

Permaculture

Activist

Watersheds—

Basins of Relation

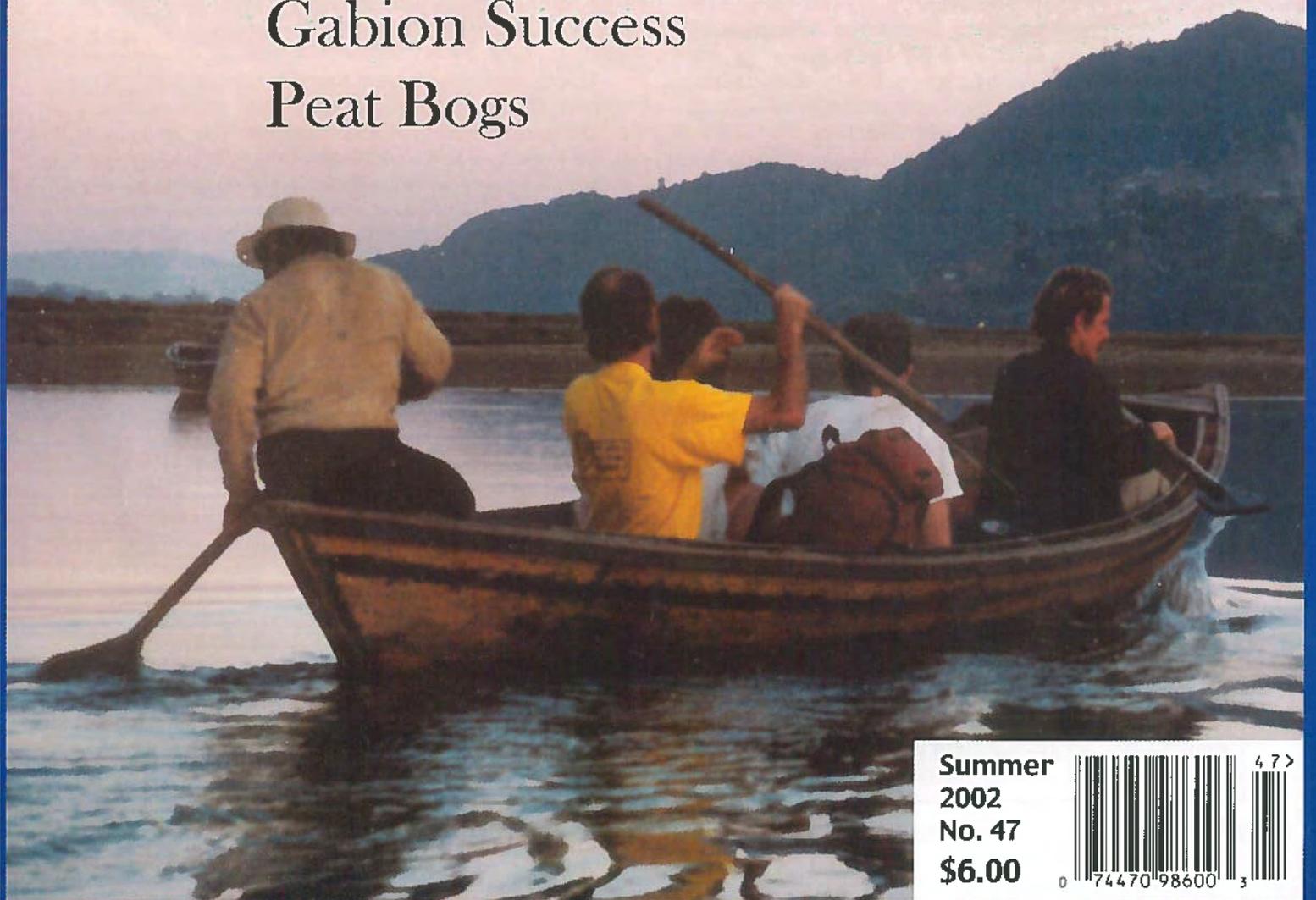
Crystal Waters Development

Wisdom of the Beaver

Skywater Restoration

Gabion Success

Peat Bogs



Summer
2002
No. 47
\$6.00



Flowing Again

Peter Bane

A Watershed moment is a point of decision—toward which basin or relations will we flow? In setting the theme of this issue I had in mind an injunction laid out for me by Lea Harrison and Max Lindegger 12 years ago: “Permaculture has to lift its game.” They meant that the world situation was accelerating and that change had to happen—if it was to match the demands of the era—on a larger scale: Increasingly, we would have to design communities and watersheds. Permaculture couldn’t live up to its mission if the focus remained on individual homes and small properties in isolation. We needed to develop greater webs of connectivity.

Little did I imagine how dramatically this period would frame the issue for the world. The global crisis has accelerated geometrically over the past nine months.

