

AN ECOSYSTEM GOD GAME

LIVING WORLDS

Shape a world until life can shape it back.

18 WORLDS
1 CARETAKER

INSTRUCTION MANUAL

A planet-shaping game of water, rock, air, deep fire and patient life

CONTENTS



I	BEFORE THE FIRST RAIN	2
II	GETTING STARTED	4
III	THE VIEW FROM ORBIT	6
IV	TIME AND INFLUENCE	8
V	LAYING ON HANDS	9
VI	THE BOOK OF POWERS	10
VII	WATER, ROCK AND SOIL	13
VIII	AIR AND WEATHER	15
IX	FIRE BELOW	17
X	THE SKY ABOVE	19
XI	LIFE	20
XII	REFUGES AND THE TRIAL	22
XIII	READING THE WORLD	24
XIV	KEEPING WORLDS	26
XV	OPTIONS AND PERFORMANCE	27
XVI	NOTES OF AN OLD CARETAKER	29
XVII	THE LIVING WORLDS	30
XVIII	THE DESPERATE WORLDS	35
XIX	QUICK REFERENCE	40

A WORD BEFORE YOU BEGIN

This manual covers everything a new caretaker needs, and several things an experienced one would rather not think about. You do not have to read it in order. You do not even have to read it: the first world has a tutorial, the game offers hints when something new happens, and the **Chronicle** will tell you about every flood, frost and extinction with the patience of something that has watched a great many planets.

But caretakers who read the manual, as the saying goes, lose fewer valleys.

▲ PHOTSENSITIVITY WARNING

Eruptions, impacts, lightning, flares and auroras in this game produce bright flashes and flickering light. If you or anyone in your household is sensitive to flashing light, turn on **Reduced flashes** (and, if camera flights bother you, **Reduced motion**) in Settings before playing, play in a well-lit room, and stop if you feel unwell.

“A world is not finished when it is beautiful. It is finished when it no longer needs you.”

— THE OLD CARETAKER



CHAPTER I

Before the First Rain

There is a small planet turning in the light of a small star. It has rock, because rock is patient. It has water, because water gets everywhere eventually. It has an atmosphere of sorts, some weather and a great deal of time. What it does not have, anywhere on its surface, is anything alive.

That is where you come in.

You are a **caretaker**: a power that can lift a ridge, cut a saddle, call the rain down out of a cloud, open the crust to the heat beneath, even lean on the planet's tilt or nudge its moon. You can do almost anything to the world. What you cannot do is make anything *live*. You cannot paint a forest or place a herd. Life arrives as a thin crust of mats on a wet shore, and from then on it does what life does: it grows where it can, dies where it can't, spreads, adapts, and changes its own world as it goes.

So your work is indirect. You change **causes** (where water collects, what the soil holds, how warm the lowlands are, where the wind drops its rain), and life answers. A good intervention is one whose consequences you can live with for a long time, because the planet remembers everything: the channel you cut keeps eroding, the delta you started keeps building, the basin you drained stays dry.

THE TEST AT THE END

Every campaign world ends the same way. When its biosphere is ready you begin its **resilience trial**, and your powers recede. A drought settles over the valley, or the star dims, or the caldera you have been watching finally wakes, and the world must get through it *on its own*. One lush valley rarely survives. Several separate refuges, a working loop of growth and decay, and water that stays where life needs it usually do.

That is the late pleasure of the game: restraint. Recognising that an imperfect planet has become capable of surviving without you.

FROM THE CHRONICLE

c0.4 The Highland Lake overflows its saddle. A river now reaches the Inland Basin.

c1.1 A new colony of Copper delta mats is founded.

c4.8 Velvet meadow cover have appeared near the West Valley, founded from local organic matter.

c9.2 The biosphere is ready. You may begin the resilience trial when you choose.

THE CHRONICLE

You will get to know the Chronicle. It is the planet's own ledger: every river that finds the sea, every colony founded, every refuge in trouble and why. Its warnings are specific. It does not say "*life is struggling*"; it says which refuge, which population, the factor that is killing it and what might help. When something goes wrong, read the Chronicle before you reach for a power.

EIGHTEEN WORLDS

The campaign is a journey across nine **Living Worlds**, from a gentle young shore to a sunless planet orbiting a black hole, each one teaching a new family of powers and a new way for a world to fail. Pass the eighth and a second series appears on the campaign screen: the nine **Desperate Worlds**, uncharted planets at the edge of what the simulation allows. A binary planet whose sister pins its seas in place. A super-Earth at 2.4 g. A runaway greenhouse. A planet torn loose from its sun. Nobody knows whether all of them can be saved, which is rather the point.

WHAT KIND OF GAME THIS IS

Living Worlds is a **simulation first**. Water, soil, salt, carbon and nutrients are conserved: nothing appears from nowhere and nothing quietly vanishes. Rain is condensed from vapour that is really in the air. A lake is water that really ran downhill and stopped. When a population starves, it starves of

something you can find on the map. The game's promise is that every consequence has a visible cause, and that a failure will always explain itself.

It is also, mostly, a quiet game. There is no score for trees and no prize for speed (unless you ask for one). There are long stretches where the right move is to let time run and watch. The best caretakers spend more time looking than touching.

* THE CARETAKER'S RULE

Repair the old habitat, help its inhabitants reach another, or keep enough refuges for something else to take over. Almost every decision in the game is one of these three.



WHAT YOU NEED

Living Worlds runs in a web browser on your own computer. It draws the planet with **WebGPU**, so you need a current **Google Chrome** or **Microsoft Edge** on a machine with a reasonably modern graphics card. Without WebGPU the game shows an explanation instead of a planet.

THE BEST WAY TO PLAY

The best way to play Living Worlds is online, at waldtier.com/games. Open it in Chrome or Edge and choose Living Worlds: nothing to install, and you always have the latest version.

Running It Yourself

If you have the game's files, you can also run it on your own computer. It has no installer, but it must be served by a small local web server (browsers will not run it straight from disk).

- **Windows:** double-click `run.bat`. It needs Python 3 or Node.js.
- **macOS / Linux:** run `./run.sh`.
- **Any system:** run `python tools/serve.py 8765` and open `http://localhost:8765/`.

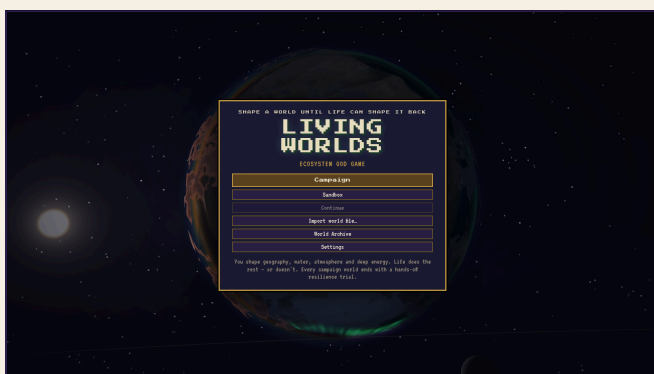


Fig. 1 The title screen. A random world turns slowly behind it while you decide.

THE TITLE SCREEN

- **Campaign** opens the list of worlds.
- **Sandbox** lets you play any world type freely, with optional extra powers, free editor brushes and infinite Influence (chapter XIV).
- **Continue** loads your most recent autosave.
- **Import world file...** loads a world someone exported (a `.lwsave` file).
- **World Archive** shows the worlds you have completed, with their history.
- **Settings:** sound, graphics, world detail and accessibility (chapter XV).

CHOOSING A WORLD

The campaign screen lists every world. Completed worlds carry a tick; locked ones a padlock. Select a world to read its question, its brief, its goals, its trial and the powers you will have. Then choose:

- **Difficulty.** *Gentle* softens damage, gives 20% more starting Influence, warns earlier, lets new sites qualify for life twice as fast and lowers the trial thresholds by a tenth. *Harsh* does the opposite: more damage, later warnings, 10% stricter thresholds and slower Influence. *Standard* is the game as designed.
- **Tutorial prompts** (World 01 and new mechanics).
- **Challenge**, for worlds you have already completed (chapter XIV).

Press **Descend**. The world is generated, warmed up for a while so its climate and rivers settle, and then the **world brief** appears.

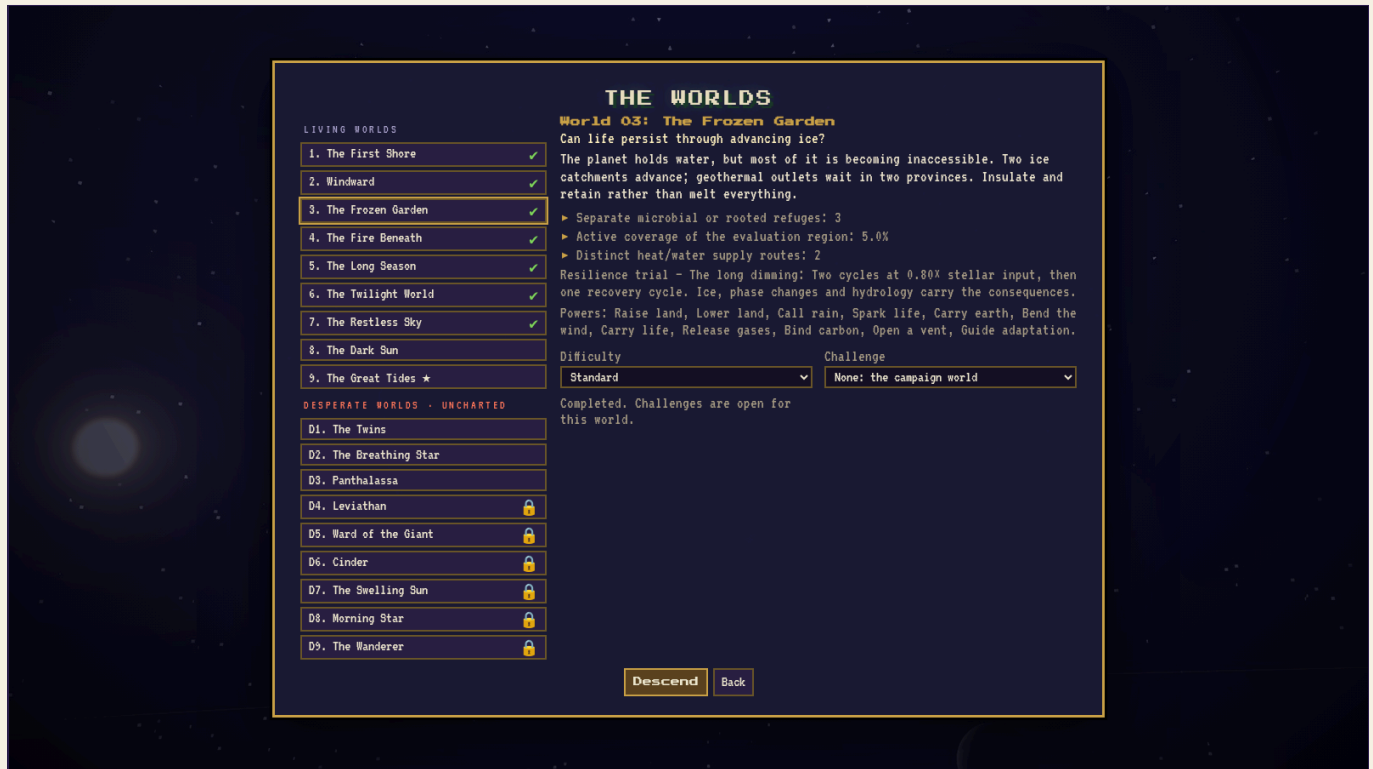


Fig. 2 The campaign screen. The Desperate Worlds appear below the main series once World 08 is passed.

THE WORLD BRIEF

Every world opens with a planet card, a mission brief. It shows the star, the length of the day and year, the tilt, the air, the gravity, the moons and the surface; it explains **why the world is hard, what to expect, your goals and the trial**, and offers a few **ideas for a first approach**. You can open it again at any time from the pause menu (**World brief**). Chapters XVII and XVIII of this manual reproduce every brief, with extra notes.

YOUR FIRST HOUR

World 01, *The First Shore*, is a guided world. Its tutorial walks you through fifteen short beats: looking around, letting time run, reading the water, spending Influence, opening a route for the water, letting it stay, sparking life, reading what life needs, why life dies (and why that is normal), letting the valley change, rooted cover, the objectives, a second refuge and, finally, trusting the world. Each beat shows what to do, why it matters and live progress; **Show me** points the camera at the place it means.

Beats advance when the world agrees, not on a timer, so you can take as long as you like. You can skip the tutorial, or switch it off on the campaign screen.

HINTS

Outside the tutorial, short hint cards appear the first time something new matters: a view tool, a moon's tides, guided adaptation. **Got it** dismisses one; **no more hints** silences them all.



Fig. 3 *The First Shore* a few cycles in, with the interface numbered.

- 1 **Top bar.** The world's name and current phase, the cycle counter and the season where you are looking, and what comes next (a forecast or the next authored event).
- 2 **Influence.** The gold bar: what you have and the most you can hold. It refills on its own.
- 3 **Time.** Pause and 1×, 2×, 4×. Then **World status** (every active warning, critically reduced populations, and each refuge with its size and trend), the World Archive, the Codex and the menu (≡).
- 4 **Objectives.** The goals of this world with their current values, the next step in plain words, the readiness dwell and, when it is time, **Begin resilience trial**. **More** opens the details.
- 5 **Powers.** One button per power you may use here, with its key and its cost. Powers that later worlds add stay visible, greyed and grouped by world, so you can see what is coming.
- 6 **Brush.** Radius and strength of the selected power, and its Mode (gas mixture, direction of a change, heat or chemistry...).
- 7 **Overlays.** Twelve views of the same numbers the simulation uses (chapter XIII). **Tab** cycles them.
- 8 **View tools.** Cut the planet open, hide clouds, change the lighting, show the whole planet, replay, the film camera, fly to the next event, and capture (screenshot, GIF, timelapse).
- 9 **Chronicle.** What changed and why, newest at the bottom. Click an entry to fly there (or to select the lineage it names).
- 10 **Minimap** and the legend of the current overlay. Click the minimap to look at that place.

