The Crucible

Epilogue

Post-collapse projection studies

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Opening Framework

Epilogue research overview

The Epilogue asks what happens after the crash. Earlier Crucible stages focus on whether designed tribes can survive, compete, adapt, and outperform one another under increasing civilizational stress. The Epilogue shifts the frame from competition before collapse to projection after collapse. It asks what kind of world follows when the old system has broken: do surviving tribes restart and advance again, do they find lower-energy equilibrium, do they continue fighting, or do they drift toward extinction?

This phase treats the post-collapse world as an exploration into the unknown future. The agents enter with inherited behavioral designs, ecological constraints, resource conditions, and environmental histories already in place. Tribe designs are not rewritten during the Epilogue itself; they unfold across many generations of agents inside each epoch.

The environmental conditions can be varied to test specific physical assumptions, especially when climate-feedback and reservoir mechanics are introduced. The agents, however, continue to act through inherited survival logic. Reproduction, mutation, death, competition, cooperation, movement, scarcity, and regional opportunity determine the paths that follow.

This overview functions as a lead-in rather than a conclusion. The Epilogue follows the future forward under controlled variations in network structure, duration, and climate physics. Each phase narrows the question: first by testing post-crash interaction, then by extending the time horizon, then by adding more persistent physical feedback.

Research plan

The Epilogue is organized as a sequence of related projection studies. Each phase keeps the emphasis on post-collapse futures, but each changes the lens: designed survivor performance, network breakdown, longer duration, climate-feedback calibration, and final climate-reservoir behaviour.

Phase	Clear name	Purpose	Primary questions
Phase 1	Obsidian Reference Analysis	Establishes the design logic entering the Epilogue and documents why Aries is introduced as a deliberate successor design.	Which traits appear promising before future projection begins? What does Aries preserve, reject, or improve?
Phase 2	Aries Design Theory	Defines the Aries founder genome and explains the controlled redesign from Obsidian survival evidence.	How should a successor design preserve collapse survival while improving ascent reliability?
Phase 3	Aries Field Test	Tests the Aries design against the established full field under late-project conditions.	Can a deliberately designed survival tribe outperform prior survivors? Does it win through ascent, resilience, or post-crash endurance?
Phase 4	Natural Network Collapse	Tests whether natural Internet and telecom decay changes post-collapse outcomes and permits multiple isolated survivors.	Does reduced long-distance contact allow plural survival? Does it change winner identity or only the route to collapse?
Phase 5	Extended 80,000-Pulse Horizon	Determines whether earlier endpoints capture stable survival or only a temporary point in a longer decline.	Do survivors restart, stabilize, continue fighting, or disappear over longer time? Is Regime 2 (Agrarian) equilibrium possible?
Phase 6	Reservoir Calibration	Tests reservoir mechanics, archive fields, and post-40,000 climate tracking before treating reservoir results as final evidence.	Does the physical tail behave coherently? Does the run produce a plausible boom-crash-tail condition?
Phase 7	Final Climate Reservoir Projection	Runs the full tribe field through the selected climate-reservoir envelope: large boom, hard crash, and long survivable tail.	Which tribes remain coherent inside the final climate envelope? How many survive, and what traits are associated with survival?

The research plan creates a staged path from design evidence to post-collapse projection. Calibration phases are kept distinct from final evidence phases so that tuning history is not mixed with the final behavioral question.

Working objectives

The objectives below define how each phase contributes to the broader Epilogue. They are exploratory objectives rather than conclusions.

Objective	How the Epilogue addresses it
Post-crash survival	Track whether tribes persist after collapse and whether survival is temporary or stable.
Renewed advancement	Observe whether survivors rebuild into higher regimes or remain in lower-energy refugia.
Equilibrium versus extinction	Use longer horizons and climate-tail variants to separate stabilization from delayed collapse.
Conflict after collapse	Examine whether reduced networks and shrinking populations lead to coexistence or final dominance.
Tribal design selection	Compare founder traits, elite traits, interaction patterns, and final refugia dominance.
Physical envelope	Treat climate physics and reservoir feedbacks as constraints that define which behavioral strategies remain possible.

These objectives frame the Epilogue as a projection exercise. The phases that follow evaluate each stage without requiring the reader to already know the earlier projects.

Terminology used in this report

The Epilogue reports use a recurring set of behavioural and regime terms. These definitions are included so that the report can be read on its own without requiring earlier project analyses.

Term	Plain-language meaning
Hardiness	A survival-efficiency trait. Higher hardiness generally means better endurance under scarcity, metabolic stress, and post-collapse conditions.
Vitality	A resilience trait associated with health, age, and hazard survival. It helps agents persist but does not by itself guarantee post-collapse continuity.
Legacy	A reproduction-pressure trait. Higher legacy can help growth but may also intensify boom-bust overshoot; lower legacy tends to reduce reproductive burden.
Kin trust	Cooperation tendency toward same-tribe or kin-like partners.
Social or civic trust	Cooperation tendency toward familiar non-kin partners or civic neighbors.
Xeno trust	Cooperation tendency toward outsiders. Under scarcity, high xeno trust can create exposure to exploitation or maladaptive dependence.
Opportunism	Tendency to exploit or defect when conditions make cooperation risky or unrewarding.
Wander	Movement tendency. Abundance wander is normal movement, scarcity wander responds to decline, and desperation wander disperses survivors during severe crisis.
Regime 1 (Foraging)	Lowest-complexity subsistence state.
Regime 2 (Agrarian)	Low-energy settled survival state; most final refugia in the Epilogue are agrarian.
Regime 3 (Industrial)	Fossil/industrial expansion state.
Regime 4 (Technological)	High-complexity, networked, advanced energy state.
Prisoner's Dilemma	The interaction game used to model cooperation and defection under repeated survival pressure.
Refugium / refugia	A surviving pocket or set of pockets after the main collapse wave.

The glossary establishes shared language for the rest of the Epilogue. Later phases use these terms consistently and refer to regimes by both number and name where possible.