Moving smoothly toward deadline last September, we were overtaken in a sense by the shock wave of 9/11. No, the post office didn’t stop delivering mail—though the possibility hung in the air for a few tenuous days. (You think about these things when your work depends on them.) But the damaging effects of that barbarous act of political theater were not confined to Ground Zero in New York. They disrupted flows seen and unseen across the globe.

To bridge this divide today seems nearly impossible. How to live in a world where the most momentous political event of a decade has no communicable meaning? When millions in the United States accept a melodramatic fiction as pretext for endless war and secret government, can there be hope to make a reasoned case for so little understood a subject as ethical, environmental design? Perhaps I can be forgiven for wondering.

Faced with evidence of mass delusion, it’s important to keep checking in with reality if we want to keep the main thing, the main thing.

Well, the icecaps are still melting, faster than before. Extinctions keep ratcheting up, fish stocks have plummeted and not recovered, and we’re learning we’ve dumped more poison into the biosphere than anyone imagined even five years ago. No one has yet discovered a way to make nuclear waste safe...ever. Nor, apparently, capitalism.

So I’ve put my money on the sustainability horse, definitely a long shot. That means communities and watersheds, local lore, good neighbors, knitting together the fabric of life. That’s what you’ll find in this issue: how to know your watershed, how to make it a community, how to increase its water holding capacity, and some evidence that all those things can be done (because they have been) by people like you and me.

Subscribers and other readers have reason to wonder why this magazine disappeared for so many months. This issue was due to

have been published in November, and is only making its appearance half a year later. We certainly apologize to all who have been inconvenienced by this hiatus: our readers, subscribers, advertisers, and those seeking information about the state of the permaculture movement in North America.

Never our intention to lapse, and after four or five timely issues, with reason to be surprised ourselves that it happened, we fell victim at one level to our own choices, though over the past six months there haven’t been many ways available to us to direct the situation toward a different outcome. In some cases the consequences were predictable, and we can accept responsibility with equanimity. In other cases the consequences were delayed, hidden, deviously embedded in the matrix of past-present-future: In the classic formulation, “It weren’t my fault!”

The first failure was my failure to abandon a public works project at Earthaven village that I committed to direct: building a large cistern for the community water system. When that project was delayed by controversy, failure to complete other work on schedule, and a scope that no one had adequately assessed, it ate up much of October and part of November that had been reserved for editorial work. Since that water reservoir is both fire protection for my home and the only winter source of water to the community where I live it, was difficult to walk away from it, nor did cold weather come (in the warmest, driest autumn on record) to shut it down, nor would anyone else step forward to offer relief. The tank I am pleased to say, was completed successfully and has been functioning since the New Year. I’m sorry that its benefits are not more tangible to the readers of this publication, but local action is like that. There is a ripple effect, but it takes time. I assure you I’m a happier fellow for getting a bath regularly.

That tank set us back about five weeks, a calculated delay I was willing to risk. What I didn’t anticipate was what came after.

The second failure was probably unavoidable but no easier to endure because of it: the community meeting hall where our offices are located (temporarily, for lack of any other adequately large, electrified, all-weather spaces—real life sustainability is no joy ride) became a construction zone the day after the tank project ended. For seven weeks, dust and noise were the dominant reality for all hours of the day and night, as floor was laid (concrete, then subflooring, then finish maple - it’s lovely, by the way). There was no notice, no plan, no alternative scheduling, no place to retreat, and no way to concentrate on words and concepts in the midst of it all. In the hours when construction wasn’t actually in full swing, the small off-grid power system supplying the building was reeling from the demands of power tools. Blackouts were frequent—a perilous condition for computer work. Shocked, distressed, frustrated, powerless (literally) to work—I was all of the above. When the dust settled after the New Year, a week-long gathering descended on the hall for day and night meetings. Can this really be happening to me, I wondered? The gathering over, it’s now mid-January.

The third failure four days later, was my health. (See shocked and distressed above.) When you can’t take care of your obligations, do your work, or have any say over the matters most vital in your life, it leads, not surprisingly, to depression—or as the doctor diagnosed, stagnant liver energy, manifesting suddenly as a bladder infection with unpleasant effects on the prostate

continued on page 74

— Future Issues: Themes & Deadlines —

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#50 Ecosystems: Succession & Evolution	December 15
#51 Traditional Knowledge: New & Old	March 10

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The Permaculture Activist is an independent publication serving the permaculture movement in North America. Our primary goal is to provide information useful to people actively working to establish permaculture systems "on the ground."

The postal address for subscription, advertisements, editorial, and all correspondence is P.O. Box 1209, Black Mountain, NC 28711. Please see the inside back cover for complete subscription information.

The publisher assumes no responsibility for unsolicited materials. Please send typescript or material on 3-1/2" diskette, zip disk, or via email to our address below. Manuscripts or artwork not accompanied by a stamped, self-addressed envelope will not be returned. Copy and artwork should be submitted two months prior to publication date.