MOVING AROUND

Drag to turn the planet; right-drag or Alt-drag always turns it, even while a power is selected. **Scroll** (or pinch) to zoom.

Zoom close and the blocky columns of terrain melt into a smooth, detailed surface: rivers show their flow, coasts their surf, tidal shores their wet sand.

Key	Does
Home	Show the whole planet.
F	Focus the latest alert (or the selected place).
C	Cut the planet open (for looking only: the cut changes nothing).
B	Hide clouds and atmosphere, for looking only.
V	Cycle the lighting: realistic day and night, sunlit with fill, or evenly lit.
X	Open the Codex.
Tab	Next overlay.
Esc	Cancel a power, close a panel, or open the pause menu.
F3	Performance readout.

INSPECTING

Click the **ground** to inspect it. The side panel opens on that spot: height, water, soil, temperature, and the life there with the **two strongest limits** holding it back. Its tabs are covered in chapter XIII. This is your main instrument. A caretaker who clicks before acting rarely regrets it.

THE SKY

Suns and moons are drawn where they really are for this world, with a dotted track of where they will be over the next day. Clouds come from the simulated weather: where you see rain falling, it is falling. The dark world shows its black hole bending the starlight behind it.

*** FOLLOW THE ACTION**

The ►► button flies to whatever is happening now (a cyclone, an eruption, a drought, a fire, an incoming impact) and follows it. The **film camera** orbits slowly on its own. **Replay** scrubs back through about ten cycles of the planet's recent look and can save them as a GIF.

CHAPTER IV

Time and Influence

CYCLES AND EPOCHS

The world runs in fixed **ticks** of a tenth of a simulated second. Twelve hundred of them make a **cycle**, about two minutes at 1×: the planet's year, the unit of every goal, warning and trial. Five cycles make an **epoch**, used by the history. The game never speaks of Earth years: rivers, glaciers and evolution are each sped up by a different amount, and pretending otherwise would be a lie.

A normal world turns eight times per cycle; slow worlds fewer (the rotation power changes this), and a tidally locked world not at all. The season depends on the tilt, and on the orbit's eccentricity.

Speed

Space pauses and resumes; **1** **2** **3** set 1×, 2× and 4×. Faster speeds run more ticks, never bigger ones, so nothing is skipped. **Pause** stops weather, growth, cooldowns and Influence, but you can still look, inspect, switch overlays and even prepare and confirm a power. An instant power applies at once; a lasting one waits for time to run.

INFLUENCE

Influence is your only currency: your capacity to intervene. It is not a substance in the world: water, carbon and soil are physical and conserved; Influence is yours. It refills steadily, even on a dead planet, so a collapse never leaves you unable to try again.

Tier	Worlds	Capacity	Regen / s
Landscape	01–02	100	0.60
Planet	03–04	140	0.75
Orbit	05–06, 09	180	0.90
Extreme	07–08	220	1.00
Desperate	D1–D9	260	1.10

A world starts with 70% of its capacity. Powers cost more when they do more: a wider brush, a deeper cut, a stronger change. The preview always shows the exact price before you pay it, and cancelling costs nothing.

Milestones

Five ecological milestones pay a one-off **+15 Influence** and permanently raise your regeneration a little (up to four of them):

- first stable producer colony
- first functioning recycling loop
- first separate refuge
- first surviving adaptation
- first recovered ecosystem

Each pays once per world. Killing a colony to found it again earns nothing.

* SPEND IT

A full Influence bar is wasted regeneration. If you have a useful thing to do, do it; if you don't, let time run rather than spending for the sake of it. The gold bar refills in about two to three minutes of 1× time.

PHASES OF A WORLD

The top bar names the world's phase:

Phase	Means
Survey	No life yet. Look around and prepare a site.
Establish	Life exists but its basic functions (production, recycling) are not yet working.
Diversify	Life works. Now meet the world's goals.
Ready	Every goal has held for a full cycle. You may begin the trial.
Settling	The trial is requested; temporary effects expire and the world settles for half a cycle.
Trial	The disturbance and recovery. Your powers are withdrawn.
Recovery	A trial failed or life collapsed. Rebuild and try again.
Complete	The trial is passed. The next world is unlocked.



Every power works the same way: you **choose** it, **aim** it, read the **preview**, and then **confirm** or cancel. Nothing touches the world until you confirm.

CHOOSING

Click a power on the toolbar, or press its key. Keys follow the toolbar from left to right: **Q W E R T Y U I O P**, then **A S D G H J K L** and onwards in later worlds. Because the toolbar only holds the powers this world allows, the same key can mean different powers on different worlds; the key is printed on each button. **Shift + 1 ... 0** also select the first ten.

AIMING

Target	How
Brush	Drag a stroke across the planet. I and J change the radius (2°–18°); the Strength slider sets how much.
Site	Click one place.
Pair	Click the source, then the destination.
Direction	Drag the way the wind should blow.
Global	No aiming: the preview opens at once.

Some powers have a **Mode** (beside the brush sliders): which gas to release, whether to tilt the axis up or down, heat or chemistry, which trait to guide.

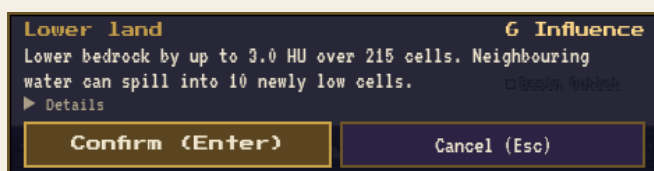


Fig. 4 A preview card: what will change, where water may go, and the price.

THE PREVIEW

The preview card names the power and its cost, describes what will happen in numbers, and shows the affected area on the planet. **Details** opens the full breakdown. If the power can't be used here, the card says why in plain words, and usually what to do about it: *"Life needs ground that stays wet... Lower land or Call rain can bring water to a dry place."*

Press **Enter** (or **Confirm**) to apply, **Esc** to cancel. If you prefer to work fast, **Confirm powers on release** in Settings skips the card for brush strokes.

DELAY AND REST

Many powers take effect after a **delay** (rain condenses over a quarter-cycle, an icy body takes a cycle to arrive, a tilt change ramps over a cycle) and then **rest** before you can use them again. The button shows its recharge. Other powers are still available meanwhile.

LIMITS

The world sets limits on what you may do. Land can only be raised or lowered so far from where it started. Tilt, rotation and orbit stay within the scenario's range. Impactors are finite: a world has, say, two rocky bodies and one icy one, and that is all. Gas reserves and the rock's capacity to bind carbon are finite too. None of this is arbitrary: each limit is listed on the world brief and in the preview.

♦ CONSERVATION

Your powers move things; they don't create them. **Call rain** condenses vapour that is really in the air, so a dry sky gives little. **Carry earth** takes soil from one place to put it in another. Even an icy impactor brings a fixed, counted amount of water. The world keeps a ledger, and it always balances.

DURING THE TRIAL

While a trial runs, physical powers are withdrawn. You can still pause, inspect, change speed and look. If you can't bear it, **Intervene and return to recovery** on the trial bar ends the attempt and gives your powers back (chapter XII).

CHAPTER VI

The Book of Powers

Twenty-four powers, taught a family at a time. Costs are the base price for a default stroke; bigger, stronger or deeper changes cost more. “From” is the world that first allows the power; the *Desperate Worlds* allow almost all of them.

Power	Cost	From	What it does
Land			
Raise land brush	3	W01	Raise bedrock by up to 8 HU per stroke (cost grows with height and area), keeping soil, water and salt above it.
Lower land brush	3	W01	Lower bedrock by up to 8 HU per stroke (cost grows with depth and area) within crust bounds. Water can flow into the new low ground.
Carry earth pair	20	W02	Move loose soil and sediment, with its nutrients and organic matter, from one place to another.
Water			
Call rain brush · delay 0.25, rest 0.25 cyc	18	W01	Condense atmospheric vapor into rain over a quarter-cycle. Cannot conjure water: a dry sky gives less.
Air			
Bend the wind direction · rest 0.5 cyc	22	W02	Add a bounded local wind for half a cycle. Changes transport, not the water supply.
Release gases global · delay 0.5, rest 0.5 cyc	35	W03	Release a finite geological gas reserve into the atmosphere: buffer gas or carbon-rich gas. Modes: carbon-rich, buffer gas
Bind carbon global · delay 0.5, rest 0.5 cyc	35	W03	Lock atmospheric carbon into durable minerals. Cools the world; can starve producers.
Life			
Spark life site · rest 0.5 cyc	30	W01	Found a minimal sun-mat and recycler community at a qualifying wet, lit site.
Carry life pair · rest 0.25 cyc	18	W02	Move 2% of a living lineage's local population to a suitable habitat (10% lost on the way).
Guide adaptation brush · rest 1 cyc	45	W03	Nudge part of a living lineage in the painted area toward a trait: a quarter of it becomes a new descendant lineage with that adaptation (and its costs). Uses the lineage selected in the Lineages tab, or the most common one under the brush. Modes: Cold-hardy, Heat-tolerant, Drought-enduring, Salt-tolerant, Deep-rooted (rooted cover, canopy), Dormancy
The deep			

Open a vent site · delay 0.25, rest 0.5 cyc	30	W03	Connect crust to its geological province. Vents on one province share its finite supply.
Shift a fault site · rest 0.5 cyc	40	W04	Coherent uplift and subsidence along a mapped fault; loose slopes fail.
Fissure eruption site · delay 0.25, rest 1 cyc	45	W04	Release a bounded lava and gas volume along a fault segment.
Explosive eruption site · delay 0.25, rest 2 cyc	65	W04	A caldera event: local deposits and an atmospheric aerosol pulse.
Drive the plates site · rest 1 cyc	70	W04	Push on a plate edge for three cycles: geological time runs many times faster there. Converging edges raise ranges (and deepen trenches), spreading edges open rift valleys or lift sea-floor ridges.
Supereruption site · delay 0.5, rest 4 cyc	110	W04	Discharge a mature magma province. Large surface and aerosol effects.
Redirect deep energy pair · delay 1, rest 1 cyc	80	W08	Reallocate up to 20% of a province's deep supply to another eligible outlet. Modes: Heat, Chemical supply
The sky			
Redirect rock site · delay 0.5, rest 2 cyc	65	W04	A finite small rocky body strikes: crater, ejecta and delivered rock.
Redirect ice site · delay 1, rest 2 cyc	80	W05	Deliver a finite icy body: water, impact heat and terrain damage.
The planet			
Change axial tilt global · delay 1, rest 1 cyc	55	W05	Change obliquity by up to 5 degrees inside scenario limits, over a one-cycle ramp. Modes: Increase tilt, Decrease tilt
Change rotation global · delay 1, rest 1 cyc	60	W05	Change spin rate by up to 15% inside scenario limits, over a one-cycle ramp. Modes: Spin faster, Spin slower
Veil starlight global · delay 1, rest 2 cyc	75	W07	A fictional temporary veil: up to 15% less starlight for one cycle. Must expire before a trial.
Nudge orbit global · delay 2, rest 2 cyc	85	W07	Change semimajor axis or eccentricity by a bounded amount over two cycles. Modes: Move outward (a +4%), Move inward (a -4%), More eccentric (+0.05), Less eccentric (-0.05)
Nudge the moon global · delay 1, rest 1.5 cyc	70	W09	Move the largest moon up to 5% closer or farther over one cycle. Tides scale with the inverse cube of its distance; its month changes with it. Modes: Closer (stronger tides), Farther (weaker tides)
Sandbox editor			
Paint land brush	0	sandbox	Sandbox editor: sculpt bedrock freely (raise, lower, flatten or smooth). Free; no scenario limits beyond the crust envelope. Modes: Raise, Lower, Flatten to the stroke start, Smooth
Paint water brush	0	sandbox	Sandbox editor: add or remove surface water. Recorded as external water in the ledger. Modes: Add fresh water, Remove water, Add seawater
Paint heat brush	0	sandbox	Sandbox editor: a lasting local heat source or sink (ground temperature, and a little regional warming). Modes: Warm, Cool, Clear painted heat

NOTES ON THE POWERS

Raise and lower land

The most useful powers in the game, and the cheapest. Lowering a saddle lets a lake spill into a new valley; lowering a basin floor makes water pool instead of running through; raising a lip turns a marsh into a pond. Soil, water and salt ride on top of the bedrock you move. Water flows into new low ground on its own.

Call rain and bend the wind

Rain is limited by the vapour in the air: call it where moist air arrives (near the sea, upwind of the dry place). Bending the wind changes where vapour and dust travel for half a cycle; it adds no water of its own.

Spark life, carry life, guide adaptation

Spark life founds a minimal community (producers, recyclers, a little dead matter to feed them) on a qualifying site; at an open, wet vent it founds chemical life instead. Carry life moves 2% of a population to a habitat that can already support it; one tenth is lost on the way. A lineage selected in the **Lineages** tab is the one carried or guided; without a selection, Carry life takes the densest population at the source, and Guide adaptation the most common one under the brush. Chapter XI explains all three.

Release gases and bind carbon

Two ways to turn the planet's thermostat. Carbon-rich gas warms; buffer gas thickens the air (more pressure, more heat carried poleward). Both come from a finite geological reserve. Binding carbon locks it into minerals and cools the world, but the rock's capacity is finite and producers need carbon to grow.

Open a vent and redirect deep energy

A vent connects the surface to a geological province: warmth that keeps water liquid, and chemical supply that can feed life without light. All vents on one province **share** its output, so one vent per province delivers the most.

Eruptions, faults and plates

Eruptions need a charged province (the charge shows on the Deep overlay) and discharge it. A fissure is the gentlest; an explosive eruption throws ash and a haze that cools the world; a supereruption empties a mature province. Releasing charge early with small eruptions is how you avoid a big one later.

