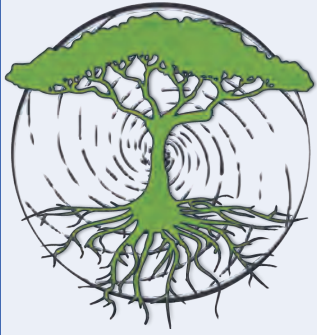


Permaculture



Design

Regenerating Life Together

Transportation

Paradigm shift

Transportation choices

Pigeons & rabbits



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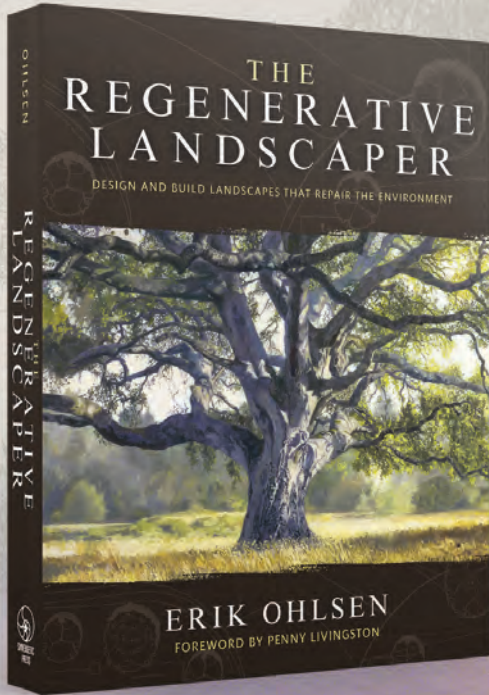
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February 2024

Issue #131

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Permaculture is a holistic system of DESIGN, based on direct observation of nature, learning from traditional knowledge, and the findings of modern science. Embodying a philosophy of positive action and grassroots education, Permaculture aims to restructure society by returning control of resources for living: food, water, shelter, and the means of livelihood, to ordinary people in their communities, as the only antidote to centralized power. For 40 years Pc has combined top-down thinking with bottom-up action to make a world of difference in over 100 countries. We are everywhere.

Editor's Edge

Transportation is the lifeblood of modern society, enabling the movement of people, goods, and ideas across vast distances. However, our current transportation systems often come at a high cost to the environment, contributing to pollution, habitat destruction, and climate change. Permaculture designers use a holistic approach to designing sustainable systems, and creative transportation concepts offer innovative solutions to mitigate these negative impacts and create regenerative, resilient communities.

This edition of *Permaculture Design* contains thoughtful articles that discuss various transportation factors that a designer might encounter when designing a permaculture system. Not only do designers take into account how people are moved about, but also how to move animals, crops, supplies, materials, and natural resources, like the transportation of water through the permaculture landscape.

At its core, permaculture emphasizes the integration of natural ecosystems with human habitats, seeking to mimic nature's patterns and processes to create abundance and stability. In the context of transportation, this means reimagining how we move ourselves and our resources in ways that align with the principles of permaculture.

One of the fundamental permaculture concepts that influences transportation is localization. By prioritizing local production and consumption, communities can reduce their reliance on long-distance transportation networks, thereby lowering carbon emissions and enhancing resilience. This can be achieved through strategies such as supporting local farmers markets, promoting urban agriculture, and fostering decentralized manufacturing hubs. By shortening supply chains, communities can minimize the need for fossil fuel-powered transportation while simultaneously strengthening local economies and food security.

Another key principle is the integration of multiple modes of transportation to create interconnected networks that are efficient, accessible, and environmentally friendly. Permaculture advocates for the use of human-powered and low-impact modes of transportation, such as walking, cycling, and sailing, whenever possible. These modes not only reduce greenhouse gas emissions but also promote physical activity and community engagement. In addition, the development of public transit systems, including buses, trains, and trams, prioritizes efficiency, affordability, and inclusivity, ensuring that transportation options are accessible to all members of society.

Furthermore, permaculture concepts emphasize the importance of regenerative design, seeking to minimize negative environmental impacts and maximize positive outcomes. This involves integrating transportation infrastructure with ecological restoration projects, such as reforestation, wetland restoration, and habitat enhancement. By incorporating green infrastructure, such as vegetated swales, permeable pavements, and wildlife corridors, transportation networks can mitigate the effects of urbanization, reduce storm water runoff, and provide habitat for native species.

Innovations in technology also play a crucial role in advancing sustainable transportation within the framework of permaculture. Electric vehicles, powered by renewable energy sources

such as solar and wind, offer a cleaner alternative to traditional gasoline-powered cars. Also, advancements in autonomous vehicles and shared mobility services have the potential to optimize transportation efficiency, reduce congestion, and enhance access to transportation for underserved communities.

As we confront the challenges of climate change and environmental degradation, it is imperative that we rethink our approach to transportation through the lens of permaculture. By embracing localization, integrating multiple modes of transportation, prioritizing regenerative design, and leveraging technological innovation, we can create transportation systems that not only meet our needs but also enrich our communities and restore harmony with the natural world. Through collaborative effort and collective vision, we can pave the way towards a more sustainable and resilient future for all.

In addition, permaculture offers a holistic perspective on transportation that goes beyond mere functionality. It recognizes the profound social and cultural dimensions of mobility, acknowledging the importance of equitable access to transportation and the preservation of traditional knowledge and practices.

In many communities, particularly in rural and marginalized areas, access to transportation is not just a matter of convenience but a matter of social justice. Communities become empowered through participatory decision-making processes that prioritize their needs and preferences. This might involve investing in community-led transportation initiatives, such as cooperative transportation services or community-owned bike-sharing programs, that provide affordable and culturally appropriate options for mobility.

Moreover, permaculture designers can encourage the preservation and revival of indigenous transportation practices that have sustained communities for generations. These may include methods such as horse-drawn carts, pack animals, or traditional watercraft, which not only have low environmental impact but also carry deep cultural significance. By honoring and revitalizing these traditions, we can foster a deeper connection to place and heritage while promoting sustainability and resilience.

Permaculture designers should not think of transportation being limited to the movement of people—it also encompasses the movement of resources within and between farms and homesteads. This aspect is crucial for optimizing efficiency, minimizing

Next issue:

Energy

**If you have something for this issue,
please send immediately.**

Energy

submission deadline: June 1

ing waste, and enhancing overall sustainability.

In permaculture design, careful consideration is given to the movement of resources such as water, animals, and harvested crops. Efficient water management, for example, involves capturing, storing, and distributing water in ways that minimize energy inputs and maximize ecosystem benefits. Techniques such as rainwater harvesting, swales, and keyline design help to capture and channel water across the landscape, reducing erosion, replenishing groundwater, and supporting healthy plant growth.

When it comes to transporting animals within a permaculture system, the emphasis is on minimizing stress and maximizing welfare while also optimizing their contribution to the farm ecosystem. This may involve rotational grazing systems that allow animals to move freely between different pasture areas, mimicking natural herd behavior and promoting soil health. Additionally, integrated animal systems, where livestock are raised alongside crops, help to transport nutrients as they cycle through the system and enhance overall system resilience.

Harvested crops are another resource that requires careful management and transportation within a permaculture system. Rather than relying solely on fossil fuel-powered machinery and long-distance transportation networks, permaculture emphasizes the use of human-powered and low-impact methods for harvesting and transporting crops. This might include hand tools, bicycles, wheelbarrows, or even simple animal-drawn carts, depending on the scale and context of the farm. By minimizing the distance between where crops are grown and where they are consumed, permaculturists can reduce their carbon footprint and strengthen local food systems.

Good permaculture design encourages the integration of food forests, perennial polycultures, and agroforestry systems, which produce a diverse array of crops while enhancing biodiversity and ecosystem services. In these systems, the transportation of resources occurs organically as plants interact with each other and with the surrounding environment. For example, nitrogen-fixing trees might provide nutrients for adjacent crops, while pollinator-attracting plants support the health of fruit and nut trees.

Overall, transportation of resources within a permaculture system is viewed as an integral part of the larger ecosystem, where efficiency, resilience, and ecological harmony are prioritized. By employing thoughtful design strategies and embracing low-impact methods, permaculturists can create regenerative systems that not only produce abundant harvests but also support healthy ecosystems and thriving communities.

Transportation concepts in permaculture offer a comprehensive framework for reimagining how we move and connect in the world. By embracing localization, integrating diverse modes of transportation, prioritizing regenerative design, leveraging technology, and fostering social equity and cultural resilience, we can create transportation systems that serve both human needs and the needs of the planet. In doing so, we can pave the way towards a more sustainable, equitable, and harmonious future for all. Δ

Thom Illingworth

Our magazine needs your input. What have been your experiences as a permaculture designer, educator, practitioner, or enthusiast? We have some exciting themes coming in the next editions and we'd be overjoyed if you contributed. Have you tried designing alternative energy sources in your permaculture systems? What have been some challenges as a permaculturist that you encountered that were unexpected? Did you find ways to mitigate or overcome them. Do you have any ideas that might help budding permaculture designers? Share some ideas with us; we'd love to hear from you!

Publisher's Corner

Last Friday morning, around 3:30, I woke to the sound of a whippoorwill. It came from the wooded hollow about 50 ft. outside our bedroom window. It came closer from Zone 4 all the way to Zone 1, until it seemed to be just outside the room, knocking on the door. Then it moved away. When I was a child, we heard whippoorwills almost every day at dusk and dawn, all summer long. This was the first one I'd heard in months. You cannot see one of these birds. I must have heard hundreds of them but have never laid eyes on one. Their perfect camouflage renders them magically invisible, like a Siberian tiger or one of those Arctic animals that blends perfectly into the snow. Humans are not yet so perfectly matched to this world, where we evolved and where we belong. Highways are being born on a daily basis, and habitat destruction plows onward.

The whippoorwill is one of the casualties of road building, clearcutting, and general destruction that goes in the name of Progress. It's one of the myriad precious, irreplaceable things we've almost lost. Officially, it's not endangered, even though their numbers are down over 60%. Just how far does a population have to plunge to move from "concern" to "threatened" to "endangered?" I suspect if it were human populations, we would have passed through various levels of hand-wringing that have as yet no names.

I've heard the whippoorwill every day since then. Optimistically, I imagine there's more than one, that they will elude destruction, find suitable companions, and raise a new generation to repopulate the woods. And then move out to further woodlands, replenishing the threatened populations of the Southeast, inspiring poets and regular people everywhere, who have never heard a whippoorwill before. That is a more optimistic version of me than most people know.

Does the whippoorwill matter? It matters to the bird. And it matters to me. Δ

A Permaculture Look at Transportation, Cars, and Suburbia

Paradigm Shift

Jan Spencer

TRANSPORTATION IS AN ESSENTIAL PART of the human experience. *Homo sapiens* migrated out of Africa to all over the world tens of thousands of years ago. People have forsaken the security of home for trade, glory, adventure, and conquest. The Roman road network was a wonder of the ancient world. If humans can survive their remarkable adventures over the millennia, finding our way to sustainability shouldn't be too much to ask. Sustainability will take a lot of work, but will be well worth the effort.

A climate-controlled car, loaded with electronics and gadgets, can easily cover the Oregon Trail in three days instead of the months of danger and discomfort in a covered wagon that were required only 150 years ago. At this point, there are more cars and trucks in the US than people who drive them. Half of all Americans live in suburbia, and cars have made suburbia possible with enormous consequences.

This article is the first in a series with the heading "A Primer For Paradigm Shift." In future issues, *Permaculture Design* will feature additional articles in the Paradigm Shift series, including a deconstruction of capitalism, aspects of paradigm shift, taking paradigm shift to a wider audience, real-life examples of paradigm shift, and more.

This article will include

- The rise of cars
- The relationship between cars, capitalism, and suburbia
- Permaculture meets the automobile
- Transforming a suburban property
- Remaking the neighborhood

Key words: footprints, external costs, prioritize time and money, edges, allies and assets, common cause

Transportation, cars, suburbia, capitalism, paradigm shift

Cars dominate not only our transportation system, but also our very lives and economy. We can think of cars as a proxy for the behavior of capitalism and its consumer culture. We are beholden to cars and their demands. That relationship is not a healthy one, and it's not an accident. To understand our transportation system and the rise of the car and to push back, we need to understand capitalism.

Of great importance to the discussion about transportation, cars, urban design, and our lifestyles is the mythical but seldom questioned growth-based economy. Understanding the concept of doubling could illuminate the thinking of many people who have not considered the implications of this growth-based way of life.

An economic growth rate of 2% means that economy will double in size in 35 years. That means double the need and use of energy and resources. [Note, a 2% economic growth rate would be considered only OK and nothing to write home about.]

Here is a quote from a recent article written by researcher and writer Richard Heinberg in regard to economic growth. "Since 1997, we have used over half the non-renewable resources extracted since the origin of humans." That statement is a challenge to process.

This writer can't verify that data, but at the very least, the concept should jolt one's perception of our current state of affairs. Can one imagine our sprawling cities, freeways, suburbia, and their impact on the environment being twice what it is now in 30 or so years? If this economic system doesn't grow, it doesn't survive. Mayday!

Cars are only one example of how capitalism and the consumer culture degrade the well-being of people and planet. We know what ecofootprints are. That's the damage human activity causes on the natural world. We can add the term social footprint. Our positive human potential, progress, and uplift as individuals and as a society is also diminished by capitalism, the consumer culture. Many familiar products and services including cars, suburbia, pop culture distractions, junk food, and a lot more disempower our social capacities.

Virtually all the well-known problems and downward trends of our time have a common denominator, and that common denominator is this growth-based, cost-externalizing, profits-above-all economic system. Cars are a huge chunk of that economic system. When we thoughtfully push back on cars, we push back on many of the damaging aspects of capitalism and the consumer culture as diverse as climate change, affordable housing, species extinction, economic inequity, and the celebration of vanity and excess.

I use the term "paradigm shift." In the sense applied here, paradigm shift refers to a deep and fundamental change in our values, goals, and how we interact with the social and physical world around us.

Humans have enormous positive potentials as individuals, as friends, neighbors, communities, and society to live healthy, uplifted and productive lives within the boundaries of the natural world. If we don't have a conception of human destiny, we can make one up. These ideals are good ones. There are more.

We can enjoy many of the benefits of these modern times even as we move forward with paradigm shift. An important term to understand is "prioritize time and money." That means we are purposeful with how we manage our own personal resources. Importantly, people can coordinate their own time and money with others for mutual benefit. Common cause is an essential part of paradigm shift.

Moving towards a sustainable society, we patronize the products and services that serve a sustainable future, and we leave the rest behind. We make time for building civic culture. Playing an active part in our communities makes them better places to live. Reducing the need and use of cars fits in.

Many products, services, and jobs we are familiar with at this time in history will not make the cut to a sustainable future. Deciding what makes the cut and what doesn't is a primary task



Steam Ferry



Omnibus



Horse Railway

Antiquated Horse Car

The Rise of the Car



Model T



Trolley

Transportation innovations drive history and economies.

of paradigm shift. The car culture as we know it will not make the cut.

Our focus in this article is transportation, and transportation means cars. Cars and its close companion, suburbia, are two of the most iconic and damaging products of capitalism and consumer culture.

Should those who advocate and teach permaculture actively call for a future beyond cars, capitalism, and the consumer culture? A short review of how cars came to dominate our way of life and worldview and then a thoughtful critique of capitalism through the lens of permaculture's 12 principles can be helpful for answering those questions.

Transportation & cars

Cars did not just appear. They are the most recent in a long series of transportation innovations.

In modern transportation history, the omnibus was a sort of urban stage coach in the mid-19th century. There was the horse-drawn railway a few decades later, a horse or mule pulling a trolley on tracks through town with a schedule. Then came the cable car. A huge innovation was the electric trolley towards the end of the 19th century. An important advance for the trolley was to lower the top of the track flush to street-surface level.

With each transportation innovation, people came to live further and further from where they worked, did their shopping, and took care of other needs. Many trolley companies were actually owned by land development companies. The trolley lines opened up relatively cheap distant parcels of land to suburban residential development.

Trolleys and interurban rail were common throughout the US during the first half of the 20th

century. There was an interurban line here in the Willamette Valley connecting Eugene and Portland, with links to Corvallis, Albany, Salem, and many places in between. In the mid-20s, there were a dozen trains between Eugene and Portland every day. Now there are two, even though our regional population is many times larger.

Eugene had its own public but privately-owned trolley system. It featured a special Saturday night run for Eugene patrons returning late from Springfield. At the time, Springfield was wet, and Eugene was dry. You can still see the tracks here and there around town. Many other trolley systems came to an end, more or less mid-last century with the rise of the car and a bit of big business skulduggery.

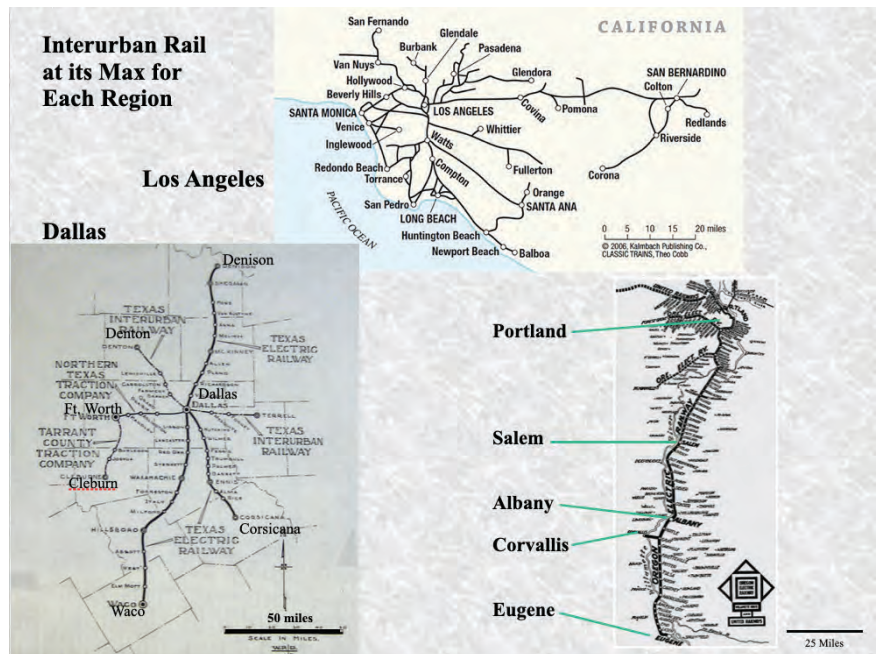
The Los Angeles area had an extensive interurban. The Pacific Electric, almost 100 years ago, could boast of serving distant locations with lines radiating out from downtown LA to San Bernardino, San Fernando, Balboa, Santa Monica, and Long Beach.

I used to live in Dallas. Not long before my time, there was an interurban connecting Dallas to 70-mile distant Denison, also Corsicana, Denton, Waco, Ft. Worth to the west, and Terrell to the east.

Typically, a trolley stop was a commercial area with residential development easing out some distance. One could make their stop, do some shopping, and walk home—the ideal for urban design, the proverbial transit-oriented development (TOD).

All the interurban locations described above and many other have modern fragments of those former expansive networks. Many cities and town are trying to rebuild light rail and trolley along with TOD, but the cost is immense, and cars still rule.

Cars and trucks came to dominate our nation's transportation



Many cities and regions had extensive rail transit.

for a number of reasons.

- Historical timing
- Car-related business interests influenced government policy
- The devotion of capitalism to oversized products
- Cars' appeal to the human love of gadgets
- Advertising amplified that human appeal

included racist property ownership restrictions. The term redlining comes to us from this post-war era.

New uses of social theory made their way into the realm of modern advertising. Purchases with credit became common. The foundations were set for the rise of the middle class. Cars and home ownership took their places as the apex products of the accelerating consumer culture. They were the core products and wants of the mythical American Dream.

And very important to emphasize, suburbia would not exist without cars. The two are economic Siamese Twins.

In Ken's book, he describes how economic interests with much to gain from home and highway construction, have deeply and successfully influenced government housing and transportation policy.

Many with an interest in transportation are acquainted with how General Motors, Standard Oil of California, Firestone Tire, and others with name recognition covertly took over dozens of private city transportation companies with the intent to replace the street cars with buses. The businesses were found guilty of conspiracy to manipulate commerce. Their punishment was minimal. We are all suffering the results. We have cars and sprawl instead of rail and walkable neighborhoods.

The term "jaywalking" comes to us from the 20s and 30s. Before cars, streets were for people. This is not to over-romanticize urban living. Many high-density residential locations in the early 20th century and even still, included terrible living conditions. Cars do not share streets with people so there was a transition period from streets for people to streets for cars, a critical part of transportation history.

Jaywalking is a derogatory term invented by car enthusiasts



Federal Housing Policy late 30's favored White suburbia at the expense of inner city neighborhoods. Ditto post WW II



National Cities Lines, a front company for GM, Firestone & Standard Oil bought many city transportation companies and purposefully destroyed them in favor of cars, tires, oil.

Suburbia Benefits From Great Depression Post WW II Financial Interests Government Policy Interstate highways External costs - cheap energy

Suburbia is a make work project producing homes, furnishings, infrastructure & climate change



Depression era housing policy put many unemployed back to work. Suburbia then was a make work program and still is.

Transportation choices make history and are a product of history.

I recommend a book with the title *Crabgrass Frontier* by Ken Jackson. It's a history of suburbia that includes transportation. Suburbia and cars are inseparable. The book is easy reading and very informative. Ken teaches history at Columbia University. I have talked with him.

Cars ascended partly because of assembly line production in early 20th century. Mass production lowered the cost. US government housing and transportation policy for the past 100 years has favored cars and suburbia at the expense of rail and urban residential density. Roads have been a public expense via taxes while rail has been, for the most part, a private expense, on its own.

Federal housing policy during the Great Depression favored suburban residential development to create jobs for unemployed construction workers. There was a severe housing shortage following WWII, and suburban development again was favored, a well-deserved reward for returning GIs assisted in their purchase by the GI Bill. Government-backed mortgage insurance was made available to facilitate the purchase of those suburban homes.

After WWII, war time industries were retooled to produce civilian products. Those suburban houses were the perfect destination for a flood of cars, refrigerators, furniture, TVs, and the rest. Many suburban developments, such as Levittown

Interstate Highways



Interstate Highways profoundly affected the culture & economy of the US on behalf of cars, highways, oil, suburbia,,



Chrysler Freeway, Detroit. Completed in 1967. Urban freeways destroyed many lower income inner city neighborhoods to benefit suburban commuters.



Northland Mall, 1954 Detroit. The interstate highways facilitated White flight to the suburbs and debilitated traditional downtowns with the rise of the suburban shopping mall.



The chair of the blue ribbon commission appointed by Eisenhower to advise on the possible interstate highway system was a board member of General Motors.

The interstate highways super-charged cars and suburbia.

at that time to shame people who had the nerve to use public streets as places to walk. As cars became more common, their advocates in car clubs and car retailers helped push people onto sidewalks so the cars could have the streets to themselves. Many cities took up the jaywalking cause by outlawing people to walk in the streets.

In the mid-50s, President Eisenhower appointed a commission to study the idea of a limited access, uniformly designed, free-from-stoplights coast-to-coast highway system, ostensibly for military purposes. The chair of the committee appointed by Eisenhower was a retired general with ties to General Motors.

Of course, the commission advised in favor of what became the nation's interstate highway system. The interstate highways pumped up the car culture while opening vast areas on the periphery of cities to suburban residential development during the late 50s into the 60s and up to the present. Again, cars and suburbia go together.

In the late 50s, our family moved from a rural subdivision near Fishkill, New York to a suburban, four bedroom, brick ranch-style home in a subdivision with many dozens of other such homes, in north Dallas, Texas. The property had an air conditioned dog house. We lived in the last built-out suburban neighborhood before more countryside opened up to the north. My dad commuted to Texas Instruments five miles away when Texas Instruments still had a dirt parking lot.

Now, the edge of urban development in that area extends north past the ten-lane LBJ Freeway (I-610), car dealerships, shopping malls, strip malls, new residential developments, and stoplights 15 miles solid to Frisco. The one time lonely Frisco flashing yellow traffic light surrounded by sorghum and cotton fields is now a city of 200,000 and the home of the Dallas Cowboys and the National Soccer Museum. Cars rule.

I have traveled a good deal in Europe. Far denser European cities take up a fraction of the land area compared to their similar population sized American counterparts. has a high level of urban density. Atlanta compared to Barcelona takes up about 25 times more land area even though their regional populations are comparable. Spread-out suburbia is the reason why—suburban sprawl. People live up, not out in Barcelona. We will have a look at Barcelona's exciting "super blocks" in a future article, a pioneering effort to make the city more livable by taking car space, even busy intersections, and repurposing that car space in favor of pedestrians, bikes, children, and community building.

The Interstates were also known for bulldozing minority neighborhoods in many cities so mostly white commuters could access their downtown jobs from their mostly white suburban homes. The Interstate system totals almost 49,000 miles, the nation's largest ever public works project. In today's dollars, the cost would be about half a trillion dollars. The interstates stimulated economic development, reduced use of rail transportation in favor of trucks, and greatly increased the use and dependence on cars. Construction of the interstate system during the 50s and 60s is reaching the end of its intended lifespan.

Along with the aging interstate highways, there is an increasing sense, even among the Mainstream, that highways and cars as we know them are not such a good idea. We need to be making transportation and urban

design plans that are more friendly to people and planet. Do we have the time and money to repair and retrofit our towns and cities to become sustainable? As a level-headed person with great interest in the issue, I would say no way. We simply don't have the money and probably not the time, nor the will to fully repair American cities and towns.

The time? Yes, not the time. There is a price to pay for what capitalism has done to our cities and towns. Some kind of polycrisis, already incubating—part resource, part ecological, part economic, part social, with a lot of karma—will make an unambiguous statement about cars and the consumer culture in its own good time.

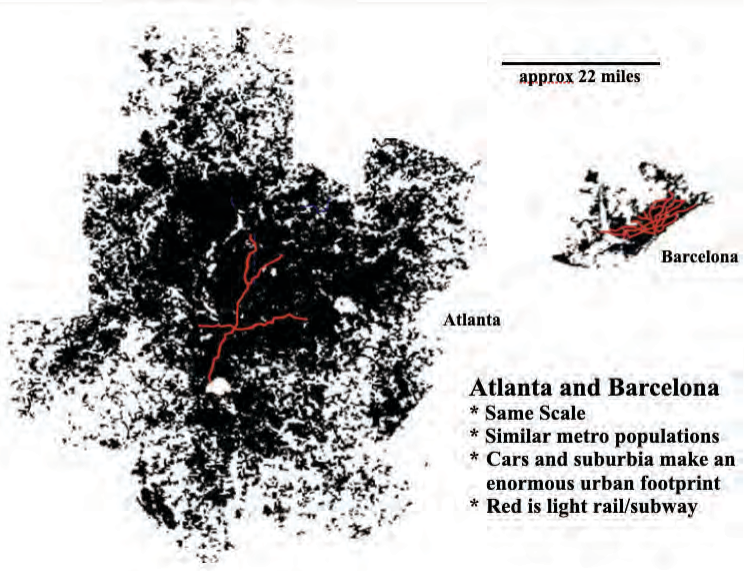
Retrofitting Dallas, Las Vegas, and dozens of other car-dependent cities to make them people- and planet-friendly, given the ecological and economic trends, is simply unlikely. The issue is not just transportation. Those cities need water, food, energy, and other inputs often delivered from hundreds if not thousands of miles away, by truck. There is no easy exit from the car culture. Still, the more people who do create alternatives, the better.

Collaborations between friends and neighbors may be the best option given the inability and disinterest, of the economic system and its keepers to appreciably change course, much less embrace paradigm shift.

I asked Ken Jackson, the author of *Crabgrass Frontier*, if he thought self-serving economic interests, the businesses that profited from cars, highway construction, and suburbia had had a profound effect on bringing about this auto-dependent way of life and its many problems. He said yes, of course.

A term used in economics is "external cost." The term refers to the condition where the price paid for a product or service does not address the damage that service or product imposes on public well-being and the environment.

Various efforts have guesstimated that the cost of a gallon of gasoline, if all the external costs were included, would range upwards from \$20 to \$30 or more per gallon. Some of those external costs include accidents to people and property, air pollution, oil spills, time lost in traffic jams, military costs to



American cities are super-sized and super wasteful.

protect the global oil supply, the dispiriting car-centric urban landscape, costly highway infrastructure and repair, low income people skimping on family needs to pay for the car and its various related expenses.

At the same time, cars facilitate an enormous amount of economic activity such as people driving to their jobs that provide products and services, driving to the store to buy stuff and spending thousands of dollars each year on car expenses. Trucks deliver products to countless stores and shopping centers all over the country. I ride my bike to a nearby truck-dependent big box for my soy milk. Cars and trucks produce an enormous amount of economic activity.

So we have cars and trucks that are responsible for many billions in damage to people and planet, yet we depend on them for many necessary and healthy products and services. We have hitched our fate to a deeply mistaken form of transportation.

Medieval cars

Cars do not need to be a necessity of life. But many millions of people have become hostage to a lifestyle where cars are a near necessity because there are limited options for taking care of their needs without a car.

In the Middle Ages, peasants were exploited and tied to someone else's land with little option. We have an automobile peasantry at the present time. Millions of people are automobile peasants, beholden to the automobile, highway and oil industrial complex. Instead of being tied to the land, these modern peasants are tied to their cars. We are on the receiving end of one of history's most remarkable examples of social engineering. Imagine, millions of people are paying for their own suffering.

Given the immense problems at this point in history directly related to over-consumption, in particular cars and suburbia, we should be pioneering ways to reduce our need and use of cars while keeping the good stuff the current economic system produces. An increasing number of people are already engaged in paradigm shift. We do have allies and assets for this task, with permaculture being one of the most important.

Do I have a car? No I don't. Like many people, I had a car or truck since high school. Even as a big critic of cars, I had my Ford Ranger until last summer when I gave it away after 33 years, to a local charity. It had 85,000 miles. It served me well, and I have no regrets not having it. I ride a self-powered, non-electric recumbent bike year-round. I go for weeks without riding in a car at all.

That said, I am not totally anti-car. I am critical of cars used as is the norm at this time in history. I would be better with one car shared by, say 20 people. That condition, of course, would require far improved public transportation and reworking our urban land use towards the proverbial 15-min. neighborhood, as well as simply not engaging in so many behaviors that require cars in the first place.

A month ago, I discovered there is a small public bus that connects Eugene with Florence on the coast. Another even smaller bus connects Florence to several towns up the coast. So, I put my bike on the bus in Eugene, took the two buses to Yachats, north of Florence. I rode my bike the 25 mi. south from Yachats to Florence along the awesome Oregon coast on a primo sunny and mild December day. I caught the afternoon bus

back to Eugene and rode home from the Eugene bus stop at the train station. I spent 15 dollars on bus fair, had a picnic lunch watching the larger-than-usual waves exploding on the rocks by a lighthouse, and had a wonderful car-free day. The lesson: when we look for alternatives to the usual, we might find there is more available than we realize. We just need to take the time to make use of unexpected opportunities.

Of course, services and options for reducing use of cars are not the reality for most people at this time. Nevertheless, we can still move towards a more conscious way of living. Not owning a car is easier for me than for most people, but I have made thoughtful choices over the years that make not having a car a lot easier. This option is available for many people.

I see electric cars as a distraction—another green-wash. Electric cars are, basically, just another example of marketing a slight variation of a damaging but very profitable product, with little if any interest in seriously addressing the source of the automobile problem.

History is on the side of diminishing car ownership, either by choice or by default. We are already in the early going. I am certain that we will either make the changes required by the laws of physics, history, and karma, or we will wish we had. As they say, Nature bats last. Reducing use of cars and reducing our ecofootprints overall is in our best interest, not only for the natural world but also for our own humanity. People and planet deserve better than cars, suburbia and the consumer culture.