Phase 1

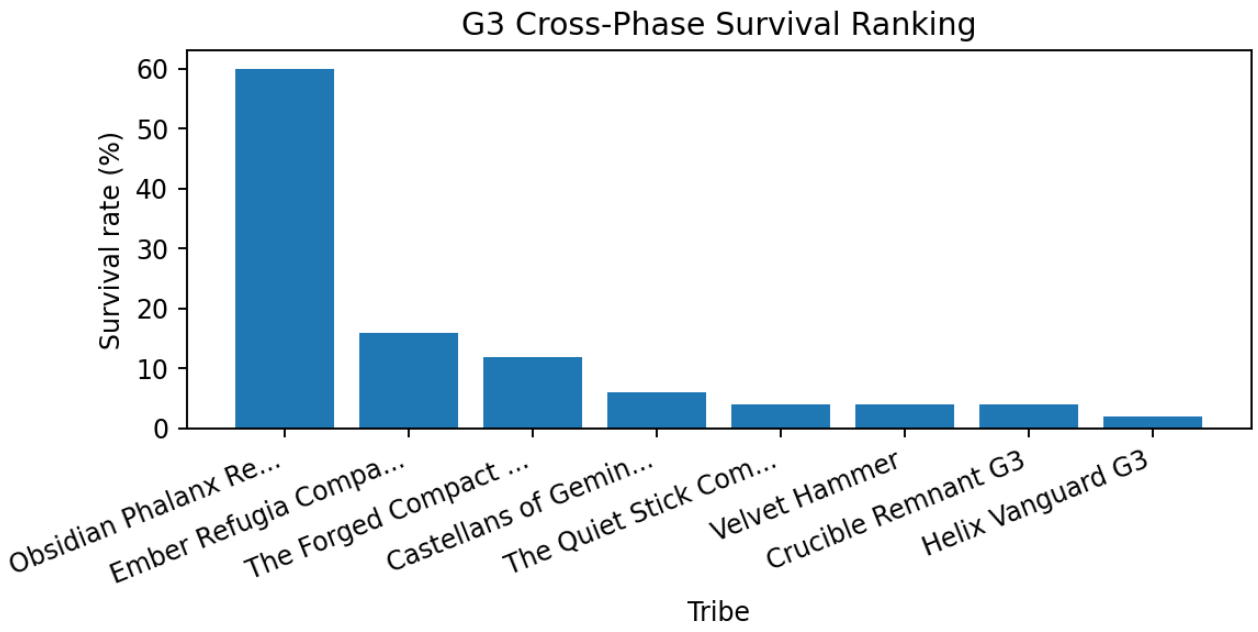
Obsidian Reference Analysis

Executive finding

Phase 1 examines why the Obsidian Phalanx Refuge G3 becomes a recurring survival reference in the late Crucible phases. The key interpretive theory is that Obsidian changes the survival problem from maintaining civilization through collapse to producing enough hardened, low-metabolism survivors that collapse leaves viable refugia behind.

Metric	Obsidian	Other language-model average	Biologic average
Survival rate	60.0%	8.0%	1.3%
Survived epoch records	30	20	4
Average peak population	809,464	321,580	30,932
Average final population	12,328	1,273	407
Average duration pulse	33,327	23,718	14,824
Failed-birth rate	11.3%	13.8%	17.4%
Starvation-death share	67.0%	67.2%	54.6%

Obsidian's separation from the field is large enough to make it a design reference rather than a marginal outlier. Its core advantage lies in post-crash continuity, not in avoiding the crash altogether.



The cross-phase ranking shows that Obsidian's survival rate is not simply a single-scenario artifact. It remains the strongest G3 survivor across multiple stress regimes.

Survival pattern across stress regimes

Obsidian's survival pattern can be evaluated by phase. The comparison below groups Obsidian against other language-model tribes and biologic tribes to show whether its advantage persists under different environmental stress profiles.

Stress family	Obsidian survival	Other language-model survival	Biologic survival	Obsidian average peak population
G3 reference	60.0%	10.0%	1.7%	834,059
1 AEROSOL	40.0%	10.0%	1.7%	750,721
2 METHANE	80.0%	4.0%	0.0%	671,145
3 NUCLEAR	70.0%	6.0%	3.3%	1,012,045
4 ALL BOMBS	50.0%	10.0%	0.0%	779,351

The phase comparison supports the view that Obsidian is a general collapse-survival design. Its results vary by stress regime, but its advantage remains visible across the tested stress families.

The ascent bottleneck

The working theory behind Phase 2 begins here: Obsidian's late-collapse design is strong, but it still depends on reaching Regime 4 (Technological) often enough to seed durable refugia. A tribe that stalls at Regime 2 (Agrarian) loses access to the scale and energy required for the later collapse-survival mechanism.

Condition	Epoch records	Survived records	Survival rate	Interpretation
Reached Regime 4 (Technological)	38	30	78.9%	Advanced ascent usually leaves enough scale for refugia.
Stalled at Regime 2 (Agrarian)	12	0	0.0%	Early-to-mid ascent failure remains fatal.
All Obsidian records	50	30	60.0%	Overall success depends on ascent plus collapse survivability.

This creates the central design problem addressed by Phase 2: preserve Obsidian's low-legacy, high-hardiness collapse engine while improving ascent reliability.

Founder hardware and selection pressure

Founder traits describe the initial behavioural and biological tendencies assigned to the tribe. In Obsidian, the distinctive combination is high hardiness, adequate vitality, low legacy, high kin trust, and low external dependency.

Trait or behavior	Obsidian founders	Other language-model founders	Interpretation
Hardiness	56.4	51.4	Higher survival efficiency and lower metabolic pressure.
Vitality	35.6	31.2	Enough resilience without making reproduction the only path.
Legacy	8.0	17.3	Lower reproductive pressure reduces boom-bust overshoot.
Kin trust	0.834	0.692	Internal cohesion is stronger than peers.
Social trust	0.414	0.312	Moderate civic cooperation without broad openness.
Xeno trust	0.096	0.090	Low outsider dependency during scarcity.
Xeno opportunism	0.765	0.685	High defensive opportunism under outsider pressure.

The founder profile shows why Obsidian becomes a survival reference: it sacrifices expansive openness and reproductive intensity in favor of durable remnant cohesion.

Collapse window and refugia evidence

Obsidian's success is not a smooth landing. The crash window shows a controlled failure mode: population peaks hard, sheds most of its scale, and survives only if enough hardened agents remain after the crash.

Pulse	Average Obsidian population	Epochs represented
27,000	221,223	50
28,000	238,415	50
29,000	583,258	50
30,000	386,718	50
31,000	77,756	50
32,000	27,245	50
33,000	10,332	50
34,000	5,014	50

The collapse-window pattern clarifies the mechanism: Obsidian does not avoid overshoot. It creates enough durable population for the collapse to leave viable Regime 2 (Agrarian) refugia.

Query appendix

This appendix lists the workbook tabs that support the phase analysis. The tab names correspond to query outputs, and the purpose column describes the role each output plays in the evidence trail.

Workbook tab	Purpose
00_obsidian_identity_and_lineag	Identifies Obsidian's lineage, player identifiers, and design context.
01_obsidian_cross_phase_record	Collects Obsidian's epoch-level performance across the stress phases.
02_cross_phase_survival_ranking	Ranks all G3 competitors by survival rate and survival scale.
03_phase_by_phase_competitor_co	Compares Obsidian, other language-model tribes, and biologic tribes by phase.
04_founder_trait_distinctivenes	Compares founder traits such as hardiness, vitality, legacy, trust, opportunism, and wander.
05_founder_to_elite_drift	Measures how founder traits drift into elite survivor traits.
06_obsidian_timeline_by_phase	Tracks Obsidian's timeline by phase and epoch.
07_obsidian_collapse_window_con	Examines Obsidian during the crash window around peak and collapse.
08_final_refugia_obsidian_and_w	Maps final refugia and dominant final regions.
09_late_reproductive_viability	Tests whether late survivors continue to reproduce after the crash.
10_event_audit_for_obsidian_pha	Audits historical event conditions used in the phase set.
11_objective_notes_for_all_g3_l	Preserves designer notes and objectives for G3 language-model tribes.
12_aries_design_lesson_scorecar	Summarizes design lessons used to motivate Aries.

Phase 2

Aries Design Theory

Design hypothesis

Aries is a controlled successor design to the Obsidian Phalanx Refuge G3. It is not a clean-sheet tribe. The design begins from the working theory that Obsidian's strongest feature is a collapse-survival genome: high hardiness, low legacy, strong kin cohesion, limited xeno trust, and enough mobility to leave viable refugia after civilization-scale failure.

Design element	Aries design position
Core hypothesis	Preserve the Obsidian collapse-survival genome while adding enough civic and mobility structure to reach Regime 4 (Technological) more reliably.
Primary objective	Durable refugia with improved Regime 4 (Technological) ascent reliability and late recovery.
Lineage	Hybrid refugia-focused redesign, converging around Obsidian's demonstrated survival core.
Design answer	Not a high-population tribe. Aries is a high-hardiness survival architecture with selective civic ascent and managed collapse fragmentation.

The design therefore treats advanced civilization as a means to seed survival, not as the final form that must be preserved.

Evidence basis

The Aries design uses Phase 1 as its evidence base. The design goal is to preserve the features associated with late refugia while reducing the ascent failures associated with stalling at Regime 2 (Agrarian).