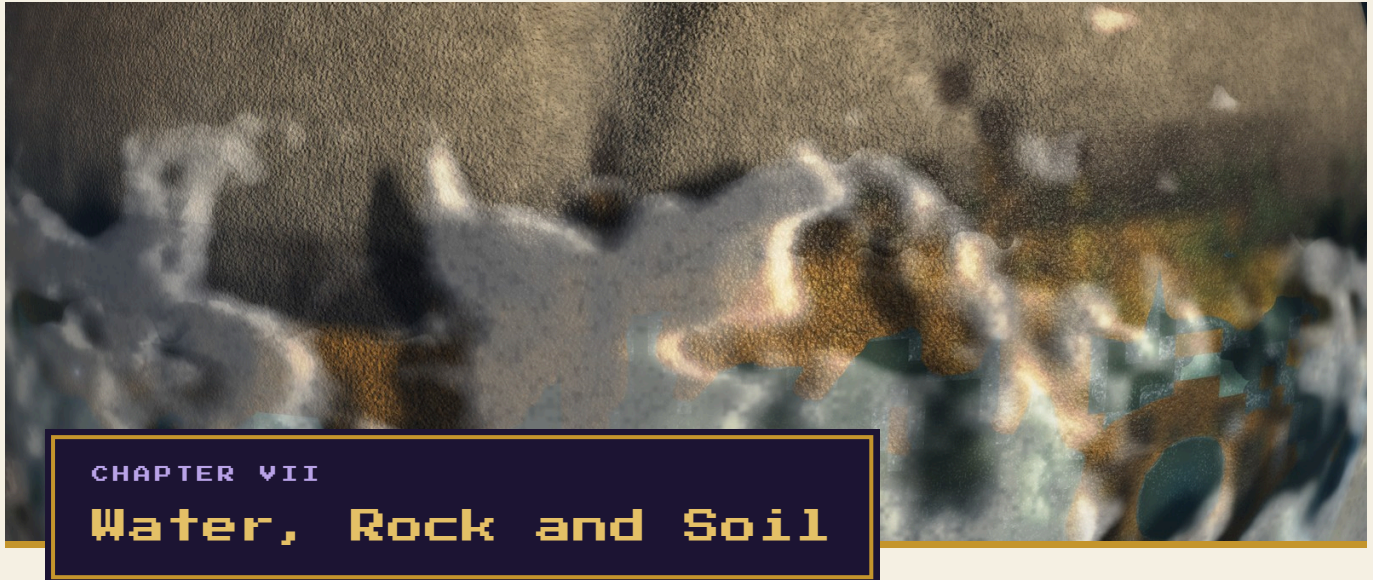
Impactors

A finite number of small bodies can be steered into the planet. A rocky body leaves a crater and delivers rock; an icy one delivers water and heat. Into the sea, either one raises a tsunami.

Tilt, rotation, orbit, veil, moon

The planetary powers act slowly and within the world's limits. Less tilt softens the seasons; faster spin evens out day and night;

moving outward cools the world; less eccentricity steadies the year. The veil dims the star by up to 15% for one cycle and must have expired before a trial. Moving the moon closer strengthens tides with the inverse cube of its distance.



CHAPTER VII

Water, Rock and Soil

Water is the first thing to understand on any world and the last thing you will stop learning about. Life needs it, rivers are made of it, soil moves because of it, and almost every failure in the campaign is in some way a failure of water to be where life needed it.

HEIGHT UNITS

Heights and depths are measured in **HU** (height units). A puddle is a fraction of an HU; a lake a few HU; an ocean tens. Water is kept in its own ledger (shown as WU in the Planet tab): rain, rivers, lakes, ice, vapour and soil water are all the same water moving between stores.

RIVERS AND LAKES

Water runs downhill. Where it meets a hollow it pools, and a pool rises until it reaches the lowest point of its rim, the **saddle**, and spills over. That is the whole secret of a lake. To make one, give water a hollow; to drain one, lower its saddle; to send a lake somewhere else, lower a *different* saddle. Lasting rivers and lakes name themselves in the Chronicle.

Water that stands still evaporates. A shallow, sunny basin with no outlet will lose its lake slowly, and leave its **salt** behind: closed basins grow saltier year after year, then crack into white salt pans. Sea water is salty from the start. Most life tolerates some salt; salt-tolerant descendants tolerate more.

Into the ground

Rain soaks into loose soil before it runs off, and wet soil is a habitat in its own right (mats, recyclers, rooted cover). Bare rock sheds water at once. The Moisture overlay shows how wet the soil is; pale blue on the Water overlay means shallow water or saturated ground, the kind of ground life can be founded on.

EROSION AND DEPOSITION

Fast water picks up soil; slow water drops it. So rivers cut into slopes and narrows, and build fans, plains and **deltas** where

they slow down. Over many cycles this reshapes the land: canyons deepen, deltas grow seaward, a saddle you lowered keeps lowering as the river works on it. The Erosion overlay shows where ground is being lost (red) and gained (green).

Roots hold soil. Rooted cover and canopy protect the ground beneath them from erosion, up to about 85% under dense cover, and keep protecting it for a while after they die. Bare, dry, fine soil also blows away in strong wind: World 02 is built around that.

SOIL AND NUTRIENTS

Rock weathers slowly into loose soil, and fine sediment carries the **nutrients** life needs. Rivers move nutrients downstream with the mud, which is why deltas and floodplains are fertile and scoured highlands are not. Dead matter that is not recycled becomes soil organic matter; recyclers turn it back into nutrients and carbon.

Carry earth moves loose soil, with its nutrients and organic matter, from one place to another: from a deep lowland deposit onto a starving refuge, say. It cannot move bare rock.

FROM THE CHRONICLE

At the current decline rate, the Sorrel Pools refuge may fail within about a cycle. Main limit for the Copper delta mats there: exhausted nutrients.

TIDES

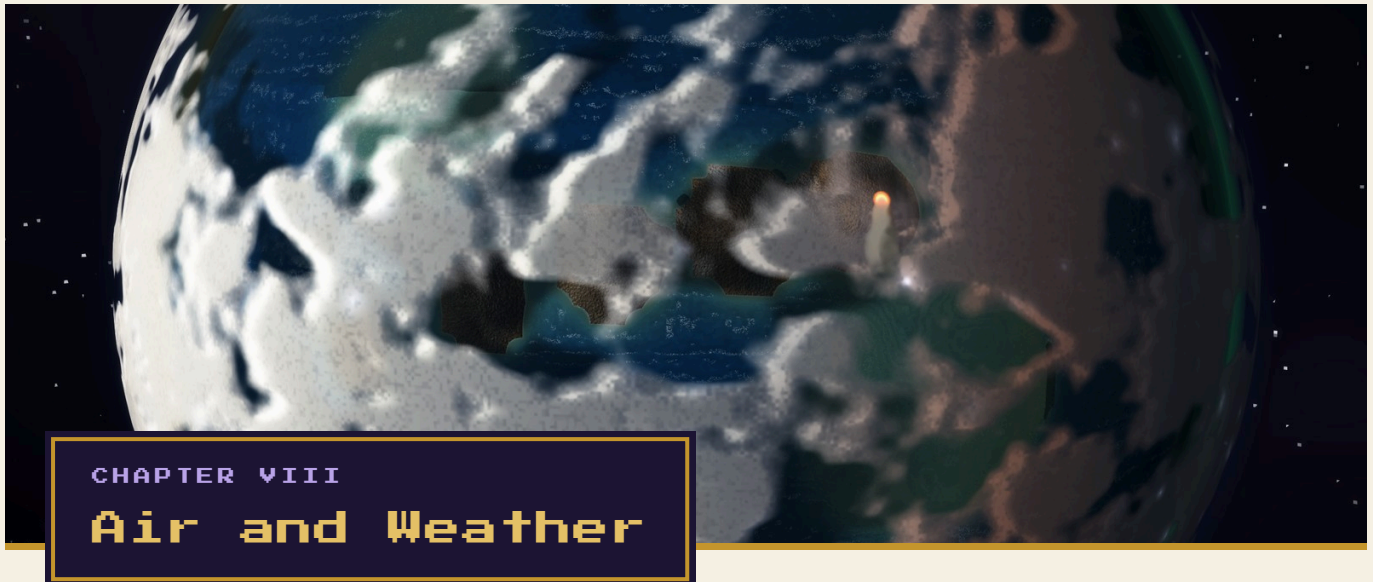
Worlds with moons have **tides**, and they are real: water moves between the open sea and the shore as the moon goes round, flooding flats and draining them again. A big, close moon raises tides of several HU (World 09). Estuaries funnel and amplify them; lagoons behind natural sills keep their water at low tide. The Forecast overlay shows the ground inside the tide's reach. Tides also carry salt inland, and storms push **surges** on top of them.

ICE

Snow that survives the summer compacts into ice, and thick ice flows downhill as a **glacier**, scraping its bed as it goes. Glaciers grow meltwater ponds in summer and the Chronicle reports when they grow or retreat. Lakes freeze from the top: an **ice lid** insulates the water beneath it, so a frozen lake can hold liquid water, and life, through a hard winter. Ice reflects sunlight, which makes cold worlds colder; that feedback is what you are fighting on World 03.

❖ WATER THAT STAYS

A wet place that lasts is worth more than a wet place that is very wet for a season. Prefer hollows with a lip, lakes with a high saddle, valleys that are fed from upstream. A river through a basin passes through; a lake in a basin *stays*.



CHAPTER VIII

Air and Weather

THE ATMOSPHERE

The air is a short list of numbers you can read in the Planet tab, and each matters:

- **Buffer gas** is the bulk of the air. More of it means more pressure and more heat carried from the warm places to the cold ones.
- **Carbon** is the greenhouse gas, and also what producers build themselves from. Too little starves life; too much bakes it.
- **Oxygen** is released by producers over time. Mats, vent mats and recyclers can live without it; rooted plants and animals need it.
- **Aerosol** is haze: volcanic ash and impact dust. It cools the world while it lasts, and settles out over a few cycles.

HEAT

Starlight warms the ground; the greenhouse keeps the warmth; wind and water carry it from the tropics toward the poles and from the day side toward the night. Ice and snow reflect light away. Deep heat from geological provinces warms the ground above them a little and, through vents, a lot. The Temperature overlay shows the range a place sees over a cycle, which is what life cares about.

The carbon cycle

Life binds carbon as it grows and releases it as it is recycled. The rock can bind carbon into minerals (slowly by itself, quickly with **Bind carbon**), and volcanoes return it. Release gases and Bind carbon are your thermostat, but both draw on finite stores. On World 03 every warm degree is bought from a small reserve; on Morning Star (D08) the whole game is binding carbon fast enough.

WIND AND RAIN

Air moves in broad prevailing winds. Where it is pushed up a slope it cools and drops its rain: the **windward** side of a ridge is wet, the **lee** side dry. That rain shadow shapes whole

continents (World 02). The Wind overlay shows speeds, rising and sinking air and the direction of flow; the Humidity overlay shows where the air is moist and where it is raining. **Bend the wind** adds a local wind for half a cycle.

WEATHER THAT MATTERS

- **Seasons.** Tilted worlds have summers and winters; an eccentric orbit adds a hot and a cold half of the year. World 05 has both at once.
- **Monsoons.** On tilted worlds, tropical coasts get onshore winds and heavy rain in the hot season, and offshore, drying winds in the cool one.
- **Droughts.** Now and then a blocking high parks over a land region for half a cycle to a cycle and withholds most of its rain. The Chronicle names the place and how long. Droughts never begin during a resilience trial, and the twilight and dark worlds have none.
- **Thunderstorms.** Towering clouds and lightning. On fire-prone worlds lightning starts fires.
- **Tropical cyclones.** Over warm sea, storms organise into cyclones with a clear eye. They track west, then poleward, dump heavy rain, spin up winds, and push a storm surge onto the coast where they land. The Forecast overlay shows each one's steered track. On Panthalassa (D03) they are a way of life.

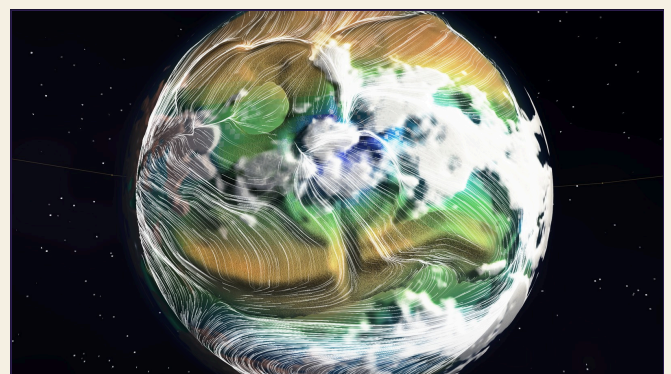


Fig. 5 The Humidity overlay: moist air, falling rain, and streaks showing the wind that carries the vapour.

◆ CALLING RAIN

Call rain where moist air is arriving, not where you want the water to end up: water runs downhill to the place that needs it. Rain called over a dry sky gives little, and the preview says so.



CHAPTER IX

Fire Below

PROVINCES

From World 03 on, the crust has **geological provinces**: regions above a source of deep heat and, often, of **chemical supply**. Each has its own ratings for both. The Deep overlay shows them, with heat in orange, chemical supply in violet, and charge (how close a volcanic province is to erupting) as a redder tint.

VENTS

Open a vent to connect the surface to its province. A vent warms the ground and water around it, and, if it is wet, feeds chemical supply into the water. Two things to remember:

- **Heat and chemistry are different.** Heat keeps water liquid; chemistry feeds life. A hot vent with no chemistry warms a pond nothing can eat from.
- **Vents on one province share its supply.** Two vents on the same province each get half. One vent per province delivers its full output, and two provinces are two independent sources (which several worlds ask for).

A chemically fed vent pool can host **vent mats**, producers that live on chemistry instead of light. On a dark world they are the only way life can begin. Spark life at an open, wet vent founds chemical life; the patch it needs is a fifth the size of a sunlit one.

Redirect deep energy (World 08) sends up to 20% of one province's heat or chemistry to another province's outlet for a cycle. The source's own outlets get correspondingly less.

VOLCANOES

Volcanic provinces build **charge**. Discharging it is an eruption, and the bigger the charge, the bigger the eruption:

- **Fissure eruption:** a curtain of lava fountains along a fault segment and a low gas plume. Lava buries what it reaches, then cools into new land.

