The Lowtech Almanac: A Field Guide

Permacomputing, appropriate technology, the small web, and resilience thinking

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A survey of permacomputing, appropriate technology, the small web, and resilience thinking.

How to Use This Guide

This guide has two reading modes:

New to this space? Start with What This Is, then read the domain introductions in order. Each section has a *Start here* pointer. By the end you'll have a mental map of the landscape and several well-chosen entry points.

Already in the weeds? Jump to Connections & Patterns for cross-cutting analysis, or go straight to whichever domain you know least. Each section ends with *Deep cuts* — resources that reward sustained attention.

What This Is

These movements share a question: *what would technology look like if it took seriously the limits of the planet, the fragility of supply chains, and the value of things that last?*

That question has been asked before. In the 1970s it produced the Appropriate Technology movement — E.F. Schumacher's *Small is Beautiful*, the Whole Earth Catalog, and a generation of engineers who wanted tools that communities could build and repair themselves. That movement faded when cheap oil returned and personal computers promised a different kind of liberation.

The question is being asked again, with more urgency and more specific answers.

Today the askers include: sailors computing on solar power thousands of miles from the nearest data center; designers building operating systems designed to run on hardware from a post-collapse future; writers powering their publications from a single solar panel on a rooftop in Barcelona; programmers who think the web peaked somewhere around 2005 and have been building alternatives ever since.

They do not agree on everything. Some are motivated by ecological crisis, others by aesthetic preferences for simplicity, others by a distrust of large platforms, others by a genuine love of old hardware. But they tend to orbit the same resources, share the same references, and recognize each other across the boundaries of their particular subculture.

This almanac is a map of that orbit.

A Brief History

1970s — Appropriate Technology. The first oil shock of 1973 made resource limits suddenly legible. Schumacher argued that technology should be sized to human communities,

not industrial scale. Stewart Brand's Whole Earth Catalog offered tools and knowledge for self-reliance. The movement produced solar water heaters, composting toilets, and the first personal computers — then largely dissolved when cheap oil returned.

1990s-2000s — The Web's promise. The early web was genuinely decentralized: anyone could publish, anyone could run a server, the protocol was simple enough to implement in a weekend. That openness attracted a generation of idealists.

2010s — Platform capture. Most of that openness was absorbed into a handful of platforms. The web became heavier, more surveilled, more dependent on JavaScript and CDNs and cloud infrastructure. A reaction began forming.

2015-present — Convergence. Several threads converged: the IndieWeb movement pushing for ownership of your own data; the Gemini Protocol offering a deliberately minimal alternative to HTTP; communities like Merveilles forming around aesthetics of constraint and care; the Uxn virtual machine offering a stable, minimal computing target designed to survive hardware obsolescence; and the coining of "permacomputing" as a name for computing within ecological limits. Meanwhile, the climate crisis sharpened the question for everyone.

These weren't coordinated movements. They found each other through webrings, wikis, and forums — the same distributed, low-tech web infrastructure they were arguing for.

Computing & Culture

Philosophy, art, and theory of minimal and resilient computing.

Start here: Permacomputing

The word "permacomputing" was coined around 2020, but the ideas it names are older. It asks: what would it mean to compute within planetary limits? Not just to use less energy, but to design systems that could be understood, repaired, and rebuilt by communities without access to semiconductor fabs or global logistics networks.

The answers range from the practical to the philosophical. On the practical side: prefer software that runs on old hardware, avoid dependencies that require constant updates, write

code that can be read and modified without specialized tooling. On the philosophical side: computing is not neutral, every architectural decision embeds assumptions about who has power, what lasts, and what matters.

XXIIVV is the personal wiki of Devine Lu Linvega, one of the central figures in this space. It's a sprawling, beautiful artifact — part notebook, part design manifesto, part software documentation. The wiki itself embodies its subject: it's built to last, navigable without JavaScript, updated continuously over more than a decade.

Hundred Rabbits is the studio formed by Devine and Rek Bell, who live and work on a sailboat. Their work is a sustained argument by example: you can do serious creative and technical work with minimal, solar-powered computing. Their software (the Uxn virtual machine, the Orca livecoding environment, the Ronin graphics tool) is designed to run on any hardware, survive hardware obsolescence, and be legible to anyone who wants to modify it.

Compudanzas approaches computing through embodied practice — workshops, performances, and writing that ask what it feels like to compute at human scale. It sits at the intersection of education, art, and technology.