An ad rate card is available upon request from: *The Permaculture Activist*
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Cover photo by Peter Bane

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Please send subscriptions, letters, and material for publication to:
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PERMACULTURE, or "permanent culture" is the practice of creating mutually beneficial relationships with the natural world. Permaculture designs are a synthesis of ancient traditions, appropriate technologies, and an enlivened connection with nature.
—Penny Livingston

Water as Commodity

Maude Barlow

THE WORLD IS POISED to make crucial and irrevocable decisions about water. When world leaders and civil society representatives gathered at the tenth Stockholm Water Symposium in August 2000, there was little disagreement about the urgent nature of the water crisis facing the world.

All the attendees agreed that the human race has taken water for granted and massively misjudged the capacity of the earth's water systems to sustain the demands made upon them. Our supply of available fresh water is finite and represents less than half of one percent of the world's total water stock. Thirty-one countries are facing water stress and scarcity and over a billion people lack adequate access to clean drinking water. By consensus, the group recognized the terrible reality that by the year 2025, as much as two-thirds of the world's population will be living with water shortages or absolute water scarcity. (1)

The Stockholm Water Symposium also acknowledged that instead of taking great care with the limited water we have, we are diverting, polluting, and depleting it at an astonishing rate as if there were no reckoning to come.

But there is profound disagreement among those in the "water world," around the nature of the threat and the solution to it. A growing movement of people believe that the imperatives of economic globalization—unlimited growth, a seamless global consumer market, corporate rule, deregulation, privatization, and free trade—are the driving forces behind the destruction of our water systems. These must be challenged and rejected if the world's water is to be saved.

Economic Globalization

Economic globalization integrates the economies of nation-states into a single unified market and carries industrial production to new levels. It intensifies natural resource exploitation and exacerbates every existing environmental problem. The imperative of globalization is unlimited growth, making it impossible for participating countries to make preservation a priority.

Developing countries have restructured their economic systems to pay their debt and export their way to prosperity, destroying both natural ecosystems and environmental regulations. Economic globalization has also resulted in the exponential increase in the use of fossil fuels, dams and diversions, massive transportation systems needed to carry out global trade, and roads carved out of wilderness. In the global market, running out of a local resource can be quickly rectified: when East Coast cod are depleted, we just move on to Chilean sea bass.

In the new economy, everything is for sale, even those areas of life once considered sacred, like seeds and genes, culture and heritage, food, air, and water. As never before in history, the public space, the vital commons of knowledge and our natural heritage has been hijacked by the forces of private greed.

As environmental leader Paul Hawken says, "Given current corporate practices, not one wildlife reserve, wilderness, or indigenous culture will survive the global economy. We know that every natural system on the planet is disintegrating. The land, water, air, and sea have been functionally transformed from life-supporting systems into repositories for waste. There is no polite way to say that business is destroying the world."

In the race to compete for foreign direct investment, countries are stripping their environmental laws and protection of natural resources, including water protection. In some cases, such as the world's 850 free trade zones, they either look the other way as environmental laws are broken and waters are criminally polluted or actually set lower standards in these zones than for the rest of the country.

Throughout Latin America and Asia, massive industrialization in rural communities is affecting the balance between humans and nature. Water use is being diverted from agriculture to industry. Huge corporate factories are moving up the rivers of the Third World, sucking them dry as they go. Agribusinesses growing crops for export are claiming more of the water once used by family and peasant farmers for food self-sufficiency. The global expansion in mining and manufacturing is increasing the threat of pollution of underground water supplies and contaminating the aquifers that provide more than 50 percent of domestic supplies in most Asian countries.

To feed the voracious global consumer market, China has transformed its entire economy, massively diverting water use from communities and local farming to its burgeoning industrial sector. As the big industrial wells consume more water, millions of Chinese farmers have found their local wells pumped dry. Eighty percent of China's major rivers are now so degraded, they no longer support fish. Economic globalization and the policies that drive it are proving to be totally unsustainable.

The Water Transnationals

This leads to a second area of potential disagreement, the role of transnational corporations in determining the future of water. Just as governments are backing away from their regulatory responsibilities, giant transnational water, food, energy, and shipping corporations are acquiring control of water through the ownership of dams and waterways. These corporations are gaining control over the burgeoning bottled water industry, the development of new technologies such as water desalination and purification, the privatization of municipal and regional water services, including sewage and water delivery, the construction of water infrastructure, and water exportation.

The goal is to render water a private commodity, sold and traded on the open market, and guaranteed for use by private capital through global trade and investment agreements. These companies do not view water as a social resource necessary for all life, but an economic resource to be managed by market

forces—like any other commodity.

At conferences like the Stockholm Water Symposium, transnational water companies assert that they are in this business for almost altruistic reasons. It is to their benefit to blur the lines between government and the private sector, and they certainly are doing a very good job of that. A closer and well-documented examination of their practices tells a very different story: higher consumer rates, dramatic corporate profits, corruption and bribery, lower water quality standards, and overuse of the resource for profit. While the companies argue



that the privatization of water services is socially beneficial the consequence of corporate control is that social and environmental concerns come second to the economic imperative of maximum profits for the shareholders.