Cars & permaculture principles

Permaculture meets the automobile. Here is a critique of cars based on this writer's take on permaculture ethics—earth care, people care, fair share, and the 12 recognized permaculture principles. There is a lot of overlap between the principles. Comments I make for one principle can be applied to others, so there is a modest degree of repetition. How would you assess cars with permaculture principles?

Observe and interact.

We can easily observe the car culture. It is hard to miss. Cars take up an enormous amount of urban space—eight parking places for each car—and most would say it is a dispiriting landscape with freeways, noise, air pollution, strip malls, franchise fast food, billboards, and all the rest. Interacting with the car-centric landscape cannot be healthy. I ride a bike—I know. We grew up with cars, we are used to them, and we are numb to them. We are forced to interact with them even if we don't want them.

The consumer culture numbs us down so that we cannot imagine and create a society that humans deserve and that we are capable of. We should be active and thoughtful in our short, medium, and long-term personal goals to reduce use of cars and other unhealthy products of the consumer culture. The money and time we don't spend on unhealthy products can be redirected instead towards positive outcomes.

Best to interact with others with similar ideals to reduce ecofootprints and encourage each other. Share these ideas with people who may be new to thinking this way about cars. As we observe the tragedy of cars, we should act on our own sense of what life could be and make common cause with others to push

back.

Catch and store energy.

Cars are dependent on constant energy and money inputs. Cars absolutely perform essential services, but only because there are few options for most people to take care of their needs in other, healthier ways. Oil is amazingly energy-dense. It takes eons to turn plants into oil, then little time to turn oil into gasoline and finally to burn it up. For cars, it is perfect, and it is killing us. Money is energy, too. Less money spent on cars means more money for productive use or simply not spending the money. A green dollar is one not spent at all. Downsizing our ecofootprints can save money, and that could mean less need to work for money to support a car or perhaps create a car share. Diminishing the use of cars means we can catch and store more of our own energy, time, and money for positive outcomes.

Obtain a yield.

Efficiency is a core myth of capitalism. The capitalist myth of efficiency claims the free market allocates resources in the most productive way possible. One would have a hard time imagining a form of transportation less efficient than a car other than even larger cars and monster trucks. By far, the great majority of a car's energy use is simply to move its own steel and plastic carcass. Most of the time, the useful load, a single person and their cargo, is negligible. In terms of efficiency and the laws of thermodynamics, cars are a disaster.

Of course, sensible and modest lifestyles would be a disaster for this economic system. Our own personal yields are compromised by having to buy into a remarkably inefficient System. Spending less time in the consumer culture opens up time to produce more desirable social and well-being yields in our own lives.

Apply self-regulation and accept feedback.

Our economic system does not welcome feedback unless it's profitable. We know cars kill over 40,000 people in the US every year and cause hundreds of billions in property damage. Recall from above, the comments about external costs of cars. All those damages and many more are disregarded by the mainstream economic system. We have more and larger cars than ever. Damage and mayhem is often "good" for this economy.

Self-regulation and feedback to climate change and many other problems would lead to far fewer cars. Homes would be smaller, more densely developed, and more lived in. People would have to learn new social skills. For starters, there would be no junk food, the end of confined feeding of animals, limited violent entertainment, fewer vanity-based products.

The goal for capitalism is not to self-regulate and eliminate problems, it's to make more money from technical innovation to do "something" about the problem but not about the real cause of the problem. Imagine, millions of jobs exist to repair the damage caused by millions of other jobs. Some call this "disaster capitalism". Can you think of anything more corrupt than making money from products we know damage the environment and even kill people—and then, to advertise to encourage the use of those unhealthy products.

If the economic system and those who serve it really cared about public health and the well-being of the natural world, our lifestyles, transportation, urban design, and all the rest would be immensely different from what we have. The need for the economic system to grow is the System's primary goal. Capitalism is simply not able to self-regulate. The economic system is not broken—damage to people and planet in countless ways is just what it does. It is unable and not interested to self-regulate.

Use and value renewable resources and services.

Our transportation system and society overwhelmingly depends on nonrenewable energy. This system is immensely wasteful, and that waste is very profitable. Big cars loaded with tech and big homes loaded with far more stuff than needed make more profit. There are untold books and articles that go into more detail. Try *Small is Beautiful* and *Your Money Or Your Life*. The occasional news item about some breakthrough in fusion power serves to reduce guilt for those who do not want to downsize. A good excuse to keep consuming is the belief that some breakthrough like fusion will made eternal growth, affluence, and excess possible.

Humans have had a very cheap run with fossil fuels. The track record should concern us. The stats tell us in the early days of oil production and use, one unit of energy invested delivered something like 100 units of energy out. Picture an oil gusher. Look at what has been done with that abundance! The economic system does not have the ethics or interest to moderate itself



Oil has enormously subsidized modern lifestyles at great cost.

for the good of people and planet. Cheap energy and resources enable wasteful living. Fusion, driven by profits, would only take irresponsible living to a new level.

Even many electric bikes look more like two-wheeled sport utility vehicles which are loaded with so many features one would have a hard time using it if the battery ran out. Cheap energy distorts reality. We don't need cheap energy. We need to live within the boundaries of the natural world and learn how to value and pay an honest price for what we use.

Produce no waste.

Here, we have lots of overlap with previous principles. Cars, freeways, and suburbia as we know them do address basic needs. People need to move from one place to another for work, play, school, shopping, social needs, and what people simply do in their lives. People need and deserve a home for comfort and security.

Cars and suburbia are supersized because they create more economic activity and profits than slow and simple solutions. Even average lifestyles produce an enormous amount of waste. I have answered the questions of a well-known footprint calculator from the Global Footprint Network. It asks questions about how you live, how you travel, what kind of food do you eat? What do you buy? On and on. My score was "one Earth" meaning everyone on Planet Earth could live like me, and we would be sustainable.

That assessment seems forgiving because I still depend on products and services that are not sustainable. My still very comfortable lifestyle is, without question, not the aspiration of even a lower income person, let alone middle class or affluent. I don't have a car, share my modest home with three other people, am vegetarian, don't have a mobile phone, and listen to cassette tapes. [Check my footprint article in Post Carbon's Resilience online magazine.] Capitalism cannot exist without producing enormous waste. It is utterly dependent on wasting epic amounts of time, energy, and resources.

Cars and suburbia fit within a larger economic and cultural context that we accept without question because that's what we have been taught, and it's what we grew up with and expect. The so-called American Dream is all about working hard to afford excess. A common attitude—people who miss out on affluence and over-consumption have only themselves to blame, as if over-consumption and vanity are desirable goals of life. Excess above what is comfortably needed is waste. A society that uses a lot of resources, like our average of "five earth" footprints, just because of the abundance of Nature, is unethical and tragic. We are only in the early going paying the delayed cost.

I read about apartment buildings in New York City that contained relatively affordable places to live. The article described how the older buildings were gutted so they could be remodeled into fewer but more profitable larger units. Renters who had been there for years had to leave because they couldn't afford the new rent. Affordable housing is a crisis in this country. There is no shortage of space and building materials. Affordable housing is in short supply because it's not as profitable as over-size homes.

Here in Eugene and even across the street from me, the city has spent millions creating rain gardens along streets. Rain runoff from the street is directed from gutters to open cement-

lined channels with various kinds of plants in them. The idea is to clean the water on-site, avoid having the street runoff overload the sewage treatment plant, and prevent storm water running off the street straight into the river.

Of course, we want to avoid pollution. The reason for all these expensive rain gardens is because there is so much impermeable surface on behalf of cars. Add rain gardens to the many other interventions to mitigate the damage caused by cars such as flashing lights for crosswalks, air bags, and now all kinds of on-board high tech warning systems. There is minimal discussion that maybe we should just move away from oil and cars.

Produce no waste is a wonderful idea. A society that produced no waste would not look like what we have now. This country's consumer affluence and millions of jobs are made possible by wasting enormous amounts of energy, resources, and time.

Design from patterns to details.

We are familiar with the patterns of damage caused by cars and over-consumption of energy and resources in general. They are totally predictable. Extinct species, huge issues of drug abuse, homelessness, climate change, celebrity worship, sports, gambling, and a raft of other distractions are all avoidable costs to people and planet. Damaging patterns and products are profitable and are promoted and even celebrated.

Instead, we can be designing our lives for uplifting alternatives. We can do that at home, ideally with neighbors and friends. We can create examples of what is sensible and healthy. Permaculture is the best set of principles and ideals I know of for paradigm shift. Imagine if a city's or town's land use and civic administration were based on permaculture principles for efficiency, fair share, and earth care.

That's a lot to ask for, but bits and pieces of paradigm shift are already happening. We can do what's right, and we can benefit from healthy choices in our own lives as soon as we choose to. The ideals and principles that we put into action in our own homes and neighborhoods—food choices, transportation, grass to garden, and how we contribute to the community are how we can share a healthy vision with others. The most powerful motivation for paradigm shift is showing what it looks like in real life.

Integrate rather than segregate

Our consumer culture and economic system is a social version of a monoculture. It's very narrow and very dependent on a limited set of conditions and resources, like oil, externalizing the cost and distractions. The consumer culture does not value common sense and integrating our needs with others and the environment. Much of our lives have been segregated by fences, security, and distractions.

Several well-known politicians are on record declaring the stratospherically arrogant statement, "The American way of life is non-negotiable." That declaration tells people there are no alternatives to over-consumption, and they are hostage to the needs of the System that is the cause of the many social and ecological problems we are familiar with and damaged by.

The task we have is to declare, as much as we can, our own

independence from that System—not to “drop out” but to “drop in” and help create a society and economy we can be proud of that is healthy for people and planet. Paradigm shift is all about reclaiming our self-worth and showing what humans are capable of.

There are many allies and assets to work with for a preferred future in any community. Our “team” is much greater than we realize. There is untold opportunity to integrate with others on behalf of paradigm shift.

Paradigm shift is all about reclaiming our self-worth and showing what humans are capable of.

Use small and slow solutions.

The American Dream is just about 180° in the other direction from slow and small solutions. Cars and suburbia are neither small nor slow solutions to transportation and shelter.

The consumer culture and its many billions in advertising promote the opposite of small and slow solutions. But here and there among all the nonsense, the System does produce notable products and services that can benefit sustainability. We do not have to accept what we buy as a package deal. A big part of paradigm shift is making good use of what is healthy and leave the rest behind. Product trends over the years do show large numbers of people can make healthy changes that benefit us all.

The turn against tobacco and the rise of organics, healthy food, vegetarian ideals, and lifestyles show many millions do care. Even green-washing shows that the public is interested in important issues. A primary task of permaculture is to bring more people further along towards sustainability. There are countless examples of people and groups purposefully creating alternatives to the System and sharing what they know with the wider world. These are small and slow solutions for our own lives, homes, neighborhoods, communities, and planet.

Use and value diversity.

Social, environmental, and economic inequity is one of the most telling problems of capitalism. We have seen the statistics. Remarkably small numbers of people own remarkably large slices of the nation’s financial and economic pie. This also creates political inequity. The wealthy can buy political influence in a System where money is considered free speech.

All manner of people suffer at the hands of inequity, but non-white people are on the receiving end more so than white. Non-white people are more likely to be affected by polluting industries or intrusive development projects. More poor people struggle with inadequate public transportation. For some

people, paying for a car repair is a priority at the expense of other important needs. We know the term “food desert.” Poor neighborhoods often have less access to healthy food, assuming people can afford it at all.

Permaculture and paradigm shift would do well to reach out to those most affected by social and economic inequity. The goal of paradigm shift is not to create a society where everything is the same. People who take risks that benefit people and planet should be encouraged and rewarded, but we need to redefine what those rewards are. And people deserve some kind of guaranteed security of well-being. That’s only civilized.

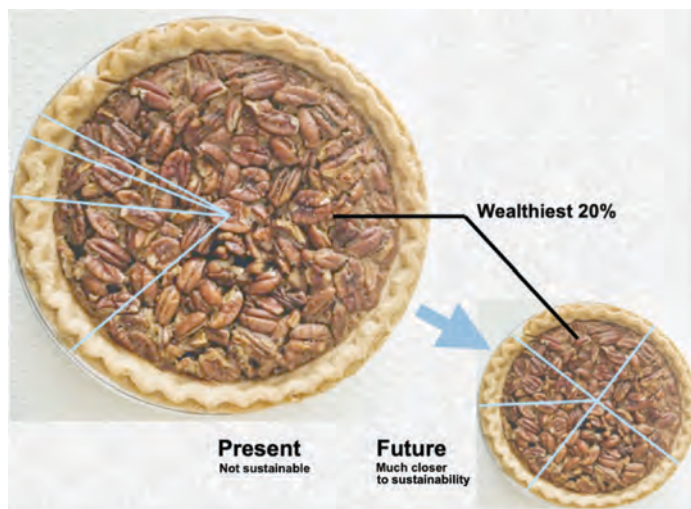
Picture two pie charts, one five times larger than the other. Imagine both pies with slices that represent five different groupings of people according to their wealth. The large pie is current. The wealthiest 20% have a slice that takes up over 80% of the pie. The poorest 20% have only a sliver of a slice.

The smaller pie represents a “maybe” sustainable pie—something like one-fifth the size of the oversized current pie which is in severe overshoot. The new slices are not all the same, but they are much more humane. Compare the actual surface area of the two pies for most wealthy 20%—could this ever happen? In a sustainable future, the wealthy would need to have lifestyle resource use similar to “lower middle class” in today’s over-sized large pie. Any volunteers?

This illustration cannot claim scientific accuracy, but the point is that a sustainable future will need to be very different from the present, and those using the most resources and owning the most money now will need to downsize the most for both ecological and equity reasons.

People who question and critique the current System are also a minority. As for myself, I feel oppressed by the consumer culture. I have to ride my bike through car-infested intersections and more than a few times, if I had not been careful, I would have been run over. When I see large houses, I think, these people are big investors in climate change. In contrast, those who prefer quiet streets, modest lifestyles, clean air, a healthy environment and urban spaces, along with peace on Earth, must endure the mayhem of the consumer culture.

A sustainable society will call for justice and respect for all its diverse members. And those diverse members will need to participate and be productive to help bring about the uplifted



Paradigm shift calls for a smaller pie, divided more humanely.

society we all deserve. Paradigm shift means everyone will need to learn new skills and take on new responsibilities. The benefits from the changes will be worth it.

Use edges and value the marginal.

In a social, cultural, and political sense, advocates of permaculture and related ideals are on the edge of our society. Somehow, we have gained a kind of immunity to the consumer message. We even use mainstream products in new and healthy ways. A big part of our historical task is to share what we know with the wider world about making the human condition better for people and planet. We are a bit evangelical, and we should be, but sharing our ideals and stories should be done in a way that is sensitive to others. After all, advocating permaculture, sustainability, and paradigm shift to the mainstream is, essentially saying, we have a way of life that is better than yours.

Many people have invested their life's energy into being a success as defined by mainstream standards. Many people's identities are what they own. Much of what they own, and by extension, does not make the cut to sustainability. Rephrased, we are saying in effect, your identity does not make the cut to sustainability. Cars and suburbia as we know them, are at the top of the list. We need to show how their lives can benefit by paradigm shift.

We are all on an edge of history. We have access [at least for now] to a great deal from the mainstream that is totally useful for paradigm shift. We also have the historic and unprecedented privilege and opportunity to integrate what is good from the down sloping mainstream with the principles and ideals that can help us bring about a society and economic system that can exist within the boundaries of the natural world and bring out the best in positive human potential. At this point of history, we have the edge of the old and the edge of the new. We can help bring these two edges together for the good of people and planet.

Creatively use and respond to change.

Many of the familiar downward social, environmental, and public well-being trends should motivate us to create alternatives to the mainstream System. Paradigm shift—a thoughtful and compassionate pushback on cars, suburbia, capitalism, and the consumer culture—is the most sensible action we can take in our lives for the present and the future. It touches on many diverse issues.

Capitalism does not effectively respond to a changing world. It depends on and promotes the products and behaviors that are the cause of the many problems we are talking about. Capitalism is creative in trying to repackage the same products so they can claim to address important issues. That's what green-washing is all about. The consumer culture cannot be made planet- and people-friendly.

One of our most important tasks for moving towards sustainability and a healthy society is to recognize, reach out to, and make common cause with allies and assets. Allies and assets are social entities. They could be formal organizations or ad hoc. Many are totally mainstream and may have no awareness of permaculture and paradigm shift, yet there can be much common ground.

As mentioned earlier, almost every social and civic organization exists to help make the community a better place to live. And almost all those entities have a particular focus of action to encourage their members to make efforts to mitigate some particular damage caused by capitalism and the consumer culture. Those efforts for repair can be social, public health, environmental, and more. All these allies and assets are on the same team. Working together can multiply the effectiveness of all these groups.

These groups can include the school PTA, Scouts, Red Cross, Kiwanis Club, and thousands more. One of our tasks is to call attention to our common cause. These groups can all be invited to participate in a wider movement for the good of people and planet.

Another values asset that deserves careful attention is the “wisdom of the world's great spiritual traditions.” This wisdom is one of the most powerful sets of ideals we have to work with as a tool for positive change. The wisdom of the world's great spiritual traditions is a perfect companion to permaculture and paradigm shift. These are social ideals, not religious. This wisdom tells me that faith communities should be helping to lead the charge towards a sustainable future.

Here is that wisdom:

- Care for the natural world
- Modesty of lifestyles
- Service to the community
- Uplift of the spirit
- Being accountable for our actions

Paradigm shift—a thoughtful and compassionate pushback on cars, suburbia, capitalism, and the consumer culture—is the most sensible action we can take in our lives for the present and the future.

These ideals also tell me that faith organizations have a great deal of common ground with each other that can bring them together to play a greater role in moving their members and the communities they are part of, towards a more uplifted and sustainable human society. This wisdom is perfect at the individual level to inform our individual lifestyles and perfect for society as a whole—perfect to help bring about a healthy and honest economic system; perfect for moving towards sensible urban land use, transportation, and sustainability.

There are plenty of reasons to motivate for paradigm shift, and we have untold allies and assets to work with. There is a place for everyone.

Earth care, people care, fair share

Earth care, people care, fair share. The critique just completed is nowhere near comprehensive. One could easily write a book about the 12 permaculture principles in regard to cars, suburbia, and capitalism. Suffice to say, the needs of the growth-based economic system and its consumer culture are not compatible with a sustainable society, uplift of the spirit, and the well-being of people and planet. There are powerful and practical alternatives.

This concludes this writer's permaculture critique of the mainstream system. I hope it leads to useful discussion. Next, let's have a look at several more aspects of transportation and then a look at some positive initiatives and potentials in suburbia.

Congestion, rail, and bikes

Certainly many cities in the US are making newsworthy efforts to push back on cars. New York City is set to become the first city in the US to impose congestion pricing, a car pushback scheme where certain cars and trucks will need to pay up to \$20 per visit, essentially a toll, to access certain parts of lower Manhattan. NYC also has a Public Plaza Program to empower citizens to turn public places that qualify such as streets, parking lots, and odd places, into pedestrian-friendly community use. The results can be dramatic such as prohibiting cars from much of Times Square, the most well-known public plaza in the city. There are dozens of others.

Los Angeles Ecovillage is working with the city to convert a minor city street next to the ecovillage, into a pedestrian plaza. Another project related to the street conversion is turning the long closed auto repair shop on the corner of the small street and a larger street into a community center. That conversion has already happened. The city street to plaza is a city program. Other streets in LA that fit the criteria could also shift from cars and concrete to people and plants.

Over the years, there have been many freeway fights in the US with significant victories. San Francisco would look far different from today if multiple freeway plans back in the 60s and 70s had been realized. The Panhandle was supposed to be a freeway. The Embarcadero Freeway was torn down decades ago. Part of Market Street is now only for taxis, buses, and bikes.

Boston's Southwest Corridor is a 6-mile-long public park with playgrounds, bike paths, community gardens, and both commuter and Amtrak rail lines sunken below ground level and off to the side. The land area for this wonderful community asset was intended to be a ten-lane urban freeway. Local people stopped it.

Even in Eugene, if divided highway plans from 50 years ago were all realized, the city would be far, far different from now. Thanks to a public vote, they were stopped. More recently, we also stopped the West Eugene Parkway. Eugene does have a notable presence of Bus Rapid Transit and is known for being comparatively bike-friendly. Still, freeway expansion is a threat if funding can be found.

Light rail and trolleys are making a hopeful comeback in Dallas, Denver, Phoenix, Salt Lake City, Kansas City, Seattle, and dozens of other cities. Most of these cities have a long way to go to match the rail transit networks many had 75 years ago (See https://en.wikipedia.org/wiki/List_of_United_States_light_rail_systems).

Periodically, the Congress for New Urbanism makes public a listing of aging and particularly poorly designed (they all are) urban freeways it considers good candidates for removal, usually to be replaced by some approximation of the streets and boulevards that existed before the freeway (See <https://www.cnu.org/our-projects/highways-boulevards/freeways-without-futures>).

Many cities boast new and expanding bikeways with some, importantly, protected from cars. Here in Eugene, the city is taking a lane from cars on several important streets and building curbs and bollard-separated two-direction bikeways with their own traffic signals. Other cities are doing likewise.

From where I live, I can bike 30 min. to the University of Oregon with only a few blocks shared with cars. I can do a quick 5-mi. bike loop only blocks from where I live, on both sides of the river, and there are no cars at all.

The US lags on car-free modes of transportation. A comparison of modes of traffic—walk, bike, transit, car—between cities in the US, Canada, Australia, and Europe shows the best bike cities in the US are 4th tier in Europe in terms of



Alghero, Sardegna. Fourth balcony right side. The writer stayed here 3 weeks summer 2023. It's the main street with everyday businesses.

percentage of trips residents make by bike.

Recall the concern over “peak oil.” Peak oil of conventional oil has already passed. The current expanded production in the US, of both oil and natural gas, is thanks to fracking. Of course, fracking includes new risks and damage to geology, water supplies, and in likelihood, only delays the inevitable decline in oil and natural gas production.

With its steep rate of depletion, it’s a good question how much longer fracking can prolong the consumer culture. We would be smart to make use of this prosperous edge to transition towards an economy and society that can last without causing immense damage to people and planet. Paradigm shift both encourages and shows how people can make this transition sooner than later.

Bikeways safe for riders, new light rail and trolleys, and deconstructing some freeways are welcome, of course, but in the US, they do not add up to a serious challenge to the car-dominated status quo. This nation has built itself into a near-impossible corner. It has squandered immense financial and material resources on cars, suburbs, and their expensive and damaging infrastructure. There is no easy exit.

Several cities in Europe, especially Paris and Barcelona, have actions, plans, and more intentions to push back on cars in ways far beyond any in the US. I have visited many cities in Europe including Houten, Copenhagen, Stockholm, Freiberg/Vauban, Strasbourg, Nice, Toulon, Barcelona, Alghero, Utrecht, Milano, Roma, Paris, Budapest, Warsaw, Ventspiel, and many more. I had my own bike in all those places, and I love urban bike riding. The popular destinations people love to visit in these places are almost all car-free. Few tourists are attracted to parking lots and freeways.

I rented an apartment in Alghero, Sardegna, population 45,000, for three weeks last summer. Alghero is a popular vacation destination on the northwest coast of Sardegna. The apartment was on the fourth floor looking down on the leafy main street of town away from the tourist area. There was a sidewalk cafe just below my balcony. Almost every shop for a daily need was within walking distance from flowers, grocery, clothes, and bikes. The street, one lane in each direction, no bike lane, was a free-for-all with cars, bikes, scooters, and motorcycles maneuvering for advantage. There were cars parked all along both sides of the street, often double parked. Alghero is a lovable mashup of car culture and walking culture. The accessibility by foot or bike to so many shops and points of interest left me with a strong impression and so did the traffic.

To be honest, most of these often-celebrated European cities are also overwhelmed with cars. Even Groningen, Holland, famous for its bike culture, has big box stores with acres of parking lot, a kilometer from the historic center of Groningen, I was awestruck by how many bikes there were, while the people walking enjoyed the car-free downtown and all its popular sidewalk cafes.

Photos from 50 years ago in China show rivers of bikes in the big cities. Chinese capitalism appears to be just as seduced by cars as anywhere else. Updated photos show massive freeways, traffic jams, and suburbia. To their credit, China’s fast train system is totally impressive. Still, it’s a shame they fell into the same automobile swamp common in other parts of the world.

There are cities in South America such as Curitiba, Bogota, Buenos Aires, Santiago, and Sao Paulo that are all known for becoming more bike- and transit-friendly. Still, cars rule.

Cars and suburbia as we know them will not make the cut to an uplifted and sustainable future. Best to be making the sensible transition towards a preferred future sooner rather than later. A growing number of people are already well into making this transformation.

Let’s have a closer look.

From the street, anyone would notice something different about these two properties in the middle of this middle class suburban block in Eugene, Oregon. The houses on one side of the street are mostly three-bedroom, frame, have been remodeled, and date from the mid 50s. The other side, new houses with more square feet and two stories, have replaced a wholesale nursery over the past 15 years. Those larger houses take up more of the smaller lots than the small grassy yards. The two quarter-acre properties of interest here, are green all the way to the street with cherry, apple, plum, and chestnut trees, marionberries, black berries, and blueberries. The house without a driveway has a grape arbor entry where the driveway used to be. Stepping onto the property, one enters a small preview of paradigm shift.

My place is a permaculture landmark in the Pacific Northwest. Literally, thousands of people have visited over the years to see what a nothing-special suburban property can become. Together, these two properties spark the imagination—”what would this street, its culture, and neighborly relationships be like if all the property owners decided to make full-on permaculture-based transformations to the homes, properties, and lifestyles of the owners?”

When I bought my place in 2000, the intention from the start was to do a permaculture makeover for many reasons. I wanted to reduce my ecological footprint by producing more basic needs on site including food, water, energy, creative expression, and aesthetics. I wanted to show what suburbia can look like. This place could not be more political.

Suburbia and its intimate companion, cars, along with their extensive support products and services, are, perhaps the most wasteful assembly of resources and human talent in history. This is not only in reference to mega homes with 5, 6, or 7 bedrooms and giant pickup trucks that require ladders to access the cab. The waste reference applies to even modest suburban homes and compact cars. The larger the home, the larger the car or truck, the greater the waste. That said, suburbia can still be an asset. It can still offer itself as a remarkable opportunity to address and repair many social, land use, environmental, and housing problems and other challenges at this point in history. But important to add, we should absolutely quit building more suburban homes, the highways that serve them, and the cars that crowd them.

My house is also a source of income. I rent three rooms and that, along with a detached passive solar accessory dwelling unit (ADU) behind the main house, helps increase the residential

density to help slow down the rate of car-dependent suburban sprawl. To advocates of New Urbanism, this is “tactical suburban redevelopment.” My place demonstrates many aspects of permaculture applied to suburbia.

I wanted to create a model of transformation that would be useful for others. The reimaged and repurposed 50-year-old modest suburban home and property points the way towards a preferred future. This place is paradigm shift in the real world. My very loose guess: if there are 150 million people living in American suburbia, at a generous four people per house, that comes out to 35 or 40 million suburban homes.

Considering most of those homes could accommodate more people, we can densify suburbia. Of course, there would need to be a significant shift in how most people regard their living conditions. Our culture does not value sharing our homes with non-related people. Densifying suburbia would be an immense undertaking for people to change their attitudes and lifestyles. I can't imagine one of my siblings sharing his 4,000 s.f. house with others.

But current observations and opinions are based on existing conditions. We have many social, economic, and environmental indicators and trends already presenting themselves that say that humans cannot continue their present over-consuming trajectory. What may sound out on the fringe now may well not stay out on the fringe.

Public discussion in the media, government policy, concerned organizations, and individuals that calls into question the consumer society overall, not only suburbia and cars, can all

play a big part in changing the growth-based, consumer-culture paradigm.

For example, one might receive tax credits for renting a room in their house to a non-family member. People who share their homes might get a break on homeowner's insurance. Local permit fees might be structured to provide a break for ADUs and remodels that add bedrooms or convert garages into living space (to qualify for tax credits, new cars would have to be prohibited. And note, I give a break on rent to housemates who do not have a car).

Say the annual rental income in a suburban home goes tax-free for the first \$4,000. Say rabbis, priests, ministers, imams, and other spiritual leaders encourage their congregations to buddy up and share their homes with others. Imagine the Sierra Club or American Association For Retired Persons (AARP) advocating home-sharing and car-sharing to their members.

Increasing residential density minus the added cars could make transit more possible. Increasing residential density in suburbia could lead to new businesses that can complement that neighborhood's needs so that we move towards walkable and bike-able neighborhoods. More density can lead to more green space.

For more livable communities, we could follow the lead of Local 20/20 in Port Townsend, Washington, and create a financial mechanism where people can invest in local development and businesses that address community social and environmental goals.

Our 42nd Avenue in Portland, Oregon, is similar. Our 42nd

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Keith Johnson does a remarkable job of maintaining this listing of permaculture resources in North America and around the world. Send us your listing (send to Editor@ permaculturedesignmagazine.com). We do reserve the right to refuse any ad that seems to us to be counter to the principles and vision of permaculture. There is no cost for the listing.

We are seeing more and more inquiries about how to get involved... where is a good course, where is a good volunteer opportunity, etc. and also about how to approach permaculture design for a new property. Send us your listings so prospective students, customers, and clients can find you!

Avenue is a small and local non-profit community development corporation that shows how small-scale redevelopment that fits progressive criteria can benefit the neighborhood.

Imagine suburban strip mall parking lots repurposed into mixed-use business and residential. There could be incentives to encourage eco-friendly businesses like bike shops and cooperative enterprise. The residential above the shops could be designed as ecofriendly quads where several people share expensive infrastructure like kitchens. These intentional residences could offer car shares and other amenities that support lifestyles with reduced ecofootprints. The existing

Permaculture is like a new language, and it brings people together in surprising ways.

car-centric streets that serve the existing strip malls could be reworked to make them safe for bikes and bus rapid transit or even light rail. An existing lane of traffic could be repurposed to bike and transit as needed.

Paradigm shift and an uplifted, sustainable future is not a matter of technology—it's a matter of elevating our own consciousness and recognizing that making use of the many positive opportunities all around us can lead to diverse benefits.

My place

When built in the mid-50s, my house was a modest two-bedroom with 1,100 s.f.. Its long axis is oriented solar-friendly east-west, with the south side facing the backyard. The long axis of the rectangular quarter acre lot is oriented north-south. There are no large trees creating shade, although an apple, a cherry, and several non-food producing trees were removed in the early years to make better use of space.

Transforming a suburban property is both common sense and personal. A location, a climate, rules and regs, reducing ecofootprints, and the goal of producing useful products on-site meant this place largely designed itself. But an owner's personal preferences make the outcome unique.

A permaculture design course I took in 1990 while living in Texas has also been a big help. The first time I ever saw the words permaculture and suburbia put together was in Houston. That was Bob Randall's subtropical food forest in the early going in the late 80s. In 2003, my place in Eugene was the first video on YouTube identified in the category "suburban permaculture." There are hundreds now.

That first-in-category YouTube video and interview was made by the Yuba Gals from near Nevada City, California.

Robin and Janaia documented many dozens of permaculture projects, mostly on the West Coast under the banner, Peak Moment TV (Search "Peak Moment TV" on YouTube).

Suburban properties have surprising potentials. And important to note, I have seen extensive suburbia in South Africa, New Zealand, and Canada. I have not visited Australia, but I have seen photos and Google maps. Suburbia seems to be most popular where the English language is spoken.