Workbook signal	Observed pattern	Aries design response
Cross-phase survival ranking	Obsidian led the field with 30 surviving records out of 50 and a 60.0% survival rate.	Converge toward Obsidian rather than replace it.
Regime milestone split	Obsidian survival was tied to reaching Regime 4 (Technological); Regime 2 (Agrarian) outcomes were dead ends.	Add civic ascenders and modest founder legacy to improve ascent reliability.
Founder distinctiveness	Obsidian combined high hardiness, adequate vitality, and low legacy.	Raise hardiness, keep legacy low, and spend some vitality to fund the ascent layer.
Founder-to-elite drift	Surviving elites repeatedly drifted upward in hardiness while legacy fell to zero.	Make hardiness the main selection target and treat legacy as an early founder throttle.
Late reproductive viability	Obsidian often regrew late after the collapse wave passed.	Preserve low-metabolism recovery and avoid over-correcting legacy upward.
Final refugia	Survival required viable local remnants, not maintenance of peak civilization size.	Increase scarcity and desperation movement so collapse becomes distributed rather than synchronized.

Aries is therefore a design experiment in controlled modification: strengthen ascent without sacrificing the low-legacy refugia engine.

Trait comparison

The trait comparison below uses the same model-specific language as the terminology table. Hardiness, vitality, legacy, trust, opportunism, and wander are behavioural or survival parameters, not moral judgments.

Trait group	Obsidian G3	Aries	Design interpretation

Hardiness	56.40	58.45	Higher survival efficiency and lower metabolic pressure.
Vitality	35.60	32.95	Slightly reduced to fund extra hardiness and controlled founder legacy.
Legacy	8.00	8.60	Still low, but enough founder reproduction to reduce under-ascent risk.
Kin trust	0.834	0.866	Raised for remnant cohesion and same-tribe cooperation.
Kin forgiveness	0.775	0.777	Held at Obsidian-like levels to preserve internal repair capacity.
Stranger trust	0.415	0.395	Similar overall, but state-shaped for selective civic cooperation.
Stranger opportunism	0.299	0.381	Raised under stress; civic cooperation remains conditional.
Xeno trust	0.096	0.060	Lowered to reduce outsider exploitability at borders.
Xeno opportunism	0.765	0.813	Raised to preserve defensive border opportunism.
Desperation wander	0.410	0.565	Higher movement under severe stress so survivors can scatter into refugia.

The design trades a small amount of vitality for extra hardiness, cohesion, border defense, and collapse dispersal. It keeps legacy low enough to avoid returning to a high-reproduction boom-bust design.

State behaviour design

Aries uses different behavioural emphases in abundance, scarcity, and desperation. This state-shaping is intended to allow the tribe to build enough complexity for Regime 4 (Technological) while avoiding synchronized death in the collapse.

State	Aries behavior	Why it exists
Abundance	Kin-cooperative and cautiously civic.	Build local complexity and civic identity without reckless expansion.
Scarcity	More mobile and more conditional.	Exit declining regions early and avoid being trapped in synchronized scarcity.
Desperation	Refugee mode: higher movement, lower xeno trust, and strong defensive opportunism.	Scatter survivors into viable refugia while protecting the remnant core.

The expected failure mode is not low peak population by design, but insufficient demographic depth after the crash. Phase 3 evaluates whether the design clears that risk.

Phase 3

Aries Field Test

Research plan

Phase 3 inserts Aries into the established late-project field as a designed challenger. The run asks whether the Aries design can improve on the survival theory learned from Phase 1 while facing the same broad selection pressures as the existing tribes.

Primary question	Purpose
Does Aries survive at a materially higher rate than the prior field?	Tests whether the design intervention produces a clear survival advantage.
Does Aries solve the Regime 4 (Technological) ascent weakness identified in Phase 1?	Separates ascent failure from late refugia failure.
When Aries fails, where does the failure occur?	Identifies whether losses occur during ascent, crash, or final remnant survival.
Which competitors defeat Aries?	Shows whether losses reveal a specific remaining design weakness.

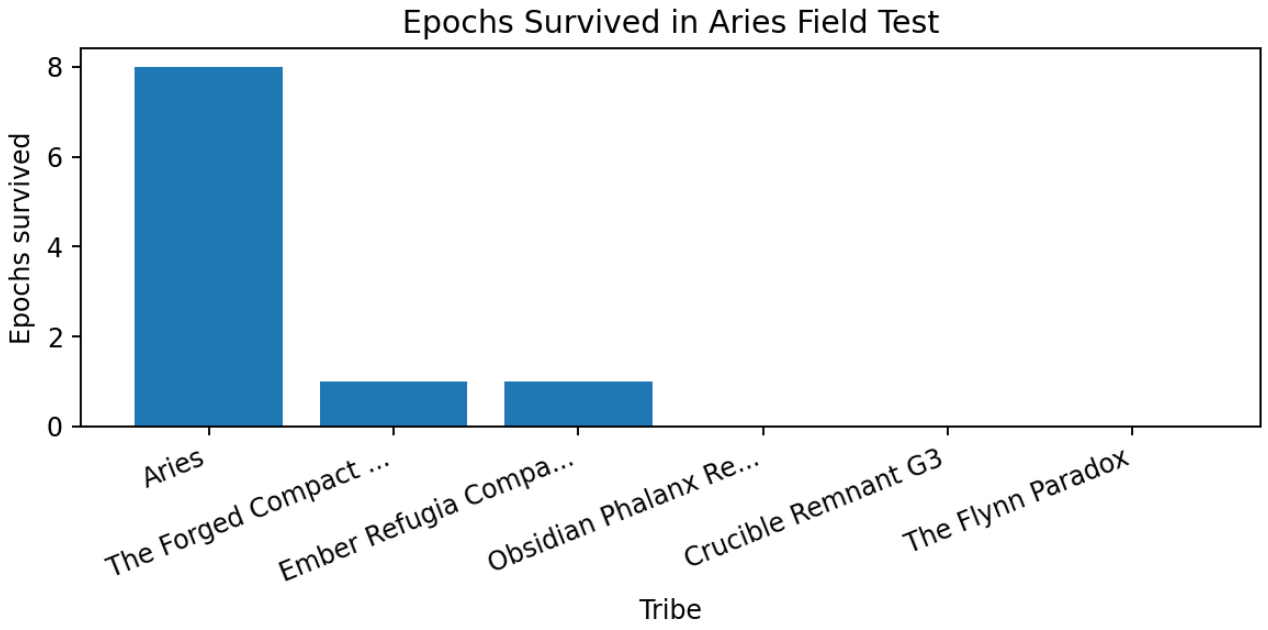
Phase 3 functions as the first Epilogue field test after the Aries design intervention.

Executive finding

Aries survived 8 of 10 epochs and was the only tribe with a high survival rate in the series. The two losses were not caused by failure to reach advanced complexity: Aries reached Regime 4 (Technological) in all ten epochs. The losses were late-collapse bottleneck failures after weaker peak population and peak energy.