Take a page from his country's past. Gerard Mestrallet, CEO of Suez Lyonnaise des Eaux, says that he wants to develop in his company the philosophy of "conquest" as Suez

moves into new markets around the world. Third World workers and community activists would agree that conquest is exactly what these water companies are about. One of his directors, Mr. During, says honestly, "We are here to make money. Sooner or later the company that invests recoups its investment, which means the customer has to pay for it." That might be an appropriate comment if one is talking about cars or golf clubs, but very distressing to hear when we are talking about water—a basic necessity of life.

The North American water companies are even more obvious, and their frontier mentality is open for all to see on their Web sites. Global Water Corporation of Canada has contracted to ship 58 billion liters per year of Alaskan glacier water by tanker to be bottled in a free trade zone in China. They openly boast that the venture "will substantially undercut all other imported products" because of China's cheap labor. Global Water entices investors to "harvest the accelerating opportunity as traditional sources of water around the world become progressively degraded and depleted" and declares that "water has moved from being an endless commodity that may be taken for granted to a rationed necessity that may be taken by force."

The president of Wetco, a water-exporting company in Anchorage, Alaska, maintains, "What we've found is that it really is possible to sell water, but you have to put your cleats on and get in the game, and, if things don't go right, you might have to be prepared to get wet."

Privatization

These companies argue that privatizing water is the best way to deliver it safely to a thirsty world. This is yet another area of potential disagreement.

It is true that governments have done an abysmal job of

protecting water within their boundaries. However, the answer is not to hand this precious resource over to the transnational corporations which have escaped nation-state laws and live by no international law other than business-friendly trade agreements. The answer is to demand that governments begin to take their role seriously and establish full water protection regimes based on watershed management and conservation.

The privatization of water ensures that decisions regarding the allocation of water center almost exclusively on commercial considerations. Corporate shareholders are seeking maximum profit, not sustainability or equal access. Privatization means that the management of water resources is based on the principles of scarcity and profit maximization rather than long-term sustainability. Corporations are dependent on increased consumption to generate profits and are much more likely to invest in desalination, diversion, or export of water rather than conservation.

The global trend to commodify what has been a public service reduces the involvement of citizens in water management decisions. For example, private water projects brokered by the World Bank have minimal disclosure requirements. A water corporation executive at the recent World Water Forum in The Hague, said publicly that as long as water was coming out of the tap, the public had no right to any information as to how it got there. The concentration of power in the hands of a single corporation and the inability of governments to reclaim management of water services allow corporations to impose their interests on government, reducing the democratic power of citizens.

As the South African Municipal Workers' Union explained, "Water privatization is a crucial issue for public debate. Human lives depend on the equitable distribution of water resources; the public should be given a voice in deciding whether an overseas-based transnational corporation whose primary interest is profit maximization should control those critical resources. Water is a life-giving scarce resource that must remain in the hands of the community through public sector delivery. Water must not be provided for profit, but to meet needs."

Advocates of privatization argue that they are seeking private-public partnerships, and give assurances that governments will still be able to establish regulations. Since the provision of water services itself does not provide sufficient return, water corporations are actively pursuing exclusive control over water service provision through acquisitions of infrastructure and water licenses. They are closing the loop around public involvement and creating huge monopolies against which local suppliers cannot compete.

In their support for large-scale project financing, the World Bank and others give preference to large multi-utility infrastructure projects that favor the biggest corporations, leading to monopolies. To add insult to injury, the World Bank underwrites these giant corporations with public money, and often incurs the risk, while the companies reap the profit. And often, governments, who supposedly represent their people, have to assure a return to the shareholder. Chile had to guarantee a profit margin of 33 percent to Suez Lyonnaise des Eaux as a condition of the World Bank—regardless of performance.

Most disturbing, the close alliance between governments, the World Bank, the United Nations, and the water companies gives these corporations undue influence over government policies that favor their interests, like deregulation and free trade, and favored

access to upcoming water contracts. The stated goal of the World Bank water loan to Budapest was to "ease political resistance to private sector involvement."

In Ontario, the Canadian government listened to the exhortations of big business, and introduced what it calls a "common sense revolution." Key to this "revolution" were massive cuts to the environment budget, privatization of water testing labs, deregulation of water protection infrastructure, and massive lay-offs of trained water-testing experts. In fact, just after a federal government study revealed that a third of Ontario's rural wells were contaminated with *E. coli*, the Ontario government dropped testing for *E. coli* from its Drinking Water Surveillance Program. One year later, they closed down the program entirely.