Transforming suburban homes and their nearby strip malls could create thousands of jobs and benefit people, planet, resilience, social cohesion, and sustainability. Many existing design and construction skills like carpenters, electricians, architects, engineers, and landscapers can be applied to transforming suburbia along with many kinds of manufacturing jobs for products such as heat pumps, solar hot water heaters, Galvalume® metal roofing, insulation, and more. My own property transformation required dozens of trips to the local big box home improvement store, and I also provided employment for people doing work I couldn't. A new kind of general contractor is already emerging: one who is fluent in permaculture and knows the other professionals who specialize in rainwater catchment, de-paving, passive solar remodels, edible landscaping, and other people- and planet-friendly features. Even now, there are dozens of dead shopping malls that have been retrofitted here and there all over the country, into mixed use commercial, residential, and other useful purposes.

Making a start

Suburban property transformation is within reach of millions of people. With more time than money, I have done most of the work here on my place myself, but a typical middle class income could afford to pay for much of the work to be done.

How to start? Home owners, like anyone, can take a look at the news and decide they want to be on the right side of history. Search online, "suburban permaculture" or "retrofit suburbia." There are books, articles, and many YouTube videos about suburban permaculture. Some cities have specific permaculture groups or "guilds." Some cities and towns have Meetup groups with names like permaculture, organic living or gardening, urban homesteading, preparedness, and other related titles.

Search online, "permaculture" and the name of your town or city. You may have to do a bit of detective work. There is probably more permaculture and similar activity in your town than you know about. Finding progressive persons and groups from your search may boost your effort. You might visit permaculture sites nearby you can gain ideas from an in-person visit. You also might find permaculture design courses online.

Also to help make a start, consider one's own unique financial conditions. And yes, money can buy happiness. To increase the likelihood of having a positive outcome to what we buy, identify one's "priorities of time and money." For a property transformation, for example, one could prioritize grass to garden, an edible landscape, a sizable rainwater collection and storage system, passive solar built or remodel, depaving, or perhaps all of these or other priorities. Prioritizing time and money also means spending money on products and services

that move us closer to our personal goals. Instead of a vanity project like a kitchen remodel, ocean cruise, or new car, consider spending that money on your property transformation. People with lesser incomes and assets might combine resources into a co-op for common cause.

As you read this account, you will see what my priorities have been relating to time and money. This form of time and money management has worked out extremely well. Technically, I have a near-poverty income, but I have defined my own priorities, done much of the work here myself, and have many systems that replace the need to earn and spend money. My place is the product of my priorities and so is the time to write this article and do what I want (including low-cost trips to Europe).

Early on, I helped a friend remodel the one-car garage into a living space. That turned the home into a three-bedroom. Later, I built a passive solar 400 s.f. ADU that is now my living and work space. I do use the house kitchen and bathroom—no need to duplicate those costly expenses. I have been renting those three bedrooms for years, and the garage remodel and ADU construction costs have long since been covered. The solar hot water heater paid for itself long ago and now saves money and reduces impact on the environment.

This transformation project started with sheet mulching the grass with cardboard and compost. I had a garden eight months after moving in where before, there was simply grass. There is edible landscaping everywhere on this quarter-acre property—apple, pear, peach, fig, mulberry, nectarine, and English walnut. There are trellised grape vines, kiwi, domestic blackberry, boysenberry, as well as culinary herbs. I anticipate climate change with two young olive trees and even a 7-ft. lemon tree although, at this point, I do need to protect it from the cold a dozen or so nights over the winter. Eugene is in plant hardiness zone 8b closing in on 9a.

I have two 1,600 gal. rainwater storage tanks, plus a 3,000 gal. food grade tank added eight years later. All tanks receive rainwater from a Galvalume® metal roof which I installed and which is, by many accounts, the best kind of surface to collect rainwater. Galvalume® has a silvery looking industrial finish, not paint.

Early on, I took out the driveway and replaced it with a storage shed and edible landscaping, including a grape trellis above the roof of the shed and a productive English walnut tree, where I once parked my pickup truck. It's now large enough to climb in. I outsmart the squirrels and harvest many pounds of walnuts.

My own smaller footprint lifestyle complements my property. I have been vegetarian for over 40 years and no longer own a vehicle. Riding a bike and producing food here, I grow my own transportation energy.

Social and civic

I make time to engage with my neighbors and community as a board member of my neighborhood association. I also have a written agreement with the city of Eugene to look after a 65-tree filbert grove in a park on public property a few blocks from

home. We have transformed that filbert grove. Once overgrown with blackberry and English ivy, it now looks great. It doesn't produce like a commercial grove but still, in a decent year, I gather as many nuts as I want. I make time to do that.

I love to collect filberts on a mild sunny day in October, by the bike path along the river, with the breeze rustling the cottonwood leaves above, no cars, a view of the river through the trees and Eugene's iconic Spencer's Butte rising in the distance. It's fun sifting through the short grass by hand looking for filberts, pausing to enjoy the ambiance and having conversations with people passing by. To me, this is a high quality of life.

A single property transformation is great, but a sustainable future will call for increasing the scale of this new kind of suburbia. I worked with a neighbor removing a 10-ft. high 40-ft. long ornamental laurel hedge. We had to work together because the hedge was flat on the property line. Instead of the hedge, we now have plums, mulberry, black berries, currants, grapes, and more. The project required working together, and we both benefit. This is a small example of expanding the scale of transforming suburbia.

Fences down

There are examples of neighborly collaborations going a lot further than me and my neighbor. In Davis, California, and across the country, a growing number of friends and neighbors are taking fences down and integrating their properties in ways beneficial to all involved. These examples show how people can trade the typical large suburban eco- and social-footprint

Riding a bike and producing food here, I grow my own transportation energy.

boxed-in lifestyles for a more ecological, resilient, and socially cooperative suburbia. This is paradigm shift in the early going.

In Davis (<https://nstreetcohousing.org>), a couple with a property in a mid-century neighborhood bought the property next door and took down the fence. Magic. Over time, other houses on that block, centered on the backyards, came up for sale and were bought by like-minded people and over the past 30 years, one by one, fences came down, and an identity emerged. There are now even allied properties across the street.

N Street has purpose and cooperation. Time and money is put to productive use. The properties, acting together, received a zoning change several years ago which has allowed them greater flexibility for how they manage their properties in terms of



Allies and assets—organizations to work with are everywhere.

setbacks, landscaping, and construction.

N Street is retrofit cohousing. It is a mutually beneficial organization. People still have their private property and privacy, but the fences are down. N Street has a shared ideal that allows for much greater collaboration and common cause. N Street is a powerful example of what suburbia can become.

Remaking suburbia can be formal and legal, like N Street, or it can be ad hoc. One major benefit to making an ambitious multi-property project legal is, it's legal. Participants don't need to worry about a yellow letter in the mail from the city.

That said, smaller-scale collaborations can be discreet and make significant changes with next-door properties as well, under the radar. Nearby neighbors from me, within shouting distance, have taken fences down, and the kids roam as they like where there used to be fences. There is a significant amount of interaction between the properties. A tiny home on one property is a close neighbor to a small strawbale residence on the other property.

Places in Eugene

Another location in Eugene is East Blair Housing Cooperative. EB dates back to the early 80s. It is a legal housing coop that owns eight tax properties. People who live there are members of the co-op. There are responsibilities for living there and many benefits. Residents learn social and communication skills for working with each other.

A major benefit is that the eight properties can be managed together. People living in the modest townhouses with only small outdoor space can have access to a garden area at another co-op location that does have space. There is a shared sauna, a shared tool room, a community house with shared washing machines, music room, and big tree house in the shared kid area.

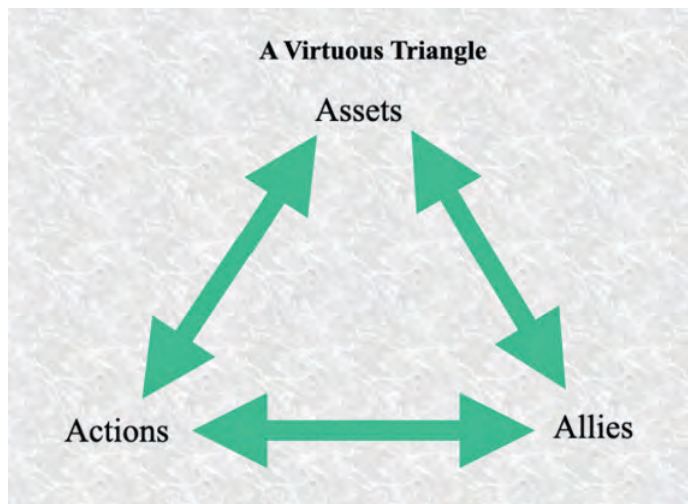
One of my favorite features at EB is the depaved 10-car parking lot. What was once an asphalt expanse along the alley is

now a fun party site with sunken fire pit and picnic table. There is edible landscaping, shrubs, flowers and trellises for grapes and kiwi fruit. Party lights hang from the trees and trellises.

There are other properties with fences down in Eugene and other examples of suburban and urban permaculture. Any group of suburban neighbors could collaborate in an informal way and duplicate these and any other kinds of projects that they chose.

We have had dozens of site tours over the years in my neighborhood and lots of other parts of Eugene. We travel with bikes and visit properties with notable features that show what paradigm shift can look like. These tours are a powerful educational experience. Some tours have attracted 4 or 5 people, while others have drawn 60 or 70. Site tours are great ways to share what people are learning to reduce ecofootprints and build community. The future of suburbia and beyond comes down to sharing what we are learning, how we prioritize our own time and money and making common cause with allies and assets.

In 2015, our neighborhood hosted the Northwest Permaculture Convergence. There are dozens of regional permaculture convergences all over the country. One can search online to locate them. Attending is encouraged. Ours was a



Any two points produce more of the third.

suburban convergence. We held the weekend event at our neighborhood rec center, 10 min. by bike from my place.

We estimate over 700 people participated in both the free and for-pay parts of the event. Our neighborhood association was a big help. People from out of town camped in neighbors' backyards. We had a hospitality coordinator. There were workshops, plenary sessions, awesome food cooked on site, an outdoor expo, site tours, social games in a huge circle, and much more. We made good use of allies and assets in the neighborhood.

My 23-year project reimagining and reworking this simple



Suburban permaculture: the writer's backyard in Eugene, Oregon.

quarter-acre property has been one of the most creative and rewarding experiences of my life. Thousands of people have visited over the years. My place is a community and regional educational resource. Now and then, people I don't personally know tell me the positive changes they have made to reduce their own ecofootprints and produce more basic needs on their own properties thanks to our on-site tours.

I threw the frisbee in Golden Gate Park in San Francisco several years ago on a sunny cool day with total strangers. They were good. After the fun session, we chatted. I mentioned I was from Eugene. We had a great laugh when we discovered the young woman among us had been in my backyard on a site tour a couple years before. Permaculture is like a new language, and it brings people together in surprising ways.

Summing up

Cars and suburbia are two of the most iconic and over-sized products of our affluent society. Over-consumption is what makes affluence possible, and affluence is the source of a wide range of familiar and deepening problems: social, political, economic, environmental, and even spiritual. The profits from cars, oil, highway construction, suburbia, and related products enrich a relatively small number of people, while society and planet suffer for those profits.

The wealth, affluence, and economic output made possible by the over-consumption of resources and energy over the short term diminishes our social and ecological well-being over the long term.

People care, earth care, fare share—a permaculture assessment of cars, suburbia, capitalism, and the consumer

culture can lead to only one conclusion: these oversized artifacts and the short-term value system that is responsible for them are not compatible with permaculture and a healthy, uplifted, and sustainable future.

Permaculture practitioners, advocates, and teachers should explicitly call for our society to move past capitalism and offer their students, friends, and readers solid advice about paradigm shift. A thoughtful and compassionate pushback on cars, suburbia, capitalism, and the consumer culture will help mitigate virtually every downward trend we know. We have many allies and assets to work with. Countless public interest organizations and movements are on the same team and can work together far more effectively in common cause—no need to wait and no permission required.

Suburban properties and neighborhoods can be places for moving forward with paradigm shift. We can make remarkably good use of our own time and money. Friends and neighbors can work together to increase the scale of transformation, and that transformation can become a core part of a green restoration economy to benefit people and planet.

The permaculture principle of edges applies to history as well. We can bring together the useful products, services, and know-how from the down-sloping consumer culture with the promise of permaculture, the wisdom of the world's great spiritual traditions, along with many other kindred sources of inspiration and action. All aspects of paradigm shift support all the others.

Many examples of social, economic, and environmental paradigm shift already exist in the real world, and they help point the way towards a sustainable and uplifted economy and society. What we leave behind from the present that doesn't make the cut will be made up for by a preferred future. Positive

human potential is our greatest renewable resource. Δ

Jan Spencer lives in Eugene, Oregon. His interests are a convergence of urban land use, economics, permaculture, the environment, and social uplift. Jan's PDC was in Austin, Texas, 1991. He has a BA in Geography and has travelled to over 40 countries on five continents. Jan has been transforming his 1/4-acre suburban property for 24 years. It is a permaculture landmark in the Pacific Northwest. Thousands of people have visited. Jan has had a hand in organizing many public education events. His current educational projects are under the heading "A Primer For Paradigm Shift." You can find links to Jan's articles at Post Carbon Institute's Resilience Magazine, YouTube content, audio at Northern Spirit Radio, and podcasts. Search "Jan Spencer, primer, and permaculture." Contact him at www.suburbanpermaculture.org.

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A Primer For Paradigm Shift

Live Zoom Educational Series
May, 2024 Saturday Mornings
May 4, 11, 18, 25; 9 AM – Noon Pacific Time
More info } suburbanpermaculture.org/shift
Register }
Participants choose their own projects.

This course explores how we can make creative and positive use of the historical edge between the economic mal practice of capitalism and a purposeful & uplifted future; friendly to people & planet.

The Primer content is action oriented. A convergence of -

- *Economics**
- *Care For The Natural World**
- *Urban Land Use**
- *Permaculture**
- *Lifestyle**
- *Social Uplift**

This course is perfect for advocates of sustainability and positive social change. Course content intended for use in one's outreach, life, home, neighborhood and community. No permission required.

Topics and Key Words

Critique of Capitalism

- *External Costs** ***Overconsumption**
- *Consumer Culture = Social Engineering**
- *Myths** ***Doubling Time** ***Footprints**

Aspects of Paradigm Shift

- *Reduce Eco Footprints & Calculator**
- *Allies and Assets** ***Time and Money**
- *Not Making the Cut** ***Civic Culture**

Transforming A Suburban Property

- *Edible Landscaping** ***Patio to Passive Solar**
- *6500 gal Rain Water System** ***1000s Visitors**
- *Depave Driveway** ***Home Economics**

Examples of Paradigm Shift

- *Kailash** ***Block Planning** ***Earth Corps**
- *Place Making** ***PLACE** ***Local 20/20**
- *LAEV** ***Boot Camp** ***Our 42nd Av**

Taking PS to a Wider Audience

- *Common Denominator = Same Team**

Paradigm Shift in Eugene

- *Site Tours** ***Suburban PC Convergence**
- *East Blair** ***Greenway** ***Duma** ***Maitreya**

Pushing Back on Cars

- US - *Cars Are A Problem** ***Congestion Pricing**
- *Freeway Fights** ***Critical Mass** ***Dead Malls**
- Europe - *Groningen** ***Houten** ***Vauban** ***Alghero**
- *Super Blocks** ***Car Free Public Places**

.....**Positive human potential is our greatest renewable resource,**.....

Choosing Your Animal “Weeds” and Breeds

Jackie Skrypnik & Jerome Osentowski

MOST OF US UNDERSTAND that animals are integral to any ecosystem and that our permaculture set-ups are no different—they cycle nutrients and create further yields, among other benefits. But how often do we really examine which animal species and breeds are the most appropriate and beneficial rather than just throw some standard laying hens into the mix and call it a day?

Our discernment tends to be a little more advanced when it comes to choosing plants; we guild them out, thinking about their resource and time requirements, their hardiness and nutritional value. Plant volunteers (so-called invasives or weeds) have won a place in our collective hearts with their ability to thrive through neglect, superior nutritive and medicinal qualities, and sheer abundance. If we look at our animal protein sources through a similar lens, we can find much the same potential.

This is something Jerome Osentowski, director of the Central Rocky Mountain Permaculture Institute (CRMPI), has given a lot of thought and developed a lot of insight into over the years. Which animals actually make the most sense in terms of the resources they require (including our time) and what we receive in return?

One animal Jerome holds up as a prime candidate for integration into a permaculture system is the pigeon. He’s heard them called “flying rats”, but that doesn’t put him off. Rather, he reads it as a testament to their resiliency in the face of inhospitable conditions – finding refuge in whatever relative safety they can carve out in cities, being regularly driven out and targeted as pests, yet continuing to procreate and thrive. Sounds like a low maintenance animal if ever there was one. And excellent for eating, as in France where they’re known as “squab”. Since pigeons are generally considered a nuisance, it’s possible to obtain your stock free of charge as Jerome did when he took some breeding pairs off the hands of a landowner eager to dispense with them.

Of course, if you bring a species into your food production system, you take on the responsibility of fulfilling its needs. A pigeon’s food must be provided, yes, but there’s some leeway as to how you source the grain portion—spent brewery grain, weed seeds, end-of-season salvage from a farmer’s field, your own small planted plot. Birds’ diets can be imprinted on them as chicks – you can develop their taste for a lot of comfrey and minimal grain from the outset, for example. Pigeons also require grit to aid their digestion (a minimal and inexpensive item), but aside from that, allow them the habitat they need to look after themselves (nesting boxes, a bathing tub, protection from predators) and they’ll do just that, multiplying for your consumption or sale. No surprise, their manure is a valuable item as well – we have just to recall that seabird guano historically fueled North American agriculture (1). Every species’ dung has its own attributes and best uses, which can be researched, but Jerome finds pigeon manure, considered “hot”, works well brewed into a

fertilizer tea or mixed with carbon and fed to his worms.

Another favorite animal of Jerome’s is the rabbit, and a needs and yields analysis will confirm he’s onto something. Rabbits are considered grazers, but can also qualify as browsers since they’ll eat and digest leaves and woody plant material. At CRMPI, the rabbits receive comfrey and other forage grown on-site, weeds and any chop & drop material, spent grain from a local brewery, damaged fruit from the property, expired produce donated from a local grocery store, willow leaves, and food forest prunings. The only food that has to be purchased is hay. But residual hay from the rabbit enclosure (with their droppings incorporated) then becomes an indispensable resource for building soil and sustaining the worm farm, with no further aging required. So, an input turned resource. And many of the rabbits themselves become meat for the freezer at the end of the season, or can be converted to income by selling them as breeding stock or pets.

Overwintering is a consideration for any animal addition to a permaculture system. According to Jerome, the general rule is to bring your numbers down (i.e., harvest for meat) going into the winter while retaining enough to breed new stock come spring. Even with reduced numbers, though, you want to know that the animals you’re working with are capable of withstanding your winter climate without undue energy on your part. Synergies might be found here, such as Jerome’s solution of having his ducks bunk in with the chickens through the freezing months.

What makes an animal most suitable to a “permanent agriculture” enterprise? Jerome advocates choosing animals that have retained some ability to fend for themselves and can be integrated into a system with minimal tending, which often means species and breeds that are closer to their wild ancestors or have gone feral. Our job is to understand the primal instinct of each animal so we can facilitate their self-tending. For example, rabbits will naturally thrive if our coop design allows for their colony-forming habit and instinctual need to dig burrows for a warm, clean place to breed and protect themselves. Raising them in a colony system requires special considerations like installing a below-ground barrier, but the payoff is a community of rabbits largely looking after themselves.

Jerome also encourages us to think way beyond meat when it comes to the yields of any animal. He uses ducks in a pond as one example. Sure, they may end up as a gourmet protein, but in the meantime they contribute to a pond-worth of manure-enriched water for your plants, keep algae in check by consuming it, control insects like flies and mosquitoes, and can free range happily within a food forest without damaging it while at the same time depositing their manure and eating slugs and other grubs. With an appropriate pump, the sludge at the bottom of the pond, along with some of the nutrient-rich water, can be harvested every couple of years or so as a rich fertilizer for a forest garden. Plus, they have entertainment value, conveniently swimming in their dinner of duckweed—as Jerome puts it, “a

pond without ducks is like watching a blank TV screen!”

By contrast, how does the standard backyard chicken measure up? Rather than evolve by their own wits and means as pigeons and rabbits have largely done (call them “weeds”, if you will), chickens in North America have been selected for production qualities with a higher dependence on human coddling to survive. Much depends on the breed, of course. The ubiquitous Cornish Cross has been bred almost exclusively for large breasts and thighs, a trait that requires more expensive inputs to fulfill. Heritage breeds tend to be hardier, and raising them has the added benefit of perpetuating their diverse genetics in our food system. As one example, Jerome favors the Silver Spangled Hamburg for its foraging and predator-evading abilities, dark meat, and ability to reliably produce eggs.

Regardless, there’s no escaping chickens’ need for grain, which permaculture properties rarely produce at scale on-site and is often expensive and/or imported – not totally congruent with a self-sustaining system. And it’s one reason some people choose to cull their entire flock before winter and order new chicks each spring, to avoid the input costs of grain when overwintering. In this way, they’re beholden to outside parties for the breeding cycle and genetics of their birds and in some ways they’re not much further ahead (financially or sovereignty-wise) than if they were to just buy free range chicken at the store. Jerome suggests allowing a couple of hens in your flock that display “broody” instinct to go ahead and hatch their own eggs, thus keeping reproduction in-house. He does urge folks to consider generally whether chickens might be best kept for personal consumption given the risk of losing an entire commercial flock to avian flu as had been borne out recently in North America and elsewhere.

So, we’re well-advised to think outside the box (or coop, as it were) for our most compatible animal partners. And if we zoom out and imagine our entire bioregion, or all of North America for that matter, as our permaculture site, we can find all kinds of hardy animals that are considered invasive or a nuisance. Think anything from Asian carp, wild boar, and locusts to Canada geese, deer, and rabbits, depending on context. These are potential protein sources already in the system in high abundance, akin to a lawn full of dandelions or an encroaching patch of nettles – either weeds to be eradicated or nutrition for the taking, depending on how you look at it. They might viably displace both industrial, inhumane meat and lab protein – in the problem lies the solution, after all.

Animals, then, have as much nuance and deserve as much careful consideration as plants in any permaculture set-up. The ones we choose can mean the difference between a system that relies on a lot of intervention and external inputs and one with built-in resilience, designed to sustain itself fruitfully over time.

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Pigeons under grass over rabbit hutch

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Transportation of water

Water Management for Every Permaculture Property

William Horvath

Adapted from a blog post at Permaculture Apprentice, with permission from the author. [Editor's note: Controlling the movement of water and how it is transported through a landscape is a critical skill for permaculturists. In this article, the author defines several techniques that permaculturists use to transport and manage water in their designs.]

WHEN I WAS A KID, my brother and I used to enjoy the winter weather at my grandparents' farm in the mountains. In a beautiful interplay of natural forces, throughout the winter and early spring, we would play in half a meter of snow, walk on frozen lakes, and then run from the floodwaters once the snow had thawed.

We always looked forward to wintertime and knew what to expect. Now that we've grown, however, these natural cycles of snow, ice, and floodwater have changed significantly. It's not as if they no longer exist, but everything has become so much less predictable, and so much more extreme.

This weird weather is the new normal for many of us. It is beyond doubt that we all are experiencing more extreme and erratic weather cycles with huge downpours and flash floods on the one hand and extreme droughts on the other.

Maybe meteorologists will one day call this period of weird weather some fancy term such as the "mid-millennium little warming period" and, looking long term, it will just be blamed on a statistical error, but for us living through this period, it is the new normal. If this new normal continues for just 50 years, although it might be a tiny speck of time in the Earth's history from a climate science perspective, for many of us it's going to exist for the rest of our lives and the lives of our children.

It is this new reality to which we have to adapt and create resilient extreme weatherproof systems that are able to handle either too much or not enough water, all in one growing season. In these circumstances, where water from rainfall is generally in short supply while at other times there is run-off from rainfall, the plan for the control of water is paramount and involves a combination of earthworks, soil-building techniques, and irrigation pipes.

Nothing defines the nature of a place more than water! Without water we would have deserts almost devoid of life, but with an abundance of water we have rainforests that are the hubs of the Earth's biodiversity.

Water is always the number one priority for any permaculture system, as Mark Shepard states, "No matter where you go and what mineral deficiencies you have, there are plants who can adapt to these conditions, but no plant can live without water!" [Ed.: Mark Shepard is the CEO of Forest Agriculture Enterprises LLC, founder of Restoration Agriculture Development LLC, and award-winning author of the book, *Restoration Agriculture: Real-World Permaculture for Farmers.*] That's why permaculture design tries to harvest, retain, and rescue as

much water as possible before it is lost from the system.

There are two basic strategies of water conservation on a permaculture farm: (1) storing water in the soil and the diversion of surface water to retention ponds and tanks for later use, and (2) storing it on the surface.

Slow, spread, and sink water

First, we want to slow, spread, and sink water as it falls from the sky into the soil. Following this, our secondary goals, as Ben Falk writes in *Resilient Farm and Homestead*, are to:

- Capture as much water as is reasonably possible.
- Store that water for dry periods.
- Transport that water, when necessary, across the site.

Whether you're going to use only one or a combination of these strategies depends on your site conditions: climate, terrain, soil, your context, etc.

However, the first objective of landscape design is to control and better use the water that falls on the surface of the land. You want to disperse the flow of water, so it can slow down and infiltrate into soil, allowing it to soak in instead of running off the surface. Essentially, you want to make the water stroll, not run, through the landscape, and to make that happen we must shape the land in such a way (more on that later) that facilitates getting water into the ground and storing it there.

Once you've made the best use of the fallen rainfall and stored that water in the soil, you'll get runoff as the capacity of the soil to retain water is reached. Truth be told, you might get this runoff straight away if your site's watershed is in a bad



Water can be diverted to and stored in a retention pond. Photo licensed under Creative Commons 0.0.

shape; however, whatever the case, you can begin diverting and storing that water on the surface in ponds and tanks. How much water you'll be able to store on the surface depends on many factors: your climate, terrain, soil, budget, and similar factors. The entire process of water management for a permaculture farm includes, but is not limited to the following:

- Assessing your site's water needs and resources
- Developing water storages (both in the ground and on the surface)
- Harvesting water
- Reticulating water

Assessing your site's water needs and resources

The first issues to address are determining what water resources are available to your property and what exactly are your needs?

- Your goals and context: What are your water needs, and how do you plan to use your harvested water? Can we do anything without being clear on what our goals and context are? NO... of course not! You'll have to be clear on what you want to achieve with your water system from the outset, because you want to know what size of storage you'll have to build and, most importantly, whether it will be possible to build due to your terrain and your budget.
 - First, think about how you are planning to use the water: do you need water for household use, livestock, irrigation, fish production, fire protection, or recreation?
 - Next, try to get a ballpark estimate of how much water you'll need for each of these activities—calculate how much you need.
 - Finally, think about what you can realistically build. Your budget, available space, and aesthetics are all factors you need to consider.

This thinking process can eliminate a great deal of unnecessary planning and will help you prioritize, based on the reality of your situation. That's why you should always start with being clear on your context and your goals: The best way to save money on a project is not to start it in the first place!

Identify the sources of water

Once you have an idea of your water needs and how you plan to use your harvested water, assess what water sources are available to your farm. You can find this out by searching for information online and by reading the landscape.

So, the first question you should be asking yourself is, "How much precipitation am I getting within the year—what is my average annual rainfall measured in mm or inches?" Secondly, "How is that precipitation distributed throughout the year? Is it being delivered in heavy downpours, only during the winter, or equally distributed throughout the year?"

Your water systems will be completely different based on these numbers. If you get 600 mm average rainfall, and most of it falls in a few huge summer storms, this will require a completely different approach than 1200 mm equally distributed throughout the year.

The precipitation and its distribution will be the foundation for your planning, and you can find this crucial information easily on the Internet just a few clicks away. Now, for other sources of water on your property and beyond, you'll have to do some permaculture detective work.

You'll want to distinguish any streams that are running across your property.

This flowing water is essentially runoff from outside the boundaries of your property and within your watershed. You can't control how this water gets onto your site, but you can use it for your water needs, if necessary. That's why you need to know the precise reliability of your water source. Is it perennial or just seasonal? Can you count on it when there is a drought?

Consider if there is underground water that's available to you.

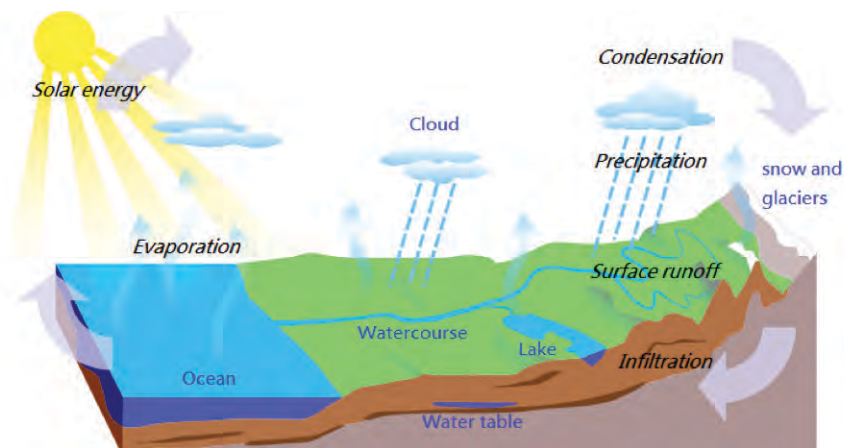
You can't reliably tell how much water you'll have under your feet unless you drill a well, but there is a tell-tale sign you can spot in the landscape: If you have any groundwater, it's another water source which you should take into account.

Watershed—determining your place in the hydrologic cycle and your site's watershed

Once you've got an idea about the precipitation you're getting and other water sources available to you, you can start by analyzing your watershed and determining your place in the hydrologic cycle.

Every piece of land belongs to a watershed, and it's defined as an area of land that drains runoff from rain or snow downhill from the highest geographical barriers, such as hills, ridges, and mountains, to a specific low point, generally a tributary outlet to a larger river or a lake.

On a larger scale, your land is almost sure to be a part of a regional watershed that drains thousands of square miles or kilometers of land, creating streams and rivers. Although knowing your regional watershed might not be of immediate use to you, I would recommend that you first look at the broader watershed.



The hydrologic cycle. Graphic by Alexchris, CC BY-SA 3.0 <<http://creativecommons.org/licenses/by-sa/3.0/>>, via Wikimedia Commons.

Water movement on your site or within your area is a function of where you are in the overall watershed.

For example, if you're high in the hills, you'll have a small flow of water, probably some small creeks, but on the other hand, if you're low in the landscape, there be lots of water, probably rivers rather than creeks.

However, to access your site's actual water resources, you'll have to look at your site's watershed or the sub-watershed. You might belong to an extensive watershed, but the precise quantities will depend on the local site's terrain.

Nothing can be more critical to this process of identifying your site's watershed than understanding the land patterns represented by topographical maps. To do this, you'll have to be able to recognize the contours for their definition of ridges, saddles, and valleys and/or gullies. This is essential for the effective calculation of catchments.

To start assessing your site's watershed, you'll have to define boundaries of your property and the watershed directly affecting your site.

You can do this by looking at a topographic map and identifying the divide lines (or center lines) on the ridges. The lines located at the tip of the ridges determine if water is flowing toward or away from your location. Find those lines.

Once you know where they are, you'll have an idea of the boundaries of that catchment and, by using simple math or on-line tools, you'll get an estimate of the size of this surface area.

Calculate your site's rainfall volume—your water budget

After you have an idea of the size of your watershed and the average rainfall you'll receive, it's easy to calculate your water budget. The first step in doing so is to multiply these two numbers.

1. To calculate rainfall volumes or total rainwater you might get, multiply watershed area by average yearly rainfall. This number gives you the total rainwater volume, assuming there is a 100% runoff, and since we're not calculating runoff from a concrete patio or a metal roof, we need to adjust that number.

2. Get a ballpark estimate of runoff volume from any sloped surface by multiplying the volume of rain that falls on that surface by its runoff coefficient.