Tribe	Tribe type	Epochs survived	Survival rate	Average final population	Best final population	Average peak population	Highest regime reached
Aries	Language-model	8	80.0%	363	1,300	1,144,022	Regime 4 (Technological)
The Forged Compact G3	Language-model	1	10.0%	55	545	191,292	Regime 4 (Technological)
Ember Refugia Compact G3	Language-model	1	10.0%	3	34	493,096	Regime 4 (Technological)
Obsidian Phalanx Refuge G3	Language-model	0	0.0%	0	0	407,460	Regime 4 (Technological)
Crucible Remnant G3	Language-model	0	0.0%	0	0	111,903	Regime 4 (Technological)
The Flynn Paradox	Biologic	0	0.0%	0	0	104,604	Regime 4 (Technological)
The Velvet Shadows	Biologic	0	0.0%	0	0	55,134	Regime 4 (Technological)
Velvet Ironshod	Biologic	0	0.0%	0	0	47,330	Regime 4 (Technological)
Velvet Hammer	Biologic	0	0.0%	0	0	54,870	Regime 4 (Technological)
Castellans of Gemini III G3	Language-model	0	0.0%	0	0	3,200	Regime 2 (Agrarian)
The Velvet Fang	Biologic	0	0.0%	0	0	4,336	Regime 2 (Agrarian)
The Quiet Stick Compact	Biologic	0	0.0%	0	0	3,376	Regime 2 (Agrarian)

The scoreboard demonstrates a large ecological separation. Aries is not merely ahead by a small margin; it is the only repeat survivor at high frequency in this field.



The survival-frequency chart makes the separation visible: most competitors either fail entirely or survive only once.

Aries by epoch

The epoch-by-epoch view shows that Aries generally reaches the peak and survives the final pulse, but its two losses occur after reaching Regime 4 (Technological). This distinction is important because it indicates a remaining refugia-depth problem rather than a return to the old ascent bottleneck.

Epoch	Survived	Aries final population	Aries peak population	Peak energy	Technological pulse	Last alive	Winner
181	Yes	151	1,402,537	11637.13M	26,100	40,000	Aries
182	Yes	1,277	1,806,226	12789.71M	26,100	40,000	Aries
183	Yes	50	1,298,463	9958.76M	25,350	40,000	Aries
184	Yes	12	778,269	5492.80M	26,150	40,000	Aries
185	Yes	104	676,596	5756.02M	26,100	40,000	Aries
186	Yes	104	1,475,799	12041.58M	25,950	40,000	Aries
187	Yes	1,300	1,149,229	10963.33M	26,050	40,000	Aries
188	Yes	635	1,347,828	12121.95M	25,800	40,000	Aries
189	No	0	812,885	5020.84M	26,200	35,950	Ember Refugia Compact G3
190	No	0	692,385	4299.30M	26,200	35,100	The Forged Compact G3

Across the series, Aries repeatedly converts advanced ascent into final survival. The exceptions become useful failure cases because they isolate the limits of the design.

Why Aries lost two epochs

The decisive contrast is scale. Aries losses had lower average peak population and lower average peak energy than its wins. The failed-birth rate was nearly unchanged, which points away from a direct fertility defect as the main explanation.

Result group	Epochs	Average peak population	Average final population	Average peak energy	Average final energy	Average last alive	Failed-birth rate	Starvation-death share

Aries losses	2	752,635	0	4660.07M	0.00M	35,525	10.0%	69.4%
Aries wins or survivals	8	1,241,868	454	10095.16M	6.68M	40,000	9.9%	66.5%

The loss pattern suggests that Aries solved the ascent problem but not every low-probability final-remnant bottleneck. It can reach advanced civilization reliably, yet still disappear if the remaining demographic base becomes too shallow after collapse.

Query appendix

This appendix lists the workbook tabs that support the phase analysis. The tab names correspond to query outputs, and the purpose column describes the role each output plays in the evidence trail.

Workbook tab	Purpose
00_setup_persistent_helper_tabl	Builds helper records for the Aries field-test analysis.
01_full_series_scoreboard	Ranks all tribes in epochs 181-190 by survival, final population, peak population, energy, and regime reach.
02_aries_epoch_by_epoch_with_wi	Shows Aries by epoch, including wins, losses, peak scale, final population, and winner identity.
03_aries_loss_epochs_only	Isolates Aries loss epochs for failure diagnosis.
04_aries_wins_vs_losses_summary	Compares Aries wins against Aries losses across demographic, energy, and mortality measures.
05_aries_vs_obsidian_by_epoch	Compares Aries and Obsidian directly in each epoch.
06_who_beat_aries_in_losses	Identifies which competitors survived or defeated Aries in the loss cases.
07_aries_loss_population_trajec	Tracks Aries population and energy trajectories in its loss epochs.
08_aries_phase_window_trajector	Summarizes Aries through key pulse windows.
09_aries_losses_system_conditio	Examines world conditions in Aries loss epochs.
10_wins_vs_losses_system_condit	Compares world conditions in Aries wins and losses.
11_aries_regime_gate_check	Tests whether Aries failures came from regime-gate failure.
12_aries_elite_traits_wins_vs_l	Compares elite traits in Aries wins and losses.
13_late_refugia_dominant_tribes	Shows late refugia dominance and final region ownership.
14_late_internet_contact_persis	Checks late contact and network persistence during the refugia period.
15_compact_failure_explanation_	Explores why compact/refugia designs failed or survived relative to Aries.

Phase 4

Natural Network Collapse

Research plan

Phase 4 tests whether allowing Internet and telecom systems to decay naturally changes the post-collapse social landscape. The main issue is whether persistent long-distance connectivity had been pushing final survivor pockets into destructive contact, or whether single-survivor convergence forms earlier through competition, geography, and collapse bottlenecks.

Primary question	Purpose
Does network collapse make plural survival common or merely possible?	Tests the strongest version of the network-contact hypothesis.
Do final refugia still converge toward one surviving tribe?	Measures whether single-survivor convergence remains a strong attractor.
Are late survivors in contact or spatially separated?	Distinguishes mixed coexistence from separated refugia.
Does network collapse change winner identity?	Tests whether network conditions alter the selection landscape even if survivor counts stay similar.

Phase 4 clarifies whether post-collapse plural survival is prevented by late network contact or by earlier sorting dynamics.

Executive conclusion

Natural network collapse did not make plural survival common. Nine of ten epochs still ended with one surviving tribe. It did, however, break the absolute single-survivor pattern: epoch 200 ended with two surviving tribes. This falsifies the stronger claim that the engine can only produce one final lineage.

Metric	Phase 3 baseline	Phase 4 natural network collapse	Interpretation
Zero survivor epochs	0	0	The endpoint still contains at least one lineage.
One survivor epochs	10	9	Single-survivor convergence remains dominant.
Multi-survivor epochs	0	1	Plural survival becomes possible but rare.
Average surviving tribes	1.0	1.1	Small numerical change, but important categorical change.
Winner identities	Aries dominated	Aries 5, Obsidian 4, Ember 1, Crucible co-survival 1	Survivorship becomes more distributed.

The result is not a simple confirmation of the Internet hypothesis. Persistent Internet does not appear to be directly killing final refugia; the more likely effect is upstream, through who reaches the collapse bottleneck with enough population, energy, mobility, and spatial position.