Critical Engineering offers a manifesto: the engineer who does not understand their tools is controlled by them. It's a useful counterweight to the optimism that runs through some of this space — a reminder that tools are political and that fluency requires more than use.

Damaged Earth Catalog is the closest thing to a reference text for the movement: a growing index of practices, concepts, and resources organized around care for damaged systems. Less a directory than an argument about what belongs together.

Deep cuts: The Awesome Permacomputing list is the most comprehensive index of the computing side of this space. Frugal Computing and Simplifier offer practical and philosophical takes on using older machines well.

Energy & Infrastructure

Solar power, networking, hardware, and off-grid systems.

Start here: Low-tech Magazine's solar server

The internet consumes approximately 4% of global electricity. Data centers, undersea cables, devices, and the infrastructure that connects them all require continuous power. Most of that power comes from fossil fuels. This domain asks: what would internet infrastructure look like if it had to account for that energy?

Solar Protocol is the most elegant answer yet built: a network of solar-powered servers that routes traffic to whichever server currently has the most sun. The website you see changes based on where solar energy is most abundant. It's not just a demonstration but a proposal — distributed infrastructure that degrades gracefully instead of failing, that makes its energy use visible rather than hiding it in a cloud.

LibreSolar and **Open Energy Monitor** sit on the hardware side: open-source solar charge controllers and energy monitoring systems that you can build, modify, and repair yourself. They represent the appropriate-technology lineage applied to contemporary renewable energy — not just using solar, but understanding and owning the systems that manage it.

Solar Internet and **Offgrid Internet** are smaller, more experimental — research into what networking looks like when you can't assume grid power. These are early-stage explorations of territory that will become more important.

A practical note for this domain: understanding solar-powered computing requires engaging with energy budgets in concrete terms. How many watt-hours does a web request cost? How much does it cost to store a gigabyte? These questions don't have universal answers, but asking them changes how you design systems.

Deep cuts: Do the Math by physicist Tom Murphy is the most rigorous public analysis of energy limits and growth. It's not about computing specifically, but it provides the numerical foundation that makes the rest of this domain make sense.

Knowledge & Preservation

Archives, wikis, offline access, and libraries — as reference points, not mirrors.

Start here: Kiwix

The web is fragile. Pages disappear, domains expire, platforms shut down. The average lifespan of a web page is measured in years. The resources in this domain take that fragility seriously.

Kiwix lets you download Wikipedia, Project Gutenberg, and other reference works for offline use. It's the most practical tool here: genuinely useful to anyone who might lose internet access, and a reminder that the knowledge on the web was never meant to require the web to access it.

Internet Archive is the institution doing the most to address web fragility at scale. The Wayback Machine has archived hundreds of billions of pages. It's also a library: public domain books, music, software, and films, preserved and accessible. Its precarity (it has faced legal challenges that threaten its mission) makes it worth paying attention to.

Appropedia is the practical knowledge base of the appropriate technology movement — how to build solar water heaters, composting systems, and low-cost appropriate technology for communities around the world. It's a wiki, actively maintained, with a strong orientation toward the Global South.

Monoskop occupies a different register: a wiki for media art, culture, and theory. It's a research resource for the intellectual history that underlies much of this space — connecting cybernetics, media theory, and contemporary practice.

Public Domain Review curates the public domain as a cultural resource — essays, image collections, and explorations of the strange and wonderful material that copyright has released into the commons.

Whole Earth Catalog Archive closes a historical loop: the original appropriate technology reference work, preserved. Reading it now, you notice both how much was anticipated and how much has changed.

Deep cuts: Project Gutenberg remains the largest source of public domain text, and worth knowing as infrastructure for offline knowledge. Branch Magazine approaches the sustainability of the web itself from a climate angle, examining what a sustainable internet would look like to design and use.

Tools & Software

Minimal operating systems, protocols, browsers, and search engines.

Start here: Gemini Protocol

This domain is where the ideas of the rest of the space meet concrete technical choices. If you want computing to be more durable, more understandable, more independent of corporate infrastructure — what do you actually build?

Uxn is the central technical artifact of the Hundred Rabbits / Merveilles ecosystem. It's a small virtual machine — about 300 lines of C — that runs on nearly any hardware and provides a stable target for software that needs to outlast its original platform. The idea is that if you write for Uxn, your software will run on whatever hardware exists in thirty years, because anyone can implement the VM. It's a bet on simplicity as a preservation strategy. The Awesome Uxn list maps the growing ecosystem of software built on it.