The results were catastrophic. *E. coli* outbreaks in a number of communities sent waves of panic through rural Ontario. In June 2000, as many as 14 people, one of them a baby, died from drinking water in the little town of Walkerton. Until that time, Walkerton had been renowned for the wonderful taste of its well water. The town had subcontracted to a branch-plant of a private testing company from Tennessee. The lab, A&L Laboratories, discovered *E. coli* in the water, but failed to report the contamination to provincial authorities, an option it has under the new "common sense" rules. In true corporate-speak, a lab spokesman said that the test results were "confidential intellectual property." As such, they belonged only to the "client"—the public officials of Walkerton who were not trained to deal with the tests.

Pricing

Privatization leads inevitably to the final area of profound disagreement about water, and that is water pricing. The argument, echoed even among some environmentalists, is that we have taken water for granted, and have overused it. Pricing water will cause us to understand its real value and force us to start conserving it from economic necessity. This argument is flawed in several ways.

First, water pricing exacerbates the existing global inequality of access to water. The countries that are now suffering severe water shortages are home to the poorest people on earth. To charge them for already scarce supplies is to guarantee growing water disparities. Water pricing was the issue that brought hundreds of thousands of Bolivians into the streets to protest when Bechtel, backed by the World Bank, doubled water rates.

The issue of water pricing will also exacerbate the North/South divide. There is a sub-text inherent in much of the hand-wringing over the world's water shortage. Almost every article on the subject starts with a reminder of the population explosion and where it is occurring. The sub-text is that "these people" are responsible for the looming water crisis. But a mere 12 percent of the world's population uses 85 percent of its water, and these 12 percent do not live in the Third World.

The privatization of this scarce resource will lead to a two-tiered world—those who can afford water and those who cannot. It will force millions to choose between necessities such as water and health care. In England, high water rates force people to choose whether or not to wash their food, flush their toilets, or even bathe.

Second, water pricing, combined with privatization, will seal water's fate as a commodity under the terms of international

trade agreements supported by the World Trade Organization (WTO) and the North American Free Trade Agreement (NAFTA). Both the WTO and NAFTA consider water to be a tradeable good, subject to the same rules as any other good. Only if water is maintained as a public service, delivered and protected by governments, can water be exempted from the onerous enforcement measures of these trade deals. Claiming environmental exemptions for water will not suffice. Every single time the WTO has been used to challenge a domestic environmental rule, the corporations have won and the environmental protection has been ruled 'trade illegal.'

The trade agreements are very clear: if water is privatized and put on the open market for sale, it will go to those who can afford it, not to those who need it. By the terms of trade rules, once the tap has been turned on, it cannot be turned off. 'Blue Gold' will become the hot commodity of the future and those who can't afford it will be left behind.

The World Bank says that it will subsidize water for the poor. Anyone familiar with the problems of welfare, particularly in the Third World, knows that such charity is punitive at best, and more often, non-existent. Water as a fundamental human right is guaranteed in the UN Universal Declaration on Human Rights. Water welfare is not what the architects of that great declaration had in mind.

Another argument against pricing is that, as it is now envisaged, it won't have much of an impact. It is generally accepted that water consumption in urban centers breaks down as 70 percent industrial, 20 percent institutional, and from six to ten percent domestic. Yet most of the discussions about water pricing are around individual water use. Large corporate users notoriously evade the cost of their water altogether.

For example, in California's Silicon Valley, the high-tech sector uses huge amounts of water. This sector is presently engaged in mechanisms to capture traditional water rights: *water pricing*, whereby industry pressures governments for subsidies and circumvents city utility equipment to pump water directly, thus paying much less than residential water users pay for water; *water mining*, whereby companies gain rights to deplete the aquifers while driving up the access costs to smaller users such as family farmers; *water ranching*, whereby industry buys up water rights of ranches and farmers; and *water dumping*, whereby industry contaminates the local water sources and then passes the costs on to the community.

Clearly, the focus must be on those who use water most and then remove the benefits of using this common good, this public trust, from the community in the form of profits, particularly in an age of mergers and transnationals. Business has no right to deprive anyone of their inalienable human rights; if that is the price of profit, the price is too high.

Finally, in an open bidding system for water, who will buy it for the environment and the future? In all of the privatization/pricing debate, we hear precious little about the natural world and other species. That is because the environment is not factored into the commercial equation. If we lose public control of our water systems, there will be no one left with the ability to claim this life-giving source for the earth.

Another Way

There is simply no way to overstate the water crisis of the planet today. No piecemeal solution is going to prevent the

collapse of whole societies and ecosystems. A radical rethinking of our values, priorities, and political systems is urgent and still possible. It's not too strong to say that we are called now to rise to the greatest challenge of our time.

The answers lie within a rejection of economic globalization and the embrace of a whole new water ethic. First, we have to declare that water belongs to the earth and all species, and is sacred to all life on the planet. All decisions about water must be based on ecosystem and watershed-based management. We need strong national and international laws to promote conservation, reclaim polluted water systems, develop water supply restrictions, ban toxic dumping and pesticides, control or ban corporate farming, and bring the rule of law to transnational corporations who pollute water systems anywhere.