The runoff coefficient is the average percentage of rainwater that runs off a certain type of surface, and it all depends on what the surface is composed of and the rain intensity—the higher the intensity, the higher the runoff coefficient. I won't go into details here about calculating rainfall volumes using different coefficients. Instead, if you're going to run some equations yourself, you can use the tables from Darren Doherty's article at <http://www.regrarians.org/off-the-contour-7-earth-dam-design/>.

Now that you've calculated your site's rainfall volume, and taken into consideration any surface streams and underground water, it's time to circle back to your goals and needs to see if this water budget is sufficient to sustain your needs, along with needs of your crops and livestock. Here's where reality kicks in, and you'll see what's possible and what isn't.

Storing water in the soil

Okay, so let's now start with storing the water in the soil. The cheapest place to store water is in the soil—it's the largest storage resource available on most sites. Maybe you have big plans for an interconnected network of cascading ponds, but let's first cover the essentials that won't cost that much money. Our initial efforts should always be to get water into the ground and store it there.

To store water in the soil, you have to focus on two objectives. The first is to **slow, spread, and sink the rainfall** so that the water takes the longest possible path across your land, rubbing to as many things as possible, spreading where it's needed, giving it time to infiltrate before it eventually leaves your site and drains away.

Your second objective is to **build the soil's organic matter**, because the key to the soil's capacity to hold water is organic matter. The organic matter acts as a sponge and absorbs the water that's slowly moving across the landscape. So, it's imperative that, if you want to store more water in the soil, you must promote organic-matter-rich topsoil.

Research shows that soil with as little as 2% organic matter can reduce the irrigation needed by 75% when compared to poor soils having less than 1% organic matter. Therefore, you'll want to focus on developing the soil sponge.

You'll also need to shape the land in such a way as to slowly spread and sink water for that sponge to absorb. To do this, you can use two very famous techniques: (1) keyline plowing/subsoiling and, (2) swales on the contour.

Keyline plowing /subsoiling—keyline pattern cultivation

The concept of keyline agriculture emerged from the drylands of Australia, thanks to P.A. Yeomans. This now legendary Australian bloke has shaped how we permaculturists think about managing water on the farm.



The Yeomans or keyline plow. Photo from Permaculture Research Institute (<https://www.permaculturenews.org/2014/07/30/tera-tracked-earth-repair-apparatus-for-large-scale-earth-repair/>)

The most fundamental concept is to spread water

While keyline agriculture contains many concepts, its most fundamental is to spread the abundance of water from where it is concentrated in wet areas to areas that are consistently too dry. Normally, water flows from ridges into valleys. The ridges stay dry, and the valleys accumulate moisture.

However, by using a keyline cultivation pattern, you can channel the water away from the valleys and towards the ridges, and, by so doing, distribute it evenly over the land and increase the infiltration. This is achieved by using the tractor and ripping lines (opening up furrows in the soil) with a keyline plow parallel to keyline (thus giving the name keyline cultivation pattern).

These small water channels in the soil, these hundreds of small drains, will then intercept water that flows down toward the valleys and move it in the other direction, toward the ridges. The net effect is that rip lines hold water for infiltration, instead of the water running down the slope. With more water in the soil, plant growth and soil microbes increase.

Another fundamental concept is to improve soil

Keyline cultivation is also a soil improvement system, as it promotes rapid topsoil formation. As you create furrows in the soil and rip the subsoil, you allow water and air to infiltrate deeper into the soil where they can be used by plants. This can break up the hardpan and build rich fertile soils, and as you already know, as soil becomes fertile, more water can be absorbed and stored.

So, now you can see why keyline pattern cultivation is such a great tool in managing water on a permaculture farm. It can harvest rainwater, distribute it equally and build rich, fertile soils by turning subsoil into topsoil. I don't want to make this post longer than it has to be, so I won't go into how to find a keyline at this point, instead you can read P.A. Yeomans' book *Water for Every Farm*.

Swales on contour

Your second strategy for storing water in the soil is to use swales. Swales also help us to slow, spread, and sink water, allowing us to hold the runoff water and allowing it to seep into the soil, thus storing it there.

In his book *Gaia's Garden*, Toby Hemenway describes a swale as a shallow trench laid out dead level along the land's contours. It can be anything from one to several feet across, a foot or so deep, and whatever length is necessary. The earth dug from the swale is piled on the downhill side to make a raised mound or berm.

During a rain event, once the soil can't absorb the falling rain any longer, overland flow occurs. Whatever water that the soil can't absorb flows downhill as runoff. As that surface water and rainwater runs downhill it is intercepted by the swale, spreads out along its length, and slowly percolates into the soil.

This underground water then seeps downslope, forming a lens of moisture. The stored water creates an underground reservoir that aids plant growth for tens of feet below the swale. Most importantly, swales are tree-growing systems; by planting trees or other crops on the mound (berm) on the downhill side of the swale (or just below it) they'll be able to take advantage of this soil moisture during dry periods.

Swales prevent gullies from forming

We primarily use swales for this purpose, but swales also prevent gullies from forming by intercepting rainwater, slowing it, spreading it, essentially decreasing its erosive potential. Swales also trap organic matter, and the ditch becomes a rich, thick layer of humus which holds a considerable volume of water. Moreover, once you have it dug out, you can bring that organic matter in, fill it out with wood chips, dead branches....

Now I know that, after hearing about swales, you'll be eager to implement them on your land, but would they work on your property? Swales are the most widely used and abused permaculture water-management technique. There are many factors that influence whether or not you swale your property, depending on your slope, soils, hydrology, type of management, ecosystem's condition, and resource base.



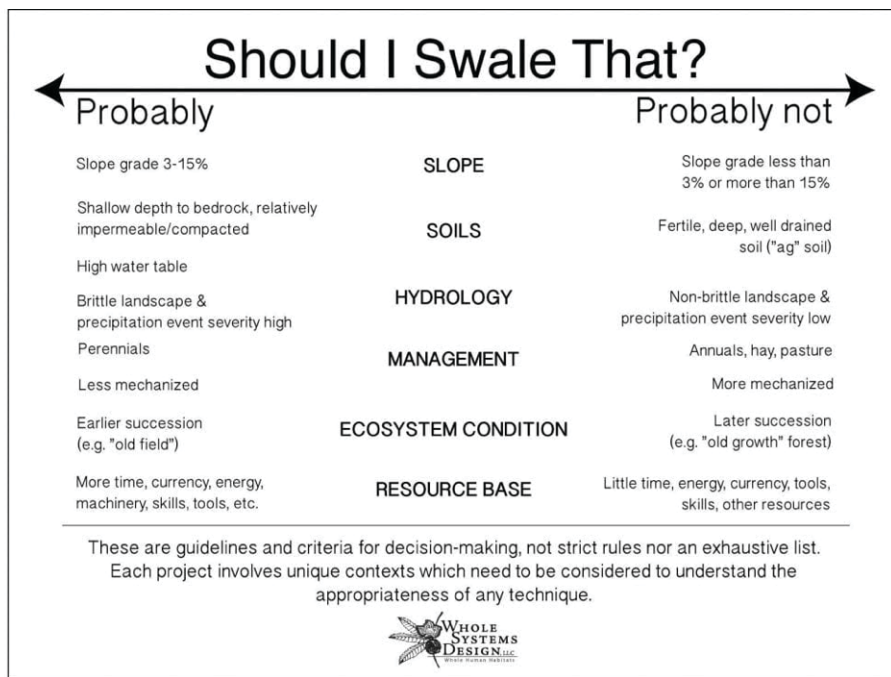
Mulching a newly constructed swale. Photo by Keith Johnson.

Generally, swales are most appropriate for slopes of 5% or less. The size of watershed, the climate, the soil type, and the land use determine how much water flows off the land and into swales. Small watersheds, sandy soil, and forested areas won't produce much runoff. Conversely, large watersheds, and soils with clay and loam, shed more water. The location's climate also plays a part because some areas are more likely to experience intense storms with more runoff.

Here is a nice infographic from Ben Falk I found online, which explains whether you should swale.

Storing water on the surface

Once you're done with storing water in the soil, and developing that cheap water storage in the soil, let's move to storing water on the surface. Here we'll be developing water systems that will store, harvest and reticulate surface water.



Ponds differ in storage capacities

The type of pond you'll be able to construct and, most importantly where, depends on your site's terrain. Different pond types and locations have different storage ratios (the volume of excavation versus the volume of storage), and this is the most important factor in determining how viable a potential site will be. When constructing a pond, what you want to ensure is to make a minimal investment in both time and earthworks for a maximal amount of storage.

Climate and evaporation loss are factors

The type and dimensions of the pond will also depend upon the climate and the amount of average evaporation losses. In semi-arid and arid zones, the amount of evaporation will be quite significant in comparison with cooler climates. Ponds in the hotter zones need to be deep to overcome annual evaporation losses.

When is a swale appropriate? Graphic by Ben Falk.
<https://m.facebook.com/wholesystemdesign/photos/a.222605601110731/1520090814695530/?type=3>

Types of ponds

With this in mind, let's go through different pond types from the most economical and easiest to dig to the more expensive ones that require more extensive earthworks. In so doing, the first rule of working with water is to keep it in its place of highest potential on the landscape, up high if it can be economically placed there. So, we'll start from the locations up the hill and go downhill.

Water storage (options)

On the surface, you can store water in ponds or dams and in water tanks. If you need to store anything less than around 100,000 liters of water or just need drinking water, then a water-storage tank is potentially a cheaper and better option. Moreover, your site terrain might indicate that pond construction would be too expensive so, yet again, a tank is a better option.

You can construct water tanks from various materials and, if you position them somewhere on the top of your property, at highest practical point, you'll have a source of effective gravity storage in conjunction with, for example, a lower-level pond, stream, or groundwater.

The cheapest way of storing large volumes of water (more than 100,000 liters) is in a water-storage dam or pond. In a changing climate, water in a pond is an enormous asset to have, you can use it for many different purposes at once—for aquaculture, irrigation, stock and domestic storage, wildlife habitat, recreation, and more.

Two types of ponds or dams

Generally speaking, there are two types of ponds/dams—an embankment pond and an excavated pond. An embankment, as the name suggests, is made by building an embankment or dam across a stream or watercourse where the stream valley is depressed enough to permit storing reasonable amounts of water.

An excavated pond is made by digging a pit or dugout in a nearly level area. Because the water capacity is obtained almost entirely by digging, excavated ponds are used where only a small supply of water is needed. Some ponds are built in gently to moderately sloping areas, and the capacity is obtained both by excavating and by building a dam.

Gully/keypoint ponds

These are probably the most common of all dams and one of the easiest storage options. Since they are constructed by building an embankment in a gully or in a drainage depression, they are also the most economic option. The required earthworks come down to building a dam wall that needs to be capable of keeping the water in a gully/valley behind it.

The right way to pinpoint the best pond location in the gully/valley would again be by using keyline design principles. In this context, this means first identifying the major keypoint of the slope (where the gully/valley slope section changes from a concave to convex profile). Once you know where the keypoint is located, the contour line on the landscape that goes through the keypoint is the keyline.

This keyline is the highest contour in the gully/valley that can efficiently hold water, and usually the highest overall practical point in the landscape to hold water. The main use for keypoint dams/ponds is to store irrigation water. This irrigation water is then generally released through the large pipe going underneath the dam's wall.

Saddle pond

A saddle is a topographic feature, simply a dip or break along a level ridge crest. Since it's on a ridge, this is the high ground and the highest available water storage in the landscape. This pond has a much smaller watershed than a gully/val-

ley pond, but still can collect water runoff from both sides of the ridge crests. The primary use of a saddle dam is for wildlife and domestic stock, not so much for irrigation.

Hillside/contour ponds

Contour or hillside ponds are built on the side of hills and usually have a three-sided or curved bank, or a long, curved bank straight across the hillside slope (on the contour). The best way to locate these types of dams is to look at your topographic map and check for any widening of the contours along the hillside. Widening means that the terrain is flattening, and this might be a good location for the pond.

These ponds are relatively expensive to build because you have to do more digging for less water storage, but they'll still provide you with gravity storage. Gravity-fed water still gets priority over ponds in the flat. They are usually filled by diversion drains or graded catch drains and have the same use as a saddle dam: for wildlife and domestic stock.

Ponds for the flat sites: excavated tanks, ring tanks, “turkey’s nest” ponds

All these are suitable for flat sites, and since they cannot capture runoff, they need to be filled from external sources. In excavated tanks, the excavation becomes the water storage below the surface level. Earth removed is stockpiled nearby unless additional dam walls are constructed for additional storage above ground level.

Ring tanks are constructed by using earth from inside the ring (circular or shaped to suit topography) to build the surrounding embankment. Water is generally stored above the natural surface. “Turkey’s nest” dams are a variation of the ring tank where the borrow pit is located outside the embankment. Water is stored above ground level.

Water harvesting

Once your water storage is ready, you need to develop and expand upon the methods of harvesting the water. Sure, you can fill your ponds with water from a well, but before you go deep and tap into the underground aquifer, you'll want to use the surface flows and rainfall runoff to fill your water storage.

Water-harvesting drains

You can capture water with water-harvesting drains that will divert the runoff, stream flow, or pumped water into your ponds, and subsequently tanks. Bill Mollison, in his *Permaculture Designers Manual*, explains: “These drains are actually trenches in the soil that aren’t dead level; they are placed in the landscape off-contour and have a slight gradient, with the goal of moving water to a specific location, such as your pond.”

You can think of diversion drains/ditches as being giant earthen gutters placed across the landscape to harvest and move water in a manner like rain gutters on a house. They differ from swales in that they are built to flow after rain and, unlike swales, which are normally built on permeable soils, diversion drains work better when the base and sides are clay-lined.

However, swales or ditches on contour can also harvest water for you, and if they are connected to your pond as they fill up, they will overflow to your ponds. Also, if you have a series of ponds connected with swales, then the overflow of one pond enters the feeder channel/swale of the next. Having a spillway

for a pond is a must, and this way you'll once more be slowing, spreading, and sinking water across your landscape.

Roads as water-harvesting components

Once installed, your roads themselves become a very important and efficient water-harvesting system. Since the roads are compacted, graded, and often made of impervious materials, they have a very high runoff coefficient. In certain landscapes like karst, the roads will be the only available runoff surface. The roads and the adjacent water collection drains can then also be integrated with other harvesting drains and/or swales, contributing to the overall hydration of the farm.

Water distribution

When developing the water resources of a farm, there are two primary water channels in addition to already mentioned harvesting drains. The other type of water channel is there for irrigation purposes. These diversion drains, which are essentially the same thing as harvesting drains (placed in the landscape off-contour, having a slight gradient for moving the water) function as irrigation channels for flow irrigation.

Water from a pond is directed into the drain, it fills up and overflows the top side, along its length, and cascades downhill over crops or paddocks. Basically, you can use these types of drains for your field irrigation of crops such as potatoes, corn, and beans, or water your pastures.

In their book, *The Bio-Integrated Farm*, Shawn and Stephanie Jadrnicek, recommend that, to build this drain, start at the outlet—a pond, retention basin, swale, or some other area with the capacity to hold and safely release the harvested water, and move down the slope towards the desired irrigated area.

Release stored water

Another way of reticulating water is to release water that has been stored in ponds and water tanks using a gravity-fed pipe network. In adopting this approach, you will use your header water tank located at the highest point in your landscape and release the stored water to irrigate your orchards and gardens through the network of irrigation pipes. You could do the same on a bigger scale by using a pond as a source of stored water and a series of irrigation reticulation pipes connected to it.

Conclusion

Managing water and determining how it is transported throughout the landscape are crucial skills in designing and setting up a permaculture farm. No permaculture site has been properly planned unless it first considers how to use the available water resources.

The water systems you establish become a permanent feature of the new landscape and the base of permaculture land development planning. All the water lines—diversions, swales, terraces, dams/ponds, and channels—form the foundation that other infrastructure components (structures, farm roads, fencing, etc.) will follow.

In summary:

- You want to boost the overall resilience of the farm by first storing water in the soil. This is done by building soil’s organic matter, using swales and keyline cultivation pattern.

- Once you have evenly hydrated the whole landscape, you can capture the runoff rainfall with harvesting drains and fill up your water tanks and ponds. Keep this water for times of drought and release it through irrigation channels and pipes to rehydrate the landscape while you're waiting for the water droplets to return. Δ

William Horvath is the founder of the website, Permaculture Apprentice. According to Mr. Horvath, having a permaculture farm and being a farmer are just a means to the end of creating a good life for himself and his family, ensuring a meaningful livelihood and helping the earth's damaged ecosystems. He strives to make permaculture a much more viable option for an average person with a plot of land, no matter the size. He believes it is the right path for us to take, for the future of our children and our planet. See www.permacultureapprentice.com

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4. Ludwig, Art. Create an Oasis with Greywater: Integrated Design for Water Conservation, Reuse, Rainwater Harvesting & Sustainable Landscaping, 6th ed. Available from Oasis Design. <https://oasisdesign.net/greywater/createoasis/>
5. *Permaculture Design's* Water Bundle. The Water booklet bundled with the 9 back issues of Permaculture Activist/Design

that focus on water and earthworks, a \$60 value, for \$40. The following issues are included (note that some of these are available as photocopies only):

Permaculture Activist V.4 (1989): Earthworks: water conservation, small dams, ponds, keyline design

Permaculture Activist VI.3 (1990): Water: Forests and the atmosphere, catchment, pond design

Permaculture Activist #32 (1995): Animals & Aquaculture: Animal polycultures, small-scale cattle, goat dairy, keyline design, feral chickens, bee plants, constructed wetlands

Permaculture Activist #44 (2000): Earthworks & Energy: Spreader dams, horse swales, earth dams, machinery, carpet-lined ponds, constructed wetlands, biogas, windmills

Permaculture Activist #47 (2002): Watersheds: Water4sale, basins o'relations, watershed development, gabions, urban runoff, beavers, skywater center, conservation investment, peat bogs, rabbits

Permaculture Activist #52 (2004): Aquaculture: EcoAquac, Fish4Health, dowsing, pond design, greywater biotreatment, North American polyculture, managing for native species, integrated village fisheries, Vietnam

Permaculture Activist #71 (2009): Earthworks: Hopewell Mound Water Management, Belize, keyline, road and dam building, Northwest agroforestry, permaculture & landscape architecture, earthbag construction, low-watt refrigerator

Permaculture Activist #78 (2010): Water Wise: Restoration engineering, watershed relations, Colorado runoff gardens, cisterns in Saudi Arabia, energy use & water, traditional Mexican catchment, rooftop gardens, home water

Permaculture Design #100 (2016): Water Extremes—Drought & Flood: "Capturing the rains of Hurricane Odile" by Brad Lancaster; "Flatlands, flash floods, and permaculture" by Bruce Blair; "Lessons from water" by Bonita Ford; "Mycorrhizal fungi in water extremes" by Peter McCoy; "The Australian Keyline Plan" by Ken Yeomans; swales, rain gardens, and more.

Regenerate Change—A Recipe for Social Alchemy

Abrah Dresdale & Adam Brock

HUMANS ARE SOCIAL PRIMATES, hardwired for both territoriality and mutualism. Sure, dominance and hierarchy are natural, but so is evolution—including evolution directed towards new ways of navigating quarrels. Which is a relief, because none of us are running enthusiastically towards our adversaries, or members of our beloved community that are angry with us. Our nervous systems and lived experience too intimately know that conflict is hard and real.

So how do we deal? We might choose to avoid conflict through deferring confrontations, or operating under pretense. We might fan the flames with our own self-righteousness, eventually fueling the heat so much that it burns bridges in its wake. Regardless of the strategy, the outcomes are frequently dismaying: ruptured relationships, broken trust, even rampant “cancel culture” and social blood baths. We’re no strangers to these dynamics at Regenerate Change, and it breaks our hearts to see toxic conflict plague incredible, visionary organizations and communities over and over again.

Here’s the thing: regardless of the harm we might cause, we’re not at fault for these erosive spirals of conflict in our work. But it is our responsibility to adapt and evolve from the conflict narratives we’ve inherited from westernized overcultures, wrought with messages of annihilation, genocide, and exile. As leaders of social and “over-cultural” change, we can craft our roles and hone our conduct to practice regenerative conflict, even when it feels scary at first.

What if instead of treating conflict like capitalism treats waste, we resist throwing “away” precious friendships and professional partnerships - even when harm has occurred?

Can we see conflict as compost? An opportunity to break down the particles of our past to nourish our character and fortify our collaborations?

Rupture and repair, a cyclical conflict framework employed in the field of personal and organizational psychology, truly mimics the dynamism of the natural world. Forest fires, for example, can repair degraded landscapes and generate new beginnings; serotinous seeds underground sprout and understory shrubs and smaller trees finally reach sunlight from the clearing in the canopy, bolstering biodiversity.

We too can tend burns, knowing they are prescribed for us humans as opportunities for rapid growth, if we take them. The repair portion of the rupture and repair cycle is critical and too often omitted. It requires us to act from the place of the initiated adult and step bravely forward, even if we’re unsure where we will land. If we stay paralyzed and don’t take the first step towards repair, it is all too easy for tension to escalate in relationships and trust to erode, sabotaging beautiful partnerships and powerful coalitions.

What if we commit to no longer let infighting capsize our collective efforts at changemaking?

Can we sense what’s at stake? And understand the costs if we neglect the incessant call to practice active rupture and repair?

In our own paths as individual changemakers and as consultants at Regenerate Change, we’ve witnessed so many unintended impacts from toxic conflict:

- Inability to bring one’s whole self to a relationship or work engagement
- Patterns of avoidance that degrade the abundance and diversity in our social circles and professional networks
- Pretense and deception as coping mechanisms to avoiding confrontation
- Feelings of shame and guilt driving strategic decisions after big ruptures
- The fracture of collaborations after disputes on social media

The good news is that conflict is like rest: we may avoid it, but we truly need it. And, in the same way our overstimulated nervous systems can learn to rest with the right practices, so too can we begin leaning into tension and productively engaging



with conflict.

With the right conceptual frameworks and a little practice, we can shift our perspective and begin to alchemize conflict—knowing that going through it rather than around it will enrich, rather than erode, our relationships and organizations. At Regenerate Change, we've supported our clients (and each other!) through many turbulent situations, drawing from multiple lineages of conscious communication along the way. Recently, we've distilled these learnings into a new pillar of Regenerate Change work: Conflict Composting.

Conflict composting

Conflict Composting is a wayfinding tool that helps individuals and organizations increase their literacy at identifying and navigating the many forms of conflict. By more easily distinguishing between challenge, conflict, violation, and harm, community leaders and organizational directors can act more skillfully in shifting group dynamics from intimidation and fragmentation to restoration and transformation. In these subtle but powerful shifts, conflict can become generative, much like rich compost.

When members of a group adopt conflict composting processes and practice leaning into tension as the norm, conflict ends up becoming a generative force:

Trust builds

- Transparency reigns
- Authenticity becomes baseline
- Contradictions to isolation prevail
- Closeness increases

Are you seeking a regenerative approach to navigating conflict among your colleagues and collaborators? Learn more about the art of Conflict Composting below in our Featured Framework. And keep reading to learn about our one-on-one Resourcing Sessions to guide you in implementing these regenerative practices in the unique context of your changemaking work!

A visual guide to composting conflict

Confused about the difference between challenge, conflict, violation and harm? Or which tools are appropriate to address each one?

This month's Featured Framework unpacks and distinguishes different types of conflict that may arise in workplaces, grassroots organizing teams, or coalitions. Check out our current best thinking about regenerative conflict in our new free resource: A Visual Guide to Composting Conflict. Download the Guide here: <https://regeneratechange.us1.list-manage.com/track/click?u=8fe5b79ccf19d49e64b95e785&id=9bbb9114e&e=9ec8aacc5c>

Resourcing for individuals + new organizations

"Make mistakes faster" is a design direction that comes from Resilience Theory. Leaning into tension and trying on new unconditioned responses to conflict means

there will likely be mistakes, which let you know you're moving out of paralysis and in the right direction!

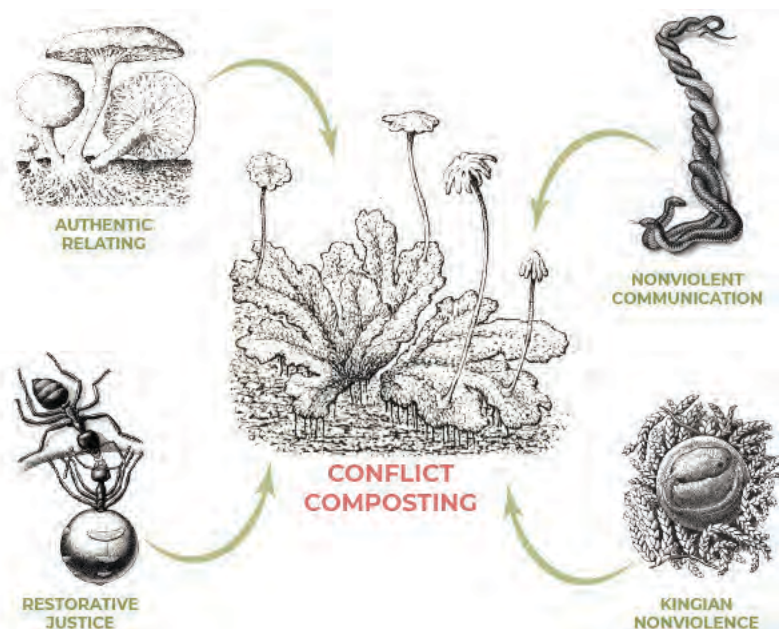
When challenging circumstances confront you and your colleagues, our one-on-one resourcing sessions are there to support you. In these sessions, one of our Organizational Ecologists work with you to understand regenerative Conflict Composting techniques and apply them to your organization, institution, or business.

Composting conflict in a national coalition

Our team has explored regenerative conflict practices for years, but our understanding of conflict composting didn't fully blossom until our recent work with the National Sustainable Agriculture Coalition (NSAC). As a national network of grassroots organizations advocating for sustainable food systems at the federal level, NSAC plays a critical role in the USA's food movement. However, the organization's many member organizations—representing a wide diversity of geographies, identities, and cultural norms—lacked a clear set of cultural expectations for equitable, inclusive practices.

Over the course of six months, Regenerate Change worked with NSAC's DEI committee to listen to member needs, develop a custom version of our conflict composting framework, and train members in responding to conflict with a variety of restorative practices. While NSAC is only beginning to integrate the new system into its culture, members already familiar with it have reported great results, with challenging moments being handled with more clarity and less anxiety. Δ

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Transportation Triage after Peak Everything

Permaculture and Freeway Fights

Mark Robinowitz

PERMACULTURE DESIGN WAS DEVELOPED in the 70s in part as a response to the energy crises of polluting, finite fossil fuels. Shifting societies to be energy efficient would require total transformation, including reduced dependence on globalized transportation systems, part of long term planning for the downslope of fossil fuel supplies imposed by Nature.

Most permaculture practice is focused at the individual level such as family gardens or small farms. Some efforts include larger approaches: community gardens, neighborhood sharing networks and similar systems aimed at increasing resilience and interdependence. At its best, permaculture is not only about growing food, it includes design strategies to shift industrial civilization toward practices better able to endure the rise and fall of fossil fuels. As a primary consumer of concentrated energy, transportation networks deserve focus from permaculture practitioners—at all levels, from personal choices to national funding priorities.

Several experts have written about permaculture and transportation, notably

- Toby Hemenway, “[The Permaculture City](#)”
- Richard Heinberg, [Post Carbon Institute](#)
- David Holmgren, “[Retrosuburbia](#)”
- Jan Lundberg <https://sailtransportnetwork.org/node?page=1> www.culturechange.org
- Jan Spencer, [SuburbanPermaculture.org](#)

This article includes a summary of my involvement in efforts to prevent highway expansions as means to prevent environmental damage and promote changes to energy policies. One of the freeways I fought was canceled due in part to my efforts, but that success did not lead to long term changes toward conservation and efficiency. That shift would probably require sustained disruptions to energy availability. We all had foreshocks from the oil shocks in the 70s and more recently, COVID closures in 2020 (both of which temporarily reduced traffic levels).

Most discussion of transportation alternatives focus on options to driving that reduce the rate of increased traffic growth, not societal level transportation “triage” that anticipates decline in overall energy availability due to depletion. We need to redirect the planned trillion dollars in highway expansions toward projects

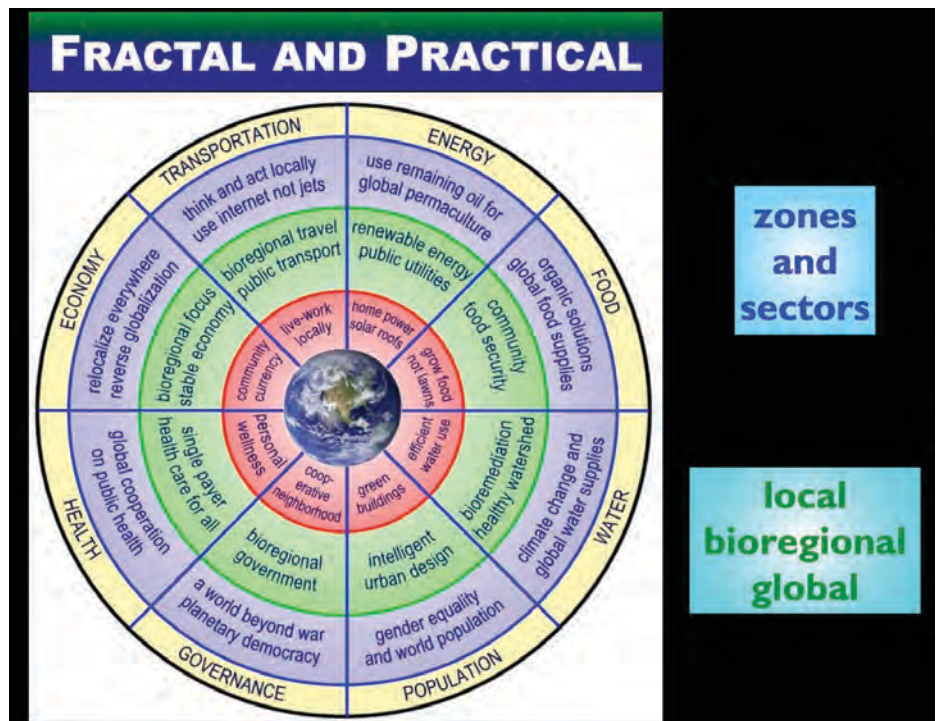
appropriate for a lower energy society. Better trains, local transit, relocalized production will require financial and energy investments. In the United States, the choice we are offered, politically, is between the “all of the above” program from the Democrats (highways and more transit) and the “highways only” approach of the Republicans. Neither says that energy shortages may constrain future funding options.

Direct and indirect impacts

The most obvious transportation problem is air pollution from internal combustion engines that burn petroleum. Exhaust causes health problems and is a primary cause of climate chaos. Roads pollute water with toxic runoff and hydrology disruptions.

Vehicle accidents are a major cause of deaths and injuries. Highways also cause massive amounts of road kill and fragment natural habitats that decimate many species ability to live.

Indirect impacts include changes to the urban environment that have made cities less friendly to “pedestrians”—a traffic industry euphemism for people walking on their two legs. Designing the built environment for cars instead of humans has created alienating landscapes with profound negative social consequences.



Transportation choices also transformed economies with the rise of long distance transport of everything, globalization of production, just in time inventory systems, homogenization of retail with big box chains, and general destruction of local cultures. There's no there, there, thanks to massive energy use.

Transportation systems have also accelerated the spread of invasive species. Here in Oregon we are overwhelmed with Himalayan (Armenian) blackberries. The southern US is smothered with kudzu. Appalachian forests were damaged by introduction of chestnut blight. Midwestern forests now face similar problems from non-native ash borers.