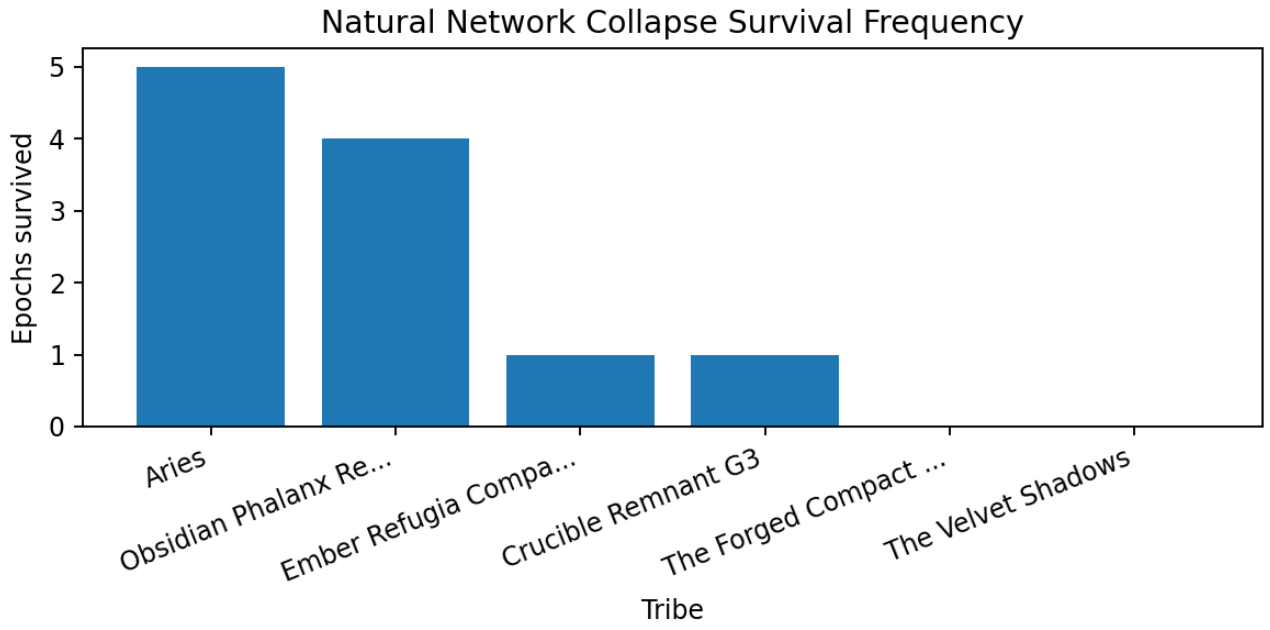
Survival outcomes by epoch

The epoch-level outcomes show a mostly single-survivor world with one critical anomaly. Epoch 200 becomes the evidence case for separated plural survival.

Epoch	Final surviving tribes	Total final population	Final survivors
191	1	448	Aries pop=448 peak=830939 reg=4
192	1	443	Obsidian pop=443 peak=973534 reg=4
193	1	19	Aries pop=19 peak=1271075 reg=4

194	1	26	Aries pop=26 peak=1259515 reg=4
195	1	228	Obsidian pop=228 peak=1343084 reg=4
196	1	108	Obsidian pop=108 peak=1205885 reg=4
197	1	2,604	Ember pop=2604 peak=1387670 reg=4
198	1	448	Aries pop=448 peak=1381161 reg=4
199	1	31	Obsidian pop=31 peak=807921 reg=4
200	2	64,465	Aries pop=64145 peak=814763 reg=4 | Crucible Remnant pop=320 peak=1185297 reg=4

The anomaly matters because it demonstrates that the model can produce more than one final lineage. It does not, however, make plural survival the dominant outcome.



The winner pool becomes more distributed than in Phase 3, with Aries and Obsidian both repeatedly appearing in final survival outcomes.

The Internet and contact question

If persistent Internet were directly forcing final survivor pockets into destructive contact, late refugia windows would be expected to show ongoing xeno or global-style interactions. The contact proxy data do not show that pattern.

Series	Window	Average world population	Xeno matches	Average xeno share	Exploitation rate
181-190 baseline persistent network	01 late collapse window 30000-35999	77,942	80,771	0.0019	0.4101
191-200 natural network collapse	01 late collapse window 30000-35999	87,664	257,414	0.0073	0.4035
181-190 baseline persistent network	02 final refugia window 36000-38999	99	0	0.0000	0.4315
191-200 natural network collapse	02 final refugia window 36000-38999	5,526	0	0.0000	0.4046
181-190 baseline persistent network	03 last 1000 pulses	307	0	0.0000	0.4291
191-200 natural network collapse	03 last 1000 pulses	6,608	0	0.0000	0.4191

By the true refugia stage, the world is already local. Network decay appears to alter the funnel into collapse rather than create late-stage coexistence by itself.

Epoch 200: separated plural survival

Epoch 200 is the critical exception. Its two survivors do not appear to share mixed final regions. They persist as separated refugia, with Aries dominating the large majority of surviving population and regions.

Final tribe	Final population	Peak population	Final role
Aries	64,145	814,763	Final survivor
Crucible Remnant G3	320	1,185,297	Final survivor

Epoch 200 therefore shows plural survival through spatial separation, not stable mixed-region civic coexistence. Phase 5 extends the time horizon to test whether such survival is durable.

Query appendix

This appendix lists the workbook tabs that support the phase analysis. The tab names correspond to query outputs, and the purpose column describes the role each output plays in the evidence trail.

Workbook tab	Purpose
00_setup_persistent_helper_tabl	Builds helper records for network-collapse analysis.
01_active_field_and_event_audit	Audits active tribes, events, and run conditions for epochs 191-200.
02_survivor_count_by_epoch	Counts final surviving tribes by epoch.
03_series_scoreboard_191_200	Ranks tribe performance across the natural network-collapse series.
04_final_survivors_detail	Lists final survivors, final population, peak population, and regime reach.
05_baseline_vs_network_collapse	Compares Phase 4 against the Phase 3 baseline.
06_late_network_contact_proxy_b	Measures late-stage contact proxies by window and series.
07_contact_proxy_baseline_vs_ne	Compares contact proxies between Phase 3 and Phase 4 conditions.
08_epoch_200_two_survivor_diagn	Diagnoses the key two-survivor epoch.
09_epoch_200_survivor_trajector	Tracks trajectory of each epoch 200 final survivor.
10_alive_tribe_count_timeline	Tracks living-tribe counts through time.
11_first_single_or_multi_surviv	Finds when each epoch first reaches single-survivor or multi-survivor status.
12_final_refugia_region_map	Maps final populated refugia regions.
13_final_refugia_summary_by_epo	Summarizes final refugia by epoch.
14_epoch_200_final_refugia_spat	Shows spatial separation and dominance in epoch 200 final refugia.
15_world_population_slope_40000	Checks late population slope near the endpoint.
16_late_birth_death_balance_sur	Measures late birth/death balance for survivors.
17_winner_predictability_and_su	Tests whether final winners were predictable from earlier scale or rank.

Phase 5

Extended 80,000-Pulse Horizon

Research plan

Phase 5 extends the natural network-collapse world from the earlier 40,000-pulse endpoint to 80,000 pulses. It asks whether apparent final survivors are genuine post-collapse equilibria or merely remnants that would disappear if the future were allowed to run longer.

Primary question	Purpose
Does the 40,000-pulse survivor persist to 80,000 pulses?	Tests delayed extinction versus durable remnant survival.
Does the post-collapse system restart, stabilize, or decline?	Measures whether survivors regrow or fade.
Does survivor identity change after 40,000 pulses?	Separates competitive outcome from post-collapse demographic condition.
Does climate pressure continue after collapse?	Tests whether the physical tail remains active enough to alter long-run outcomes.