Second, water must be declared a basic human right. This might sound elemental, but at the World Water Forum in The Hague, it was the subject of heated debate, with the World Bank and the water companies seeking to have it declared a human need. This is not semantic. If water is a human need, it can be serviced by the private sector. You cannot sell a human right.

Third, we must declare that water is a public trust to be guarded at all levels of government. No one has the right to appropriate it at another's expense for profit. Water must not be privatized, commodified, traded, or exported for commercial gain.

There are many ways to assist the developing world in this crisis. Among others, these include canceling the Third World debt, imposing a tax on currency speculation (the Tobin Tax), and taxing and controlling industrial water use.

Above all, we, as human beings, must change our behaviors. We must emphasize identifying the capacity of our watersheds

and, as communities, identify the limits we can place upon them. The world must accept conservation as the only model for survival, and we must all teach ourselves to live within our environment's capacity. The insidious problems with pricing and conservation by commodification is that it actually undermines environmental science and activism, as well as government's responsibility to protect their citizens and the environment by buying into the argument that the market will fix everything.

At stake is the whole notion of "the commons," the idea that through our public institutions we recognize a shared human and natural heritage to be preserved for future generations. Citizens in communities around the world must be the "keepers" of our waterways and establish community organizations to oversee the wise and conservative use of this precious resource. Never has there been such an urgent need to come to terms with this seminal issue. △

Notes

1. More details and bibliographic citations can be obtained in Maude Barlow (1999), "Blue Gold: The Global Water Crisis and the Commodification of the World's Water Supply," *International Forum on Globalization Special Report*. On-line summary and ordering information at ifg.org/bgsummary.html

Maude Barlow chairs the Council of Canadians. This article is reprinted with permission from the Summer 2001 issue of Food First Backgrounder, Vol. 7, No.1, published by the Institute for Food and Development Policy, 398 - 60th Street, Oakland, CA 94618, www.foodfirst.org. Additional copies of the original publication are available from Food First, 4/\$2, 100/\$45.

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Restoring a Watershed State of Being

Basins of Relations

Brock Dolman

WATERSHED, catchment, drainage, basin, *cuenca*—by any name they function the same, and everyone on the planet lives in one, sailors on the sea alone excepted. Watersheds at all scales are highly evolved geomorphic, hydrological, and biological entities that provide the most comprehensive and demanding benchmark for judging the wisdom of our past and future land use practices.

Thinking like a watershed opens up new and exciting perspectives in art and science that can nurture our hearts and spark our imaginations. I emphasize HEART here because as a global society, the quality we most urgently need is an open heart, a humility that allows us to perceive the Earth's watersheds not as human commodities but as living communities. In light of recent events and global climate trends the current commodity path seriously threatens the continuance of our own and all species. The paradigms of corporate oil and community water do not mix. Solar power may fuel watershed processes, but it will take SOUL-ar power to restore healthy watersheds.

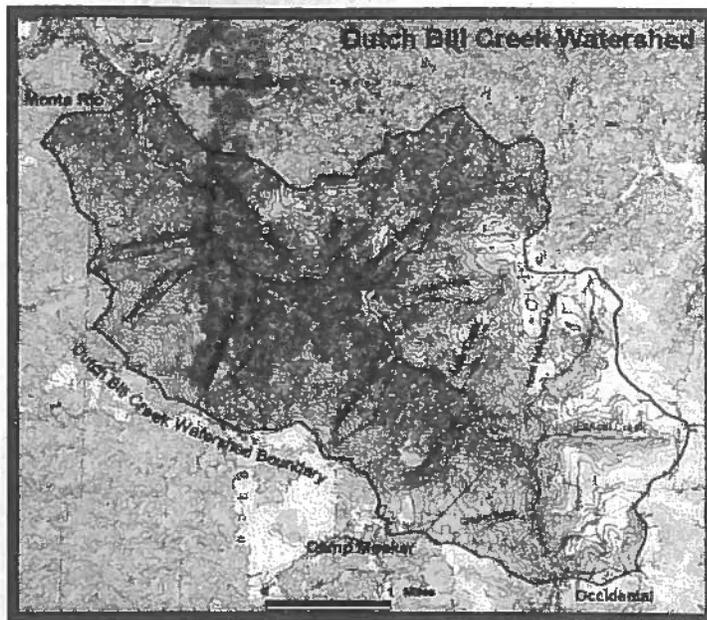
Bring your hands together and cup them, creating a vessel. Envision the rim of your hands being a water-parting divide with thumb and fingertip ridgeline spires. Fingers become the mountain slopes, palms the hills and floodplains, each wrinkle and crease a watercourse conveying over-hand flow to the mainstem riparian ecotone of adjacent hands, spilling forth towards the mouth of articulated wrists. Soul-ar-powered watershed regeneration rests in the hands and hearts of each one of us: the power to restore ourselves by restoring our relations with our home basins.