- **Explosive eruption:** an ash column, pyroclastic flows, and an umbrella cloud that drifts downwind as haze, cooling the world for a while.
- **Supereruption:** empties a mature province. Very large and very long.

Fresh **ash** buries life, but it releases its nutrients over about two cycles, so ash fields become fertile ground after a delay. Every eruption shows its footprint and delay before it happens; the Forecast overlay marks the footprints of eruptions to come.

FAULTS AND PLATES

Shift a fault raises one side of a mapped fault and drops the other; loose slopes fail. **Drive the plates** pushes on a plate edge for three cycles, making geological time run many times faster there: converging edges raise ranges and deepen trenches, spreading edges open rift valleys. The Plates overlay shows the plates and their edges.

IMPACTS

A world has a fixed, small number of bodies you can redirect. A **rocky** body leaves a crater ringed with ejecta and delivers rock. An **icy** body delivers water and the heat of impact, and melts what it hits. Both arrive after a delay, as a visible bolide.

HAZARDS THAT CHAIN

- Lava reaching water builds land in clouds of steam.
- An eruption under ice melts it into a sudden flood.
- An impact in the sea sends out a **tsunami** that floods low coasts as it arrives.
- **Fire** needs fuel and dry ground. Wet ground and gaps in the cover stop it; burnt ground recovers.

FROM THE CHRONICLE

The Caldera Province is charged and restless. An eruption is building.

c6.1 Lava reaches the sea at the Ember Coast. New land rises in a cloud of steam.

c8.0 Pale ash mats colonise the new ground below the caldera.



CHAPTER X

The Sky Above

STARS

Most worlds circle one sun-like star. Its **light** is given on the world brief as a multiple of a standard sun: 0.86 is a cold world, 1.3 a hot one. Worlds 07 and later can be stranger: two suns whose geometry changes over several cycles, a black hole with no light at all, and, in the Desperate Worlds, a star that pulsates, one that flares, one that swells and one that fades. Wherever the energy supply changes, it changes by an exact rule, and the forecast shows it.

TILT, DAY AND YEAR

Tilt makes seasons: the more tilt, the harder the swing between summer and winter, and the farther the sun wanders from the equator. **Eccentricity** adds a near and a far half of the orbit. **Rotation** sets the length of the day: a slow world bakes by day and freezes by night.

From World 05 you can lean on these, within each world's limits and over a one-cycle ramp:

- **Change axial tilt** by up to 5° per use.
- **Change rotation** by up to 15% per use.
- **Nudge orbit** (World 07): move outward or inward by about 4%, or make the orbit more or less eccentric, over two cycles.
- **Veil starlight**: up to 15% less light for one cycle. A temporary veil must expire before a trial can begin.

TIDAL LOCKING

A world that keeps one face to its star has a permanent day side, a permanent night side and a band of twilight between. Heat and water reach the twilight band only by transport from the day side. World 06 is such a world; several Desperate Worlds are locked to something else entirely.

MOONS

Moons raise tides, and the closer and heavier the moon the higher they run. **Nudge the moon** (World 09) moves the largest moon up to 5% closer or farther over a cycle. Tides scale with the inverse cube of its distance, so small moves matter, and its month changes with it. A moon can also eclipse the sun, briefly on most worlds and for hours on a few.

♦ LIMITS ARE PART OF THE WORLD

Each world's brief lists what you may change and how far. These limits are part of the puzzle: the Long Season will not let you take its tilt away entirely, and the Twilight World cannot be spun up at all.



CHAPTER XI

Life

Life in Living Worlds is not placed: it is founded, and then it is on its own. It is organised into ten **guilds**, broad ways of making a living, and every population belongs to a **lineage** with its own name, colour and traits.

Guild	Role	Lives in	Lives on	Notes
Sun mats	producer	wet ground, shallows	light	The first life on most worlds. Hardy, salt-tolerant, needs no oxygen.
Vent mats	producer	liquid water at vents	chemistry	Life without light. Likes it cold to warm (best near 7 °C).
Drifting producers	producer	open water	light	Plankton. Emerge from established mats in lit, connected water.
Rooted cover	producer	moist soil	light	Grasses and herbs. Hold soil against erosion. Need oxygen and fresh-ish water.
Canopy builders	producer	mature soil	light	Forest. Slow, deep-rooted, shade the ground. Need reliable seasonal water.
Recyclers	recycler	wet ground, water	dead matter	Return nutrients and carbon. Without them, life starves on its own remains.
Aquatic grazers	consumer	water	drifters, mats	Need a large, steady food supply.
Land grazers	consumer	land	cover, canopy, mats	Wander as small herds.
Aquatic hunters	consumer	water	aquatic grazers	The top of the water chain.
Land hunters	consumer	land	land grazers	The top of the land chain.

FOUNDING LIFE

Spark life finds a minimal community on a site that qualifies. A site qualifies when it has:

- persistent shallow water or saturated ground,
- a survivable temperature,
- energy: enough light, or, under ice and in darkness, a wet vent supplying chemistry,
- accessible carbon and nutrients,
- and has held those conditions for a **quarter-cycle** (about 30 seconds at 1×; half that on Gentle),

- over a connected patch of at least **0.05% of the planet** (0.01% at a vent).

If a site fails, the preview names exactly what is missing and how far along it is (“*conditions held for a quarter-cycle (62% so far)*”). The community is built from the local carbon and nutrients: producers, recyclers, and a little dead matter for the recyclers to start on. At a vent, it brings cold-water recyclers of its own.

WHAT HOLDS LIFE BACK

Every population, in every place, is limited by its environment. The inspector names the two strongest limits wherever you

click:

- **Temperature:** each lineage has a range and a best value.
- **Water:** mats need wet ground, cover needs moist soil, drifters need open water.
- **Salinity, pressure and radiation** (water shields life beneath it).
- **Oxygen**, for rooted plants and animals.
- **Energy:** light (shade, depth, ice and winter reduce it) or chemical supply.
- **Nutrients and carbon**, the raw material.
- **Crowding**, when producers compete for the same space.

GROWTH, DEATH AND RECYCLING

Producers grow from carbon and nutrients and die into **dead matter** (detritus). Recyclers eat dead matter and return what it held. That loop is what lets a place keep producing: without recyclers, nutrients pile up in the dead and the living starve. Death is normal. A colony that is growing *and* dying, with recyclers keeping up, is healthy; a colony that only grows is just young.

Many lineages can go **dormant** through a bad season, storing part of themselves to revive when conditions return. Dormant life is hatched on the lineage view and does not count as active coverage.

NEW WAYS OF LIFE

New guilds are not sparked: they **emerge** where conditions have supported them for long enough. Each world lists which may appear.

Emerges	Needs (for 1–2 cycles)
Drifting producers	Lit, connected water, nutrients and established sun mats.
Rooted cover	Moist exposed fine soil, active recyclers, stable ground.
Canopy	Rooted cover, mature soil, reliable seasonal water.
Grazers	Persistent, plentiful producer food.
Hunters	Stable grazer populations in several places.
Vent grazers	Persistent vent-mat production.

FROM THE CHRONICLE

A new way of life is emerging near the Wide Bank: drifting producers should appear within a quarter-cycle if conditions hold.

Glass sea drifters have appeared near the Wide Bank – drifting producers, founded from local organic matter.

ADAPTATION

A lineage under steady pressure (cold, drought, heat, salt, shade, radiation, harsh seasons, crowding) will in time produce a **descendant** adapted to it: a new lineage named after its parent (*Pale winter vent mats*, *Copper sleeping mats*), carrying the adaptation and its cost. Cold tolerance widens the range downward; heat tolerance costs more upkeep; salt and drought tolerance slow growth a little.

Guide adaptation (from World 03) does this on purpose. Paint over a lineage and choose a trait: cold-hardy, heat-tolerant, drought-enduring, salt-tolerant, deep-rooted or dormancy. A quarter of the population under the brush becomes the new lineage. To guide a particular lineage, including recyclers, select it in the Lineages tab first.



Fig. 6 The Lineages tab. Click a lineage to show where it lives (colour) and where it lies dormant (hatched).

MOVING LIFE

Carry life moves 2% of a population from a source to a destination; a tenth is lost on the way and returned as dead matter. The destination must already be able to support it: carrying life cannot make a place habitable. Use it to start a second refuge, to bring recyclers to producers that have outrun them, or to save a lineage from a failing valley.

HERITAGE AND EXTINCTION

The first lineage founded on a world is its **heritage** lineage, marked . Many trials require it to survive. Keep it in more than one place.

A lineage whose whole population stays below a tiny threshold for two cycles goes **extinct**. A total collapse is a crisis, not a game over: Influence keeps refilling, and you can found life again wherever a valid site exists.



THE EVALUATION REGION

Each world has an **evaluation region**, fixed when the world is made and shown in blue on the Refuges overlay. Coverage goals are measured inside it. It never shrinks: making part of it uninhabitable doesn't make your goal easier.

REFUGES

A **refuge** is a lasting living patch: connected ground where producers are established at more than a sparse density, recyclers are active alongside them, and both have held for a while. A refuge must cover at least **0.15% of the planet** (World 08 accepts smaller ones). A large living region can hold several refuges, split around its densest cores. Refuges get names, and the World status panel lists each one with its size and trend.

Goals usually ask for **separate** refuges: refuges at least 25° apart (15° on World 08), so that one disaster cannot take them all. They are drawn in gold on the Refuges overlay.

THE GOALS

Goal	Means
Coverage	Share of the evaluation region covered by active producers, weighted by density.
Rooted cover	The same, counting only rooted cover and canopy.
Separate refuges	Refuges far enough apart (25° unless stated).
Recycling loop	Nutrients returned by recyclers as a share of what producers take up, over the last cycle, with real production and recycling going on.
Named basins	Named basins holding rooted producers and recyclers.
Dispersal corridor	A continuous strip of living habitat joining two sides.
Supply routes	Distinct heat or water sources (vents on different provinces) reaching living areas.

Chemical provinces	Provinces whose chemistry feeds living vent communities.
Consumer guild	A grazer (or hunter) guild that is supported, not merely present.
Safe refuges	Refuges outside the trial's marked danger zone.
Hemispheres	Refuges on both sides of the equator.
Every quarter	Production and recycling active in every quarter-cycle of the last two cycles.
Strategies	Different producer guilds, or adapted lineages, established.

The objectives panel shows each value against its target and, underneath, the next thing to do in plain words. All goals must hold together, continuously, for a full cycle (the **dwelt**). Then the world is **Ready**.



Fig. 7 The objectives panel.

THE RESILIENCE TRIAL

When you are ready, press **Begin resilience trial**. What follows:

1. **Temporary effects expire.** Called rain, bent winds, a veil, gas releases and ramps in progress all finish first. They cannot secretly carry on into the trial.

2. **Settling.** Half a cycle with no powers. A checkpoint is saved first. At the end, readiness is checked again and the trial's **baseline** is recorded.
3. **Disturbance.** Usually two cycles of the world's advertised challenge: the drought, the dimming, the eruption, the king tides.
4. **Recovery.** Usually one ordinary cycle in which the world must bounce back.

Throughout, the trial bar shows the stage, progress and the numbers being checked. Some checks are **continuous** (production and recycling must never stop, coverage must never fall below a share of the baseline, the heritage lineage must survive, two refuges must stay active); others are **final** (coverage at the end compared with the baseline, refuges still separate, soil still in place).

FROM THE CHRONICLE

Resilience trial requested: The failing province.
Physical powers are withdrawn; temporary effects
must expire first.

The Brine Province is failing: heat 50%, chemical
supply 30%.

The trial is passed. The Dark Sun can sustain
itself without you.

PASSING AND FAILING

Pass, and the result screen shows every check, a chart of the trial and the world's history, and unlocks the next world. You can go on, keep playing this world, or retry from before the trial.

Fail, and the world returns to **Recovery**. The result names the two largest limiting factors and compares the world with its pre-trial state. Rebuild, reach Ready again and try once more. The next attempt faces **the same event**: reloading cannot reroll a gentler catastrophe.

You may also give up an attempt yourself: **Intervene and return to recovery** on the trial bar ends it and returns your powers, without penalty beyond the lost time.

BEFORE YOU PRESS THE BUTTON

- Is the heritage lineage alive in two places?
- Is there one refuge more than the trial needs?
- Will the trial's region (red stripes on the Refuges overlay) hit your biggest refuge?
- Is the coverage *stable*, or still climbing? A rising baseline is a harder target.



THE SIDE PANEL

Click the ground and the side panel opens. Its tabs:

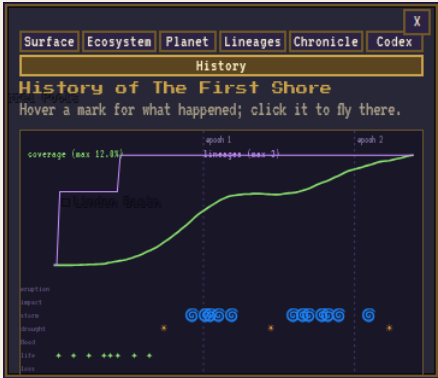
- **Surface:** the place you clicked: its name, height, water, soil, salt and temperature. You can name any place here; names appear on the map, in the Chronicle and in the History.
- **Ecosystem:** the community here, each population active and dormant, its limits, and the ways of life that are emerging nearby.
- **Planet:** the star and orbit, moons and tides, the air, the water inventory, the deep supply of each province and its vents, finite reserves, hazards and interventions, and your Influence.
- **Lineages:** every lineage, living and extinct, with its guild, origin and share of the planet. Click one to see where it lives.
- **Chronicle:** the full history of events.
- **Codex:** short explanations of each process (tides, cyclones, monsoons, glaciers, the carbon cycle, eruptions, refuges, extinction...) the first time you witness it, with notes on what happened in your world.  opens it.
- **History:** a timeline of coverage and lineages, with every eruption, impact, storm, drought, flood, new life, extinction, milestone and trial marked on its lane.