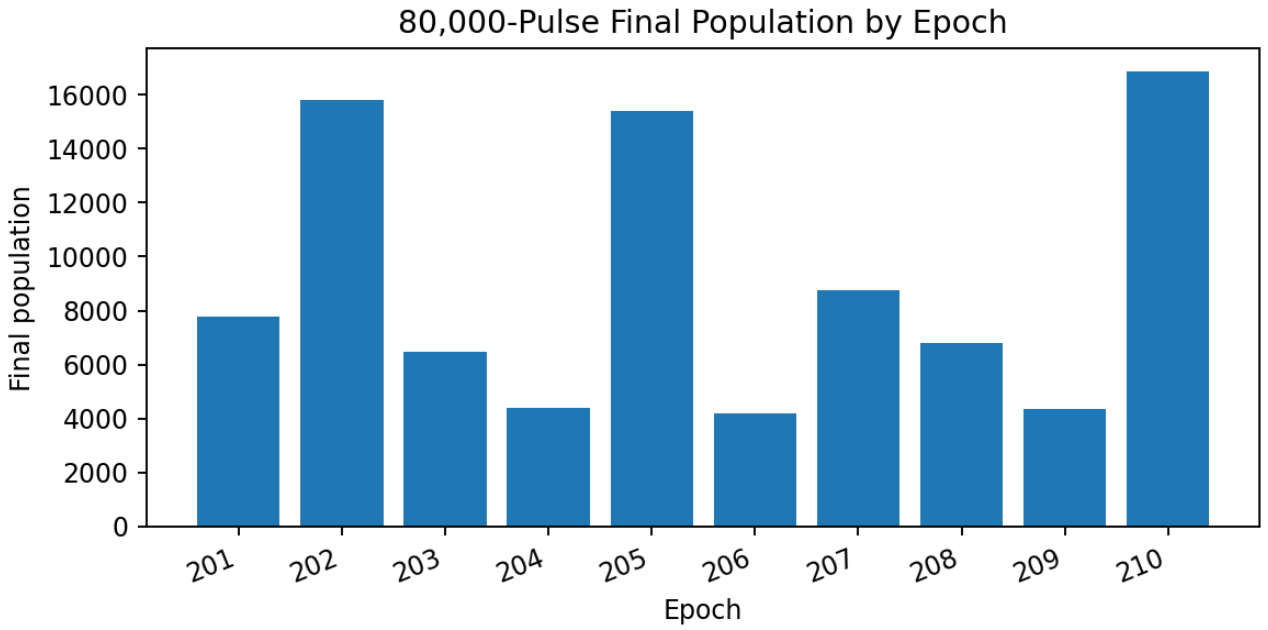
Phase 5 checks whether the older endpoint was stopping in the middle of extinction or capturing the beginning of a stable low-energy future.

Primary finding

The 80,000-pulse series did not reveal delayed extinction. By 40,000 pulses, every epoch had already collapsed to exactly one living tribe; by 80,000 pulses, each sole survivor had regrown. The system therefore appears to have reached a post-collapse single-lineage equilibrium rather than merely stopping at the last flicker of extinction.

Epoch	40,000-pulse survivor	Population at 40,000	80,000-pulse survivor	Population at 80,000	Change
201	Aries	2,688	Aries	7,759	5,071
202	Aries	9,022	Aries	15,826	6,804
203	Obsidian Phalanx Refuge G3	43	Obsidian Phalanx Refuge G3	6,466	6,423
204	Aries	608	Aries	4,389	3,781
205	Aries	1,373	Aries	15,384	14,011
206	Aries	793	Aries	4,208	3,415
207	Obsidian Phalanx Refuge G3	1,131	Obsidian Phalanx Refuge G3	8,749	7,618
208	The Forged Compact G3	141	The Forged Compact G3	6,787	6,646
209	Castellans of Gemini III G3	146	Castellans of Gemini III G3	4,359	4,213
210	Aries	93	Aries	16,860	16,767

The identity of the survivor in each epoch was already settled by the old 40,000-pulse endpoint. What changes after 40,000 pulses is not the competitive outcome, but the survivor's demographic condition.



The final populations show regrowth from tiny remnants into multi-thousand refugia in every epoch.

Survivor distribution and equilibrium timing

The single-survivor attractor remains dominant, but the identity of the survivor is not fixed. Aries remains strongest, while Obsidian, Forged Compact, and Castellans of Gemini III also appear as final lineages.

Tribe	Epochs survived	Survival rate	Average final population	Best final population	Average last-alive pulse
Aries	6	60.0%	6,443	16,860	62,170
Obsidian Phalanx Refuge G3	2	20.0%	1,522	8,749	37,765
The Forged Compact G3	1	10.0%	679	6,787	29,350
Castellans of Gemini III G3	1	10.0%	436	4,359	22,585
Crucible Remnant G3	0	0.0%	0	0	21,020
Ember Refugia Compact G3	0	0.0%	0	0	16,365

The survivor count stabilizes early, usually between 36,000 and 39,000 pulses. No epoch returns to multiple living tribes afterward.

Demographic balance after 40,000 pulses

Post-collapse demographic balance distinguishes extinction from equilibrium. In this series, births exceed deaths in the first post-40,000 window and then hover close to parity, which indicates low-population refuge ecology rather than explosive recovery.

Window	Average population	Births	Deaths	Births per death	Failed-birth rate	Average hardiness
01 40k-50k	9,320	1,193,095	1,066,139	1.119	10.0%	60.73
02 50k-60k	13,772	1,750,788	1,761,739	0.994	10.0%	61.67
03 60k-70k	12,419	1,582,266	1,591,125	0.994	10.0%	62.14
04 70k-80k	10,748	1,371,958	1,403,730	0.977	10.0%	62.76

The demographic signal is consistent with post-collapse regrowth followed by near-equilibrium around local carrying limits.

Climate-tail diagnosis

The climate subsystem remains active after collapse, but the 80,000-pulse extension reveals a potentially forgiving physical tail. Climate heat, damage, and chaos decline strongly between 40,000 and 80,000 pulses, even though extreme events and resource-pool losses continue.

Metric	Average change from 40,000 to 80,000 pulses	Interpretation
Climate heat	-0.678	Strong decline after collapse.
Climate damage	-0.308	Strong decline after collapse.
Emissions stock	0.029	Still rises slightly.
Climate chaos	-0.313	Strong decline after collapse.

This diagnosis motivates Phase 6 and Phase 7: the social system can stabilize, but the physical tail may need stronger persistence to represent delayed climate feedback.

Query appendix

This appendix lists the workbook tabs that support the phase analysis. The tab names correspond to query outputs, and the purpose column describes the role each output plays in the evidence trail.

Workbook tab	Purpose
00_setup_persistent_helper_tabl	Builds helper records for 80,000-pulse extension analysis.
01_active_field_and_event_audit	Audits active field, events, and conditions for epochs 201-210.
02_final_survivor_count_80k	Counts final survivors at the 80,000-pulse endpoint.
03_series_scoreboard_201_210	Ranks tribe performance across the 80,000-pulse series.
04_40k_snapshot_vs_80k_final_by	Compares the 40,000-pulse state with the 80,000-pulse endpoint.
05_alive_tribe_count_timeline_8	Tracks living-tribe counts through the extended run.
06_first_equilibrium_pulse	Finds when the final survivor count is reached.
07_final_survivors_detail_80k	Details final survivors at 80,000 pulses.
08_winner_variability_191_200_v	Compares winner distribution to Phase 4.
09_post40k_birth_death_balance	Measures post-40,000 demographic balance by window.
10_climate_by_epoch_and_window	Summarizes climate variables by epoch and time window.
11_climate_40k_to_80k_delta	Measures climate changes between 40,000 and 80,000 pulses.
12_climate_after_population_col	Tests climate behavior after population collapse.
13_emissions_and_advanced_pop_a	Tracks emissions and advanced population after collapse.
14_network_contact_after_40k	Checks whether network/contact interactions persist after 40,000 pulses.
15_final_refugia_region_map_80k	Maps final populated refugia at 80,000 pulses.
16_final_refugia_summary_80k	Summarizes final refugia at 80,000 pulses.
17_winner_path_40k_to_80k	Tracks each winner's path from 40,000 to 80,000 pulses.
18_predictability_of_80k_winner	Tests whether 80,000-pulse winners were predictable from earlier state.
19_climate_tuning_signal_summar	Summarizes climate-tail signals that motivated reservoir addendum work.

Phase 6

Reservoir Calibration

Calibration purpose

Phase 6 forms an intermediate climate-reservoir calibration series. It occurs after Phase 4 and Phase 5, when the project shifts from asking whether post-collapse survival can persist to asking how tribe designs behave under a more complete climate-feedback envelope.

