Finlay Biodiversity team measurement, April 2026

The Orchard already shows a biomass of 725 ug/g driven by mature perennial root systems. The F:B ratio must shift from 0.3:1 toward 10:1 or higher for orchard trees to reach peak health. The Orchard also serves as a nursery for NFM propagation via the Orchard Shield strategy: its indigenous soil microorganisms are propagated into IMO-4 material and used to inoculate the W-2 field, bridging the biological gap between forest ecosystem and cultivated farmland.

Metric	Orchard - Apr 2026
Microbial Biomass (ug/g)	725
F:B Ratio	0.3:1 (target: 10:1 to 50:1)
CO2 Respiration	25.7
Volumetric Water Content	12.29%
Electrical Conductivity	0.012 EC
Soil Temperature	84.81 F

Recommended Protocol: 55-Acre Heritage Rye Transition

Component	Input	Purpose
Structural Base	Biochar	Stable carbon, moisture retention, microbial habitat
Biological Inoculant	SFW Compost + NFM Forest Duff	Full soil food web + indigenous fungi
Liquid Energy	AEA: Rejuvenate + Sea Shield	Rapid microbial colonisation and nutrient cycling

Component	Input	Purpose
Soil Primer	LAB Serum (1:1000 dilution)	Phosphorus solubilisation + community preparation
Cover Crop	13-species mix incl. winter rye	Living roots, nitrogen fixation, continuous biology
Integrated Blend	Austrian Winter Peas or Hairy Vetch with rye	Steady nitrogen source complementing rye scavenging ability

Geological Context: Fractured Shale Profile

Soil profile analysis near the 55-acre field reveals fractured shale and shallow A horizon. **No-till strategy** preserves fungal networks penetrating shale fractures. **Heritage rye** thrives on 12 inches of annual rainfall with fibrous roots compatible with rocky profiles. **Fungal inoculation is the priority** - hyphae perform acid-dissolution weathering, releasing phosphorus and magnesium from the shale matrix. **Forage radish** as a biological drill can open fractures ahead of rye.

Carbon Sequestration & MRV Opportunity

As the 55-acre W-2 field transitions to heritage rye, implementing Monitoring, Reporting, and Verification (MRV) protocols from the outset creates the opportunity to document and monetize carbon sequestration. Biochar provides highly stable, long-duration carbon storage; heritage rye's root biomass adds additional annual sequestration. Formal MRV documentation would allow Finlay Biodiversity to participate in carbon credit markets, creating an additional revenue stream from the regeneration of this landscape.

Research Continues

This data set represents a single sampling cycle (Aug 2025 - Apr 2026). Continued seasonal sampling combined with ongoing daily field care and monthly analysis will separate durable biological gains from establishment-year effects and refine the optimal regenerative recipe for each field environment. The transition of the 55-acre W-2 field into heritage rye production will serve as the definitive proof of concept for the Finlay Biodiversity methodology: that biological soil restoration is measurable, scalable, and economically viable at the farm level.