Increased travel has spread infectious diseases, even before the oil age. In medieval Europe it gradually became understood that sailors sometimes brought the scourge of plague, leading to the practice of requiring ships to remain outside a harbor for 40 days (quarantine comes from the Italian word for forty). Sailors would either be free of plague or succumb to it, but the town would be protected. Those who imposed these policies didn't understand microbiology but they understood the practical result.

In recent years, public health experts have warned that globalized aviation risks accelerated spread of pandemics, as happened with COVID-19. Thanks to airplanes, the world today is a smaller place than the 13 colonies were in 1776.

Energy peak and climate: two parts of the same problem

Petroleum's problems are not only the pollution they create. We are also at risk from dependence on them even though they are finite — and depleting.

We are damned if we drill, since fossil fuels create pollution. We are damned if we stop, because concentrated energy powers everything. And we're damned as they run out, because we are completely unprepared, logistically or psychologically.

Peak and climate are two aspects of the crisis of ecological overshoot. They are synergistic — each makes the other harder to address.

Three references for deeper exploration:

- David Holmgren, self-described as the “co-originator of permaculture,” has a remarkable summary of peak and climate interconnections at FutureScenarios.org
- Richard Heinberg has many books and reports

that discuss these at PostCarbon.org

- My PeakChoice.org site discusses these interconnections.

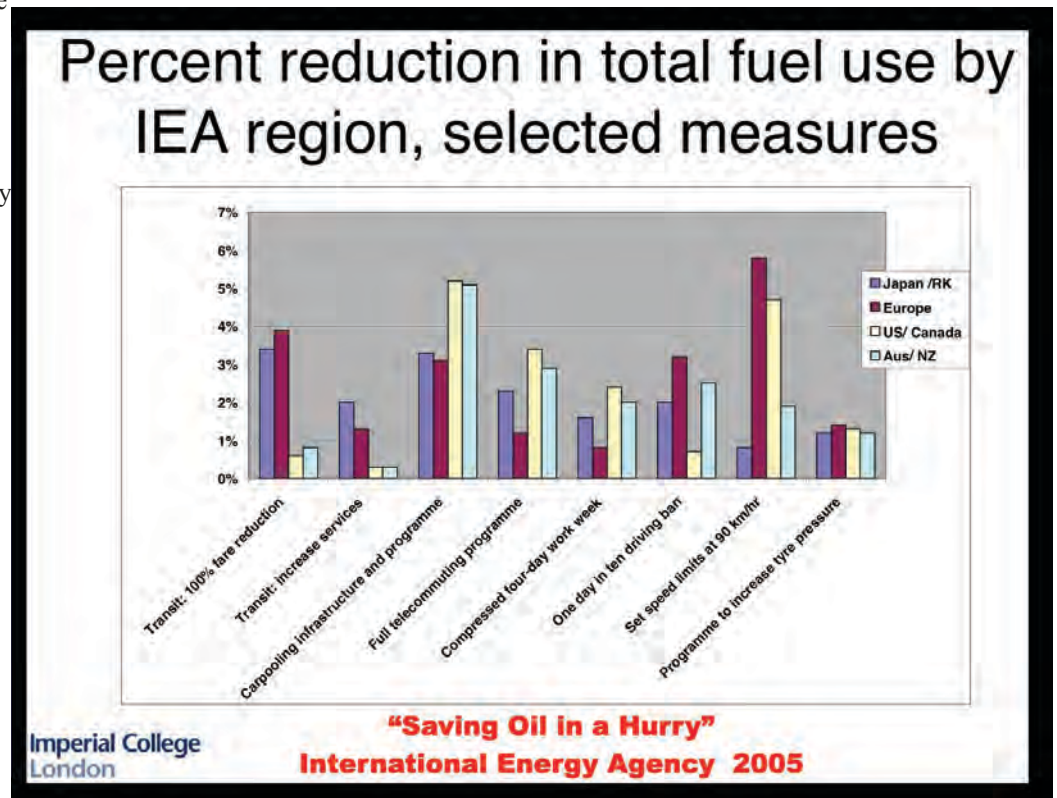
Saving oil in a hurry

“Saving Oil in a Hurry” was the title of a 2005 report to the International Energy Agency. This chart from their report, excerpted at www.peaktraffic.org/hurry.html shows a variety of policies that could quickly reduce oil consumption in the event of urgent need. The specific scenarios were left vague but could include depletion of oil fields, policies to address climate change, and of course, war that disrupts production.

Some policies would be more effective in some places than others. Making public transit free would have more impact in Japan, the Republic of Korea, and Europe than in the US, Canada, Australia, and New Zealand. Conversely, car pooling would help more in the latter countries than in the former.

The late activist Jan Lundberg, who left his family's oil consultancy to campaign against car culture, said the New York Times once offered to publish an op-ed by him but only if he focused on increasing tire pressure to make cars more efficient. He declined their offer. Among Jan's projects were the Alliance for a Paving Moratorium, Culture Change, and the Sail Transport Network.

I shared this graphic with the Climate and Energy staffperson for the City of Eugene. He was literate about the risks Peak Oil poses to everything and said this graphic was extremely helpful. I asked what he planned to do with it, would he share it with his colleagues planning Eugene's future? He replied that he would keep it to his files, waiting for a time when sharing it



would be better received. Unfortunately, advance planning for crisis works better than waiting for chaos.

Being in less of a hurry would save oil in a hurry.

Electric cars can't solve energy crises

Highway officials usually cite planned increases in electric cars when asked how fossil fuel depletion fits into their expansion plans. This is a form of bargaining and denial, not acceptance that there are physical limits to endless growth. Electric cars require finite minerals to manufacture, highway construction and maintenance still require energy intensive steel and concrete, asphalt is made from the dregs of oil refineries, and electricity is not a sustainable resource—it requires huge energy infrastructures to generate.

As of spring 2024, it looks as if electric car purchases may have hit a peak as early interest has been satiated, charging network problems deter some from purchase, and reliability concerns linger. Perhaps the problems will be solved, and sales will continue upward, but it's worth remembering electric cars can't solve social problems of car over-dependence.

Energy density

Part of our collective problem is we all use such enormous amounts of energy it is difficult to consider the scale of overconsumption.

Richard Heinberg offers this mental exercise to contemplate energy density. Imagine the effort to manually push a car 30 miles, and then being offered the cost of a gallon of gasoline for your labor. From this perspective, oil is ridiculously cheap.

I offer a similar analogy for electricity, a more difficult consideration since it is invisible. If you pedal a stationary bicycle that is connected to a small electric generator, you can make about 100 watts if pedaling fast. If you pedal from 9 AM to 7 PM, without stopping for lunch, no coasting, you can generate a kilowatt hour, a little more than a dime's worth of electrons.

Fracking postponed rationing

US domestic oil production from conventional wells peaked in 1970. Around 2008, the fracking industry ramped up their "unconventional" fracked wells to replace

the easier to get oil (and gas) to stave off a new, permanent energy crisis. Fracking has received deserved criticism for pollution, but it is rarely hinted that fracked wells are what's left for oil and gas production in the US. Fracked wells peak and decline far faster than conventional wells.

The largest energy source to generate electricity in the US 48 states is natural gas. Conventional gas peaked in 1973 and has dropped two-thirds—but has been replaced and surpassed by fracked gas wells. Three-fourths of US natural gas is now fracked.

Electric utilities love unnatural gas because it is seen as cleaner than coal (also in terminal decline) and easier to permit through the regulatory process. Gas power generators are easy to throttle up and down to help keep electric grids balanced between demand and generation. This is especially sought when grids include substantial amounts of variable sources like solar panels and wind farms, whose peak generation doesn't match peak demand.

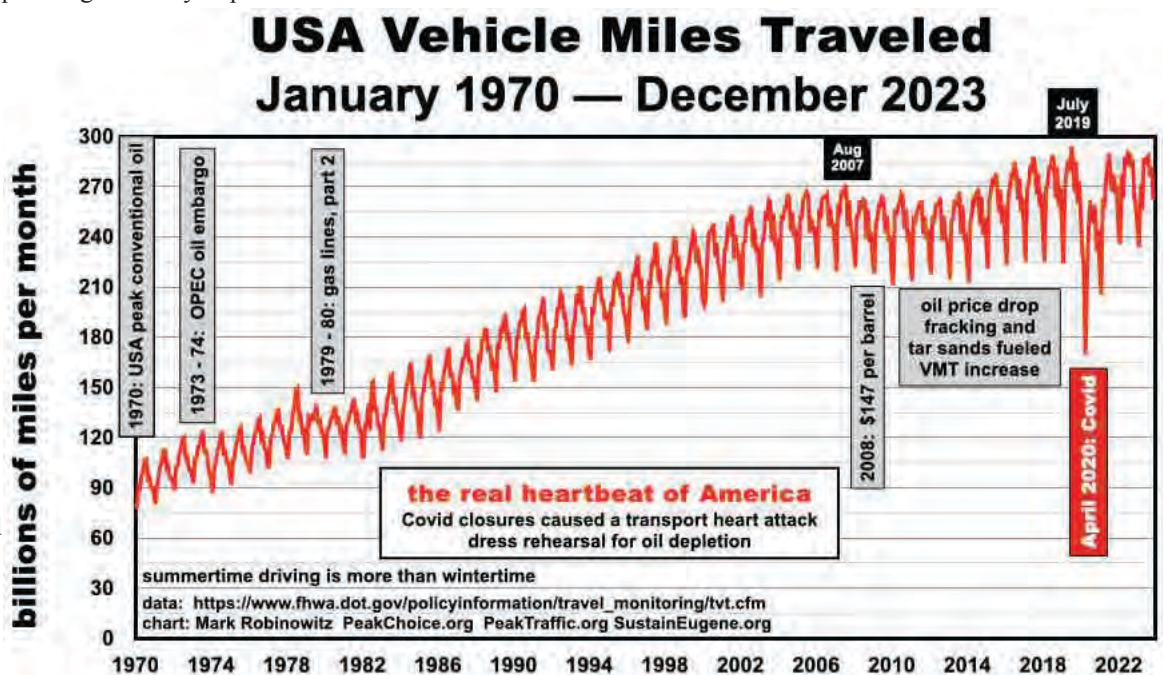
Gas now powers too many things: electricity, homes (mostly heat), factories, and various petrochemicals. About the only thing natural gas isn't used much for is transportation.

I wish I could cite renewables as the answer to these problems. I have used solar panels since 1990, and I'm glad there are utility scale efforts for solar panel installations. But

I feel it is an illusion that 100% renewable can be 100% of "current" consumption, pun intended. When I first learned to tinker with photovoltaic panels, the first lesson was to be extremely efficient or learn to do without—and this applies to the societal level, too.

Solar electric panels (and inverters) are "alternative" technologies—better things you can buy, but not "appropriate" technology that can be made with locally available things.

Transportation triage



“These forty million [poor] people are invisible because America is so affluent, so rich; because our expressways carry us away from the ghetto, we don’t see the poor.”—Martin Luther King, “Remaining Awake Through a Great Revolution,” March 31, 1968 (five days before his assassination)

Environmental movements have encouraged choosing public transit over driving cars, but transportation impacts also involve societal level decisions about investments, urban design and whether products are made locally or outsourced to globalized factories.

We already have more highway repair requirements than we can afford to make, even without considering energy limits. New infrastructure investments would be better spent on systems that better prepare us for constrained futures.

Trillion dollar highway plans

The scale of planned highway expansions are hard to grasp. I’ve searched since the 90s and haven’t found any lists of the total number of bypasses, Outer Beltways, Outer Outer Beltways, widened roads, and related projects. A rough estimate based on national priority lists and current construction plans is a complete count probably exceeds a trillion dollars.

Democratic administrations suggest we can have both more highways and more transit—an all-of-the-above approach. Republicans tend to focus only on highway expansions. Neither says that energy constraints will require a choice (and not only in transportation policies, but all aspects of society).

Currently, the Biden administration has endorsed some efforts to remove some old highways that barreled through urban cores, downgrade interstates to boulevards, or cover them with urban parks. But the bulk of the transportation funds still goes to the highway expansion programs, even if the rhetoric discretely avoids discussing this.

Biden has supported Amtrak since its creation in 1971, but the funding for passenger rail is a small fraction of what would be required for a European quality network.

The limits to smart growth

Urban designs that include permaculture perspectives would balance needs for housing with protection of green space for community gardens and natural habitats. Unfortunately,

the most vibrant cities in the country often see natural areas as opportunities for gentrification (not “affordable housing”), and food production is seen as irrelevant. A presentation on the role of realtors and construction companies controlling zoning decisions is beyond the scale of this article, but it’s vital to focus on, especially as farmland continues to get paved over.

Peak VMT: vehicle miles traveled

Vehicle Miles Traveled closely matches the rise and plateau of petroleum production.

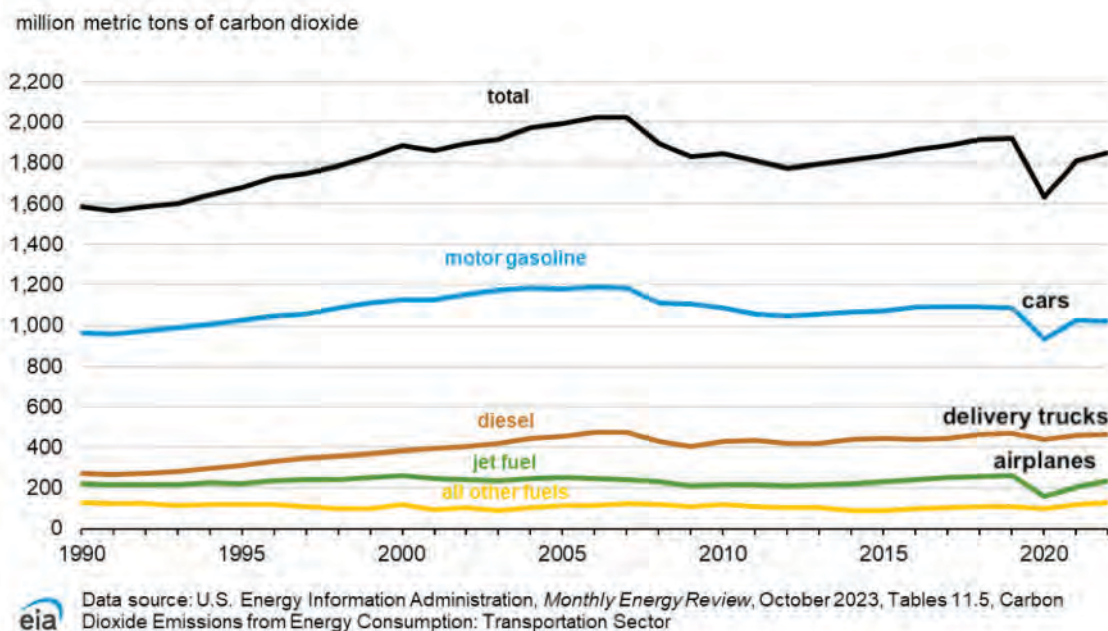
In 1973, VMT had the first plateau, caused by the Saudi oil embargo (a reduction of a few percent of availability caused considerable political and economic disruptions). A few years later, a similar shock caused by the Iranian Islamic Revolution also cut VMT growth. Subsequently, a quarter century of steady growth continued all the way to 2007. In 2008, oil reached \$100 a barrel, the global economy had significant shocks and global petroleum peaked (from conventional wells).

After that, the development of fracking for oil and natural gas got underway in the United States, which offset continued declines from conventional drilling.

Fracking enabled VMTs to exceed the 2007 levels all the way to 2020, when COVID closures cut travel demand faster than anything since World War II.

Since COVID peaked, some places have seen higher VMTs, and some have not. In Oregon, counties with extensive public transit and better design have not seen new traffic peaks, whereas counties with minimal transit have had traffic increases.

COVID closures cut carbon more than climate concerns



Transportation CO₂ emissions by fuel source.

In 2020, COVID closures cut transportation demand and emissions faster than any environmental concerns. Similarly, aviation demand fell sharper than the drop-off after the 9/11 attack. But these mechanisms became intensely hated, especially after it became obvious that the crisis would last longer than an unplanned vacation. I consider this to be a dress rehearsal for how society may cope with irreversible energy depletion—a permanent new abnormal looming on the horizon, and there is no vaccine to refill oil and gas wells once drained.

Road scholar

My introduction to energy concerns was in 1973, waiting with my mom in her car when the USA experienced a shortage of gasoline availability due to the Saudi oil embargo. That was a political problem, not a fundamental supply disruption, but it caused economic havoc and was intensely unpopular. It was a dress rehearsal for the broader concerns about fossil fuel depletion, although this was rarely acknowledged.

As an adult, I got involved in efforts to stop nuclear power and weapons, promote energy efficiency, and advocate for bicycles, but the most important were efforts to prevent highway expansions. Given the massive role of highways in energy consumption and habitat decimation, I came to realize that preventing new (and wider) roads might be more effective than promoting better public transit and bike lanes.

Freeway fights are notoriously difficult campaigns to win. Most efforts are unsuccessful, and even when they are effective, the outcomes often result in scaling back proposals or including mitigation efforts that barely reduce the damage.

The two most significant efforts I was involved in were the Intercounty Connector (ICC) in Maryland in the 90s, a part of the original Outer Beltway around Washington, DC, and the West Eugene Parkway (WEP) in Oregon, in the early 2000s.

The effort to prevent the ICC resulted in withdrawal of an option for that superhighway, but not formal cancellation. A decade later, a subsequent study resulted in formal federal approval, and the highway was built.

In contrast, the WEP was formally canceled through a “No Build” decision by Federal Highway Administration (FHWA) in 2007. It was one of the longest proposed projects in the country, first suggested in 1951.

I had prepared the outlines of a federal lawsuit to stop WEP if it were approved, but FHWA withdrew the proposal because it would have violated nearly every applicable federal law (www.sustaineugene.org/law.pdf has details).

A legal strategy to prevent trillion dollars of highways

Most legal roadblocks for highway approvals focus on ecological impacts: destruction of wetlands, air pollution increases, fragmentation of endangered species habitat, disruption of residential neighborhoods, and similar consequences. These laws require disclosure of impacts, not

prevention—there is no requirement to pick the least damaging options such as shorter routes, avoiding a rare ecological feature or neighborhood, or implementing alternatives to a new freeway.

The main law that stalled the ICC and stopped the WEP was stronger. Section 4(f) of the 1966 Transportation Act bars FHWA from approving a highway that would take parkland if there is a feasible alternative. It may be the strongest environmental law in the country on any topic (although narrowly focused on highways through parkland).

The National Environmental Policy Act (NEPA), which governs all federal projects that damage the environment, requires disclosure, not prevention. But it also requires that the approval process consider “new circumstances” that impact potential decisions.

My lawsuit would have focused on legal precedents, including Section 4(f), which prohibits federal aid highways through parks. But it also would have tried to have set a new precedent combining the facts of peak oil and peak traffic as reasons the 20-year planning rule no longer justifies highway expansions. Privately, some of the highway planners recognized this, but it’s a taboo topic to admit in public since acknowledgement would not only force changes to transportation plans, but to everything else.

Since the WEP was canceled without having to file suit, this argument was not tested in federal court. I hope a different freeway fight will include this in their efforts to set a precedent that could impact the country’s planned trillion dollars of highway expansions.

While it is impossible to precisely predict energy supplies as we pass peak energy, pretending that resource limits won’t impact travel demand is the biggest mistake.

The biggest threat of peak energy is not the disruption of the inalienable right to drive as much as we want—but the risk to food supplies. In the industrial world, nearly all food requires enormous energy inputs: fertilizer from natural gas, pesticides from petroleum, diesel tractors. Even organic food is usually trucked long distances and packaged with petroleum-based plastics.

While trains and transit could play important roles for post-peak transportation, recognizing we’re passing the limits to growth and relocalizing food production are probably the most important responses. Δ

Mark Robinowitz is a permaculture practitioner in Eugene, Oregon and a “road scholar” who helped prevent the proposed West Eugene Parkway bypass highway through a nature preserve. PeakTraffic.org and SustainEugene.org archive his freeway fighting experiences. introduction. See detailed charts supporting his conclusions presented in this article at www.peakchoice.org/pdf.html

In memoriam:

Joe Hollis

With sadness we must share the news that our beloved founder, teacher, and dear friend Joe Hollis passed peacefully, November 7, 2023, after being diagnosed in September with an aggressive form of cancer. Joe enjoyed life until the very end, satisfied with his many accomplishments and secure that his legacy will continue in the hands of the next generation of caretakers and garden visionaries. Joe was buried on the land he called home for more than 50 years, with a sweet view over the gardens and the rooftops of the cabins there. Thank you, Joe, for all your wisdom, generosity, and inspiration. Your brilliance with carry us forward.

While it may be hard to imagine a Mountain Gardens without Joe, Joe has been pushing us to imagine it for more than two years now, as we've met and planned and visioned toward a future for Mountain Gardens in the form that Joe most desired—as an educational garden, refuge, and nursery of useful plants, directed by a small group of dedicated stewards. Joe's passing has only hastened the work that we've already been doing.

It was a beautiful autumn in the mountains, and Mountain Gardens has been shining in golden orange splendor, punctuated by the landscaping accents that Joe assembled: bright shriveling berries on the dogwoods, blossoms on the witch hazels, needles turning shades on the evergreens. The library that burned last year has been rebuilt into a full structure now—it has walls, a roof, windows, and doors. It needs only to be insulated, sided,



and finished on the inside. Mountain Gardens still has many financial needs. Aside from the completion of the library, the crucial work truck needs a number of repairs and a new set of tires, and most of the dwellings on the land are in need of structural upgrades in order to stay livable, lovely, and welcoming for the decades to come. For all of these and for the administrative costs of transferring to collective non-profit ownership, we are still raising funds. Please spread the word and share our campaign, so that Joe's legacy can live on. Thank you!! Δ

Support the Future of Mountain Gardens

https://www.gofundme.com/f/the-future-of-mountain-gardens?utm_campaign=unknown&utm_content=www.mountaingardensherbs.com&utm_medium=referral&utm_source=widget



Joe Hollis leading a plant walk at Mountain Gardens. <https://www.gofundme.com/f/the-future-of-mountain-gardens>

The Irony of Cuba:

How Old, Polluting American Cars in Havana Point the Way Toward Degrowth

Phil Wilson

IN 2017 MY WIFE AND I WENT TO CUBA for two weeks. We dropped off asthma inhalers at the only synagogue in Havana. Shelly had collected these from members of her physicians' journal club. This shul runs a small pharmacy dispensing mostly common, over the counter medicines that, ironically, in the world's most "medicalized" society, are in short supply. These are offered free to the public.

The shul's administrative director, a tall, middle aged Black man named Leonardo told us proudly that there is no anti-Semitism in Cuba. "The only place on earth," he emphasized, "where we are safe. We don't even have to lock the doors." In Havana members of the small Jewish community resemble the people walking in the streets. A woman named Rosa told a story about Fidel Castro's visit many years earlier. "He asked me how many Jews lived in Havana. The actual number is about 1,200 but I told him 1,500. It sounded so much more impressive." This line provoked gales of laughter from people who overheard it.

Cuba has more doctors per capita than any country on earth – and it isn't even close. Medical expertise may well be Cuba's outstanding export, with authorities leasing physicians to nations in every corner of the globe, and yet you may not find a bottle of acetaminophen at the critical moment when a migraine aura forecasts the imminent arrival of an unbearable headache. Such are the strange contradictions engendered by the eternal US embargo. The blockade has, for generations now, enforced greatly diminished material circumstances upon the Cuban people. (Today, Cuba is in an economic crises. We saw awful poverty six years ago, but healthy, well fed people. Obama had taken steps toward normalizing relations with Raul Castro's regime. Fresh produce was cheap, and available everywhere – no longer. Trump and now Biden continue the American tradition of tormenting the Cuban people.)

Havana offers a startling mosaic

Sky scraping monuments and glistening filaments of sea spray vie with broken architectural structures that scream of entropy and decay. Chunks of limestone, fallen from once sublime



A 'maquina' or 'yank tank' (1956 Ford) in Trinidad, Cuba, 4 January 2004. Photograph by Dirk van der Made CC BY 1.0, <https://commons.wikimedia.org/w/index.php?curid=10634>

buildings, gather with uncollected trash in the streets. However, music blares everywhere, and not just any music, but, most often, Cuban music.

We met American composer and musical impresario, Robert Kraft, by random chance. I had never heard of him, but later learned online that he had written the scores for a number of box office breaking films including "Titanic." We asked him for directions to the Hotel Nacional and struck up a conversation. I am inclined to believe his contention that Cuban musicians drive our planet's creative rhythms and musical trends. There is nowhere on earth as musically important as Havana, Kraft stated.

Our talk with Kraft – he gave us tickets to the Havana premiere of the movie, "Score" – reinforced my sense of Cuba as a place of endless incongruities. Here, suffering and artistic grace have come together almost seamlessly. Is there another country on earth that has done so much with so little? Havana is home to the world's preeminent classical guitar composer, Leo

Brouwer. Its streets offer a feast of murals and sculpture. Live music is everywhere. We spoke with young graduates of The University of Havana music program. It is hard to get in to the university, and harder to make a living, but we do this full time, a young singer told us. The government gives musicians a small stipend. Gone is the party dogmatism against jazz and popular music that caused Paquito D’Rivera to defect in 1980. Irakere, one of the world’s most eclectic Latin jazz ensembles has, like Cuban cars, achieved timeless renown.

Cubans are thinking outside of the box

What sort of system builds a vast profusion of medical clinics to punctuate a crumbling cityscape? Why would a society train an army of world class musicians when the potholes in the

Cuban cars have been stripped of their primeval meaning of providing a quick adrenaline rush to buyers.

street are an existential threat? Might Cuba be inadvertently or awkwardly performing an in vivo experiment in the psychology of degrowth – with priorities directed away from economic expansion in favor of health and the arts, two pursuits critical to human well being that require no mines, factories and little expenditure of fossil fuels? Necessity and cultural vitality have made Cuba into a one of a kind outpost for thinking outside of the box. The island, true to the essence of degrowth, invests in human infrastructure. It is the poorest of the very few nations that have achieved a 100% literacy rate.

The embargo is the mother of invention

The Cuban version of degrowth is not affixed to the looming climate catastrophe, but rather, more fundamentally, focused on the fine details of triumphing in a world of chronic deprivation. In Cuba, the US embargo is the mother of invention.

Famously, visitors to Cuba gaze

upon an almost dreamlike parade of antique cars that might easily be misconstrued as a museum-like depiction of American automotive style from the 40’s and 50’s. But the ancient products of the expansive American ego have been completely repurposed as symbols of Cuban resilience and community. Cuban cars have been stripped of their primeval meaning – to provide a quick adrenaline rush to buyers. These relics have attained a sort of immortality that we don’t generally associate with the disposable products of Detroit manufacturing. There is a saying about the relationship between Cuban cars and their custodians: “there are no mechanics in Cuba, only sorcerers.”

One does not drive into Havana as one drives into Boston or San Francisco, it emerges in a startling instant, like a hallucination. Indeed, Havana is surrounded by fields rather than suburbs – its sudden and improbable array of images convey a surrealistic paradox – the Cuban revolution froze automotive time at an instant when American car design most perfectly symbolized colonial plunder. The flaring, jagged, sword-like tail fins of Cadillacs and Oldsmobiles of the fifties defined the egotistical strivings of those fully invested in material acquisitions and global conquest. Cars from that era were bigger, heavier, gaudier and more flamboyant than anything before or since. The doddering cars that still make their ways through the narrow, one-way streets of Centro Havana are ghosts – misplaced, absurd, a testament to fate’s obscene sense of humor.

Patterns of consumption can become hardwired in our psyche

In America, cars are a flagship commodity. They shine brightly and flame out. A car loses 20% of its value in one year, 30% in two. The sinking value conveys its intrapsychic purpose, to pump up dopamine quickly like a shot of Fentanyl,



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and to fade soon enough to leave the owner shaking with the urgent need to boost flaccid moods with another injection of automotive opiates. Material objects can never satiate the addictive cravings that animate capitalism. Cars, like clothing, like sound systems, like appliances, etc. are created to be acquired and discarded in an endless feedback loop of lust, disappointment and waste.

A recent paper 'Ecomodernism and the Libidinal Economy: Towards a Critical Conception of Technology in the Bio-based Economy,' by Roel Veraart, Vincent Blok, and Pieter Demmers, emphasizes that patterns of consumption become hardwired in the circuitry of human psychology. No movement to slow down the self destructive, planet ruining trajectory of human behavior can succeed, the authors argue, without targeting the fundamental problem of material addiction:

Principally tasked with endlessly promoting and accelerating consumption, modern media technologies become increasingly short-termist, narrowing our attention and feeding it with fabricated fantasies.

The paper, quoted above, applies the ideas of the late French philosopher, Bernard Steigler to the contemporary debate between Ecomodernists and those who argue that sustainable human economies must embrace "degrowth." Steigler, in his 2010 manifesto argued that the human brain has been restructured via advertising bombardment to become an accoutrement to neoliberal markets:

Now, while this generalized becoming-waste pollutes the natural environment, the disposability of the object affects the subjects who dispose of these objects: they feel that they themselves are disposable. Consumerist society thus proves to have become, today, and in the eyes of everyone, toxic, not only for the physical environment, but also for mental structures and psychic apparatuses: as drive-based, it has become massively addictogenic...

Steigler distilled the threats exposed by the 2008 global economic collapse into the term, "politico-militaro-ecological catastrophe." This social apocalypse, Steigler stated, linked to the psychological ruin that consumerism inflicted on the public. One hears echoes of Steigler in a recent piece by Jason Hickel, stating that,

No political program that promises to analyze and resolve the ecological crisis can hope to succeed if it does not also simultaneously—that is, in the same stroke—analyze and resolve the social crisis.

Cuban life is lived in the street

Centro Havana does not have any excess space. One sees few parks, playgrounds and parking lots. Life is lived openly in the streets with soccer and stickball (played with broom handles and bottle caps) and acts of mechanical sorcery performed in public view. One cannot walk down Cuban streets without seeing hoods up and faces meditatively contemplating the pistons and spirits within. Most often, there are a number of men, an informal minion of sorts, attempting to collectively resolve the seemingly impossible task of transforming ancient contraptions into states of perpetual motion.

The mechanical wizardry in Havana appeared to be carried out spontaneously, as if street mechanics drew inspiration from the same muse animating the sounds of a Cuban percussion ensemble. Improvisation is the key. Almost every mechanical task involves repurposed use of tin cans, coat hangers or mechanisms taken from random appliances – American car parts have been embargoed for sixty five years. A belt taken from a Soviet era washing machine might keep the grim reaper from collecting a 1957 Ford Fairlane.

Cuba still has its shortcomings

I do not wish to idealize Cuba. We saw no women drivers, and absolutely, no women staring into the entrails exposed by open hoods. Sexism has stubbornly dominated Havana's automotive life. Still, in a society with almost no female drivers, 61% of doctors are women. The Cuban revolution may once have inspired fits of runaway idealism, but shortcomings cannot



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be denied. The Cuban dependence on tourism has recreated uncomfortable colonial images – wealthy European vacationers being served by Black hotel staff seem to belong to a prior era. In Cuba, vibrancy and regression wrestle together with no resolution.

Cars in Cuba may have attained collective immortality, but each car proceeds into forever one day at a time. Thus, the nexus between people and cars in Cuba more closely suggests the relationship between a pianist and a piano than it resembles the perfunctory interaction between an addict and a bag of heroin. A Cuban car demands a disciplined and daily ritual of care. Like musical study, automobiles are a lifetime commitment.

Trinidad struggles with poverty

In addition to our stay in Havana, we also spent a week in Trinidad which features well preserved colonial architecture in a central district well known for burgeoning tourism. Horrific poverty characterizes neighborhoods adjacent to the tourist district.