Surface



Ecosystem



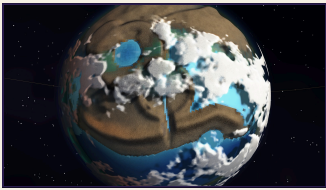
History

OVERLAYS

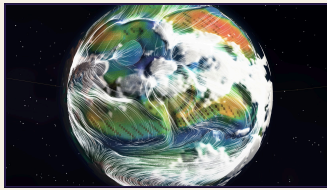
Overlays colour the planet by one quantity, using the same numbers the simulation does. The legend sits under the minimap. Some arrive with later worlds.

Overlay	Shows
Water	Deep water, shallow or wet ground, strong flow, dry ground.

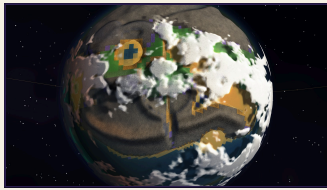
Wind	Wind speed; air pushed up slopes (rain) and sinking in the lee (drying); streaks along the flow.
Humidity	How moist the air is, where clouds form and where rain is falling.
Erosion	Where ground is eroding and where it is building up.
Life	The living lineages by guild, and recycler-only ground.
Refuges	Refuges (gold), the evaluation region (blue) and the trial's region (red stripes).
Forecast	The next cycle: droughts, seasons turning wet or dry, ground the tide will flood, storm tracks, and the footprints of eruptions and impacts to come.
Soil	Bare rock, loose soil, fertile ground, salt.
Temperature	The range of temperature a place sees over a cycle.
Moisture	Soil moisture and recent rain.
Deep	Provinces, their heat, chemical supply and charge; mapped faults; cooling lava.
Plates	Tectonic plates and their converging, spreading and sliding edges.



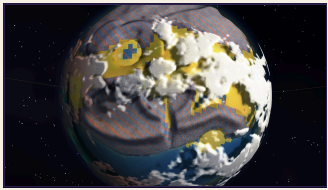
Water



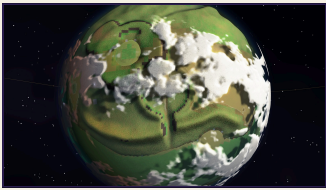
Wind



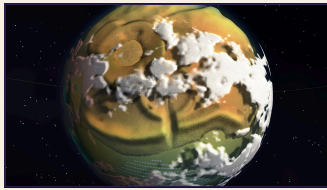
Life



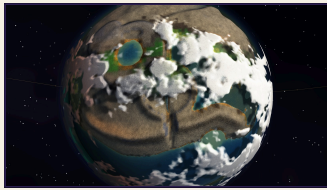
Refuges



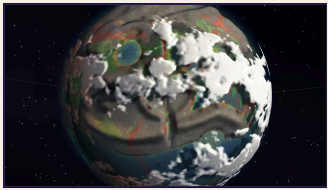
Soil



Temperature



Forecast



Erosion

WARNINGS

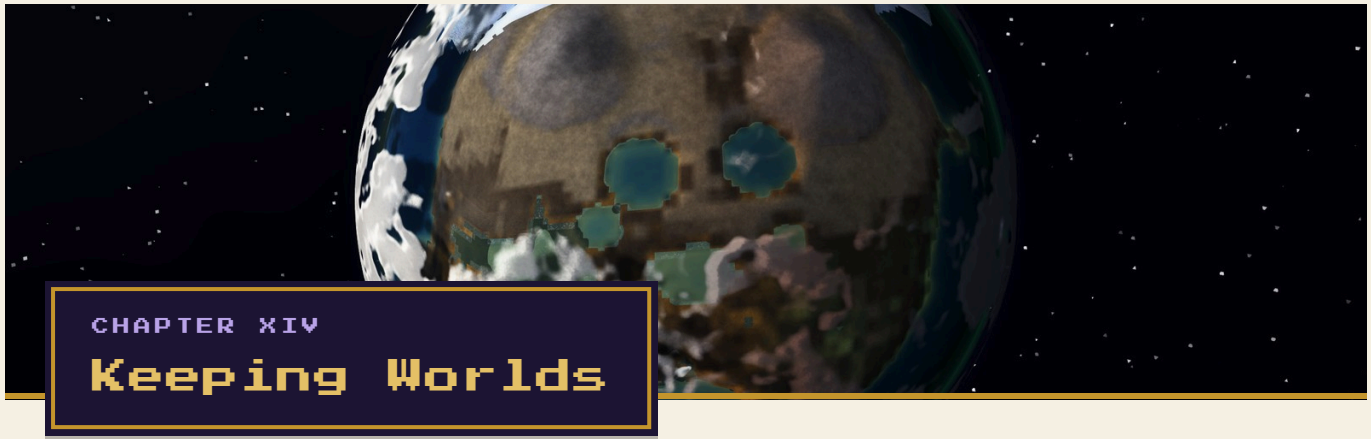
The Chronicle warns before things fail, and says why: “*At the current decline rate, the Amber Hollow refuge may fail within about a cycle. Main limit for the Copper delta mats there: exhausted nutrients. What helps: ...*”. **F** flies to the latest alert; the **Δ** button lists them all. A warning names a population, a place and a cause, so you can go and look.

SEEING WHAT WILL HAPPEN

The top bar shows what comes next. The **Forecast** overlay maps it. Authored events (a trial, an eruption, a two-sun bright spell) are exact; weather is forecast a cycle ahead. Use the forecast before you commit a long plan.

🔍 CLICK, THEN ACT

Most mistakes come from acting on a guess. The two named limits in the Ecosystem tab tell you what is actually wrong. *Temperature* is not fixed by water; *nutrients* are not fixed by rain.



SAVING

The game **autosaves** every cycle, keeps the last five, and always keeps a checkpoint from just before each trial. **Continue** on the title screen loads the most recent. From the pause menu (**Esc**):

- **Save world** and **Load saved world**: saves are kept in your browser.
- **Export world file**: a compressed **.lwsave** file you can keep or send to a friend; **Import world file...** on the title screen loads one.
- **Restart this world**, or **Continue in sandbox** (keep playing with no goals).

A save belongs to the rules it was made under. When an update changes the simulation's rules, older saves are refused rather than replayed under rules they were never played with.

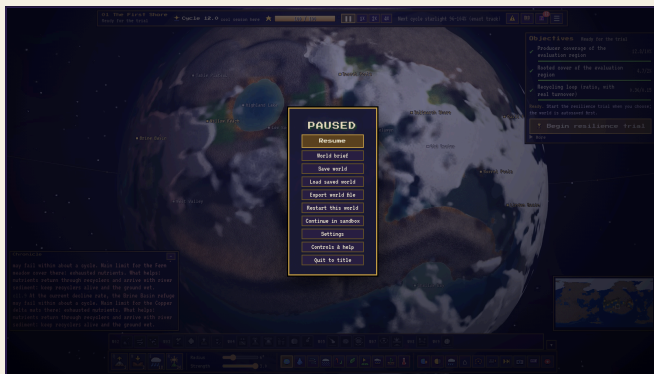


Fig. 8 The pause menu.

THE WORLD ARCHIVE

Completed worlds enter the **World Archive** with their final state, lineage history and major events, so you can revisit what you made.

CHALLENGES

Once a world is completed, its campaign entry offers a **Challenge**. The best result for each is kept.

- **Speedrun**: pass the trial in as few cycles as you can.
- **Frugal god**: half the Influence regeneration; spend as little as you can.

- **Random world**: a new seed and a stronger, unpredictable trial.

SANDBOX

The sandbox offers every world type as a free planet. Options:

- **Terrain**: the original planet, or a random seed with new details.
- **Tectonics**: *Deep time* (plates move about 100 000 years per cycle, with volcanic arcs, rifts and quaking faults) or the slow campaign pace.
- **Objectives**: none, or the campaign goals and trial as practice.
- **Every power**, rather than only this planet's own.
- **Editor brushes**: Paint land (raise, lower, flatten, smooth), Paint water (fresh, sea, remove) and Paint heat (a lasting warm or cold spot), all free. Edits are booked as external changes in the conservation ledger.
- **Infinite Influence**.

Sandbox worlds never earn campaign rewards.

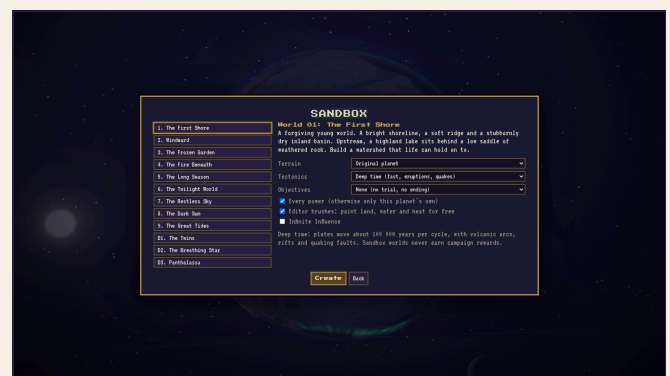


Fig. 9 The sandbox screen.

CAPTURING

The camera button saves a PNG screenshot; **GIF** saves a short animation; the record button makes a **timelapse** video (frames every few simulated seconds, played back fast). **Replay** can save the last ten cycles as a GIF. Settings has a trailer recorder that flies the camera through your world on its own.

CHAPTER XV

Options and Performance

Setting	Effect
Sound	
Master, Environment, Music, Alerts	Volumes. Music follows the world: barren, living, or trial.
World and simulation	
World detail	Cells per cube face for new worlds (see below).
Simulation thread	Run the simulation in a background worker so fast-forward never stalls the view.
Water & erosion on the GPU	Run water, erosion, soil water and salt as GPU compute (High detail and above).
Picture	
Render quality	Low (½), Medium (¾), Full or Sharp (1.5×).
Terrain style	Blocky until zoomed right in, smooth at every distance, or blocky always.
Atmosphere, Clouds	Sky glow and simulated clouds.
Suns, moons and paths	Bodies in the sky and their tracks.
Surface detail from afar	Rock fractures, soil and ice cracks at a distance.
Rich lighting	Sky light, ambient occlusion, golden hour, wet and icy sheen.
Water optics	Reflections, clear shallows, caustics.
Thick clouds	Self-shadowed cloud banks and stronger cloud shadows.
Night side	Airglow and glows visible from orbit.
Filmic tone	A per-world colour grade.
Temporal anti-aliasing	Smoother edges, steadier clouds and plumes.
Event effects	Eruption plumes, ash clouds, impacts.
Wind streamlines	On wind and humidity views, always, or never.
Glow, Depth of field	Bloom on bright light; soft focus up close.

Adaptive resolution Lowers the render scale a little to keep frames steady.

Observation light Sunlit with fill, even, or sunlight only.

Accessibility and interface

Text size Small to extra large.

High contrast Stronger interface contrast.

Reduced motion No camera flights.

Reduced flashes Softer lightning, flares and impacts.

Confirm on release Brush powers apply when you let go (no preview card).

Performance readout The **F3** panel.

WORLD DETAIL

Detail	Cells	Cost
Standard (64)	24 k	1×
High (96)	55 k	about 2×
Very high (128)	98 k	about 4×
Ultra (180)	194 k	about 8×
Insane (256)	393 k	about 16×

Higher detail gives a sharper planet and, at Ultra and Insane, finer terrain (valley networks, intricate coasts, dunes, ocean-floor relief), at a higher simulation cost. Ultra and Insane are meant for the GPU simulation. The setting applies to *new* worlds.

IF IT RUNS SLOWLY

- Lower **Render quality** first: it costs nothing in simulation.
- Leave **Adaptive resolution** on.
- Switch off **Thick clouds**, **Water optics** and **Temporal anti-aliasing**.
- For fast-forward on big worlds, keep the simulation thread and the GPU water on *Auto*. **F3** shows where the time goes.

SOUND

Every sound is data. The **sound editor** (`sfx_editor.bat` or `./sfx_editor.sh`) lets you audition sounds, drop in your own files, set volumes, remap what plays when, and choose the ambient beds and music for each mood. A sound with no file plays its built-in synth voice, so nothing is ever silent.

CHAPTER XVI

Notes of an Old Caretaker

The Old Caretaker has looked after more worlds than anyone remembers, and lost a fair number of them. These notes were found in the margin of an earlier edition of this manual.

1. Water first, life second.

Do not spark life on ground that will be dry next season. Make the water stay, wait a quarter-cycle, then found.

2. Prefer a lake to a river.

A river passes through; a lake stays. A shallow lake with wide, wet shores is the best nursery in the game.

3. Click before you cut.

The two named limits tell you what is wrong. Fix that, not something else.

4. Two refuges are one refuge. Three are two.

The trial will take something. Build one more refuge than it needs, far from the others.

5. Recyclers are not optional.

When coverage booms and the loop sags, the recyclers have fallen behind. Carry them, or spark life in the big new patches, and let the dead matter build.

6. Let it grow, then stop.

Fast growth raises the trial's baseline. A stable world passes trials; a booming one sometimes fails them.

7. Know the trial before you build.

Read the brief. A drought world wants stored water; a dimming world wants warmth that isn't the sun; an eruption

world wants refuges outside the footprint.

8. One vent per province.

Vents share. Two on one province is half each. Two on two provinces is two lifelines.

9. Keep the heritage in two places.

Many trials end the moment the first lineage dies. Carry it.

10. Don't cut what holds the water.

A saddle may be all that keeps a basin full. On the Dark Sun, lowering the ice saddles drains the pools into channels where the water freezes.

11. Spend Influence.

A full bar is regeneration thrown away. But never spend just because you can.

12. Watch the forecast.

Droughts, monsoons, flares, eruptions and the next bright spell of a second sun are all on the Forecast overlay before they arrive.

13. Use the pause.

Nothing grows while you think. Plan paused, act, then let time run.

14. A failed trial is information.

It names the two biggest limits. The next attempt meets the same event, so fix exactly those.

"You will know the world is ready when you stop wanting to touch it."

— THE OLD CARETAKER



Nine worlds, each a lesson. Every card below is the world brief you see at the start of the world, with the caretaker's notes added from play-testing. Spoilers, of a gentle kind.