Gemini Protocol is a response to the complexity of the modern web: a new protocol, simpler than HTTP, with a document format simpler than HTML, designed for low-bandwidth connections and minimal clients. It has attracted a small but active community of writers and developers. **Lagrange** is the most polished Gemini browser, offering a full graphical experience within the protocol's constraints.

Suckless has been making the minimalist software argument since 2002: software should have the minimum necessary features, be understandable by reading the source, and avoid bloat. Their tools (dwm, st, surf) are influential. Their philosophy — that code quality is inversely proportional to lines of code — is worth engaging with, even where you disagree.

Collapse OS occupies the extreme end of the resilience argument: an operating system designed to run on salvaged microcontrollers after global supply chains have failed. It's a thought experiment made real. Whether or not you think collapse is likely, the exercise of designing for it produces interesting constraints.

Plan 9 is the Bell Labs operating system that took Unix's "everything is a file" principle further than Unix did. It's not in active development, but it represents an alternative architectural lineage worth knowing — a road not taken in operating system design.

The search engines here — **Marginalia** and **Lieu** — address a different problem: the mainstream web's search has become a game of SEO optimization, surfacing content designed to rank rather than to inform. Marginalia deliberately indexes small, low-traffic sites and penalizes the commercial web. Lieu searches specifically within the Merveilles webring ecosystem.

Deep cuts: TinyTools catalogs small web tools that embody these principles. Collapse Computing on GitHub surfaces projects in this vein that haven't found their way into other directories yet.

Community & Practice

Webrings, forums, repair communities, and maker culture.

Start here: Merveilles Hub

The ideas in this space circulate through communities as much as through publications. Understanding where people gather is as important as understanding what they're saying.

Merveilles is the community at the center of the computing side of this space — a Mastodon instance and webring whose members include many of the people building the tools and writing the ideas documented here. Its aesthetic is distinctive: dark themes, geometric art, a preference for systems that are comprehensible and repairable. The webring (accessible through the hub) leads to dozens of personal sites worth exploring.

Tildeverse is a federation of public Unix servers — "tilde" machines — where anyone can get a shell account and host a personal site. It's a deliberate revival of the pre-commercial internet, where shared computing resources and command-line culture were normal.

IndieWeb is the most organized effort to rebuild the decentralized web: a community developing standards (WebMention, Micropub, IndieAuth) that allow personal sites to interact without requiring a central platform. Its principles — own your data, publish on your own site — are foundational to much of the small web.

Neocities is the most accessible entry point for someone who wants to participate: free hosting for personal websites, explicitly positioned as a revival of GeoCities and the early

web ethos of hand-made sites. It has attracted a large community of young people discovering HTML for the first time, alongside veterans rebuilding their web presence outside platforms.

Modding Fridays represents the repair and reuse side of this space — a community gathering around extending the life of hardware and software through modification. It connects the computing world to the broader repair movement.

512kb Club and **1MB Club** are simple arguments made by example: a list of websites that stay under a size threshold. The argument is that most websites are far heavier than they need to be, and that a site can be beautiful and functional at a fraction of the typical weight.

Lobsters is the technical forum most friendly to these ideas — a small, invite-only link aggregator where discussions about minimal software, alternative protocols, and computing history happen without the noise of larger platforms.

Deep cuts: Small Web Movement is a concise essay articulating the philosophy behind this cluster. Text-only Web is a tool for experiencing any site stripped to its text, a useful reminder of what content actually is underneath the weight of modern web design.

Ecology & Resilience

Degrowth, permaculture, resilience thinking, and appropriate technology.

Start here: Low-tech Magazine

This domain provides the broader context for everything else in this almanac. The computing and web communities documented above are responses to a larger crisis; this domain is where that crisis is analyzed most directly.

Low-tech Magazine is the essential publication. Run by Kris De Decker from a solar-powered server in Barcelona, it publishes long-form essays on low-tech solutions to contemporary problems — not nostalgia for the past, but rigorous analysis of which historical technologies remain viable and which modern assumptions are worth questioning. The solar server itself is part of the argument: the site goes offline when there isn't enough sun,

making its energy use legible.

Resilience.org and the **Post Carbon Institute** emerged from the peak oil analysis of the 2000s and have evolved into the most substantial ongoing analysis of the transition away from fossil fuels. They're less interested in individual behavior change than in systemic understanding — what does an economy look like after cheap energy?