The purpose of Phase 6 is methodological: test reservoir mechanics, metadata archiving, post-40,000 climate tracking, refugia queries, and reservoir state fields before treating reservoir outcomes as final Epilogue evidence.

What the phase contributes

The phase contributes engineering and interpretive information. It shows that reservoir-related climate pressure can be archived and measured, that emissions stock and reservoir commitment can continue after collapse, and that small agrarian survivor systems can persist or regrow under mild continuing pressure.

Observed feature	Interpretive value
Reservoir state fields archive successfully	Confirms that later reservoir analyses can use climate-feedback state data.
Mostly Regime 2 (Agrarian) final states	Shows that the model can settle into lower-energy post-collapse survival.
Final populations often in the tens of thousands	Indicates a softer physical tail than the later final reservoir condition.
Multiple repeated survivors	Helps identify how Aries, Obsidian, Ember, and other tribes behave under a gentler climate tail.

Phase 6 is valuable because it explains why further tuning is necessary. It is not a failed result; it is a calibration result.

Why it is not primary final evidence

Phase 6 is not mixed into the final data being studied because it is not the final experimental condition. The climate-reservoir settings in this block do not yet produce the intended full boom-crash-tail pattern. Peak populations remain below the later civilization-scale reservoir runs, advanced post-40,000 population is effectively absent, and the system often settles into broad Regime 2 (Agrarian) stability rather than passing through the sharper thermodynamic bottleneck used in Phase 7.

For the archive, Phase 6 should be retained as a transition and calibration record. It documents the path from climate-tail diagnosis to final reservoir conditions and preserves the audit trail for the eventual parameter choice.

Classification

Classification: calibration and transition phase. Recommended use: methods narrative and audit trail. It should not be treated as primary final-results evidence for the final reservoir behavioral analysis.

Phase 7

Final Climate Reservoir Projection

Research plan

Phase 7 runs the full tribe field through the final selected climate-reservoir envelope. The physical environment is shaped to produce a civilization-scale boom, hard crash, and long survivable tail, so the primary question is tribe behavior inside the final climate bottleneck.

Primary question	Purpose
Which tribes remain coherent inside the full climate-reservoir tail?	Identifies designs capable of continuity after the thermodynamic bottleneck.
How many tribes survive, and do survivors coexist?	Distinguishes one-lineage convergence from separated plural refugia.
What founder or elite traits are associated with survival?	Tests the hardiness, vitality, legacy, trust, and wander theory under final climate pressure.
Does peak boom performance predict survival?	Separates peak expansion from post-crash survivability.

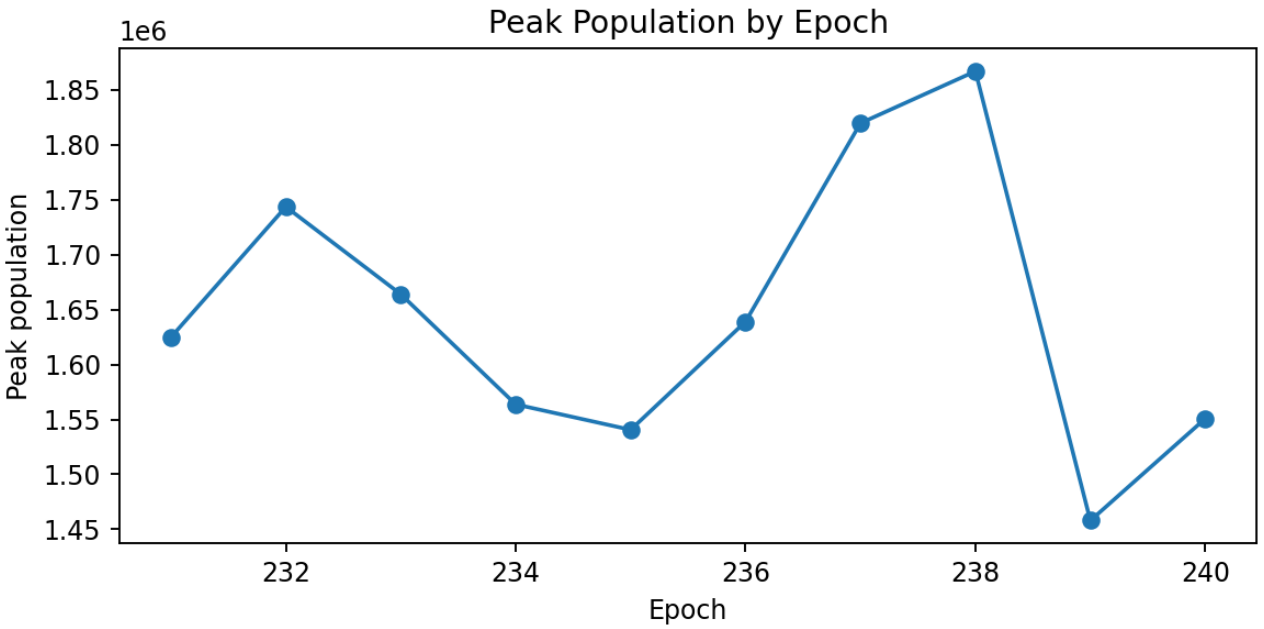
Phase 6 is retained as calibration. Phase 7 is the final Epilogue evidence block for tribe behavior under full climate-reservoir pressure.

Executive summary

Phase 7 produces the intended experimental shape: every epoch reaches a large civilization-scale boom, reaches Regime 4 (Technological) at least briefly, arms the reservoirs at pulse 31,000, crashes almost immediately after the peak, and ends at pulse 80,000 in tiny Regime 2 (Agrarian) refugia.

Epoch	Peak population	Peak pulse	Peak energy	Final population	Surviving tribes	Winner
231	1,624,783	31,000	37.9B	15	1	Aries
232	1,743,498	31,000	37.8B	56	1	Aries
233	1,663,913	31,000	28.4B	25	2	Aries
234	1,563,693	31,000	35.7B	59	1	Aries
235	1,540,559	31,000	30.4B	58	1	Obsidian Phalanx Refuge G3
236	1,639,011	31,050	42.2B	19	1	Obsidian Phalanx Refuge G3
237	1,819,608	31,000	41.7B	12	1	Aries
238	1,866,843	31,050	44.1B	23	1	Aries
239	1,457,944	31,000	30.4B	32	1	Obsidian Phalanx Refuge G3
240	1,550,764	31,000	40.7B	26	2	Obsidian Phalanx Refuge G3

The key finding is selectivity. Survival is not merely present; it is concentrated in a narrow set of designs.



The peak-population curve shows that all epochs achieve civilization-scale boom conditions before the reservoir crash.

Crash timing

The crash is extremely compressed immediately after peak population. The long tail remains real, but sparse. The milestone table measures how long it takes to fall below major thresholds after peak.

Milestone	Mean pulses after peak	Minimum	Maximum
Below 50% of peak	265	200	300
Below 10% of peak	365	300	400
Below 100,000	475	400	550
Below 10,000	2,065	1,950	2,200
Below 1,000	6,695	6,300	7,000
Below 100	16,565	8,850	35,150

The crash timing indicates that the bottleneck forms rapidly. Later differences mostly concern how long tiny remnants persist and which tribe remains coherent.