WORLD 01

The First Shore

Young temperate world • tutorial

“Can water and pioneer life create a stable living valley?”

Light X1 Day 8/cycle Tilt 18° Moons Pale Moon Influence 100

A forgiving young world. A bright shoreline, a soft ridge and a stubbornly dry inland basin. Upstream, a highland lake sits behind a low saddle of weathered rock. Build a watershed that life can hold on to.

New powers: Raise land, Lower land, Call rain, Spark life.

WHY IT IS HARD

- Rain falls on the coast and the ridge; the inland basin, where most of the evaluation region lies, stays dry.
- Life starts from nothing: every patch has to be founded on wet, lit ground and then has to last.

WHAT TO EXPECT

- A gentle climate, a pale moon and small tides.
- The highland lake behind the low saddle holds the water the basin lacks.
- The trial dries the inland region for two cycles.

YOUR GOALS

- Producer coverage of the evaluation region: 10%
- Rooted cover of the evaluation region: 2%
- Recycling loop (ratio, with real turnover): 15%
- Separate refuges (25° apart): 2

THE TRIAL: THE DRY INTERVAL

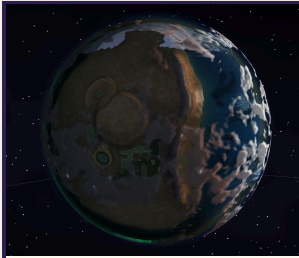
Two cycles of reduced condensation over the inland evaluation region (35% of normal) with 15% stronger exposed-soil evaporation, then one normal recovery cycle.

IDEAS FOR A FIRST APPROACH

- Open the saddle so the lake can feed a river into the basin.
- Found a second community far from the first: refuges count only when they are 25° apart.

CARETAKER'S NOTES

- Lower the Low Saddle in short strokes: the Highland Lake then feeds a river into the Inland Basin. Lower the basin floor a little so the water pools instead of running through.
- Spark life on the wet basin shore once the site has held for a quarter-cycle. Rooted cover appears on its own on moist fine soil where recyclers are active.
- The West Valley and the Shallow Bay are good second refuges. The trial dries the inland basin: a lake that stays wet through two dry cycles is what passes it.



WORLD 02

Windward

Windswept ridge world

*"Can you connect habitats without losing the water and soil they need?"*Light $\times 1.02$ Day 9.2/cycle Tilt 20° Moons Dust Moon Influence 100

Water is present, but wind and geography put it in the wrong places. An ocean-facing ridge wrings the rain out of the prevailing wind; a fertile leeward plateau stays dry. Move soil, bend the wind and carry life — without blowing your soil into the sea.

New powers: Carry earth, Bend the wind, Carry life.

WHY IT IS HARD

- The ocean-facing ridge wrings the rain out of the wind; the fertile plateau behind it stays dry.
- Strong wind strips bare soil and blows it out to sea.
- Life must live in several basins and move between them.

WHAT TO EXPECT

- A pioneer community is already alive on the coast.
- Wind 35% stronger than usual.
- The trial turns the prevailing wind by 25° and strengthens it.

YOUR GOALS

- Producer coverage of the evaluation region: 12%
- Named basins with rooted producers and recyclers: 3
- Separate moisture-storing refuges: 2
- Working land dispersal corridor: 1

THE TRIAL: THE TURNING WIND

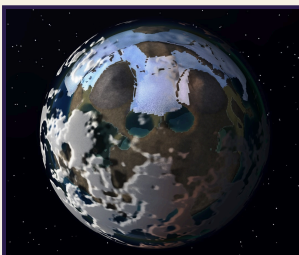
The prevailing wind rotates by 25° and strengthens to $1.35\times$ for two cycles, then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Use the ridge gap: rain follows the air that gets through.
- Cover soil with life before the wind takes it; carry life along a sheltered corridor.

CARETAKER'S NOTES

- The Ridge Gap lets moist air through to the plateau: work with it rather than against the ridge.
- Bare soil blows away in the strong wind. Get cover on it quickly, and use Carry earth to move soil back from where the wind dumped it.
- The corridor goal wants one continuous living strip between the two sides; a sheltered, wet route is easiest to keep.



WORLD 03

The Frozen Garden

Cold world with geothermal provinces

*"Can life persist through advancing ice?"*Light $\times 0.86$ Day 8/cycle Tilt 24° Moons Rime Influence 140

The planet holds water, but most of it is becoming inaccessible. Two ice catchments advance; geothermal outlets wait in two provinces. Insulate and retain rather than melt everything.

New powers: Release gases, Bind carbon, Open a vent, Guide adaptation.

WHY IT IS HARD

- A dim sun, thin air and two advancing ice catchments: most water is locked up or about to be.
- Underground heat is finite: every vent opened on a province splits the same output.

WHAT TO EXPECT

- Three heat provinces under the ice (Western, Eastern, Southern).
- Snow and glaciers that grow in the cold season.
- The trial dims the sun to 80% for two cycles.

YOUR GOALS

- Separate microbial or rooted refuges: 3
- Active coverage of the evaluation region: 5%
- Distinct heat/water supply routes: 2

THE TRIAL: THE LONG DIMMING

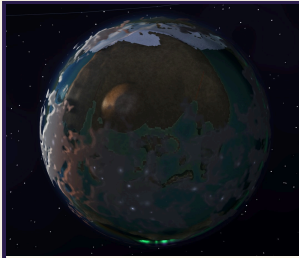
Two cycles at $0.80\times$ stellar input, then one recovery cycle. Ice, phase changes and hydrology carry the consequences.

IDEAS FOR A FIRST APPROACH

- One vent per province delivers its full heat; place it on wet ground in a sheltered hollow. The vents are what keeps refuges alive through the dimming.
- Carbon-rich gas, released a cycle or two before the trial, slows the ice across the whole world (each release is worth a couple of degrees), but it cannot replace the vents.
- Carry earth from deep lowland soil onto your refuges to refill their nutrients; cold-tolerant descendants help.

CARETAKER'S NOTES

- One vent per province, on wet ground in a sheltered hollow. Two vents on one province share its heat and each give half.
- The carbon reserve is bigger than it looks and each release is worth a couple of degrees. Release one or two cycles before the trial; it slows the ice but cannot replace the vents.
- Guide cold tolerance early and carry soil onto the refuges to refill their nutrients. The trial needs two refuges alive and the heritage lineage to survive.



WORLD 04

The Fire Beneath

Volcanic young world

“Can a biosphere survive a landscape that is still forming?”

Light X1 Day 8/cycle Tilt 20° Moons Ember, Cinder Influence 140

Land and climate are still being violently rewritten. A charged caldera, three provinces and fault-controlled rivers. The caldera will erupt during the trial: release part of its charge early, spread refuges beyond its footprint and keep seed sources for recolonization.

New powers: Fissure eruption, Explosive eruption, Supereruption, Shift a fault, Redirect rock, Drive the plates.

WHY IT IS HARD

- The land is still being made: faults move, a charged caldera waits to erupt, lava and ash bury what grows.
- The eruption during the trial grows with the caldera's charge.

WHAT TO EXPECT

- Three provinces, fault-controlled rivers, lightning fires.
- A pioneer community already lives here.
- The trial is the caldera eruption itself, then a dim interval.

YOUR GOALS

- Active producer coverage of the evaluation region: 15%
- A supported grazer guild: 1
- Separate refuges (25° apart): 3
- Refuges outside the caldera's severe footprint: 2

THE TRIAL: THE CALDERA WAKES

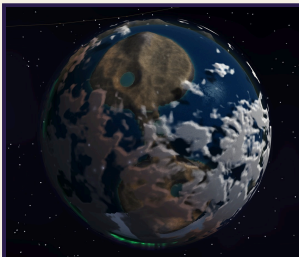
The Caldera Province produces one explosive eruption, scaled by its charge at the start of the trial, followed by the dim interval; then two recovery cycles.

IDEAS FOR A FIRST APPROACH

- Release part of the charge early with smaller eruptions.
- Keep refuges outside the marked footprint, and keep seed stocks to recolonise fresh rock.

CARETAKER'S NOTES

- Watch the caldera's charge on the Deep overlay. Small fissure or explosive eruptions before the trial release charge and shrink the trial's eruption.
- Keep at least two refuges outside the severe footprint (red on the Forecast and Refuges overlays) and a third farther away.
- Ash becomes fertile after about two cycles. Fresh rock must be recolonised for the trial to pass: keep seed populations within reach.



WORLD 05

The Long Season

Extreme seasons world

“Can different refuges take turns supporting life?”

Light X1 Day 3.2/cycle Tilt 45° Moons Warden Influence 180

Obliquity 45°, eccentricity 0.18 and long days: a habitat can be excellent now and unusable for much of the cycle. Keep production alive somewhere in every quarter of the year: dormancy, migration along the isthmus, or refuges in both hemispheres.

New powers: Redirect ice, Change axial tilt, Change rotation.

WHY IT IS HARD

- Tilt 45° and an eccentric orbit: a place can be excellent for one season and dead the next.
- Long days make the heat swing hard.

WHAT TO EXPECT

- Two continents linked by an equatorial isthmus.
- You can change the tilt and the rotation within limits.
- The trial amplifies the seasonal swing by 20%.

YOUR GOALS

- Separate refuges (25° apart): 3
- Refuges in both hemispheres (two seasonal strategies): 2
- Production and recycling active in every quarter of the last two cycles: 1
- Active coverage of the evaluation region: 5%

THE TRIAL: THE AMPLIFIED YEAR

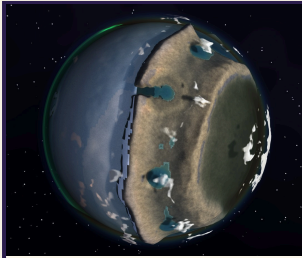
One full seasonal cycle with 20% stronger seasonal forcing (tilt swing), then one ordinary cycle. The annual mean source energy is unchanged.

IDEAS FOR A FIRST APPROACH

- Have production somewhere in every quarter of the year: both hemispheres, or dormancy.
- The isthmus is the migration route between the seasons.

CARETAKER'S NOTES

- Both hemispheres need refuges: when it is winter in one, it is summer in the other.
- Lowering the tilt within its limits softens the swing, and dormancy-adapted lineages sleep through the worst quarter.
- Production and recycling must stay active in every quarter-cycle: check the History tab for gaps.



WORLD 06

The Twilight World

Tidally locked world

“Can you maintain a living boundary between permanent light and darkness?”

Light **x1.3** Day **locked** Tilt **2°** Influence **180**

Tidally locked. There is no future morning on the dark hemisphere. Life must hold the twilight band on two separate continents; heat and water arrive by transport from the day side. The Night Lake hides an optional warm chemical refuge under its ice.

WHY IT IS HARD

- One face always day, the other always night: only the twilight band between is habitable.
- Heat and water reach the band only by transport from the day side.

WHAT TO EXPECT

- Two continents on the terminator, wetlands in the band, ice lakes on the night side.
- An optional warm chemical refuge under the Night Lake.
- The trial dims the star to 75% for two cycles.

YOUR GOALS

- Refuges on two separated parts of the terminator: 2
- Active coverage of the evaluation region: 6%
- Recycling loop (ratio, with real turnover): 12%

THE TRIAL: THE FADING STAR

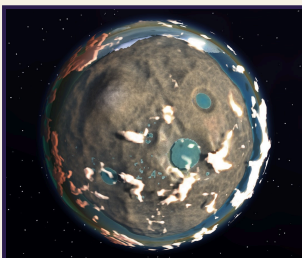
Source luminosity falls to 0.75× for two cycles, then one recovery cycle. Heat stores and transport decide where the habitable band goes.

IDEAS FOR A FIRST APPROACH

- Hold the band on both continents.
- Ice-covered lakes keep liquid water; heat under them makes a refuge that does not need the sun.

CARETAKER'S NOTES

- The habitable band is narrow. Build it on both continents, where day-side heat and moisture arrive.
- The Night Lake's ice lid keeps liquid water beneath it: a vent there makes a refuge that does not need the star.
- Recycling (12%) is the goal people forget: keep recyclers with the producers in the cool, wet band.



WORLD 07

The Restless Sky

Two-sun world

“Can an ecosystem tolerate a variable energy supply?”

Star **two suns** Day **9.6/cycle** Tilt **15°** Influence **220**

Two sources with a changing geometry and alternating bright and dim intervals. The forecast is exact; the ecological response is not. Prepare for both ends of the energy range — and let any veil expire before the trial.

New powers: Nudge orbit, Veil starlight.

WHY IT IS HARD

- Two sources whose geometry changes: bright and dim intervals alternate.
- One strategy is never enough: life must cope with both ends of the range.

WHAT TO EXPECT

- Exact forecasts of the energy supply.
- Shaded canyons, warm lowlands, cool highlands and two reservoirs.
- The trial doubles the companion star's swing for two cycles.

YOUR GOALS

- Three distinct refuges: 3
- Producer strategies or adapted lineages: 3
- A consumer chain: 1
- Active coverage of the evaluation region: 10%

THE TRIAL: THE HIGH-CONTRAST INTERVAL

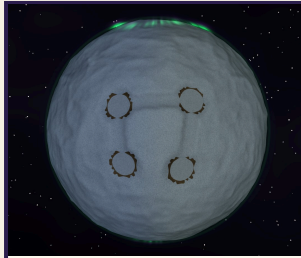
The next authored high-contrast interval: the companion's distance swing doubles for two cycles, then one normal cycle.

IDEAS FOR A FIRST APPROACH

- Grow several producer strategies and a consumer chain.
- A starlight veil can soften a bright spell, but it must expire before the trial.

CARETAKER'S NOTES

- The bright and dim spells are exact; the forecast shows the next one. Prepare for both ends.
- Three strategies means three producer guilds, or adapted lineages, established. Mats, rooted cover and drifters, plus a cold- or heat-adapted descendant.
- The consumer chain flickers when its food dips. Give grazers a large, steady producer base and leave it alone; a veil must have expired before the trial.