We decided one morning to hike to a beach some seven miles southeast and after about ten miles of walking, we realized that we were lost. We had strayed from the main road and found ourselves in a neighborhood of houses so dilapidated that I can not adequately describe them. There were broken windows patched with strips of newspaper. Some houses had sagging walls and roofs as if their demise might be moments away. An elderly man reclining on a front porch recognized our confusion and instructed two neighborhood children to escort us to a nearby house where, notably, a red and white 1958 Chevy Belair sat parked in the yard. The man pointed at the Chevy and promised, “Ernesto will drive you for only five Cucs.”

Ernesto, a man in his late 50s, confirmed that he had been named for Ernesto “Che” Guevara, whose iconic image dominates the symbolism of Cuban life. A particular photo of Guevara has become the most reproduced image on earth, and can be seen – in various revisions – stenciled on houses, framed on interior walls and sold to tourists on tee-shirts.

While he drove us to the beach, we talked to Ernesto about many things, and Shelly (I speak no Spanish) questioned him about how he came to have the car. He said that it had been given to him by his grandfather some thirty years ago, and that once, after the Soviet collapse, he had considered selling the vehicle. “Sometimes things are good and sometimes not.” He told us that he will one day give the car to his son. Ernesto paused, breathing deeply. Talking about the car, he said, reminded him of his grandfather and he softly wept, apologizing for his emotions.

Discovering the true meaning of possessions

Later, Shelly asked him about the vehicle’s value. At first he shrugged his shoulders indifferently, but then squinted as if thinking hard. He said nothing for a full two minutes, and just as Shelly asked him how he felt about Raul Castro, Ernesto blurted out, \$50,000. His face relaxed with satisfaction, but a moment later he changed his mind and upped the figure to \$70,000. I had

my doubts. The car belched out hellish circles of black smoke, and ran with ear piercing, grinding decibels of mechanical distress. The price that Ernesto impulsively blurted out may just as well have been in the millions – I assumed that \$70,000 was a metaphor for priceless.

When I argue that Cubans have reinvented the connections that people form with material objects, I obviously do not imply that they simultaneously have tamed machines to take up the tasks of environmental sustainability. Cuban cars are an ecological disaster forced upon desperate people by the US embargo.

If we ever euthanize consumerism and replace it with degrowth we will have to adore material things far more deeply than we currently do.

Cubans have reinvented the connections that people form with material objects

Ernesto told us that he did all of his own repairs and described how just yesterday he had secured a dangling tail pipe with metal strips, solder and coat hanger wire. So many times, Ernesto related, he had worried that the car might not be saved, but always there is a way. Again, a tear rolled down his face.

It struck me that, along with the language barrier, we talked across an ocean of incommensurate cultural comprehension. My car means nothing to me. When my teenage son totaled our car hydroplaning while fiddling with Blue Tooth, he was not hurt, and insurance mostly covered the cost of replacement. I felt nothing other than relief. Ironically, in a hyper-materialistic society, things have almost no emotional value.

Perhaps no one else had ever asked Ernesto to talk in detail about his car. Cubans understand the commitment, time and skill that cars demand. There is no need to talk about things that are obvious. But the emotional weight of a car might be something else entirely. I sensed that Ernesto experienced a catharsis from indulging our curiosity.

Cuban cars are a metaphor for the fate of Cuba

Cuban cars share the precarious and uncertain fate that characterizes Cuba as a whole. To keep a ’58 Belair running

with no access to replacement parts is akin to climbing a rock face with no safety ropes. Unlike in America, where cars are as disposable as plastic cups, every Cuban car, I imagine, has a story – perhaps a near death experience in which oblivion and sorcery converged.

When we arrived at the beach in Trinidad, Ernesto got out of the car and showed us details of his work. He pointed out a spot where he had painted over rust. He showed us that the Belair had two exhaust pipes, and opened the hood to display an enormous V-8 engine, touching various parts with his calloused finger to trace particular fine details. One by one, he listed which parts were original and which were his own replacements. His eyes and hands had scrutinized the hidden patterns of the motor in a manner of intimacy that made no sense to me at the moment. It almost seemed as if Ernesto wanted to sell us the car, but it was all quite the opposite, for Ernesto had already explained that even the worst contingencies of Cuba's economic vulnerability could not dislodge the Belair from his family.

I can only guess about the precise meaning that cars have in Cuba – do people worry about them, feel sorry for them and have nightmares about their eventual deaths? Do people ever imagine some future time when sorcery runs out and the Malecon is still? We should have asked Ernesto if he had named his car.

Self-reliance in the world of “degrowth”

I did not realize it at the time, but Ernesto taught us a critical lesson about the essence of degrowth (a term I was not yet aware of). If we ever euthanize consumerism and replace it with degrowth we will have to adore material things far more deeply than we currently do. In this future world every possession will need love and attention – cars, shirts, shoes, cell phones, coats, hats, dishes, bowls, appliances...these will all become important, and, in the best case scenario, might make us happier. We will become, like Ernesto, not owners but stewards – tailors, mechanics, carpenters, repairpersons, potters. We will have to reinvent the lost art of self-reliance.

Philosophers, poets and writers, throughout human history have praised the virtues of simplicity. Thoreau wrote in Walden about the benefits of wearing pants with patched knees. He warned us to beware of any “enterprise that required new clothes.” A pair of pants with patches at the knees has transformed the mender – the relationship between a garment and wearer becomes one of reciprocity rather than of commodification.

Rather presciently, Thoreau wrote that undue pursuit of things and comfort is a trap:

The luxuriously rich are not simply kept comfortably warm, but unnaturally hot; as I implied before, they are cooked, of course a la mode.

We are deeply connected to our possessions

There is a growing body of research supporting Thoreau (and Ernesto) regarding the deep connection between people and

possessions in the context of a simpler lifestyle.

A recent study – “Toward a Theory of Minimalism and Well Being,” by Kasey Lloyd and William Pennington discovered that:

Many participants reported they no longer engage in recreational shopping, and almost all participants reported any purchases they now made were strategic, purposeful, and well-researched. While participants tended to reject the materialistic idea that possessions portrayed status, a number of participants reported that the possessions they currently own add joy or value to their lives. As they truly liked and identified with their possessions, they assisted them to feel more authentic.

Lloyd and Pennington specified that simplicity benefitted the well off, but did not bestow happiness upon those living in poverty. Such an assertion, I believe, diminishes the agency and resourcefulness of Cubans who have – under terrible circumstances – created medical, musical and automotive miracles despite being bullied and harassed by the world's most predatory nation. I believe that degrowth has value to all, and if widely adopted would powerfully address inequity.

It will not be easy to embrace degrowth even though we must do so. Degrowth will involve hard work. We could, however, easily lift the blockade. Δ

Phil Wilson is a retired mental health worker who lives in Northampton, Massachusetts, and has written articles for Common Dreams, Counterpunch, Resilience, Current Affairs, The Future Fire, Common Ground Review, and other publications. This article was originally published by Resilience, 23 January 2024, under a Creative Commons License.. <https://www.resilience.org/stories/2024-01-23/the-irony-of-cuba-how-old-polluting-american-cars-in-havana-point-the-way-toward-degrowth/>

Gardening and a Gardener's Mental Health

Becky Elder

A garden is a grand teacher. It teaches patience and careful watchfulness; it teaches industry and thrift; above all it teaches entire trust.—Gertrude Jekyll

“Harvest wellness!” she said... Vinnie, a recently retired psychologist, was presenting her program at the 2024 Pueblo Sun, Soil, Water and AG Summit. She was using her own experiences to explore plants, gardening and one's mental health. Vinnie was sharing her seasoned view of the healing power of working with plants in a garden. The healing is there for all of us and for those who experience traumas in their life. She sees how a garden can benefit a person working to deepen their understanding of self. Vinnie encouraged her audience to take gardening lightly as they go about learning the ropes.

Cleaning the garden beds, for instance, all that raking, picking up sticks and rocks, and sifting the soil helps to cleanse and clear a mind. Vinnie's first personal garden goal was for one thing to stay alive. Just one plant. She set that goal and worked on paying attention to what was going on. Observation is a powerful tool in a garden. Is the soil moist? Are the plants coming up? What sort of insect is that? What is digging a hole here? How did this get moved? So many questions... so many answers.

If one makes the effort: sowing seeds, planting starts, soil preparation, watering and monitoring, there will be rewards. Even if everything died, learning would happen. Wonder occurs. Deeper understanding develops. No matter if everything dies, Vinnie keeps at it. She makes her garden a big experiment. If one is experimenting, one expects to collect evidence and knowledge as the season ticks by. If experimenting, one doesn't have to feel bad about losses, but can feel so good about successes. If one has a loss, here comes the experimenting work. *“So, let's try...”* and fill in the blank. Let's try a different plant, a different watering pattern, a different location in the landscape.... Trying something different continues the experiment.

Experimenting allows a budding gardener the freedom to keep moving forward. All failures will drop away as one moves through time with a garden. Skills develop and there will be successes. Maybe not a lot at first, but patience will pay off. Wisdom is not gained in seeking perfection, but in applying brains and hands to the garden while watching the results.

When Vinnie goes out the door, she says *“I get to go garden!”* She doesn't say she has to garden. She gets to garden! She gets to be outside and feels gratitude. She gets to be out in the yard. She gets to feel the sun on her skin. She gets to listen to the buzz of nature. She anticipates being in the garden. The ego, she warns, is an inner voice that may be working to keep a gardener small to avoid the hurt of disasters and failed experiments. The ego may encourage a gardener to stop. Don't let one's ego lead the gardener astray. Let the heart lead instead. Let the heart

manage the experiments. Emphasize play and wonderment in the garden to get outside and get beyond one's own fears or hesitancy.

Gardens give each one a chance to practice trust. Making mistakes is okay. Mistakes are for learning. There is a forgiving community around gardens and gardening. One can find support. One may be alone in the yard, but there is a community there to celebrate and be grateful for. Vinnie thanks her garlic. She planted all sorts of vegetables, but only the garlic came up. Gratitude to garlic! Success! Celebrate successes, don't suffer the losses. Vinnie will even express gratitude to the garden chair for helping her. Trust is found through the passing of time and in the seasonal patterns of nature. Trusting nature brings another chance to try again. Trust is built with consistency in one's effort.

Gardening is good for everyone. Feeling within, touching with fingers and toes, smelling the smells of the soil, the flowers, the herbs, hearing the birds... brings that joy of being alive. Gratitude in the garden becomes a solid base for good mental health. Gardening is an avenue to finding joy as well. There is joy in being alive and participating in the cycles of life.

Gardening teaches one about self-care. Vinnie encourages that practice. Practice self-care. Taking care of oneself along with the plants. Practice appreciating the efforts made. Practice letting joy flow when out in the garden, in the moment. Just sowing seeds doesn't mean they will rise up. Just because a plant is planted doesn't mean it will grow. That isn't a slam against a gardener's self-worth. Gratitude and joy will come through any negatives. Play with garden experiments. Learn a lot. Learning is a path. Grow a garden and nothing will be wasted!

Belder 3-2024

Blue Planet Becky Elder the gardener

Peace is more precious than perfection.—Unknown

Blue Planet Becky Elder the gardener

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Blueplanetbecky@gmail.com

People don't notice whether it's winter or summer when they're happy.—Anton Chekhov

A Naughty, Knotty Tuber

Crosne

Laura Crystal

Given Name: *Stachys affinis* (aka *S. tuberosa*, *S. sieboldii*)

Nicknames: Chinese artichoke, betony artichoke, chorogi, Japanese artichoke, knotroot, uneven pearls, Michelin Men, fat caterpillars

Family: Mint (Lamiaceae)

Psst... I have an important secret to tell you: I'm a good luck charm. It's true. Put my tuber under your pillow or keep it in your pocket, and I guarantee you will attract positive energy. No, I'm not smirking—you're smirking. Anyway, I can help you achieve enlightenment... and never grow old..., and gold will fall from the sky.

Ha! Fooled you. You shoulda seen your face—you actually believed me. Oh, you humans are so gullible!

But seriously, if you put me in your garden and wait 6 months, you'll find buried treasure. No, really! In the early spring, find a spot that's in full sun, bury a few of my tubers a foot apart, make sure you water the area regularly and come back in the fall. Dig a hole and voila, you've been tricked. Again. Ha ha! No gold, no jewels. You know, this ploy is my personal favourite because now that you've planted me, you're stuck with me. Yup, I'll grow back even if you leave only a small tuber in the ground. Hey—why aren't you laughing?

Oh, you think that I lied. Well then, there's clearly been a misunderstanding here. You see, I didn't *technically* lie. I never actually specified what kind of treasure you'd find, and my 2-3-in. tubers, which multiply prolifically through the growing season, *could* be considered treasure. After all, they're a delicious and nutritious food.

You don't believe me? What have I *ever* done to make you think I'm untrustworthy. Oh, yeah... I did just try to trick you twice. But aside from that? Come on! Give me another chance. I know your eyes are desperately warning your brain to stay far away from those firm, white, grubby things that pass for my tubers (yes, yes, having sweet and nutty tubers that look like sun-bleached poop emojis is really one of my better tricks). But I'm coming clean about this—much like my tubers easily come clean after harvesting: I'm good to eat. I swear it on my ancestor's graves.

And speaking of those ancestors—they were eaten too. We've been fooling... I mean *feeding* people in China and Japan for centuries. And if, even with all our modern ways to make sure I'm edible, you're still balking at the idea of eating me, just imagine the poor French people who were first introduced to me in the 1800s. I can just hear them, their voices dripping with scorn, "You want me to eat *that*?" It would have been hilarious! I wonder, did the French first try me raw, cooked, or fermented? Probably fermented since that's how I was often traditionally prepared (it makes me easier to digest). Plus, fermentation extends my short shelf-life. Obviously keeping me in the fridge, soaked in lemon juice and water, like you would now (for up to

a month), just wasn't possible in the 1800s. But back to the French trying me—I bet they plugged their noses and scrunched up their eyes, while they took their first crunch (I keep my crunch no matter how I'm prepared). And then, ha! I tricked them! I'm yummy!

So, now that you know a little about me, can you guess what family I'm from? I bet you can't... not in a million years. Okay here's a hint: square stem, aromatic, opposite leaves, and irregular flowers. I'm a mint family plant! What? Did I just blow your mind? But don't tell anyone else—I want to see their faces when they realize an edible tuber comes from a family known for aromatic leaves (peppermint, oregano, lemon balm, thyme, and the list goes on...).

Okay, can we take a break from messing around? No really, I'm not trying to get you to put your guard down. I want to be serious for a moment. I know I can be vexing, but the gags and humour are just my way of trying to help people—make life a little more fun, a little lighter, a little easier. But I want you to know that that's not the only way I help: like many of my minty cousins, I'm a traditional medicine. In China, I was used for colds, infections, heart disease, pain relief, ischemic brain injury, dementia, and gastrointestinal related diseases. And some of these traditional uses have been proven effective by modern science: one study concluded that I would be helpful for people suffering from cardiovascular disease and diabetes, while others found that my extract protects against learning and memory dysfunction associated with ischemic brain injury, dementia, and Alzheimer's. No joke. As rascally as I am, I wouldn't kid about something like this.



Crosne and peas

But I *would* encourage you to play practical jokes with me! Maybe you could stick one of my tubers in a family member's meal. They'll think a giant grub crawled into their food! Oh don't be a spoil sport... it's not mean. I'm high in iron, protein, vitamins, and antioxidants, so really your antics would be doing them a favour.

What about putting me in cookies? You think that's mean too? Hehehe—the joke's on you this time—I'm not joshing. One of the ways I was used traditionally was dried, powdered, and baked into rice cookies. Okay, yes, this does have the added bonus of seeing people squirm when you show them what you made the cookies from—but the intention was to be helpful.

You could also hide my tuber in your sister's bed or on your boss' chair. Ooooooo... wouldn't their squeals be worth any trouble you might get into? Me, a bad influence? Pshaw! I just want you to have fun. At another's expense? Maybe... but goodness knows people need to learn how to laugh at themselves.

I laugh at myself *all* the time. Like how I can be either beautiful or productive—not both. You see, in order to get the largest tubers possible, people need to keep me trimmed to about 6 in. (I naturally have a 2-ft. sprawl). That means no beautiful mauve flowers. How is that fair? It's not. But do I get angry? Maybe I did... centuries ago. Am I sad about it? Sure, but I've come to accept it. Do I laugh about it? Big time! The universe has a great sense of humor, and it keeps us all humble.

Anyhoo, I have to go. I've planned an elaborate hoax, involving red shiso leaves, me and pickling, and I'm "dyeing" to start it. Don't worry, it has nothing to do with you... or does it? I guess you'll find out...

Stay outta trouble (because that's my domain),
Mischievous Crosne Δ

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Born to be wild—crosne aka Chinese artichoke

Reviews

Earth care, people care and fair share: the first 30,000 years

Shannon Frances

The Dawn of Everything

David Graeber & David Wengrow

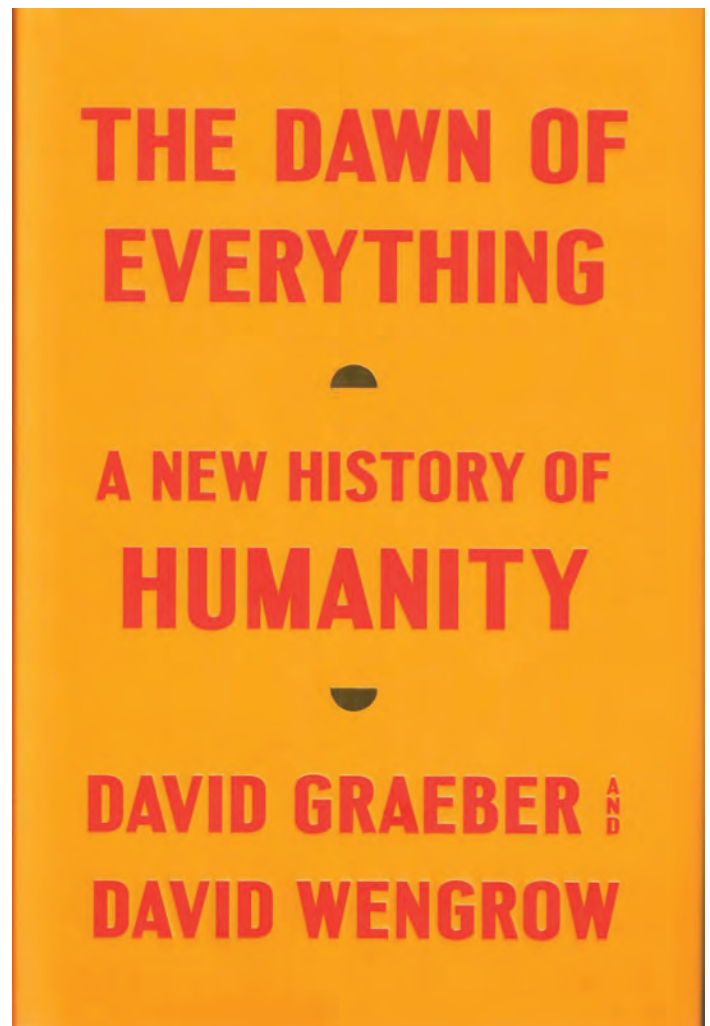
DAVID HOLMGREN HAS STATED that he didn't invent permaculture, that he and co-founder Bill Mollison just gave a name to lifestyles lots of people have already been living. In fact, the concept of permaculture was heavily informed by contemporary and historical indigenous lifestyles by asking the question: How have people who have lived sustainably been able to do it?

The Dawn of Everything reads like an answer to this question. David Graeber and David Wengrow discuss huge amounts of archeological and anthropological data that have accumulated in the last three decades as well as observations from ethnographic studies to give details about peoples who lived sustainably, regeneratively for centuries—even millennia. The data indicate that such lifestyles have been a predominant and thriving part of our human history for most of the time that we have been human. And the authors make a good argument that it is only the last few millennia that we have somehow gotten stuck in the tendency towards exploitive and extractive regimes.

The authors start off reviewing the two attitudes currently prevalent about the past—"we evolved in a paradise, developed agriculture, and it has all been downhill since then" or "we lived like miserable savages, developed agriculture and now things are better than they ever have been". They also explore how these attitudes developed in a non-benign way into an excuse for the supremacy of the Western focus on technological advancement and, of course, the privilege of Western people. Much of the rest of the book tears apart both false assumptions about the past.

The truly interesting thing about their arguments—the part that I think any practitioner of permaculture will find interesting—is the data-supported fact that we humans have explored and experimented with an amazing variety of ways of organizing ourselves. From foragers that dabbled in agriculture for thousands of years to agriculture-fueled empires culminating in exploitation of the populace to the point of mass human sacrifice. From huge urban settlements that had no detectable hierarchy (no kings, no bureaucrats, no police, no military) to tiny kingdoms where the supreme leader had absolute power (but only in his immediate presence). From patriarchy or matriarchy to groups that lived under patriarchy in one season and matriarchy in the other. They also argue that, in no way, are tyrannical and extractive states inevitable. People can and have reversed such trends when they chose to create durable, egalitarian societies.

The tone of the book is very hopeful: no matter what human groups have gotten themselves into, there has always been the option to try new modes of living. In a way, the book sup-



ports and encourages all of us to explore living the way that we want to and believe is right. So let us continue to celebrate our uniquely human ability to create choices for ourselves and live regeneratively, inclusively and reciprocally in our food ways, built environment and social structures. Let us be encouraged to continue the time-honored choice we now call permaculture. Δ

After traveling the world as a digital nomad, Shannon Frances finally discovered a place where she wants to settle down: The Island of Enchantment. In Puerto Rico, she seeks to grow some of her own food in a demonstration permaculture garden established with mostly recycled materials to show that real people can grow an abundance of food in urban environments. As much as possible, the rest of her food comes from the wonderful, hard-working, resourceful, creative people on the island who take care of the Earth and care about her inhabitants, too. Her dream is to someday enter that mythical state of retirement that will allow her to stop thinking about money and devote all her time to being delighted. You can find her random ponderings about the shift in mentality (referred to by David Holmgren as "cultural revolution") needed to live the permaculture principles at the level of the individual and the community at www.goatcheeseinmypocket.wordpress.com.

Climate Change—The War is Over

Jack Meeks

A GLOBAL AVERAGE ATMOSPHERIC carbon dioxide concentration of 417.06 ppm was measured in 2022. This sets a record and has been the highest in the last million years or so. There is a time lag between atmospheric carbon and the shift in the planet's temperature. Given the present path we are now on, temperature change will exceed 1.5°C in the 2020s, and 2°C before 2050. Even with the most aggressive attempts to deal with fossil fuels, it would take 30 years or so to have the planet's temperature stabilize. The UN has stated that there is some kind of a winnable race to end climate change, and others such as Bill McKibben have said that we need to declare war on climate change. But it seems as if the planet may have lost the first battle, and the fossil fuel industries are ahead as scientists delivered a "final warning" on climate change less than a year ago. However, we can change the narrative and declare that "War is over." We can create a habitable world if we can overcome the doom and gloom and imagine the world as a better greenhouse by restoring forests and wetlands. There was some more hope as well at COP28, where they used this text in the final agreement: The time has come for "transitioning away from fossil fuels in energy systems, in a just, orderly, and equitable manner." Also, since the "war is over," we can sign a "peace" treaty of sorts such as Los Angeles did in 2022 when they voted unanimously to adopt a resolution in support of the global plant-based treaty initiative which helps deal with climate change by a shift to healthy sustainable diets and a plan to promote the rewilding of natural habitats. Some level of acceptance is going to be necessary as far as what has already been done to the planet as far as global warming goes. Weather conditions will likely worsen in the near future, and in many regions of the tropics, outdoor life will become almost impossible.

Thus, one must free up resources to deal with present and future consequences in order to shore up low level coastal areas, cities, and islands. To be noted here is that the quality of life is very much affected by climate change which has a greater impact on women and girls as it relates to gender inequalities and creates unique threats to livelihoods, health, and safety. Women depend more on, yet have less access to, natural resources, and as a result climate-related hazards have the effect of higher workloads for women. We will need more funding for developing countries to cope/deal with the planet warming as they usually contribute less emissions and have more intense climatic issues. We do have the tools and technology to survive and to be able to adapt to new lifestyles. Thus, part of our strategy will be to shore up these types of resources for not just the well-to-do, but also women, people of color, and low income communities. Some type of special programs will be needed for the most vulnerable areas of the world and the people living there.

So in many ways, it is a time of great hope. Even though the methods used so far in the environmental movement have not had much success, this is also the time to revisit tactics that may be useful in making the point of where we are really at as far as climate change. Solving the issues does involve strategizing and rethinking what we have been doing as it does require a great socio-economic transformation. Also we ought to stop treating global warming as something that is elevated above and overrides everything else. Yes, it is urgent and ecology, to be sure, is central, but there are also issues of economy, society, politics, and public health! Change happens from both above and below. Since we have declared that the climate war is over, and thus it is not a time for despair, we will probably see that the wealthy will soon understand that they cannot hide behind their gated communities, and this will lead to new alliances and coalitions. Change from below will happen when climate change affects areas in low income communities such as in rural Ohio and the Appalachian

mountains where fracking has a strong presence, and they are likely to be severely impacted by the side effects of this.

Transportation is responsible for about one-third of global emissions. We hear much about how we are living in a post-industrial society, and cars are an ancient relic of our industrial past. Yet, at the same time we subsidize driving through toll roads, highway expansion/repairs, and free parking while paying little attention to or actively resisting healthier, more affordable, and more sustainable alternatives. It does seem very little has changed with people's driving habits, and not much has been done to improve mass transit infrastructure. In the San Francisco Bay Area, there is a movement to ban cars on Telegraph Ave. in Berkeley that has not been successful yet, and there is an existing partial ban on cars on Market St. in San Francisco that is now in place. However, one of the mayoral candidates now wants to undo this in the name of economic progress. We need to shift from this idea of progress and replace it with ecological progress and environmental justice. Public safety is also an issue where car-free areas tend to be a bit more crime-resistant. An important note to youth and students here, up to age 35, injuries from accidents involving cars are the leading cause of death. Often one hears that moving to a sustainable way of living here on the planet would require that one must give up something. However, by us changing the narrative and moving to an evergreen economy—green, but growing in a slower and more positive manner, we can see there are important additions to our health and sense of well-being.

We can re-think our transportation system and have the motto of "world without cars" by having bicycle freeways, public transport infrastructure rebuilding, and even working on solutions for transit in rural areas. Car culture is dangerous and inequitable, and anyone who has been to Europe can see how successful life can be with fewer cars and a good train system. Speaking of Europe, a record number of people went to Europe the summer of 2023 while the world was burning and almost 62,000 people died of heat-related causes. This does show the importance of having an environmental consciousness and looking at one's individual eco-friendly consumption patterns.

The environment is fundamentally altered by human interventions, and climate change itself illustrates what happens when these human ecological footprints are of a negative nature. Since we are no longer 'eco-warriors' fighting in a climate war, these are some ways we can enjoy ourselves and not cause significant adverse effects to the environment such as spending time outside in nature, riding bikes, and other forms of public recreation, and going to public places like beaches and parks where one can enjoy and commune with nature in ways that are usually carbon-neutral. We could have our productive forces be more in tune with the natural environment rather than after the fact where we are having to deal with the issues created by re-use, such as recycling. In many ways, the infrastructure of the economy is going to have to be recreated along the lines of being in harmony with the environment and using natural energy resources (e.g., thermal). In many ways, the climate crisis is a major opportunity that presents itself to us as we begin to reimagine a world where anything is possible. We shall soon see new ways of doing things that we have not even thought were possible before, and that will help us in our organizing efforts and may determine the livability of our planet. Δ

The Pleasant Fallacy of Tapping into Inexhaustible Flows

Tom Murphy

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I RECENTLY CAME ACROSS A STATEMENT to the effect that once we transition away from fossil fuels to renewable energy like solar, wind, and hydro, we would essentially be home free for the long run—tapping into inexhaustible flows. It is a very pleasant notion, to be sure, and one that I believe is relatively common among enthusiasts for renewable energy.

Naturally, I am concerned by the question of: what magnificent things would we do with everlasting copious energy? As an excellent guide, we can ask what amazing things have we done with the recent bolus of energy from fossil fuels? Well, in the course of pursuing material affluence, we have eliminated 85% of primeval forest, made new deserts, created numerous oceanic dead zones, drained swamps, lost whole ecosystems, almost squashed the remaining wild land mammals, and initiated a sixth mass extinction with extinction rates perhaps thousands of times higher than their background levels—all without the help of CO₂ and climate change (which indeed adds to the list of ills). These trends are still accelerating. Yay for humans, who can now (temporarily) live in greater comfort and numbers than at any time in history!

But the direction I want to take in this post is on the narrower (and ultimately less important) technical side. All the renewable energy technologies rely on non-renewable materials. Therefore, inexhaustible flows are beside the point. It's like saying that fossil fuel energy is not practically limited by available oxygen for combustion, so we can enjoy fossil fuels indefinitely. Or that D-T fusion has billions of years of deuterium available, when there's no naturally-occurring tritium (thus reliant on limited lithium supply). In a multi-part system, the limiting factor is, well, the limiting factor. Sure, into the far future the sun will shine, the wind will blow, and rain will fall. But capturing those flows to make electricity will require physical stuff: all the more material for such diffuse flows. If that stuff is not itself of renewable origin, then oops. The best guarantee of renewability is being part of natural regeneration (i.e., of biological origin). If solar panels, wires, inverters, and batteries were made of wood and the like: alright, then.

Recognizing that biological organisms—plants and the animals that directly or indirectly draw energy from them—have already figured out how to tap into (essentially) inexhaustible flows—solar, primarily—I became interested in comparing the performance of the human animal to that of a solar panel or wind turbine, in terms of mineral requirements. After all, the biosphere gets by without mining the depths. So

let's dig into the material requirements of life.

A pinch of dirt

Human construction requires very few mineral elements that do not come to us from water and air. I think that's really cool. Our caloric intake consists of carbohydrates, fat, and protein—the whole set requiring only four elements that are obtained from air and water.

This Wikipedia page provides a compositional breakdown of the human body—presented both by mass and by atoms. Note, however, that the two forms listed on the Wikipedia page are not wholly self-consistent, so I arbitrarily adopt the by-atom numbers (more significant digits, meaningful or not) and produce by-mass fractions from them—though the result is not qualitatively different if starting from the by-mass numbers instead. Below are two tables that capture approximate numbers, broken up according to elements that derive from air and water, and those that we get from the ground. The first table also notes the elemental origins within our environment.

| ELEMENT | % MASS | % ATOMS | SOURCE |
|----------|--------|---------|--|
| Oxygen | 61.2 | 24.0 | direct from air and water |
| Carbon | 23.0 | 12.0 | air via plants/ photosynthesis |
| Hydrogen | 10.0 | 62.0 | water: direct and via plants/sugars |
| Nitrogen | 2.5 | 1.1 | air via plants and microbes |
| Totals | 96.7 | 99.1 | |

So, about 99% of the atoms in our bodies come from air and water, often processed by other lifeforms before entering our mouths. That's a very neat trick! By mass, it's 97%. The difference is due to the most abundant elements in our bodies being on the lighter side (especially hydrogen), while the rarer minerals tend to be heavier atoms. Now for the dirt elements.

| ELEMENT | % MASS | % ATOMS |
|------------|--------|---------|
| Calcium | 1.4 | 0.22 |
| Phosphorus | 1.1 | 0.22 |
| Potassium | 0.19 | 0.03 |
| Sulfur | 0.19 | 0.038 |
| Sodium | 0.14 | 0.037 |
| Chlorine | 0.14 | 0.024 |
| Magnesium | 0.06 | 0.015 |
| Totals | 3.22 | 0.574 |

Other minerals appear in trace amounts, totaling a small fraction of one percent. The elements in the table above are typically found in soils and rocks, accessed by fungi and roots. The comparatively small amount of ash left over from burning a log completely tends to be composed of elements on this list. The sources of these elements in our diets can be found

on this website (<https://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/>) (and similar variants on the URL for other elements).