Dark Mountain Project occupies the cultural end of this space: a network of writers, artists, and thinkers who have concluded that the dominant culture's stories about progress and growth are no longer adequate, and are looking for different stories. It's melancholy at times, but it's doing necessary work.

Low-tech Lab takes the appropriate technology argument and makes it hands-on: documentation of low-tech solutions tested in practice, oriented toward people who want to build rather than just read. It sits between the theoretical and the practical.

Permaculture Research Institute and **Open Source Ecology** represent the agricultural and industrial branches of this space. Permaculture design applies ecological principles to land use; Open Source Ecology is building a library of open-source industrial machines — from tractors to 3D printers — that communities can build themselves.

Farm Hack is the community where farmers and engineers share tool designs — the most grounded, practical end of the appropriate technology lineage.

Deep cuts: No Tech Magazine is the curation companion to Low-tech Magazine — shorter pieces, links, and historical material. Low Impact provides practical guides for reducing footprint across many life domains.

Connections & Patterns

The six domains in this almanac are not cleanly separated. Several threads run through all of them:

The energy thread. Solar power appears in Energy & Infrastructure (Solar Protocol, LibreSolar), in publications (Low-tech Magazine's solar server), and as a constraint that shapes software design (Hundred Rabbits computing at sea). Energy is not a separate

concern — it's the budget within which everything else operates.

The Merveilles cluster. The community around Merveilles, XXIIVV, and Hundred Rabbits is unusually dense: it spans Computing & Culture, Tools & Software, and Community & Practice, and has produced a coherent aesthetic and technical ecosystem (Uxn, the webring, the Mastodon instance). It's the closest thing in this space to a coherent scene.

Degrowth as substrate. The critique of economic growth and resource extraction underlies both the ecology/resilience domain and the computing/culture domain, but they rarely cite each other directly. Post Carbon Institute and permacomputing.net are addressing the same underlying problem from different angles. Connecting them is productive.

The archive impulse. Multiple domains include resources oriented toward preservation: Internet Archive, Whole Earth Catalog Archive, TempleOS Archive, Kiwix. The impulse to preserve — software, knowledge, hardware, culture — is a response to fragility and ephemerality that runs through the whole space.

IndieWeb as connective tissue. The IndieWeb principles (own your data, use the open web) connect Community & Practice to Knowledge & Preservation to Tools & Software. Gemini, Tildeverse, and personal sites on Neocities are all expressions of the same underlying commitment to a web that isn't owned by platforms.

What's Missing

No directory is complete. These are the gaps most visible in the current collection:

Radio and mesh networking. Amateur radio, LoRa, and mesh networking projects represent a different approach to resilient communication infrastructure — one that doesn't depend on the internet at all. This is a significant gap.

Global South perspectives. Most resources here are from Europe, North America, and Australia. Appropriate technology has a much longer history in contexts where grid power and global supply chains were never reliable. That work is underrepresented.

Repair movement infrastructure. Repair cafes, iFixit, and the right-to-repair movement are adjacent but mostly absent. The repair dimension is touched through Modding

Fridays and some tags, but deserves more coverage.

Biological computing and low-tech biotech. Fermentation, mycelium, and other biological systems as computing or processing substrates are an emerging area that sits at the intersection of appropriate technology and computing.

Practical transition guides. This space has strong theory and strong individual examples, but few resources that help someone transition existing infrastructure — a home, a small organization, a rural community — toward these principles step by step.

Where to Start

If you have 30 minutes: Read the front page of Permacomputing and browse two or three entries from the domain that interests you most. Subscribe to Low-tech Magazine's RSS feed.

If you have a weekend: Work through the XXIIVV wiki, particularly the pages on Uxn and computing philosophy. Read the first few issues of Branch Magazine. Make a Neocities site or post in a Tildeverse forum.

If you're building something: Look at Uxn as a compilation target. Study how Solar Protocol routes requests. Read Suckless's philosophy alongside their code. Build a personal site that weighs under 512 KB.

If you're researching: The Damaged Earth Catalog and Awesome Permacomputing are the most comprehensive indices. Use Do the Math to ground the energy claims in actual numbers.