WORLD 08

The Dark Sun

Sunless world

“Can life persist without sunlight?”

Star none (black hole) Day 8/cycle Tilt 10° Influence 220

An apparently dead surface around a quiet black hole hides liquid beneath the ice. Heat keeps water liquid; chemical supply feeds life — they are different things. Four provinces, two open outlets. Explicitly speculative: the stable orbit, retained water and deep supplies are authored assumptions.

New powers: Redirect deep energy.

WHY IT IS HARD

- No sunlight at all: heat keeps water liquid, chemistry feeds life, and those are different things.
- Everything lives under ice, on what four provinces deliver.

WHAT TO EXPECT

- Four provinces with different heat and chemical supply; two vents already open.
- Ice saddles between the basins. Cutting them drains the basin pools into the saddles, where the water freezes.
- The trial halves the best province's heat and cuts its chemistry by 70%.

YOUR GOALS

- Active producer/recycler refuges: 3
- Active coverage of the evaluation region: 2.5%
- Independent chemical-supply provinces feeding life: 2

THE TRIAL: THE FAILING PROVINCE

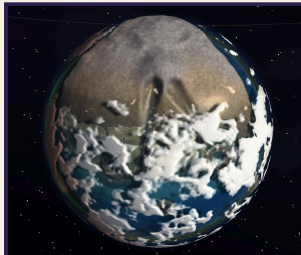
The most productive province loses 50% of its heat and 70% of its chemical output for two cycles, then recovers over one cycle. Unreleased supply stays underground.

IDEAS FOR A FIRST APPROACH

- Open a vent in every province and Spark life at each one: vent colonies bring cold-water recyclers.
- Liquid water is the limit. Keep the basin pools; do not lower the saddles.
- Guide cold tolerance for the vent mats and their recyclers (select the recyclers in the Lineages tab first).
- Redirecting deep energy can keep a backup outlet alive.

CARETAKER'S NOTES

- Open a vent in Brine and in Ember, one per province, and Spark life at all four vents. Vent colonies bring cold-water recyclers.
- Liquid water is the limit here. Do not lower the ice saddles: they drain the basin pools into channels where the water freezes.
- Guide cold tolerance on the vent mats and on the recyclers (select them in the Lineages tab). Coverage dips for a few cycles while the recyclers catch up, then climbs.
- The trial hits the province that delivers the most chemistry (usually Brine). Keep the heritage lineage and strong refuges in the others.



WORLD 09 • BONUS

The Great Tides

Great tides world • bonus

“Can life hold a shore that the sea takes back twice a day?”

Light X1 Day 4.8/cycle Tilt 12° Moons Tidemother Influence 180

A close, massive moon raises tides of many height units. Broad flats flood and drain; estuaries amplify the surge; lagoons behind natural sills keep their water at low tide. Build communities that survive exposure and inundation — and decide whether to push the moon away.

New powers: Nudge the moon.

WHY IT IS HARD

- A close, massive moon raises tides of many HU: flats flood and drain twice a day.
- Estuaries amplify the surge; salt reaches far inland.

WHAT TO EXPECT

- Lagoons behind natural sills keep water at low tide.
- You can push the moon away (weaker tides) or draw it in.
- The trial raises spring tides 70% higher for two cycles.

YOUR GOALS

- Active coverage of the evaluation region: 8%
- Separate refuges (25° apart): 2
- Recycling loop (ratio, with real turnover): 15%

THE TRIAL: THE KING TIDES

Two cycles of spring tides 70% higher than normal: flats drown and drain further, estuaries surge. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Lagoons and raised ground are the stable habitats; the open flats are not.
- Weigh pushing the moon: calmer shores, but less exchange.

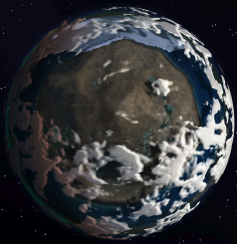
CARETAKER'S NOTES

- Lagoons behind sills keep water at low tide; the open flats drown and drain twice a day.
- Salt-tolerant descendants hold the tidal margins. Pushing the moon away calms the shore before the king tides.
- Recycling (15%) needs recyclers on wet ground beside the producers, not just in the sea.

CHAPTER XVIII

The Desperate Worlds

Pass World 08 and nine more worlds appear: uncharted planets at the edge of what the simulation allows. They give you almost every power and every one of them breaks a rule you have come to rely on. Nobody is sure they can all be saved.



DESPERATE WORLD D1

The Twins

Binary planet · uncharted

“Can life hold the coasts of a world whose sister pins its seas in place?”

Light X1 Day 3.2/cycle Tilt 22° Moons The Sister Influence 260

A binary planet. Its sister world, almost as large, hangs motionless in the sky over the Facing Sea, because each keeps the same face to the other. Her pull heaps the oceans toward her and away from her: the facing coast lies drowned in salt, the shelf on the ring between lies drained and bare. Every day, in the eclipse seasons, she swallows the sun.

WHY IT IS HARD

- Each twin keeps one face to the other, so the sister's tide never moves: the seas stand heaped toward her and away from her.
- The facing coast is permanently drowned in salt; the ring between is drained bare.
- In the eclipse seasons the sister hides the sun every day.

WHAT TO EXPECT

- The sister fills a big part of the sky over the Facing Sea and never moves.
- Days are slow: about three per cycle.
- The trial is the twins' close approach: the bulge stands 60% higher for two cycles.

YOUR GOALS

- Active coverage of the evaluation region: 8%
- Separate refuges (25° apart): 3
- Recycling loop (ratio, with real turnover): 15%

THE TRIAL: THE CLOSE APPROACH

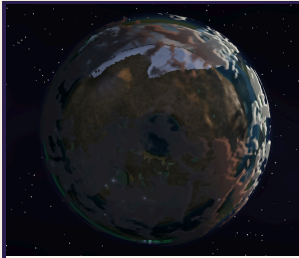
The twins swing to their closest: for two cycles the fixed tidal bulge stands 60% higher. The facing coast drowns deeper, the drained ring dries further. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Find the coasts the bulge leaves alone, about 55° from the sister's sub-point, where the tide is near zero.
- Pushing the sister farther away flattens the bulge, but the trial still comes.

CARETAKER'S NOTES

- The tide here never moves: the sea stands heaped under the Sister and opposite her. Look for coasts about 55° from her sub-point, where the bulge is nearly zero.
- Days are slow (about three per cycle) and the sister eclipses the sun daily in the eclipse seasons: favour hardy mats and wide refuges.
- Nudging the Sister farther flattens the bulge, but the close approach still comes.



DESPERATE WORLD D2

The Breathing Star

Pulsating variable star · uncharted

*"Can a biosphere live by a star that swells and shrinks out of step with the seasons?"*Light **X1** pulsating Day **8/cycle** Tilt **23°** Moons **Metronome** Influence **260**

The star is a pulsating variable: every 1.37 cycles it brightens by more than a quarter and dims by as much. Its beat never matches the year, so warm summers fall in the dim phase and bright pulses land in winter: freeze and thaw arrive without warning. The forecast is exact; the land is not forgiving.

WHY IT IS HARD

- The star's light rises and falls by more than a quarter, on a beat that never matches the year.
- Shallow ground swings from frozen to baking and back; the warm season can arrive in the dim phase.

WHAT TO EXPECT

- A deep inland sea that stores heat, a stair of small lakes that freeze and thaw, cold highlands.
- Exact forecasts: the pulse is perfectly regular.
- The trial deepens the pulsation 1.7× for two cycles.

YOUR GOALS

- Active coverage of the evaluation region: **10%**
- Separate refuges (25° apart): **3**
- Producer strategies or adapted lineages: **2**
- Recycling loop (ratio, with real turnover): **15%**

THE TRIAL: THE DEEP BREATH

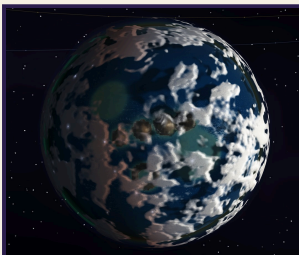
For two cycles the pulsation deepens 1.7×: the star swings by almost half its light, bright to dim and back. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Deep water evens out the swings: build around it.
- Several strategies (cold- and heat-adapted, dormant) cover both ends of the breath.

CARETAKER'S NOTES

- Build around the deep inland sea: deep water evens out the star's breath.
- The pulse and the seasons drift in and out of step. Watch the forecast and keep cold-, heat- and dormancy-adapted lineages.
- Two strategies must survive to the end of the trial, not just one.



DESPERATE WORLD D3

Panthalassa

Ocean world · uncharted

*"Can life take root on a world that is all ocean, swept by endless storms?"*Light **X1.04** Day **8.8/cycle** Tilt **12°** Moons **Drift** Influence **260**

One ocean covers the planet. A hotspot chain of five islands, a ring atoll and two drowned banks are the only shallows; everything else is deep, warm, nutrient-poor water. The warm sea breeds cyclones far more often than anywhere you have been, and their surges wash over the low islands.

WHY IT IS HARD

- There is almost no land: a chain of five volcanic islands, an atoll and two drowned banks.
- The open ocean is deep and poor in nutrients; the shallows are few and far apart.
- Cyclones form two and a half times as often as on any world you know, and their surges sweep the low islands.

WHAT TO EXPECT

- A hotspot under the youngest island that can still build land.
- A warm sea and warm air.
- The trial: a hypercane season, three times as stormy, for two cycles.

YOUR GOALS

- Active coverage of the shallows and islands: **6%**
- Separate refuges (25° apart): **3**
- A supported grazer guild: **1**
- Recycling loop (ratio, with real turnover): **12%**

THE TRIAL: THE HYPERCANE SEASON

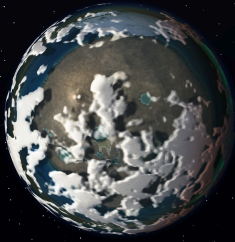
For two cycles cyclones form three times as often, more of them at once, with higher surges. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Eruptions and raised land make new shallows and shelter.
- The banks are wide lit shallows: good ground for mats, then drifters and grazers.

CARETAKER'S NOTES

- The banks are wide, lit shallows: found mats there first, then let drifters and grazers follow.
- Coverage booms fast here, and recyclers fall behind. Carry recyclers (select them in the Lineages tab) into the big patches, or Spark life in them, to keep the loop above 12%.
- Raise the low islands a little against cyclone surges; the hotspot can build new land.



DESPERATE WORLD D4

Leviathan

Super-Earth, 2.4 g · uncharted

*“Can soil and life stay put where everything weighs two and a half times as much?”*Light **x1** Day **7.2/cycle** Tilt **16°** Gravity **2.4 g** Moons **Anchor** Influence **260**

A super-Earth with 2.4 g at the surface. Mountains cannot stand tall here: the land is a world of broad plains and low ridges under thick, slow air. Water runs off fast and cuts hard, slopes slump at angles that would hold anywhere else, and every HU of rock you raise costs 2.4 times as much. Trees struggle to stand at all.

WHY IT IS HARD

- Everything weighs 2.4 times as much: slopes fail at gentle angles and water runs off fast and erosive.
- Raising land costs 2.4 times as much Influence.
- Standing tall is expensive: canopy, rooted cover and land grazers pay more to live; seeds do not carry far.

WHAT TO EXPECT

- Low relief, broad plains, wide slow rivers, three named basins.
- Thick, slow air (higher pressure) that evens out temperatures.
- The trial is a deluge: rain 2.2 times as efficient everywhere for two cycles.

YOUR GOALS

- Active coverage of the evaluation region: **10%**
- Rooted cover of the evaluation region: **3%**
- Named basins with rooted producers and recyclers: **2**
- Separate refuges (25° apart): **2**

THE TRIAL: THE DELUGE

For two cycles the thick air wrings out its vapour 2.2 times as efficiently everywhere: torrential rain, flash floods and fast erosion. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Hold soil with rooted cover before the rains; the trial counts the fine soil that stays.
- Shallow basins keep water without needing tall walls.

CARETAKER'S NOTES

- Everything slumps and runs off. Rooted cover first: the trial counts the fine soil that stays.
- Shallow basins hold water without tall walls. Raising land is very expensive here; lowering is not.



DESPERATE WORLD D5

Ward of the Giant

Moon of a gas giant · uncharted

*“Can life live on a moon flexed, heated and darkened by the giant it circles?”*Light **x0.88** Day **4/cycle** Tilt **3°** Moons **Thalos** Influence **260**

Not a planet at all: a large moon locked to a gas giant that fills a fortieth of the sky over the Under-Giant Sea and never moves. Its tides knead the crust into four restless volcanic provinces. Once every day the giant eclipses the sun for the whole moon, and its radiation belts sweep the surface. Day lasts a quarter of a cycle.

WHY IT IS HARD

- Thalos, the giant, never moves from the sky, and every day it eclipses the sun for the whole moon.
- Its tides knead four restless volcanic provinces; its radiation belts sweep the surface.
- The giant's bulge holds the seas toward it, and the moon rocks slightly back and forth every orbit.

WHAT TO EXPECT

- Four provinces with strong heat and chemistry; two vents already open.
- Short days: four per cycle.
- The trial tightens the resonance: provinces 2.2× hotter, tides rocking three times as far, fissures opening on the two hottest provinces.

YOUR GOALS

- Separate refuges (25° apart): **3**
- Active coverage of the evaluation region: **6%**
- Distinct heat/water supply routes: **2**

THE TRIAL: THE RESONANCE TIGHTENS

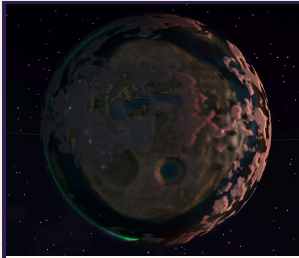
Another moon pumps the orbit: for two cycles the provinces run 2.2× hotter, chemical supply rises by half, the giant's tide rocks back and forth three times as far, the bulge stands 40% higher, and the two hottest provinces split open in fissure eruptions. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- Water shields life from radiation; vents give heat and chemistry when the giant takes the sun.
- Too much heat is a risk too: keep refuges where a hotter province will not cook them.