Power performance

Now let's look at the material efficiency of the human body and compare to that of a solar panel. According to the United Nations' Food and Agriculture Organization, the global average caloric intake is 2,800 kcal per day, translating to an average continuous power of about 135 W. The mineral requirements to accomplish this constitute just over 3% of body mass, or 2 kg for the global average body mass of 62 kg. Thus, a human achieves roughly 70 W per kilogram of minerals. Note that even though the human body is only 20–25% efficient at converting metabolic energy into external mechanical work, the rest is not waste to us: it provides crucial thermal energy to keep body temperature up, and thus counts as a critical contribution.

Let's look at solar panels. Typical 60-cell panels produce 300 W in full sun, and have a mass around 20 kg. Straight away we compute 15 W/kg—a factor of five lower than human performance. But to be fair, we must account for the fact that the sun is not always directly in front of the panel, producing a typical capacity factor of 20%, or an average power delivery of 60 W. Now the deployed panel delivers 3 W/kg: less than 5% as “efficient” as a human, in mineral terms.

Massive wind turbines at 20% capacity factor (typical global average) score even worse, at 0.4–0.6 W/kg. Without the mass-dominant concrete pad, a wind turbine would pump out 1.6–2.4 W/kg, for the short time it remained standing.

Just as a wind turbine needs a mounting base, a realistic utility-scale solar deployment has a material mass far in excess of the bare panels: support structures, interconnect wiring, inverters, storage (if truly replacing fossil fuels). I would not be surprised if a whole-system figure dropped to 1 or 2 W/kg, while humans stay smugly perched at 70. The score for wind would erode as well once other necessary components are considered—especially storage. Moreover, the minerals needed by humans are in wide circulation within the community of life at the surface: no mining (and associated tailings, energy, processing, pollution) necessary.

Thus, biology has far exceeded technology in capturing the inexhaustible flow from the sun using a minimum of minerals—and those being extracted from and re-deposited to the soil in a continuous, self-sustaining cycle, importantly. Biology and evolution really figured things out! Modernity looks like a bumbling idiot by comparison—like R2D2 in a stair-climbing competition against an athlete.

Replacement considerations

What about the fact that the human body does not store its minerals indefinitely, but requires dietary replenishment? By contrast, solar and wind infrastructure lasts a few decades (it is not indefinite, either). To get a lower limit for replenishment times, I look at the recommended daily allowance (RDA) of minerals, provided at this site (<https://www.hsph.harvard.edu/>

[nutritionsource/vitamins/](https://www.hsph.harvard.edu/nutritionsource/vitamins/)), represented as the RDA column in the table below.

| ELEMENT | RDA (G) | IN BODY (G) | DURATION (DAYS) |
|------------|---------|-------------|-----------------|
| Calcium | 1.0 | 870 | 870 |
| Phosphorus | 0.7 | 670 | 960 |
| Potassium | 3.0 | 120 | 40 |
| Sodium | 1.5 | 85 | 60 |
| Chlorine | 2.0 | 85 | 40 |
| Magnesium | 0.35 | 40 | 110 |
| Total | 8.55 | 1870 | 220 |

Dividing the amount of elemental mass in the body (obtained via mass percentage in the second table) by the RDA produces a timescale for complete replacement, as indicated in the last column of the table above. It makes some sense to me that calcium and phosphorus—locked up in bones—would persist for a long time, while mediators of biochemistry might flush more routinely. Still, I would imagine the RDA numbers to be conservative (a bit overkill; while staying short of harmful), translating into a more mineral-hungry portrait than is actually necessary. For instance, it seems unlikely that the average dwell time of calcium in your bones is just a few years. I'd be willing to bet that an RDA-consuming person passes unabsorbed calcium (and other minerals) in their poop. But I'm not likely to wade in there, experimentally.

In any case, in a 24-hour day, our 135 W standard human cranks out 3.2 kWh of energy, requiring daily intake of 8.55 grams of minerals according to the RDA standard. In order to compare to renewable energy figures, I'll translate into tons per TWh to get about 2,600 tons of mineral input needed to produce one TWh of human metabolic energy (probably a lot less under actual body requirements).

According to Table 10.4 of the Department of Energy Quadrennial Technology Review (<https://www.energy.gov/sites/prod/files/2017/03/f34/qtr-2015-chapter10.pdf>), the production of electricity entails the following material requirements (in the form of aluminum, concrete/cement, copper, glass, steel, etc.):

| TECHNOLOGY | TON/TWH | FACTOR |
|------------|---------|--------|
| Coal | 1185 | 0.45 |
| Gas | 572 | 0.22 |
| Solar PV | 16447 | 6.2 |
| Wind | 10260 | 3.9 |
| Hydro | 14068 | 5.3 |

We see that on this measure as well renewable energy technologies are more mineral-hungry than biological systems (at 2,600 ton/TWh) by substantial factors—and more if RDA is conservatively overstated. Moreover, the required elements are different from those needed for life—more “exotic” so-as to require mining, vs. readily at hand on the surface in biological circulation.

To help appreciate this difference, imagine placing an end-of-life solar panel and all its accompanying stuff out in the forest. What components are eagerly eaten by the resident biology? At the same time, put a dead plant or animal next to the solar junk and come back in ten years. One will be much the same, while the microbes and fungi have consumed the other, leaving no discernible trace.

Note that the fossil fuel entries in the table above are “cheating” by not including the mass of the fuel itself. The intent is to capture the infrastructural “machinery” needed to convert the flow to electricity. At energy densities of 6 and 13 kcal/g for coal and gas, respectively, the corresponding ton/TWh numbers translate to 143,000 and 66,000—numbers typical of chemical energy. I could make the case that the numbers in the table are still fair in the materials sense, counting the elements that are not provided by derivatives of air and water via photosynthetic processes—much as we ignored the bulk of the human mass (and food intake) for the same reasons. Missing in the other direction is ore purity and thus mine tailings, which can exceed the end-product material mass by factors of hundreds, so that the total extracted mass is far larger than indicated in the table above. Still, this post is not intended as an argument for or against fossil fuels.

One point to note is that for every ton of fossil fuel removed from the land, another six tons are removed in the form of sand, metal, rock, and wood. Inferring from the table and figures above (and common sense), these materials are not primarily devoted to the machinery needed to burn fossil fuels (i.e., engines and power plants). They are going to the human enterprise called modernity: buildings, roads, consumer goods, etc. Replacing modernity’s engine with another source, like renewable energy, aims to keep the bulk of material extraction in full swing—in fact enhancing it to supply the extra materials necessary for diffuse renewable energy to function.

The inexhaustible point

For all intents and purposes, biology has figured out a way to tap into the continuous and (seasonally) reliable flow of solar energy using a bare minimum of mineral requirements from the land’s surface. It took billions of years to solve this very hard problem. One could consider the result to be a “circular economy,” in that minerals are recycled into the environment and taken in by microbes, fungi, plants, and on up the food chain. By working within the strictures of multi-level selection (evolution) subject to long-term ecological viability in relation to other life, the result has the word “sustainable” effectively built in: sustain-a-built. No? Okay, yeah, that’s pretty lame.

Our technologies are clumsy and materially insatiable, by comparison—no surprise, given the short development time and our complete disregard for the unforgiving constraint of sustainable practices. Make no mistake: “renewable” energy is not the same as sustainable technology. The only demonstrated sustainable technologies to date are those found outside modernity, in the biodiverse ecological realm (including things made from wood and plant materials, for instance). Until a technology achieves closed-loop sustainability in concert with the rest of the community of life—which may not be possible—it’s not truly “renewable.” Systems that require mining, produce mine tailings/pollution, destroy habitats, and result in collateral damage in the form of permanent species extinctions can’t be considered to be long-term viable, in my view—just part of the jaw-dropping fireworks show that will soon shock itself by self-terminating. Nobody could have seen it coming!

A typical unsubstantiated knee-jerk reaction is that aggressive/complete recycling could address the concerns. But recycling yield is always going to disappoint, so that a moratorium on new mining (or simple exhaustion of economically recoverable material as the low-hanging fruit is depleted) would result in a slow dwindling of available materials until the weakest link falters below some minimum threshold required to keep the industry alive—likely on a timescale that is lightning-fast compared to that of ecological evolution. Recycling also consumes copious energy: more and more as higher and higher yields are sought. It becomes self-defeating: from what source does such energy come, and at what additional material cost? Plus, I always return to the question of what we use the energy to do. Thus far, it’s been 99.9% unsustainable activity (my crude guess: vanishingly little goes into restoration of ecological damage). Sixth mass extinction, anyone?

So, is technology on the verge of inexhaustibly tapping into inexhaustible flows? I don’t think so.

It should not be surprising that we have not yet been—and may never be—able to engineer long-term-sustainable modernity (i.e., high-tech). I strongly suspect that’s not even a thing. Why on Earth would we just assume that it’s possible? Where does that hubris come from? It’s not from a thorough analysis in full ecological context, and certainly not from any demonstration. It’s just a lazy and wishful assumption based on the brief and highly anomalous window on the world to which we’ve been exposed. Comparing modernity-relevant timescales to those relevant to evolution, and looking at the profligate rate of one-time inheritance spending (i.e., of non-renewable resources) that has been required to produce modernity tells us a lot. Unlike biology, this ain’t built to last. I know which team is a better long-term investment—the ultimate victors unless everyone loses first. Δ

Tom Murphy is a professor of physics at the University of California, San Diego. An amateur astronomer in high school, physics major at Georgia Tech, and PhD student in physics at Caltech, Murphy has spent decades reveling in the study of astrophysics. He currently leads a project to test General Relativity by bouncing laser pulses off of the reflectors left on the Moon by the Apollo astronauts, achieving one-millimeter range precision. Murphy’s keen interest in energy topics began with his teaching a course on energy and the environment for non-science majors at UCSD. Motivated by the unprecedented challenges we face, he has applied his instrumentation skills to exploring alternative energy and associated measurement schemes. Following his natural instincts to educate, Murphy is eager to get people thinking about the quantitatively convincing case that our pursuit of an ever-bigger scale of life faces gigantic challenges and carries significant risks. To learn more about this author and whether you should dismiss some of his views as alarmist, read his Chicken Little page (<http://physics.ucsd.edu/do-the-math/just-another-cassandra/>).

Transportation Resources

How to downsize a transport network

Kris De Decker

Fast and cheap transportation props up industrial societies, both for the moving of people and cargo. However, our transport networks are very wasteful of energy and utterly dependent on fossil fuels. In this series of articles, *Low-tech Magazine* critically examines the call for electrified vehicles, which depend on unsustainable batteries and infrastructures. Much more important than the chosen power source is vehicle design: size, weight, speed, acceleration, and comfort level. Furthermore, public transport is more resource efficient, and we could electrify it without batteries. The book's second part deals with long-distance transportation: planes, trains, sailing ships, and ocean liners. By placing transportation technology in a historical context, *Low-tech Magazine* challenges our high-tech approach to sustainability and highlights the possibilities of alternative solutions.

Contents: How to Downsize a Transport Network: the Chinese Wheelbarrow; The Citroën 2CV: Cleantech from the 1940s; The Status Quo of Electric Cars: Better Batteries, Same Range; Electric Velomobiles: as Fast and Comfortable as Automobiles, but 80 times more Efficient; Get Wired again: Trolleybuses and Trolleytrucks; High Speed Trains are Killing the European Railway Network; Life Without Airplanes: from London to New York in 3 Days and 12 Hours; How to Design a Sailing Ship for the 21st Century?

Available from <https://www.lulu.com/shop/kris-de-decker/how-to-downsize-a-transport-network/paperback/product-42n4p7.html?q=&page=1&pageSize=4>

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Taking Draft Animals Seriously

Wendell Berry

Those of us who use draft animals for work on the farm or ranch or in the woods usually know that we are odd. We don't fit well into the modern pattern or live up to the modern ideal, which applies relentlessly to every task the maximum available power with the greatest possible speed. The teamsters of farms and forests are likely to be regarded as old-timers—or, worse, as hobbyists—clinging to outmoded technologies and ways for reasons merely sentimental.

Maybe there is a grain or two of truth in that, but it is not significant. The larger truth is that draft animals have continued to be used, by people who know how to use them, because they make their own kind of practical sense. Put to appropriate tasks that are appropriately scaled, their work gives a favorable practical result and a favorable economic return. If that were not true, the draft breeds and the teamsters' skills would not have survived.

Back in the 1970's, with the examples of good Amish farms before us, my friend Maury Telleen helped me to see that the presence of draft horses or mules on those farms was not a simple choice of one kind of traction power over another. It was, instead a choice of one kind of farming, and one way of thinking about farming, over another. What Maury understood and helped me to understand was that those work teams were a determining force against specialization and for diversity. They were part of a package or a pattern. If you were working horses or mules, then, merely in the nature of things and following an obvious logic, you would also have pastures, fenced fields, forage crops, feed grains, barns for stable room and feed storage. Those things in turn made for the keeping of other kinds of animals. Diversity of crops and animals led, in turn, to the rotation of crops, the use of cover crops, the use of manure as fertilizer. The farm thus sponsored much of its own operating energy and fertility. Moreover, the use of draft animals determined the scale of the farm. The farms had to be what we would call "small" or "family-sized"—acres that could be worked and maintained with a reasonable expenditure of effort by the work animals and therefore by the people as well. A good Amish farmer told me that he had learned from his father never to have a horse harnessed after supper. That guaranteed enough rest and good health for the horses, and also some leisure for the family.

If the use of draft animals implies diversity, homegrown energy and fertility, appropriateness of scale, and a significant measure of built-in economic health on the farm, it also implies economic diversity and health in the local community. I am thinking, for example, of Holmes County, Ohio, where the horse-powered farms are supplied and served by an impressive variety of local shops, trades and industries: harness makers, farriers, farm equipment factories, and so on. I am also thinking of the small towns of my boyhood, in which all sorts of independent small businesses survived and even thrived by participating in an economy of small, horse – mule-powered farms – in which every shore-repair shop repaired harness, and

a lot of farm equipment was built or re-built or repaired in local blacksmith shops.

If we can see that draft animals on the farm belonged to and led to a distinctive kind of farming, then we will have no trouble in seeing that the substitution of tractors for draft animals belonged to and led to farming of a radically different kind. The tractors too have proved to be part of a package, as we can now clearly see. The tractor package included increased dependence on farm equipment corporations and oil companies, increased dependence on credit, increased dependence on toxic chemicals, ever-larger farms and ever-fewer farmers, loss of diversity, increased specialization, more acreage planted in annual crops and less in perennials, more erosion, clearing of woodlots, removal of fences, less wildlife. All this implies and has led to a highly centralized long-distance economy, a commensurate decline of local economies and communities and of the whole social structure of rural America. I don't mean to say that you can't farm well with a tractor. You can, but to do so you must take care to regulate your work by the nature, the carrying capacity, and the sustaining pattern of your farm, not by the capabilities of your machinery.

The same interests and forces that have brought about our centralized, long-distance agricultural economy have also brought about a centralized, long-distance forest economy. The economic principle is everywhere the same: a domestic colonialism that extracts an immense wealth from our rural landscapes, returning as near nothing as possible to the land and the people. The producers of agricultural products, nearly all, nearly always, are absolutely at the mercy of the buyers. Producers of forest products are in about the same fix. The Market News Service of the Kentucky Department of Agriculture doesn't publish the current market prices for saw logs.

Given the growing demand for local food, and the increasing numbers of farmers' markets and Community Supported Agriculture farms, it is becoming fairly easy to imagine the development of local farm and food economies in which communities and localities produce, process, market, and consume local farm products, marketing any surpluses to outside demand.

But we need to be moving also toward the integration of forestry into the local farm and food economy, wherever the farms are likely to include woodlands. And wherever forests or woodlands are predominant in the landscape we need to think of developing local forest economies which, instead of exporting raw logs, would produce, process or manufacture, and market the fullest variety of forest products, from lumber for building to mushrooms and nuts, from fence post to firewood, from Christmas decorations to finished furniture.

The answer, the only answer, to economic colonialism is to make the greatest local advantage of the products of the local countryside, producing and processing for local consumption

first of all, and then for export. This exactly reverses the colonial ideal, which would have the local people starve in order to export food, or live in shacks and shanties in order to export logs.

Obviously, I'm already talking about "job creation" in the best sense. If your community is making its living primarily by the export of raw materials for manufacture elsewhere, then along with your logs or your wheat or your cattle you are exporting jobs, and then you will be exporting your young people to take those jobs. All that is clear enough. We have seen it happening.

But now, since we're a convocation of users and lovers of draft animals and are used to being odd, let's carry this vision of local forest and farm economies just one radical step further. Let's suppose that a significant part of the traction power in those already complex economies were to be furnished by horses and mules — and, since this is a democratic vision, and for the sake of ox drivers who may be listening, let us include oxen. If we should do this, we would create more jobs, somewhat in the pattern of the best Amish communities. By scaling down and simplifying our technology, we would truly be bringing our economy home, where it belongs. Instead of paying outside the community for large machines and fuel, we would be providing income locally to makers of equipment, producers of feed, farriers, breeders, and so on.

The economic advantages of such local economies as I am talking about are probably clear enough. Their promise is not luxury or extravagance for a few, but a modest, decent, sustainable prosperity for many. In addition, there would be an equally significant ecological advantage. In a complex local economy, in which a lot of people were economically dependent on the products of the local landscape, there would be the strongest local support for good land use. People knowingly dependent on the land would not willingly see it cropped or grazed or logged to exhaustion.

I've laid before you what I've been calling, rightly, a vision. Like you all, I hope, I'm skeptical of visions. And so I will hasten to point out that this vision is a modest one. The scale is small, and I would be greatly surprised if it should produce even one billionaire. It is also a practical vision. I don't think it is fully in practice anywhere, not even among the Amish. But we know that many, maybe most, of the pieces of it are already in existence, properties of the actual daily lives of actual people, though so far they may be pretty widely scattered.

This vision, in no doubt many versions, exists because it is attractive to some of us. But also we are going to see it enforced from the outside, so to speak, by the increasingly manifest failures of industrial forms of land use. I don't think I need to say a lot about these failures beyond just listing them. The principal ones are these:

1. Erosion and degradation of the soil.
2. Pollution by toxic chemicals, resulting in unswimable

streams, inedible fish and a "dead zone" in the Gulf of Mexico (one of at least 400 worldwide) of 6,000 square miles.

3. Toxic or pathogenic food.
4. Forest ecosystems damaged or destroyed by high-grading, clear-cutting, tree monocultures, etc.
5. Land destruction on a gigantic scale by forms of surface mining, culminating in mountaintop removal.
6. Destruction of rural communities and the cultures of husbandry.



Two-wheeled cart drawn by a donkey. Photo by Anani A. George. Creative Commons 4.0.

For a long time the exorbitant costs and damages of industrial exploitation of land and people were talked about only by a fringe of dissidents and protesters. But now these problems have caught the attention of mainstream reporters and are making their way into public consciousness. To give just one example, TIME magazine for August 31, 2009, carries an article on industrial agriculture and industrial food that would have been unimaginable even last year. The article says flat out:

With the exhaustion of the soil, the impact of global warming and the inevitable rising price of oil . . . our industrial style of food production will end sooner or later . . . Unless Americans radically rethink the way they grow and consume food, they face a future of eroded farmland, hollowed-out countryside, scarier germs, and higher health costs . . .

But the good news is that we don't have to be consenting victims of agribusiness-as-usual. To give just one example on the positive side, Wes Jackson and The Land Institute — with the backing of a numerous coalition of groups and institutions — have just proposed to the Secretary of Agriculture "A 50-year Farm Bill" which addresses head-on the problems of erosion, toxicity, and the decline of farm communities. The key change proposed by this bill is the increase in the acreage of perennial plants from 20% in 2009 to 80% in 2059. This change would involve at first increases in pasture and forage crops, and then, starting in 2019, the introduction of perennial grain crops.

The proposed perennialization of agriculture, like the horse and the tractor, would not be a simple choice. It to will be a

package deal. A significant increase just in pastures and forages implies a new diversification. Replacing corn and soy beans grown for animal feed with perennial grasses and legumes would reduce erosion and save energy; it would also take cattle, hogs, and poultry out of the animal factories and put them back on farms, where they belong. Diversification would tend to reduce the size and increase the number of farms; it would bring more people into agriculture where at least some of them belong. An increase in the number of diversified family-size farms, together with higher energy costs, would increase the number of places where draft animals would fit in and make practical sense.

This is a prospect pleasing to all of us who are devoted to draft animals and to better, kinder ways of using the land. But it involves worries too, and to make this speech as honest as possible I want to speak of a couple of worries.

Most people who understand good land use know that to use our land in the best way, we will need more people on our farms and ranches and in our forests. We need a better ration of eyes to acres, as Wes Jackson has put it. We need more people skilled in physical work, who have workable minds. How are we going to get them? That is my first worry. I don't think we can get the best work done by underpaying and overworking an underclass of migrant workers. I think we will have to go back to our old agrarian ideal, espoused by Thomas Jefferson among many others, of a countryside populated by settled families and stable communities earning a decent livelihood from their work and their goods. But by reducing our land-using population as drastically as we have done since World War II, we have dangerously reduced the skills necessary for resettling our land. It seems certain to me that we are coming to a time when a lot of people are going to need a lot of patient and neighborly instruction.

If you can imagine a good many ignorant people wishing or needing to learn to use draft animals, then you will know my second worry. The most knowledgeable users of work animals know they don't know everything. And probably most of them have a list of mistakes, bad surprises, narrow escapes, and sometimes serious injury or damage. We want those lists to stay as short as possible. If, as seems possible, more people are going to think of using draft animals at work, they and we will need to stay reminded that some people should NOT use them, and that, in using them, ignorance is dangerous. Moreover, those of us who appreciate these good animals don't want to see any of them misused or mistreated. Capable and conscientious teamsters already have, and certainly will continue to have, a responsibility to pass along their knowledge. We need to keep this on our minds. One of my own favorite pleasures is to imagine the teaching that will be branching out from the work of hands-on teachers like Jason Rutledge, his students, and their students, on and on for generations to come. Δ



Horse Logging in the Out Woods, Charnwood Forest. The Ancient Woodland called the Out Woods in Charnwood Forest near Loughborough is carefully managed. Rather than using destructive wheeled tractors to haul the felled logs up the hill, the British Horse Loggers Charitable Trust provides a more interesting and sympathetic service. Photo by Douglas Maas. Creative Commons 2.0.

Wendall Berry, American philosopher, writer, social critic, and poet, was born in Port Royal, Kentucky, and lives there today on his farm. There are many resources online for the exploration of his works, including [The Berry Center \(berrycenter.org/resources/\)](http://berrycenter.org/resources/) and brtom.typepad.com/wberry/. This article is reprinted from Healing Harvest Forest Foundation (www.healingharvestforestfoundation.org/forest-understories/taking-draft-animals-seriously).

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VI,4*Nov. '90 **Urban Pc**: EcoCity Conf., Soil Detox, Suburbs & Pc
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#24 Oct. '91 **Creativity in Design**: Case Studies, Index to Issues #1-23 \$5
#25 Dec. '91 **Design for Community**: CSA Restoring Forests, Gdn Ecology
#26*May '92 **Soil**: Our Past, Our Future, Fertility, Worms, Cover Crops
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#29/30* Jul. '93 **Networks**: Media Revw, Rural Reconstructn, Leaf Concentrate, Comm'ty Food, Palestine Pc, Do-Nothing Educ, Feng Shui, Pc Academy
#31*May '94 **Forest Gardening**: Energy & Pc, Mushrm Cultivation, Robt.Hart's Forest Gdn., Spp for No. Cal., Alders, Agroforestry: Belize &China, Honeylocust, Nitrogen-fixers
#32*Apr. '95 **Animals & Aquaculture**: Animal Polyculture, Sm-scale Cattle, Goat Dairy, Keyline, Feral chickens, Bee Plants, Constructed Wetlands
#33 Dec. '95 **Cities & Their Regions**: Green Cities, L.A. Ecovillage, MAGIC Gdns, CoHousing, Micro-Enterprise Lending, Suburban Conversion
#34 June '96 **Useful Plants**: Bamboo Polyculture, Medicinals, Pest Control, Root Crops, Oaks, R. Hart's F.G., Russian Plants, Regional. Plants
#35 Nov. '96 **Village Design**: Pattern Language, Consensus Democracy, Conflict, Historic & New Villages, Planning for Tribe, Village Economics \$5
#36*Mar. '97 **Climate & Microclimate**: Climate Change, Windbreaks, Low-Tech Sun Locator, Drylands, Cool Slopes, Straw-Clay Bldg. Round Beehive, Water Catchment
#37 Sept. '97 **Tools & Appropriate Technology**: Dowsing, Workbikes, Scythes, Japanese Saws, Nursery, Ferrocement, Greywater, Levels, Ram Pump, Solar Toilet, Log Yoke, Cookstoves
#38*Feb. '98 **Economic Transformation**: Speculation, No Middle Class, Coops, WWOOF, Global Warm'g, Hol. Fin. Plan'g. Land Use, Adopt-a-Hive
#39 Jul. '98 **Knowledge, Pattern & Design**: Pc Way of Seeing, Native Consvn Sand Dunes, Language-Worldview-Gender, Patterning Process, Land-Use Plan., Teaching Pc, Vietnam, Holmgren on Pc
#40*Dec. '98 **New Forestry**: Regl. Devl., Horses, Menominee Reservatn, Forest Investing, Restoratn, Old Growth, Homestead Tenure, Soils, Forest Farmg, Rainforests, Windbreaks, Coppice
#41*May '99 **Natural Building**: Oregon Cob, Cordwood, Bamboo, Thatch, Ethics, High Winds, Origins of Conflict, Greenhouses, Ponds, Adobe, Road Bldg, MicroHydro, Living Bldgs.
#42 Dec. '99 **Self-Reliance & Community Cooperation**: Co-Intelligence & Self-Orgn, Archetype Dsgn, Sovereignty, Mondragon, Natural Housing, Comm. Gdns., Zone 0, Solar Electric Tractor, Beekeeping
#43*June '00 **Food & Fiber**: Hunger, Ferments, Seasonal Salad, Heirlooms, Fencing Self-Fertile Gdns, Rice Revoltn, Cold-Climate Food, Edible Insects, Food Origins, Ethnobotany, Wild Food, Bamboo, Hemp
#44 Nov. '00 **Earthworks & Energy**: Spreader Drain, Horse Swales, Earth Dams, Machinery, Carpet-lined Ponds, Constr. Wetlands, Biogas, Windmills
-

- #45 Mar. '01 **Medicine & Health:** World & Self, Healthy Home, Designing Care, Ayurveda, Agents of Decay, Comn. Health Ctr., Women Trad. Med. 4th World Apoth., Healing Weeds, Medicnl Crops, Hawaiian Bot'ls
- #46 July '01 **Good Work & Right Livelihood:** Pc Golf Course, Downsize Cost of Living, New Forest Econ., Energy Currency, Buddhist Mktg, End Wage Slavery, What's Surplus?, Enterprise Facil'n
- #47 June '02 **Watersheds:** Water4Sale, Basins o'Relations, Watershed Devl, Gabions, Urban Runoff, Beavers, Skywater Ctr, Consvn. Investmt, Peat Bogs, Rabbits
- #48*Sept '02 **Making Changes:** Co-Intelligent Activism, Webs of Power, Urban Food, How to Change, Teaching for Change, Global Transform'n, City Repair, Escaping Job Trap, Argentine Recovery, Costa Rica Pc
- #49 Dec. '02 **Where is Permaculture?** Land-Rent Reform, 10 N. Amer. Sites, Cuba Ag, Rainbow Vall. NZ, Cacti/Succulents, Animal Self-Meds, Challenge2Pc
- #50 May '03 **Ecosystems:** Holmgren on Pc Mvmt, Hazelip & Syng. Ag, Chestnuts/Pigeons, Oak Savannas, Root Crop Polycult., Alders, Fungal Ecosys. Humans & Wilderness, Indoor Systems, Humid Trop
- #51 Jan '04 **Trad'l. Knowledge & Regeneration:** Cataclysm & Collective Memory, Genome Wisdom, Waru Waru, Biosculpture, Inuit Medicine, Fermented Stimulants
- #52 May '04 **Aquaculture:** EcoAquac, Fish4Health, Dowsing, Pond Design, Greywater Biotreatment, N. Amer. Polyculture, Manage for Native Spp, Integrated Village Fisheries, Vietnam
- #53 Aug. '04 **Education:** Lifelong Learning, Edge-ucation, Albany Free Schl, Indigenous Ed. & Ecology, Ecocentric Pedagogy, School Gardens & Dances, Ecology of Learning, Brain Gym
- #54 Nov. '04 **Fire & Catastrophe:** Design Beyond Disaster, New Opportunities Globalization, Invasion Biology, Street Orchards, Food Security
- #55 Feb. '05 **Learning from Our Mistakes:** Petrol Dependency, Village Design, Australian Lessons, RTFM!, Trial&Error, Forestry Experiments, Owner-Bldr, 10 Mistaken Ideas in Pc
- #56 May '05 **Tree Crops & Guilds:** Pine Nuts, Tree Vege, Acorns, American Chestnut, Honeylocust Silvopasture, Broadscale Agroforestry, Bamboo, Willow, Social Forestry
- #57 Aug. '05 **20th Anniv.: Challenges & Changes, USA** Pc, Hawai'i Retrospect, Permaturecture, Pc's Soft Edge, Gaia U, PINC, Oil Depl, IPC-7, Retrofit Suburbs
- #58 Nov. '05 **Urban Pc:** Urban/Rural Futures, City Zones & Sectors, Growing Food, Detroit Visionaries, ReBldg. New Orleans & Everywhere, Transforming a Military Base, Workers Co-op, Energy Descent.
- #59 Feb. '06 **Peak Oil:** Eco-Collapse & Trauma, Thom Hartmann, Pathways for Energy Descent, How Cuba Survived, Oil & Food, Biofuels, Algae for Fuel, Relocalize
- #60 May '06 **Land Use Past & Present:** Sust.Ag an Oxyoron?, Negev Bedouin, East. Woodlands AgroForestry, Pc Heals in India, Arcsanti, Pop. Growth/Land Hunger, Mexican Reforestation
- #61 Aug. '06 **Unseen Kin-doms:** Observation as Design Tool, Soil Food Web, Bees, Mycelial Internet, D-I-Y Mycorrhizal Inoculum, Cover Crops as Bee Forage, Earth Energies, Local Currencies, Dead Zones
- #62 Nov. '06 **Art of Permaculture:** Painting, Writing & Pc, Ecoartists, Art, Activism & Cmty, Street Theatre, Art & Bioremediation, Living Willow, Body as Zone 0, Art of the Found, Water Magic
- #63 Feb. '07 **Building & Technology:** How to Dwell? Natural Bldg & the Law, Bldg Code, Strawbale in China, Cob in Armenia, Integrated Solar Heating, Cooking, Pumping, Nation-Scale Pc in Brazil
- #64 May '07 **Waste = Food:** Throwaway Econ, Strategy of Salvage, Peak Soil, Pigs & Waste Mgmt, Bikes, Soil & Garbage, Farm as Organism, Opportunistic Plants, Simple Biodigester, Vermiculture
- #65 Aug. '07 **Climate Change:** Shrinking Seas, Forests' Role in Climate, Urban Forests, Making Trees Pay, Rainwater Harvesting, Indoor Gardens, Water Filtration, De-Stabilizing Climate
- #66 Nov. '07 **Animals in Design:** Jumbo Shrimp, Pawpaw Patch, Alpaca, Insects as Food, Integrated NH Farm, Pastured Poultry & Rabbits, Urban Livestock, Predator Restorat'n, Bees, Agrichar
- #67 Feb. '08 **Kids in Pc:** School as Ecosystem, Pc Education, Gardening Kids, Pc to H.S. Students, Tlaxcalan Kids Make Seedballs, Fostering Research Skills, Bottled Water Boycotts, Feeding 8 Billion.
- #68 May '08 **Plants on the Move:** Rethinking Non-Natives, Forest Migration, Black Walnuts, Saving Seed Savers, Grow a Community Gdn, N'hood Greening, Healthy Honeybees, Biofuels & Food Prices
- #69 Aug. '08 **Permaculture at Home:** Hawai'ian Cmty, London Forest Gdn, Suburban Renaissance, Calif. Campus, Phila. Orchards, Drinking Roofwater, Floating Island Bioremed., Bike Transport, Miss. Pc
- #70 Nov. '08 **Ethics at Work:** BAU is the Enemy, 13 Princ. of People Care, Pc in Business, Ecovillages, White Man in India, Uganda Boarding School, No Waste, Qual. Control, City Farming w/Runoff, Amaranth
- #71 Feb. '09 **Earthworks:** Hopewell Mound Water Mgmt, Belize, Keyline, Road & Dam Bldg., NW AgroFor, Pc&Landscape Arch, Earthbag Bldg, Low-Watt Fridge
- #72 May '09 **The View from Abroad:** War, Oil & Snails in Nigeria, Green Tech Future, Ethiopian Water Mgmt., Shrinking Forests, Food Exploration in Caucasus, Maya Agroforestry/Biochar, Pc to Trinidad,
- #73 Aug. '09 **Bioregionalism:** New Paradigm, Rocky Mtn. Wildlands, Wild Elephants, Organizing Houston, Heirloom Seeds, L.A. Gdns, Re claim. Commons, Transition Hohenwald, Tenn., BioCongress Saga
- #74 Nov. '09 **Energy Descent:** In the Home, Transition Communities, Pc in Mexico, Biochar, US Consumption Dropping, EcoTechnic Future, No More Throwaway Economy, Making Fuel Alcohol
- #75 Feb. '10 **Local Food:** A City & Regl. Food System, Working Family on 5Ac, CSAs & Wild Foraging, City Backyard Gdng., Food Bank Gdns & Orchards, Salt Collecting, Regional Staples, City Grains.
- #76 May '10 **Soil Fertility:** Permaculture Way of Soil, Biochar, Sheet Mulch, Hawai'ian Soil Farming w/ Worms, Demystifying Humanure, Urine Fertilizer, Crop Rotations, Mushrooms Build Soil
- #77 Aug. '10 **Eco-Nomics:** Measuring Many Forms of Capital & Quality of Life, Bob Swann & Invisible Structures, Bioshelter Market Gdn, Green Collar Economy, Pc & Finance, Pc Inst., Cert. Diplomas

#78 Nov. '10 **Water Wise:** Restoration Engineering, Watershed Relations, Colorado Runoff Gdns, Cisterns in Saudi Arabia, Energy Use & H₂O, Trad'l. Mexican Catchment, Rooftop Garden, Home Water

#79 Feb. '11 **The Urban Frontier:** Indoor Denver Farm, Rooftop Food, Home town Returns, Urban Ecovillage, City Bees, Urban Pc Projects, Start Pc Farming: Mark Shephard, Index to issues #24-40.