Watersheds in the Mind

Effective watershed restoration must be based in watershed literacy. The word "watershed" has many different meanings and intentions. In its most literal sense, watershed refers to the parting of waters, the actual ridge dividing drainages. In 1852, Darwin referred to the "Line of Watershed dividing inland streams from those on the coast," the continental divide of North America being a primary example. In 1878 Huxley first invoked watershed as a landscape entity or catchment basin stating, "all that part of a river basin from which rain is collected, and from which therefore the river is fed." This definition encapsulates the basic physical definition of a watershed today. Our challenge is to move beyond a static, hydrologic definition towards a dynamic understanding of the wholeness of watersheds and how they form the foundation of all human activities.

It's all watershed

"Watershed" also refers to a significant event. Lodged deep within our collective psyche is a subconscious recognition of the profound meaning each distinctive drainage basin holds: new creatures, new places, new experiences, a new face of divinity awaits. A certain excitement of impending discovery, an



Dutch Bill Creek watershed near Occidental, California

archetypal intrigue, arises as you pass into a new "watershed." Watershed as metaphor brings awareness to a critical transition or point of demarcation, as, for instance, "they reached a watershed in the peace negotiations." What does it imply to "reach a watershed"? How does this resonate with the feelings of awe and apprehension at cresting a ridge and gazing down into a new, unknown, and promise-filled "Basin of Relation"?

The figurative watershed moments in one's life are often where a certain clarity is achieved, marked perhaps by a rite of passage fulfilled or by the unexpected reappraisal of deeply held beliefs. In Aldo Leopold's *A Sand County Almanac*, he describes a personal "watershed" moment after shooting a she-wolf in the Gila Wilderness in 1922: "We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes—something known only to her and to the mountain. I was young then and full of trigger itch; I thought that because fewer wolves meant more deer, then no wolves meant a hunter's paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view."

Terra Incognita

The earliest descriptions of North America by Europeans evoke a vision of snow-capped peaks, forested ridges, wooded slopes, rolling prairies, flood plains, riparian jungles, beaver wetlands, and river mouth estuaries brimming with wildlife—an ecstatically pervious world that cleansed and cycled and savored its own water to the benefit of unfathomable biodiversity. Let us dive into that vision for a moment: Rain falling at 30 mph is slowed and sweetened by outstretched leaves; these in turn drip

nutrient-laden tea from the canopy to a forest floor of fluffy duff. Infused with humus capable of absorbing ten times its own weight in water, this protective sponge spreads the life-giving liquid over a flocculated soil shot through with nutrient-grabbing mycorrhizae, fungal threads connecting all the rooted plants. These vegetated landscapes of yore seeded and combed the aqueous clouds, rehumidified the downwind air, buffered their own climates, and passed on the surplus to recharge groundwater aquifers that sustained the flow of springs, creeks, and rivers.

Approaching the Tipping Point

Now imagine this hydrological wonderland after some centuries of development based on dessication: Cutting, clearing, burning, draining have hardened the upland capillaries and aquatic arteries of the landscape. Clearcut logging, mining, overgrazing, plow agriculture, housing, commercial development, road building, and parking lots, all add up to extreme imperviousness in a watershed. In a *Baltimore Sun* story by Tom Horton, October 6, 2000, he reports on studies in Maryland indicating that "once development hardens even 15% of a stream's watershed, aquatic health falls off sharply, (at) 25%, degradation is severe. Native brook trout may disappear after as little as 2%." Tom Schueler, Center For Watershed Protection in Ellicott City, MD, further states that "around 10%, which is equal to single family homes on 1-2 acre lots, is often the tipping point where you begin to see decline."

This 10% tipping point is a critical "watershed" divide in relation to fundamental system thresholds and carrying capacity. "Tipping" initiates an accelerating feedback reaction of mutually failing inter-dependencies, the breaking of links that once formed the foundation of ecosystem health and resiliency. The synergistic effects of cumulative impacts present a daunting challenge to would-be restorationists. Fragmented habitat, species extinction, soil erosion, sedimentation, flooding, loss of ground water recharge, contaminated water, reductions in stream flow, salted soils, microclimate alterations, reduced ecological carrying capacity, social disruption, community collapse, and economic hindrance form a litany of issues screaming out for holistic response.

Running Upstream

There are certain "canaries" in the watershed coal mine that can help us begin to think like a watershed. Freeman House's recent book, *Totem Salmon*, examines the plight of chinook salmon—a species decimated by the effects of human ignorance, and provides an inspiring view of one community's response. Residents of California's Mattole River watershed have adopted the chinook as their totem animal. Let's meander down the stream of salmon consciousness for a moment to see if we can understand why. Chinook, like other salmon species, are anadromous, i.e., they're hatched and spend the early years of their lives in cold freshwater streams, then swim downstream to estuaries where they adapt physiologically for a life in the salty sea fattening up on a smorgasbord of prey rich in eons worth of minerals leached from the land. After a species-specific number of years they return home to the farthest headwater reaches of their natal streams to procreate, die, and leave their weighty corpses of reclaimed elements for future progeny and myriad other life forms.