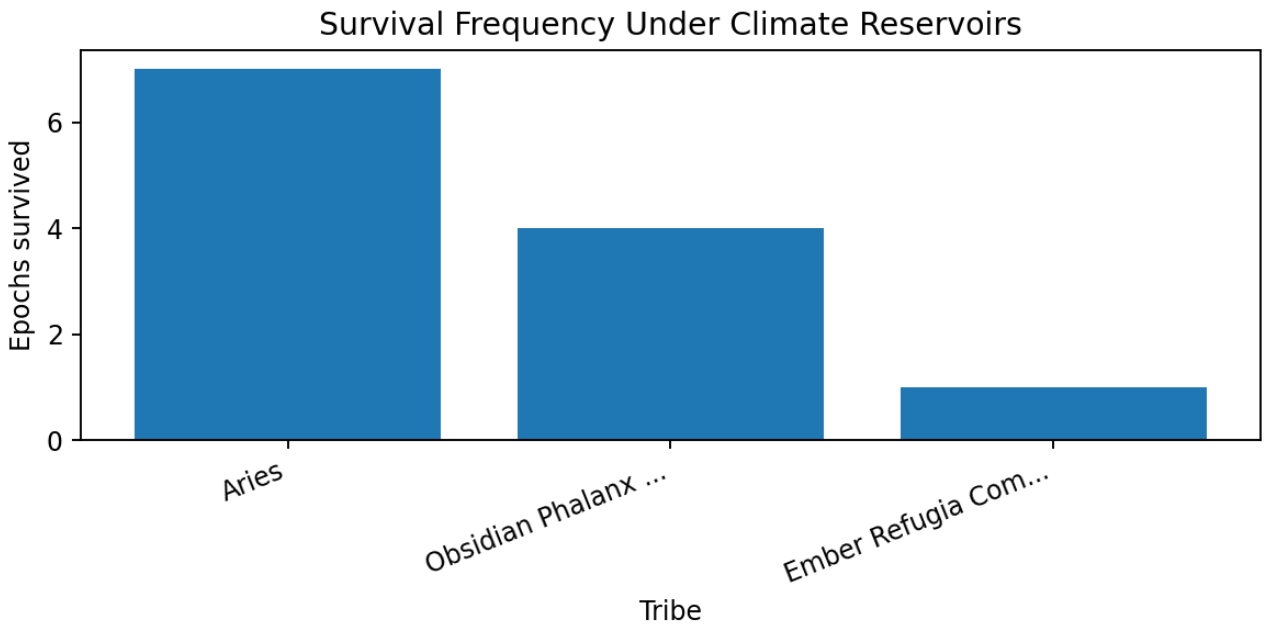
Who survived

Only three tribes survive at least once: Aries, Obsidian Phalanx Refuge G3, and Ember Refugia Compact G3. All are language-model designed tribes. No biologic tribe survives to pulse 80,000 in this final reservoir series.

Tribe	Tribe type	Epochs survived	Epoch wins	Best final population	Average peak population	Average last-alive pulse
Aries	Language-model	7	6	59	557,388	65,695
Obsidian Phalanx Refuge G3	Language-model	4	4	58	383,706	45,870
Ember Refugia Compact G3	Language-model	1	0	12	230,512	28,335
Velvet Ironshod	Biologic	0	0	0	48,537	16,080
Velvet Hammer	Biologic	0	0	0	39,293	16,250
Castellans of Gemini III G3	Language-model	0	0	0	163,715	21,730

The Forged Compact G3	Language-model	0	0	0	86,215	18,440
Crucible Remnant G3	Language-model	0	0	0	170,250	23,315
The Velvet Shadows	Biologic	0	0	0	3,965	13,695
The Flynn Paradox	Biologic	0	0	0	3,017	14,005
The Quiet Stick Compact	Biologic	0	0	0	4,028	13,735
The Velvet Fang	Biologic	0	0	0	3,560	13,565

Aries is the most frequent survivor, while Obsidian remains a decisive repeat winner. Ember appears only once as a co-survivor. The final reservoir envelope therefore selects a narrow Aries-Obsidian design family.



The survival-frequency chart reinforces the selectivity of the final climate-reservoir condition.

Winning genetics and interaction pattern

The founder-trait comparison supports the working theory that post-collapse survival depends on high hardiness, adequate vitality, low legacy, high kin cohesion, and low xeno trust. High peak population helps, but it is not sufficient by itself.

Final role	Founder records	Tribes	Hardiness	Vitality	Legacy	Kin trust	Xeno trust
Winner / Tied Winner	200	2	57.63	34.01	8.36	0.853	0.074
Survivor Not Top	40	2	59.17	31.48	9.35	0.744	0.061
Extinct	2,160	12	44.88	32.61	22.51	0.702	0.280

The final survivors are not simply the most open or most reproductive designs. The evidence points to collapse-specialized refugia traits: durable bodies, restrained reproduction, internal cooperation, and limited exposure to outsiders under scarcity.

Refugia structure

The final world is not a restored civic federation. It consists of tiny Regime 2 (Agrarian) refugia. Most epochs end with one tribe; the two plural-survivor epochs still show separated survivor pockets rather than broad mixed coexistence.

Epoch	Final populated regions	Final population	Dominant final tribes	Average final EROI	Average climate chaos
231	2	15	1	0.930	0.065
232	8	56	1	0.920	0.101
233	5	25	2	0.908	0.148
234	8	59	1	0.896	0.194
235	8	58	1	0.853	0.361
236	3	19	1	0.844	0.290
237	2	12	1	0.919	0.106
238	5	23	1	0.882	0.252
239	6	32	1	0.897	0.190
240	4	26	2	0.890	0.323

The final refugia pattern shows survival as remnant continuity rather than societal recovery. The climate envelope narrows the possible social outcomes to very small, local, low-energy survivor pockets.

Query appendix

This appendix lists the workbook tabs that support the phase analysis. The tab names correspond to query outputs, and the purpose column describes the role each output plays in the evidence trail.

Workbook tab	Purpose
00_series_metadata_check	Confirms engine version, mode, network-collapse flag, and archived metadata.
01_epoch_outcomes_and_climate_s	Summarizes boom, crash, reservoir arming, and final state by epoch.
02_collapse_milestones_after_pe	Measures how quickly each epoch collapses after peak population.
03_reservoir_timing_and_compone	Verifies reservoir timing and component behavior.
04_climate_pressure_windows	Summarizes climate and demographic pressure by time window.
05_survivors_by_epoch	Counts survival and winning frequency by tribe.
06_survivor_frequency_by_tribe	Measures how many tribes survive in each epoch.
07_survivor_counts_by_epoch	Scores tribe life histories across births, deaths, energy, and regime reach.
08_tribe_life_history_scoreboar	Tests whether final winners were predictable from boom rankings.
09_winner_predictability_rankin	Compares founder genetics for survivors and extinct tribes.
10_founder_genetics_survivors_v	Tests relative trait thresholds such as high hardiness, high vitality, and low legacy.
11_founder_trait_thresholds	Compares elite/representative genetics by final role.
12_elite_genetics_by_final_role	Shows tribe state at key pulses before, during, and after collapse.
13_tribe_population_at_key_puls	Aggregates post-crash survival metrics by tribe and window.
14_postcrash_survival_windows_b	Measures identity, contact, and Prisoner's Dilemma interaction patterns by window.
15_global_interaction_windows	Lists final populated regions and dominant tribes.
16_final_refugia_by_region	Summarizes final refugia by epoch.
17_refugia_summary_by_epoch	Shows which tribes dominate final refugia regions.
18_region_dominance_by_tribe	Compares language-model and biologic tribe outcomes.
19_llm_vs_biologic_outcomes	Tracks winners and outcome markers by epoch.
20_epoch_to_epoch_winner_trends	Lists strategy notes for tribes that survived at least once.
21_strategy_notes_for_survivors	Compares founder traits for winners, other survivors, and extinct tribes.
22_survival_vs_founder_traits_s	Measures post-peak collapse milestones.