#80 May '11 **Designing for Disaster:** Collapse Mitigation, Global Storming, Responding to Major Events, Stabilizing the Climate, Self-Care, Ensuring Food Supplies, Living Through Drought

#81 Aug. '11 **Hidden Connections in the Garden:** Neighborhood Gdn, Urban Ag on Empty Lots, Food=Land Access, Indigenous Practices, Seeds, Deep Raised Beds, Greenhouses, Urban Wild Edibles

#82 Nov. '11 **Growing Staple Crops:** Broadscale Farming, Local Grain & Mkts, Non-Tillage Beans/Corn, Pigs and Potatoes, Rice in Vt. Perennial Staples - Pt. 1, Garden Farming, Acorns & Chestnuts.

#83 Feb. '12 **The Economy of Wood:** Polewood, A Northwoods Economy, Basketmaker's Landscape, Ligurian Alnoculture, Wood as Fuel, Clearing Woodland, Black Locust, Perennial Staples - Pt. 2

#84 May '12 **Home and Hearth:** Domestic Permaculture, Natural Building, Roundhouses, Hearthfire, Retrofits, Home Economy, Homeschooling, Drylands Pc, Nova Scotia Homestead

#85 Aug. '12 **There Goes the Neighborhood:** So. American Neighborhood Projects, N'hood Pattern Language, Community Solar, Food Security, SENS House, Moving Groups, Fracking & Common Rights

#86 Nov. '12 **Health and Nutrition:** Naturopathy Centre, Seasonal Eating, Plant Medicine, Mushrooms & Vit. D, Herbal First Aid, Campus Forest Gdns, Beer, Growing Wise Children, Fenugreek

#87 Feb. '13 **Weeds to the Rescue:** Managing Weedy Spp, Favorite Weeds, Weed Wisdom, Paulownia, Grafting onto Weed Trees, Polycultures, Burdock, Reputation of Weeds, General Index to PCA #41-58.

#88 May '13 **Earth Skills & Nature Connection:** Mentoring, Cultural Repair, Connecting Youth to Nature & Self, Living with Wild Animals, Observation Skills & Design, Oyster-tecture, Personal Forest.

#89 Aug. '13 **Practicing Democracy:** Slow Democracy, Seed Libraries, Rhode Island Prosperity, Lessons from the Iroquois, Community Gardens, Entrepreneurship, Social Pc, Pastoralism, Sweet Cicely

#90 Nov. '13 **Appropriate Technology:** Technology & Culture, Zone 4 Tools, Rocket Mass Htrs, Solar Pump, Solar Food Dryers, Social Sharing Software, Oil Presses, Woody Ag Trials, Scythes, PV Dbl. Cropping

**See website for complete list and to order.
Available in hard copy or USB drive.
Note: many early issues available only in photocopy.**

Explore the Back Issues Archive

The entire set of 118 back issues have now been converted to pdf files and are available for your use. If you're a current subscriber, access is free. Just use your current digital access login. Download is currently limited to one issue at a time. If you'd like the whole collection on a USB drive, it's available for \$100... or you could subscribe for \$25!

Be aware that several of the earliest issues have survived only as photocopies, and issues up to #71 were laid out in Adobe PageMaker, and had to be scanned as well. All of these were printed on newsprint, which yellows with age, the point being that getting quality scans was nearly impossible. Some scans aren't pretty, but all text is searchable. Issues #72 and onward were laid out in InDesign, and pdf quality is excellent.

Both general and species name indices of issues #1-90 are available as a separate download on the downloads page.

Instructions for digital access (to either the current issue or the back issues archive):

On the home page, click on Digital Access Login. Enter the e-mail address you'll use to login, select a password, and submit—we will approve your request if you're a subscriber. After that, click on the same button and login to download.



EVENTS

Permaculture Design Course

Online

Dates: Ongoing

Description: Our course is the classic, official 72-hour Permaculture Design Certificate Course (PDC) as taught by the founders of permaculture. This course involves study modules supported by practical exercises, fieldwork, and videos.

Instructors: Dr. Alan Enzo, Jessica Enzo, Steven Cran, Steve Hart

Cost: \$550

Contact: PermacultureEducation.com
info@PermacultureEducation.com

Permaculture Design Course

Online

Description: Oregon State University's online Permaculture Design course is a great way to build essential sustainable landscape design skills in a convenient online format. After ten weeks, you will complete a finished design with:

- * One-on-one guidance from experts

- * Timely feedback on your individual project from your designated instructor.

- * Low student / teacher ratio to ensure individualized attention for you. .

Instructors: Andrew Millison and others

Contact: <https://workspace.oregonstate.edu/course/permaculture-design-certificate-online>

Permaculture Design Course

Online

Dates: Ongoing

Description: Learn to work with nature, rather than against it. Everything you need to know about how to live in harmony with nature is free and available every time you put your hands in the soil. But for many of us, working with nature doesn't come naturally, and this is where taking a structured approach to learning (or remembering) how to think like an ecosystem comes in handy. And that's exactly what this Online Permaculture Design Course can do for you. Learn how to connect to nature's wisdom, think like an ecosystem, and innovate regenerative changes, starting with your garden and expanding as far as you want!

Instructors: Heather Jo Flores and expert faculty mentors

Cost: See website.

Contact: <https://www.permaculturewomen.com/online-permaculture-design-course/>

Permaculture Design Course (PDC)

British Columbia

Dates: June 30 - July 14

Location: O.U.R. Ecovillage, Shawnigan Lake, BC, Canada

Contact: <https://ourecovillage.org/2024-pdc-permaculture-design-certificate/>

Description: O.U.R. Ecovillage's Permaculture Design Program is co-created with Starhawk & Earth Activist Training. We intend to dive deep into ecological knowledge building and welcome you to join us. We recognize that we are all teachers and we are all learners. This gathering of educators, community practitioners, adult learners, parents, and youth will take the journey together to build capacity & interdependence in an attempt to decolonize permaculture & educate for climate and nature emergency. Shifting patterns, exploring worldviews, and practicing tools and capacity building creates new possibilities. Our 2024 Permaculture Design Programming offers a variety of opportunities for people of all ages and lived experience to gather for a co-creative inquiry into how to hold each other as we grow into the certainly uncertain future... and listen to what calls us forward. <https://ourecovillage.org/o-u-r-2024-permaculture-programs/> Course will cover: * Evidence for change & the ethics of sustainability * Principles of Permaculture * Observation & landscape analysis * Ecological planning & design methods * Organic food production and food security * Climatic factors in design * Soils: natural soil improvement * Integrated animal systems * Water: harvesting, conservation, and management * Agroforestry & forest gardening * Appropriate technologies & renewable energy systems * Mapping & design exercises * Techniques and design strategies for both urban & rural applications * Ecovillages & sustainable human settlements

Registration: <https://ourecovillage.org/2024-pdc-permaculture-design-certificate/>

Instructors: Starhawk, Charles Williams, Mark Lakeman, hiinahcit /Petrina Dezall and Guest Speakers

Permaculture Design Certificate Course (PDC)

Western Massachusetts

Dates: Full Days Onsite; July 18-22 and August 22-26

Location: Shelburne Falls, Western MA

Contact: www.PermacultureSeries.org
PermacultureSeries@gmail.com

Description: Summertime 2024 Weekend Series Permaculture Design Certification Course, with Sowing Solutions Permaculture. Immerse in the Permaculture Design Certification Course during the growing season with Sowing Solutions at our Permaculture Center in the artisan Village of Shelburne Falls in Western Massachusetts. Practice ecological design alongside leading permaculture designers and educators in the northeast; Gain your permaculture design certificate with Sowing Solutions who is celebrating over 18 years of interactive permaculture education; Network across the region and form lasting friendships and webs of mutual support; Visit numerous inspiring demonstration farms, homes, nurseries, and agroforestry projects; Apply your design skills in a guided process to create a design for a project site in the village; Join us for an informative and uplifting program.

Instructors: Kay Cafasso, Keith Zaltberg, Walker Korby, Llani Davidson, and many special guests

Cost: \$1250-\$1450; Sliding scale, work trade, and fundraising support available.

Permaculture Courses

Central Rocky Mountain Permaculture Institute (CRMPI)

Colorado

Permaculture Design Course

Date: July 15 – 22, 2024

Location: Central Rocky Mountain Permaculture Institute, Basalt, Colorado

Website: <https://crmpi.org/permaculture-certificate-1>

Description: The Permaculture Design Certificate (PDC) offered through CRMPI is the longest running course of its kind in North America. At the PDC at CRMPI you will learn from a campus-homestead where permaculture has been practiced for the past 30 years. Not only are you learning the essential concepts and practices of permaculture from a world-renowned team of master teachers who imbue their work with rich depths of life wisdom, you learn the tools to design and engineer sustainable systems, such as forest gardens, renewable energy systems, water conservation systems, and other eco-technologies. You'll not only be learning the concepts, you'll be applying these the skills needed to implement them, and seeing the fertility and abundance that result from decades of applied permaculture.

For more details: <https://crmpi.org/permaculture-certificate-1>

Instructors: Jerome Osentowski, Stephanie Syson, Mathew Davis, Adrian Fielder

Cost: \$1875 – includes camping and organic meals

Permaculture Academy

Designing and Managing High-Altitude/Low Energy Use Greenhouses, Creating Forest Gardens

Date: August 10 – 18, 2024

Location: Central Rocky Mountain Permaculture Institute, Basalt, Colorado
Website: <https://crmpi.org/permaculture-academy>

Description: Now in our 10th year, we offer 2 immersion intensives in our unique Permaculture Academy: a 9-day, 2-course, in-depth training in key elements of permaculture practice:
August 10-13 : Designing and Managing High-Altitude/Low Energy Use Greenhouses (4 days)
August 14: Day of rest; no class
August 15-18: Creating Forest Gardens (4 days)

This is one of the most in-depth Permaculture Programs currently offered anywhere. It's designed to shorten the introductory learning curve and send you out with the working, practical knowledge you need to start putting permaculture into practice. Whatever your level of interest – whether you want to reclaim an urban lot, turn your back 40 into a food forest, or take the first steps toward a career in design and consulting – this Academy can suit your need. You may choose to attend all of the modules, or pick and choose the modules you would like to attend. Although taught through on permaculture concepts, you'll be immersed in permaculture practice and application at one of the finest demonstration sites in North America, experiencing the results of 30 years of organic cultivation and state of the art, low energy use greenhouses. You'll eat delicious organic food from mature forest gardens, witness rainwater catchment, use and maintain composting toilets, enjoy light and warmth from passive and active solar technology, and participate in small animal husbandry in a vigorous and healthy poly-culture system at 7200' elevation.
Instructor: Jerome Osentowski
Cost: \$1400 or \$700 per module, includes camping and organic meals

Permaculture Workshops 2024:

Greenhouse Design + Forest Gardening

Dates: May 18th & 19th

June 15th \$ 16th

September 14th & 15th

October 12th & 15th

Location: Central Rocky Mountain Permaculture Institute, Basalt Colorado

Website: <https://crmpi.org/permaculture-workshops>

Description:

Saturdays – Greenhouse Design and Maintenance Course: This workshop offers hands-on instruction in the many aspects of greenhouse design, installation, and maintenance, and teach you how to grow your own food year-round, even tropical fruits, using Climate Battery technology. Learn the intricacies and design of greenhouse growing with an emphasis on perennial polyculture and making the most of your space. Discover how you can stack functions to make your greenhouse more effective and efficient. Or, if you don't have a greenhouse, just come to see how this low-tech greenhouse design produces papayas, pomegranates, and other tropical goodies at 7,200 feet above sea level.

Sundays – Edible Landscaping Course: This workshop offer hands-on instruction in the many aspects of high-altitude forest garden and greenhouse design, installation, and maintenance. Taught by Jerome Osentowski, founder of the Central Rocky Mountain Permaculture Institute in Basalt, CO, instruction will include:

- Designing and maintaining a forest garden
- Building Soil with vermiculture
- Integrating plant guilds with animal livestock to promote biodiversity and ecological functions
- Successful Companion planting for the high Rockies

Saturday workshops will run from 9am to 5pm and include lunch and dinner. Sunday workshops will run from 9am to 4pm and include lunch and an afternoon snack.

Instructor: Jerome Osentowski

Cost: \$175 per day, or \$350 for both days. Includes meals and curriculum material

Permaculture Design Certificate Course (PDC) California

Dates: One weekend a month, April - September, 2024

Location: near Santa Cruz, CA

Website: <https://santacruzpermaculture.com/> Registration: <https://santacruzpermaculture.com/permaculture-design-course/>

Description: Join Santa Cruz Permaculture one weekend a month for six months near Santa Cruz, California and earn your certificate in Permaculture Design! The Santa Cruz Permaculture Design Certificate course includes the internationally recognized 72-hour curriculum, augmented by an additional 38-hours of hands-on practice and field trips. Plus, folks have the option to camp on site, and build community around the fire! This course brings in leading designers and teachers from around the region, each experts in different areas of permaculture. The hands-on learning, workshops, and readings throughout the course prepare students with knowledge and whole systems thinking strategies that allow them to create detailed and thoughtful designs. A few of the topics covered include Regenerative Design & Nature Awareness, Regenerating Watersheds & Soils, Financial & Economic Permaculture, Creating Natural Homes & Edible Landscapes, Ecosystem Regeneration: Integrated Animal Husbandry & Forest Management, and Community Development.

Instructors: David Shaw and regional experts

Cost: \$1,295, register early for savings (see website for discounts available)

Permaculture Design Certificate Course (PDC) California

Dates: June 16-29, 2024

Location: near Santa Cruz, CA

Website: <https://santacruzpermaculture.com/>

Registration: <https://santacruzpermaculture.com/permaculture-design-course/>

Description: Two Week Summer Intensive June 16-29, 2024. June 16th is arrival day, with a farm orientation in the evening. The course begins Monday, June 17th. Our 2-week intensive covers the same curriculum as our 6-month course. Tuition includes catered meals and on-site camping. The 2-week intensive is followed by our 8-day Advanced Permaculture Design Course. Please consider joining us for both courses.

Instructors: David Shaw & regional experts

Cost: \$1,895 (see website for discounts)

Permaculture Skills Course California

Dates: One weekend / month, Apr.-Sept.

Location: Central Coast, CA

Website: <https://santacruzpermaculture.com/courses/>

Description: Gain skills and learn best practices to be able to successfully and confidently implement sustainable living projects! Our 6-weekend permaculture skills course focuses on developing practical skills through hands-on learning. Topics covered include: Construction & Carpentry Forestry & Wood heat: fire mimicry, rocket stoves, ovens, harvesting timber and non-timber forest products Energy: electrical, solar, biogas, bicycles Agriculture: composting, orchards and animals, no-till techniques, brush clearing, gopher trapping Water: plumbing (especially for greywater systems), drip irrigation, rainwater harvesting Landscape Construction: stonework, masonry, fencing

Instructors: David Shaw and guest instructors

Cost: \$1,395

Advanced Design Course California

Dates: July 13-20, 2024

Location: near Santa Cruz, CA

Website: <https://santacruzpermaculture.com/>

Registration: <https://santacruzpermaculture.com/permaculture-design-course/>

Description: This 8-day Advanced Design Course is an excellent follow-up to a Permaculture Design Course. Join us at the Santa Cruz Permaculture Farm on the Central Coast of California! Camping and catered meals are included in tuition. This is an opportunity to be with other dedicated permaculturists and experienced instructors to help guide you to the next steps you need to sharpen your design skills to a fine point. Upon successful completion of this course you will ... Be fluent with the design process and able to hit the ground running for any permaculture design project. Have a deeper understanding of how context drives decision-making in permaculture design. Have honed a variety of skills useful for improving permaculture designs you're doing for yourself, family and friends, or in a professional setting. Have produced a design for a real world client that can provide a start or a boost for your design portfolio. Have gained a deeper understanding of the details required for some of the most frequently encountered design scenarios.

Instructors: Dave Boehnlein of Terra Phoenix Design, David Shaw of Santa Cruz Permaculture, and guest instructors

Cost: \$1,395

Permaculture Design Certificate Course (PDC)

Costa Rica

Dates: April 14-April 28, 2024

Location: Tierramor, Nosara, Guanacaste, Costa Rica

Description: Join our diverse team of permaculture instructors led by Hugo Soto and Scott Gallant of Porvenir Design, for this life-changing 2-week experience. Additional teachers will be announced soon. The course covers the core Permaculture Design curriculum and emphasizes creating diverse multi-functional human landscapes based on ecological patterns.

This two week course will include a specific focus on the topic of Syntropic Farming, an agroforestry methodology developed in Brazil by Ernst Gotsch. You can read more on Syntropic Farming here. We will have the chance to design a new syntropic farming area, give maintenance to existing systems and in general see this methodology in action.

Utilizing Tierramor as a living classroom, the class will mix lectures and hands-on work, exploring design solutions for both temperate and tropical regions. Putting Permaculture into practice, the course concludes with students working in teams to create their own permaculture site design.

The whole-systems design thinking outlined in the course will give participants the tools to re-design and improve their surroundings; from gardens, farms and homes, to livelihoods,

relationships and communities.

The farm at **Tierramor** exists primarily to trial and document the most innovative agricultural designs and practices for dry tropical forests. It seeks to do so by blending human and ecological needs and land use, creating an environment that integrates the many functions and needs of the project. The farm is the first phase, approximately 5 hectares, of a larger 200 hectare project.

Tierramor offers a number of lodging options which are reflected in the course price options below. The course cost includes three vegetarian meals per day. For more information on lodging, food, how to arrive, and course enrollment, please visit:

Instructors: Scott Gallant, Hugo Soto, and Vero Flores; Porvenir Design and Tierramor Teams

Cost: Bunk House: US\$1800; Shared Room: US\$2,200; Private Cabin US\$3000; Day Pass US\$1200; 25% discount for Costa Rican students; Couples lodging available, please inquire. Cost includes accommodation, meals, training program

Contact: To register for this course or for more information please write directly to Fabian Corrales at operations@tierramor.cr

<https://www.porvenirdesign.com/workshops/2019/4/14/pdc-tierramor-april24>

<https://tierramor.cr/>

Permaculture Design Certification Course

Costa Rica

Dates: Nov. 24 - Dec. 7, 2024

Location: Rancho Mastatal, Costa Rica

Website: <https://ranchomastatal.com/permaculture-design-course-fall>

Description: Join our experienced team of permaculture practitioners led by the Rancho Mastatal team for this annual life-changing 2-week experience. The course covers the core Permaculture Design curriculum (developed by Bill Mollison and David Holmgren) and emphasizes creating diverse multi-functional human landscapes based on ecological patterns.

Utilizing Rancho Mastatal as a living classroom, the class will mix lectures (60%) and hands-on work (40%), exploring design solutions for both temperate and tropical regions. Putting permaculture design into practice, the course concludes with a permaculture site design for a clients property.

Instructors: The Rancho Mastatal team

Cost: See website for cost, directions, and registration info.

CALENDAR

Ongoing

Online. Permaculture Design Course. info@PermacultureEducation.com, PermacultureEducation.com.

Online. Permaculture Design Course. pace.oregonstate.edu/permaculture

Online. Food Forest Course. workspace.oregonstate.edu/course/Permaculture-Food-Forests

Online. Permaculture Design Course. <https://www.permaculturewomen.com/online-permaculture-design-course/>

May 2024

May 18-19. Colorado. Permaculture workshops. crmpi.org

June 2024

June 1. Kentucky. Skills Workshop: Integrate Cover Crops without Tillage. salamandersprings.wixsite.com/farm/workshops

June 15-16. Colorado. Permaculture workshops. crmpi.org

July 2024

July 7. Kentucky. Skills Workshop: Soil Health Principles & Practice. salamandersprings.wixsite.com/farm/workshops

July 15-22. Colorado. Permaculture Design Certificate. crmpi.org

August 2024

Aug. 10-18. Colorado. Permaculture Academy. crmpi.org

Aug. 24. Kentucky. Skills Workshop: Crop Seed Selection & Saving. salamandersprings.wixsite.com/farm/workshops

September 2024

Sept. 13-15. Kentucky. Permaculture in Practice Weekend Intensive. salamandersprings.wixsite.com/farm/workshops

Sept. 14-15. Colorado. Permaculture workshops. crmpi.org

October 2024

Oct. 12th and 15th. Colorado. Permaculture workshops. crmpi.org

November 2024

Nov. 6 - Dec. 15. Taiwan. 15th International Permaculture Convergence. ipctaiwan2024.org

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Central Rocky Mountain Permaculture

RIGHT LIVELIHOOD PROGRAM

Join CRMPI's team and support the visionary model of this long-running, high-visibility permaculture site into its exciting future. All activities at CRMPI are covered under the state of Colorado's agricultural right to use rules. CRMPI has been rooted on Basalt Mountain for over 35 years and the resources at this site can easily support a wide variety of agricultural operations and products. The livelihood program offers an exciting opportunity for individuals to step into the existing infrastructure and start earning a living from the agricultural resources that already exist there with minimal start-up costs. This is a significant value given the high cost of living and real estate prices in the area. We are looking for candidates interested in building agricultural product lines for sale in the community here in the beautiful Roaring Fork Valley or to a larger audience via the web or a combination of both. We are looking for any and all of the following livelihoods:

Herbalist
Nursery/Forest Gardener
Annual Production Gardener
Mushroom Cultivation
Maintenance Person/Woodworker
Seed Saving Livelihood

Bring your own agricultural vision!

The infrastructure at CRMPI is able to support housing, land, tools, insurance, utilities, facilities and the name recognition/network CRMPI has been building for the last 35+ years. Each livelihood will be considered and negotiated with CRMPI's Founder, Jerome Osentowski, who has produced income from all of the above in the history of his time there. Couples are encouraged to apply!

In order to be considered for one of these exciting and innovative positions, please submit the following:

Curriculum Vitae or Resume
Letter of interest/introduction (cover letter) including your unique set of skills, experience, resources you bring with you and resources you will need – no more than 1 page single spaced

For more information or to apply, visit:
<https://crmpi.org/right-livelihood-program>

LETTERBOX



We received a thank you message from one of our Design Contest winners, Dayana Valdes. Thought I would pass along her gratitude for the Permaculture Design magazines.

Elizabeth Lynch | Administrator
Permaculture Institute of North America

[Ed. note: *Permaculture Design* was honored to donate two complete sets of back issues to the PINA Design Contest winners in the latest design contest.]

Last week, two boxes of treasure were delivered to my door. I felt like a child on Christmas morning when I received those boxes full of decades of permaculture wisdom! Those magazines are priceless. I have a lot of reading and learning to do, again, thank you!

Great issue, y'all are rocking. We're having a wild ride with climate warming, we went from a treemageddon snow storm to 70 degree early spring in a week, the most pleasant weather I've ever experienced here, and I most definitely moved here for the climate.

Sad to read that Adam left us; bamboo brought us together, we were pen pals for years, and I visited The Farm back when Sue was there. A note on bamboo: we have our own North American genus, and also a living native basketry tradition with the Eastern Cherokee people. There is an interesting riverboat description of stopping at a wharf on the Mississippi and hearing a native American band with a great variety of instruments made with native bamboo.

In Western Oregon we are in one of the smallest climate zones in North America. When the Hudson Bay Company ran the show here we ran out of beaver, with heavy consequences for the geography of what is now ironically termed "the Beaver State" Maize doesn't really do much here without irrigation, but the cultures did well with the edible bulbs of Camas for many thousands of years. There was also a Composite family staple crop well-adapted to the weed-control

by fire regime for Camas: an annual which is still quite common which the Euro American settlers called "Native Wheat" and bears the botanical Latin name *Madia sativa*. The common name is "Tar Weed" Despite the stickiness (which does have medicinal uses) it is possible, with a receptacle in one hand and a small stick in the other, to harvest a meal's worth of seed in short order. Then after allowing distressed insects to flee, a short toasting in an oven and some finely crumbled dried seaweed for salt and other minerals and you'll have a Cascadia take on Gomasio, and cost of production will be offset by needing a smaller quantity for the desired effect. Camas is not as easy; it grows underground and separating the bulbs from the heavy clay soil is not supereasy. The native way is pit oven cooking with green leaves keeping the bulbs away from the dirt and adding moisture to the slow cooking needed to change the complex sugar inulin to simple glucose. (Most readers will be more familiar with inulin-containing Jerusalem artichokes, actually tubers from a Sunflower)

Rick Valley
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A dense, multilayered garden hosting a wide diversity of food-producing plants can provide a long-lasting food system capable of feeding a family as well as the planet.

Joshua Burman Thayer's *Food Forests for First Timers*, a humble, grassroots offering of garden teachings, shows how easy it is to create a home food forest.

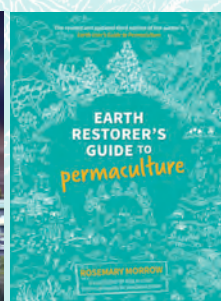
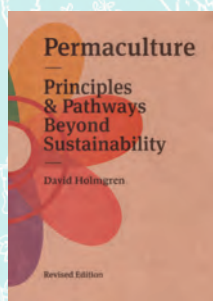


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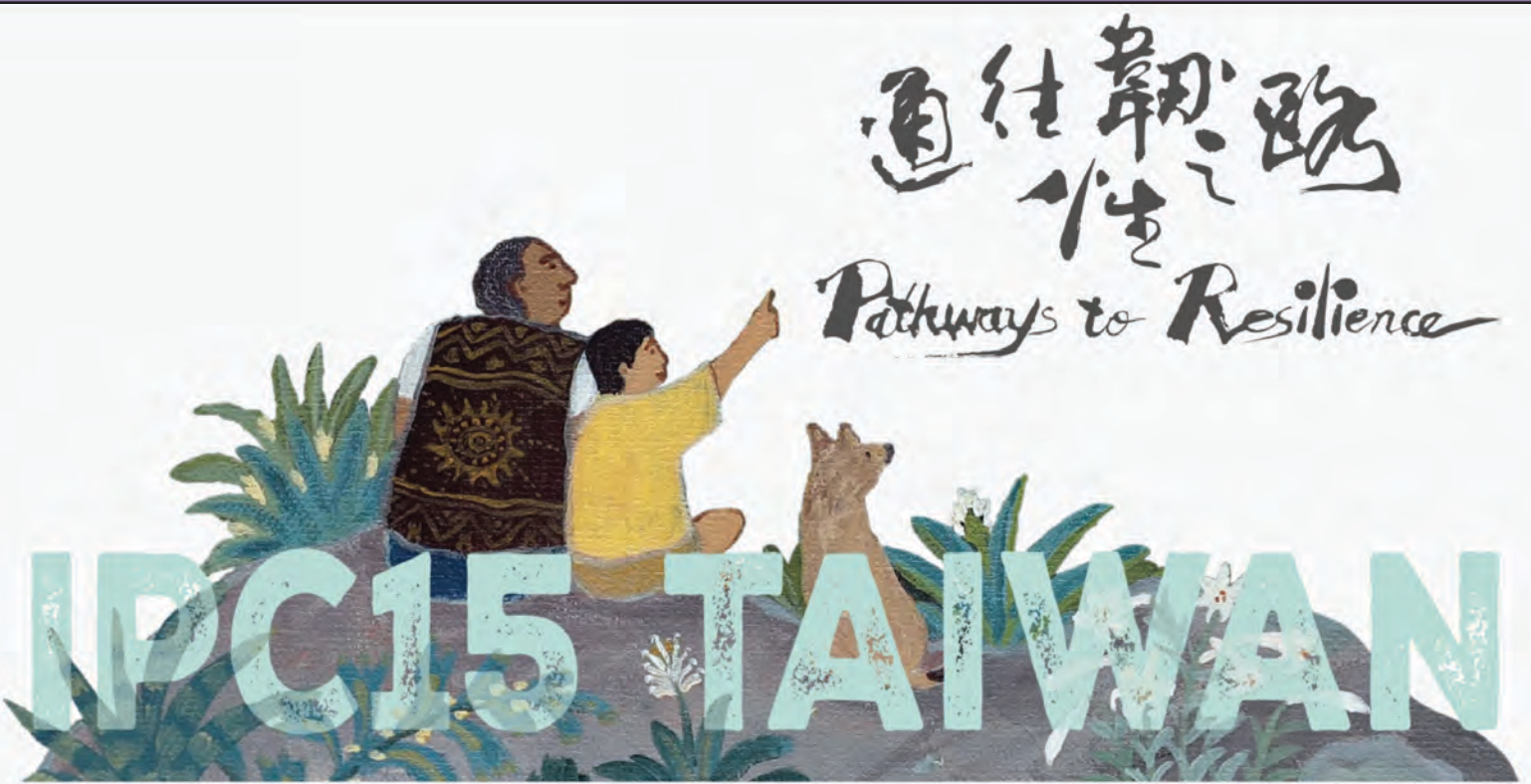
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