All Resources

Name	Domain	Type	Description
1MB Club	Community & Practice	Community	Website size awareness

Name	Domain	Type	Description
512kb Club	Community & Practice	Community	Small website advocacy
Appropedia	Knowledge & Preservation	Wiki	Sustainability knowledge base
Appropriate Technology Collaborative	Ecology & Resilience	Org	Engineering solutions
Awesome Permacomputing	Computing & Culture	Directory	Curated ecosystem list
Awesome Uxn	Tools & Software	Directory	Uxn ecosystem index
Branch Magazine	Knowledge & Preservation	Publication	Climate-conscious web design
Collapse Computing	Tools & Software	Directory	GitHub topic cluster
Collapse OS	Tools & Software	Project	OS for post-collapse
Compudanzas	Computing & Culture	Project + Practice	Human-scale computing and workshops
Critical Engineering	Computing & Culture	Art + Theory	Critical tech thinking
Damaged Earth Catalog	Computing & Culture	Catalog	Reference of practices and ideas
Dark Mountain Project	Ecology & Resilience	Publication	Cultural critique
Do the Math	Ecology & Resilience	Blog	Energy + growth analysis
Farm Hack	Ecology & Resilience	Community	Farm tool sharing
Frugal Computing	Computing & Culture	Guide	Using older machines effectively

Name	Domain	Type	Description
Gemini Protocol	Tools & Software	Protocol	Lightweight web protocol
Hacker News	Community & Practice	Community	Discussion hub
Hundred Rabbits	Computing & Culture	Studio	Self-reliant computing + living
IndieWeb.org	Community & Practice	Community	Indie web standards
Internet Archive	Knowledge & Preservation	Platform	Digital preservation
Kiwix	Knowledge & Preservation	Project	Offline Wikipedia access
Lagrange Browser	Tools & Software	Software	Minimal Gemini browser
LibreSolar	Energy & Infrastructure	Project	Open solar hardware
Lieu Search	Tools & Software	Tool	Search engine for indie sites
Lobsters	Community & Practice	Community	Minimalist tech forum
Low Impact	Ecology & Resilience	Education	Low impact living
Low-tech Lab	Ecology & Resilience	Platform	Hands-on low-tech tutorials
Low-tech Magazine	Ecology & Resilience	Publication	Solar-powered long-form essays
Marginalia Search	Tools & Software	Tool	Search for small web
Merveilles Hub	Community & Practice	Community	Gateway to indie web ecosystem
Modding Fridays	Community & Practice	Community	Repair and reuse community

Name	Domain	Type	Description
Monoskop	Computing & Culture	Wiki	Media theory archive
N-O-D-E	Computing & Culture	Publication	Experimental publishing
Neocities	Community & Practice	Platform	Personal websites
No Tech Magazine	Ecology & Resilience	Publication	Curated low-tech links
Offgrid Internet	Energy & Infrastructure	Project	Off-grid internet experiments
Open Energy Monitor	Energy & Infrastructure	Project	Energy monitoring tools
Open Source Ecology	Ecology & Resilience	Project	Open industrial machines
Permacomputing	Computing & Culture	Concept + Directory	Community exploring regenerative computing
Permaculture Research Institute	Ecology & Resilience	Publication	Permaculture knowledge
Plan 9	Tools & Software	OS	Experimental OS
Post Carbon Institute	Ecology & Resilience	Research	Energy transition research
Project Gutenberg	Knowledge & Preservation	Library	Public domain books
Public Domain Review	Knowledge & Preservation	Publication	Curated public domain
Resilience.org	Ecology & Resilience	Publication	Resilience thinking
Simplifier	Computing & Culture	Philosophy	Durable and understandable tech

Name	Domain	Type	Description
Small Web	Community & Practice	Essay	Conceptual anchor
Movement			
Solar Internet	Energy & Infrastructure	Research	Solar networking experiments
Solar Protocol	Energy & Infrastructure	Infrastructure	Solar-powered distributed web
Suckless	Tools & Software	Community	Simple UNIX tools
TempleOS	Tools & Software	OS	TempleOS archive
Archive			
Text-only Web	Tools & Software	Tool	Text-mode browsing
Tildeverse	Community & Practice	Community	Unix shell communities
TinyTools	Tools & Software	Directory	Small web tools
Uxn	Tools & Software	Tech	Minimal VM
Whole Earth	Knowledge & Preservation	Archive	Historical catalog
Catalog			
Archive			
XXIIVV	Computing & Culture	Personal wiki	Personal computing philosophy + tools