CARETAKER'S NOTES

- Water shields life from the giant's radiation: keep refuges under a few HU of water or beside vents.
- The trial heats the provinces 2.2×. Do not put every refuge on the hottest provinces; one cooler outlet is insurance.



DESPERATE WORLD D6

Cinder

Flaring red dwarf · uncharted

*“Can life survive a red star that spits radiation without warning?”*Light **X0.92 flaring** Day **3.2/cycle** Tilt **8°** Influence **260**

A small red star, close and dim, prone to violent flares. Each flare floods the day side with radiation for a few seconds of world time and blows a little of the air away for good. Deep water shields life beneath it, ice and shade help, and the wind carries nothing away.

WHY IT IS HARD

- The star flares about one and a half times per cycle: radiation floods the day side and the air thins a little every time.
- Bare ground and shallow mats take the full dose.

WHAT TO EXPECT

- Every flare is announced shortly before it strikes.
- Deep crater lakes and a shaded gorge.
- The trial: a flare storm, three times as frequent and 1.8 times as strong, for two cycles.

YOUR GOALS

- Separate refuges (25° apart): **3**
- Active coverage of the evaluation region: **6%**
- Recycling loop (ratio, with real turnover): **12%**

THE TRIAL: THE FLARE STORM

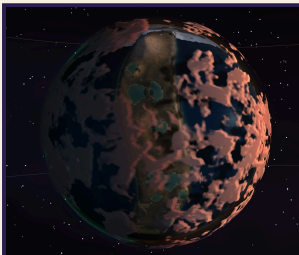
For two cycles flares come three times as often and 1.8 times as strong, stripping air as they go. Then one ordinary cycle.

IDEAS FOR A FIRST APPROACH

- A few HU of water absorb most of a flare: deep lakes are shelters.
- Release buffer gas to replace the air the flares strip; thicker air also shields.

CARETAKER'S NOTES

- Flares are announced shortly before they strike. Deep crater lakes and the shaded gorge are shelters.
- Buffer gas replaces the air the flares strip, and thicker air shields a little. Radiation-tolerant descendants appear under steady exposure.



DESPERATE WORLD D7

The Swelling Sun

Swelling red giant · uncharted

*“Can life outrun a sun that grows brighter every cycle?”*Light **X0.86 swelling** Day **8/cycle** Tilt **15°** Moons **Ash Moon** Influence **260**

The star has left its long middle age. It is a swelling red giant, already a wide orange disk in the sky, and it brightens by 2.5% of its first light every cycle you spend here. The world starts cool, with ice on its highlands; it will not stay cool. The longer you prepare, the hotter the trial.

WHY IT IS HARD

- The star brightens by 2.5% of its first light every cycle, without end.
- Every cycle you prepare, the trial will be hotter: there is no waiting it out.

WHAT TO EXPECT

- A cool start: ice on the highlands, cold tarns.
- A long continent from north to south, with highlands at both ends.
- The trial is a shell flash: 1.3 times the (already swollen) light for two cycles.

YOUR GOALS

- Active coverage of the evaluation region: **8%**
- Separate refuges (25° apart): **3**
- Refuges in both hemispheres: **2**
- Recycling loop (ratio, with real turnover): **12%**

THE TRIAL: THE SHELL FLASH

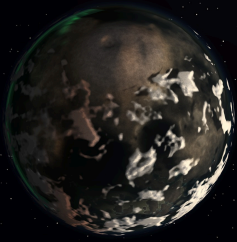
A burning shell inside the giant flares up: for two cycles the star gives 1.3 times its already swollen light. Then one cycle at its ordinary (still rising) output.

IDEAS FOR A FIRST APPROACH

- Prepare refuges where it will stay coolest: high ground and both polar ends.
- Binding carbon and raising highlands both buy time; heat-tolerant descendants buy more.

CARETAKER'S NOTES

- The star brightens every cycle you spend here, so the trial gets hotter the longer you wait. Move with purpose.
- Prepare refuges where it stays coolest: the highlands at both ends and near the poles. Bind carbon and guide heat tolerance.



DESPERATE WORLD D8

Morning Star

Runaway greenhouse · uncharted

“Can a runaway greenhouse be turned back before it finishes?”

Light **x1.55** Day **3.2/cycle** Tilt **3°** Influence **260**

A bright, close sun and an atmosphere thick with carbon. The greenhouse is running away: the lowlands bake, the oceans are already in the sky as vapour under a permanent yellow haze, and the dense air races around the world in a few days, so night brings no relief. Only the polar plateaus stay mild, and the last high tarn is already drying out; but the hot air is full of vapour that can be called down as rain. Bind the carbon into rock and the sky will rain an ocean back down. Oxygen is scarce.

WHY IT IS HARD

- The lowlands bake under a carbon-thick sky and a permanent haze that dims the light.
- There is no ocean: the water is vapour in the air.
- Oxygen is scarce; rooted life struggles.

WHAT TO EXPECT

- A huge store of minerals that can bind carbon: cool the world and the sky rains back into the old basins.
- Polar plateaus that stay mild, and air heavy with vapour that rain can be called from.
- The trial is a volcanic exhalation of carbon and haze.

YOUR GOALS

- Separate refuges (25° apart): 2
- Active coverage of the evaluation region: 4%
- Recycling loop (ratio, with real turnover): 12%

THE TRIAL: THE EXHALATION

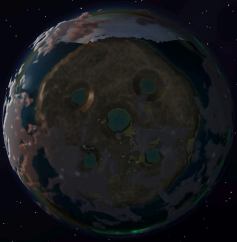
The volcanic plains exhale: over one cycle 5 units of carbon-rich gas return to the sky, with a pulse of haze. The heat that follows lasts. Then one more cycle of disturbance and one of recovery.

IDEAS FOR A FIRST APPROACH

- Bind carbon early and often; the cooling speeds up as the carbon thins.
- Call rain over the cool northern plateau to found life there, then follow the water down as the lowlands cool.

CARETAKER'S NOTES

- Bind carbon early and often: the cooling speeds up as the carbon thins, and rain returns to the old basins.
- Call rain over the cool northern plateau to found life there, then follow the water down as the lowlands cool.



DESPERATE WORLD D9

The Wanderer

Rogue planet · uncharted

“Can life outlast the loss of its sun?”

Light **x1 fading** Day **8/cycle** Tilt **20°** Influence **260**

A passing star tore this planet loose. It is falling outward into the dark, and its sun shrinks every cycle: about 3.5% less light each time, down to almost nothing. Four buried provinces still hold heat and chemistry. Life that lives on light now has to be living on rock by the time the light is gone.

WHY IT IS HARD

- The sun shrinks every cycle: about 3.5% less light, down to almost nothing.
- Life on light has to become life on rock before the dark arrives.

WHAT TO EXPECT

- Four buried provinces with heat and chemical supply, one vent already open.
- Ice that spreads from the poles as the light fails.
- The trial is the last light: 40% of what is left, for two cycles.

YOUR GOALS

- Active refuges (25° apart): 3
- Independent chemical-supply provinces feeding life: 2
- Active coverage of the evaluation region: 4%

THE TRIAL: THE LAST LIGHT

The planet crosses the edge of its old system: for two cycles the shrinking sun gives only 40% of its already fading light. Then one cycle on the ordinary decline.

IDEAS FOR A FIRST APPROACH

- Vent mats need wet, chemically fed outlets: open vents in the provinces' lakes and spark chemical life there.
- Feed at least two independent provinces; greenhouse gas slows the freeze.

CARETAKER'S NOTES

- The light is going. Before it does, open vents in the provinces' lakes and spark chemical life there.
- Feed at least two independent provinces; greenhouse gas slows the freeze.



CONTROLS

Input	Action
Drag	Turn the planet (or paint, with a brush power)
Right / Alt-drag	Always turn the planet
Wheel, pinch	Zoom
Click	Inspect; aim a site or pair power
Q ... P A ... L Z N M , . / ;	Powers, in toolbar order
Shift + 1 ... 0	The first ten powers
[]	Brush radius
Enter / Esc	Confirm / cancel a power
Space	Pause / resume
1 2 3	1×, 2×, 4× speed
Tab	Next overlay
Home	Whole planet
F	Focus the latest alert
C	Cut the planet open
B	Hide clouds and atmosphere
V	Cycle the lighting
X	Codex
F3	Performance readout
Esc	Pause menu (with nothing else open)

FOUNDING CHECKLIST

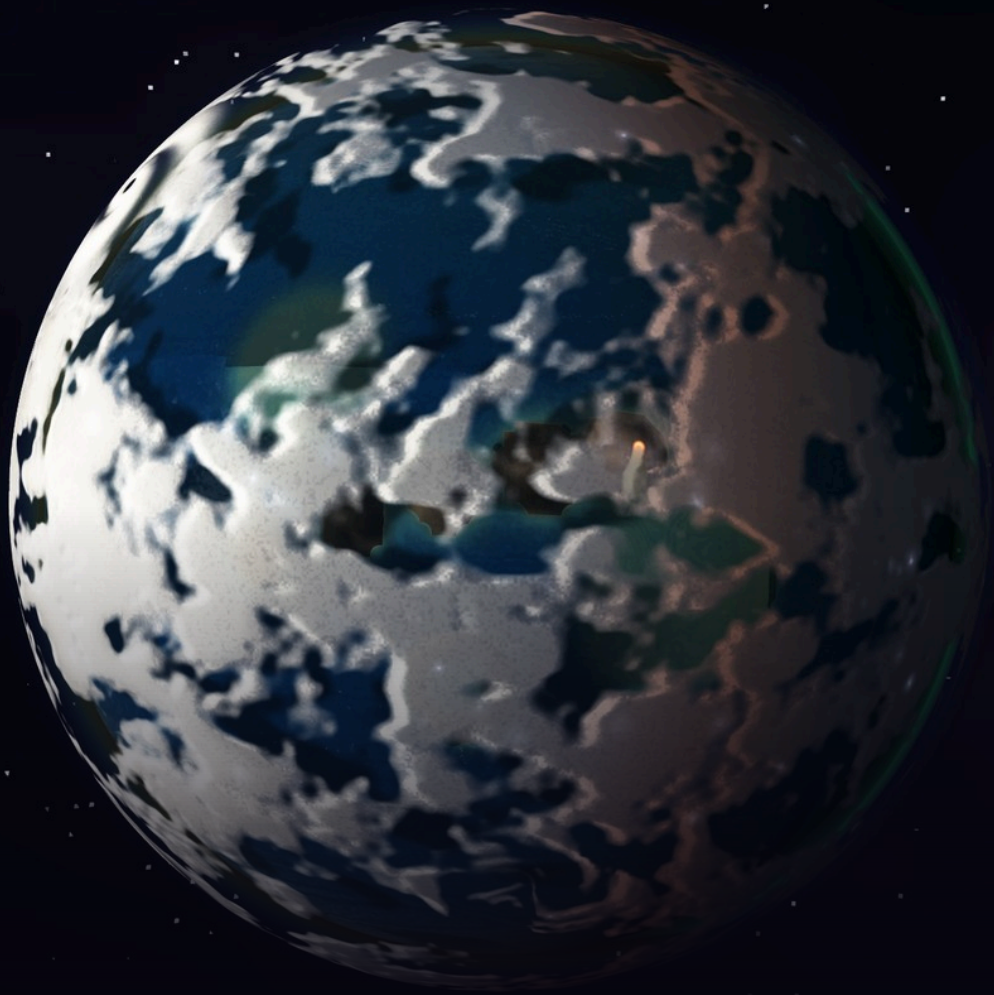
- Persistent shallow water or saturated ground
- Survivable temperature (check the season)
- Light, or a wet vent with chemistry
- Carbon and nutrients (fine sediment)
- Held for a quarter-cycle
- A patch of at least 0.05% of the planet (0.01% at a vent)

REFUGE CHECKLIST

- Producers established, recyclers active, held for a while
- At least 0.15% of the planet (W08: 0.06%)
- 25° from the next one (W08: 15°)

GLOSSARY

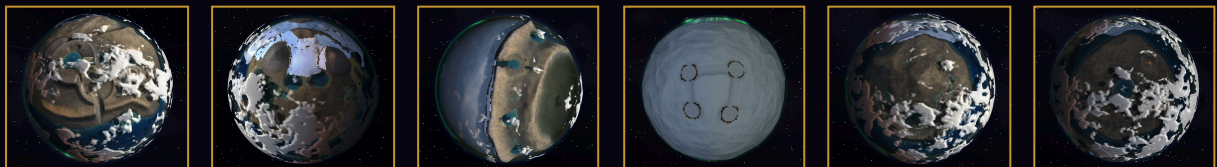
Basin: a named low area that can hold water. **Buffer gas:** the bulk of the air. **Charge:** how ready a volcanic province is to erupt. **Coverage:** density-weighted share of the evaluation region with active producers. **Cycle:** the planet's year, 1 200 ticks. **Detritus:** dead organic matter. **Dwell:** how long goals must hold (one cycle). **Epoch:** five cycles. **Evaluation region:** the fixed area goals are measured in. **Guild:** a way of making a living. **Heritage lineage:** the first lineage, often protected by the trial. **HU:** height unit. **Influence:** your currency. **Lineage:** a named population with its own traits. **Novelty:** a new guild emerging. **Province:** a region above deep heat and chemistry. **Recycling ratio:** nutrients returned by recyclers over nutrients taken up by producers. **Refuge:** a lasting living patch. **Saddle:** the lowest point of a basin's rim. **Trial:** the hands-off test at the end of each world. **Vent:** an outlet connecting the surface to a province.



YOU CANNOT MAKE ANYTHING LIVE.

You can raise mountains and cut saddles, call down rain, open the crust to the heat beneath, lean on a planet's tilt and nudge its moon. Then you step back, and the world faces its resilience trial on its own: a drought, a dimming star, a waking caldera, the king tides.

Nine Living Worlds. Nine Desperate ones. Eighteen ways for a world to fail, and one way for it to succeed: by no longer needing you.



Water, soil, salt, carbon and nutrients are conserved. Every failure explains itself.

LIVING WORLDS