The anadromous nutrient pump is no trivial concept: Univ. of

Oregon researchers studying cannery records from the turn of the 19th century found that 390 to 500 million pounds of salmon flesh was returning annually to Pacific coast watersheds in Idaho, Washington, Oregon, and California. In contrast, today's figures are roughly 5 to 7 million pounds. Other researchers have chemically analyzed the isotope ratios of specific elements such as nitrogen, phosphorus, potassium, and calcium in riparian forest trees, grizzly bear bones, and young fish. Research has shown that up to 60% of the nitrogen in protein tissues of young steelhead trout is of marine origin. These juvenile fish could only have metabolized this nitrogen by consuming, directly or indirectly, the bodies of decomposed adult salmonids.

The idea of sustainability begs the question of ability to sustain what? The critical answer is cycles. Apparently one of the most profound generators of the nutrient cycle in Pacific Northwest forests is the spawning return of anadromous salmonids and Pacific lamprey to their interior homelands. One can safely extrapolate that historic populations of Atlantic salmon provided a similar function in their watersheds. With the near extinction of salmonids disappears a cornerstone of the watershed's ability to feed itself. Salmon return, spawn, and die: bears, eagles, otters, crawdads, coons, and multitudes of aquatic macroinvertebrates eat them and go forth throughout the watershed dispersing marine nutrients through their excrement and corpses.

Salmonids are a watershed keystone species, in that their presence disproportionately elevates the web of life. But salmon are not only a keystone species, they also represent the keystone process of nutrient cycling. Watershed starvation resulting from the near extinction of totem salmon is a reality of untold proportion.

Speak Softly...

Permaculture is a design science with a pragmatic attitude of positive action. As specialized generalists, permaculture designers are well prepared for the task of watershed regeneration. So where are the fecund edges that we can begin to work for the benefit of the whole? Archimedes argued that with a lever big enough and a fulcrum in the right place, he could move the world. Analogously, how do we design an (energetic) lever to move attitudes about, and thus the fate of watersheds; where do we apply it, and how many people can we convince to help us pull it?

The following is a short list of various strategic lever placements for permaculturists interested in watershed protection and restoration:

- 1. Create a community-based watershed council:** Watershed or sub-watershed boundaries are one of the best means of literally finding common ground between neighbors. Creating a community-based watershed council that embraces all residents, stakeholders, and agency representatives helps bring focus to the unique needs of each watershed. Build community by having regular meetings to share information; identify priority restoration projects, education, and research needs; host field trips to get to know the watershed, organize watershed clean-up days and hands-on community restoration projects.
- 2. Get or make good watershed maps:** Maps may be the most effective tool to catalyze people's consciousness about their relation to the basin. Indicate on the map where roads cross both watershed divides and creeks. What about other landmarks?
- 3. Watershed signs:** Work with your local county or state

road agencies to place signs both at creek crossings and at watershed and sub-watershed divides. Signs offer a profound opportunity to educate people as they move about the landscape they inhabit. Build watershed divide interpretive displays at strategic locations with public access. Have each council representing the adjoining watersheds manage the information displayed as a public outreach/education tool.

4. Watershed Welcome Wagon packets: A perfect initial project for a newly formed watershed council. Compile a succinct citizen's guide to information for watershed landowners about watershed processes, maps, wildlife, native plants, erosion, fencing, chemical use, forestry management, rural roads, impervious surfaces, permaculture design, and other regionally appropriate land use issues. These packets can be provided to all existing residents and through real estate or county offices to all new people who purchase property in the watershed. Most people will attempt to do the right thing if they have good information.

5. Education, adopt a watershed: Working at all levels within the education system. There are some very good watershed curricula available such as *Adopt-a-Watershed* and *The Streamkeepers Field Guide*. Host workshops such as OAEC's four-day training, "Basins of Relations: Creating Community Watershed Councils."

6. Watershed monitoring: Design a monitoring program that collects data in a standardized manner with consistent quality control for accuracy and reliable analysis.

- Analyze channel types, whether confined or unconfined;
- Determine bank full width; select an unconfined study reach that is roughly 10 times as long as the bank full width;
- Survey the channel cross sections; determine the embeddedness of gravel by doing pebble counts;
- Paint flow gauges on bridges; distribute rain gauges to council members; work with existing local weather data;
- Assess riparian habitat using aerial photos; determine riparian canopy density using a densiometer; assess the impact of invasive plant species; determine revegetation project needs;
- Use GIS for watershed analysis, data collection, and storage;
- Perform wildlife or endangered species surveys; evaluate habitat connectivity and wildlife movement corridors;
- Initiate water quality monitoring for pH, dissolved oxygen, temperatures, and conductivity; perform benthic macro-invertebrate assessment;
- Assess fuel load in upland vegetation communities;
- Map upland erosion sites and road networks towards developing a priority restoration plan; assess percentage of watershed with impervious surface cover and map locations and types;
- Study historical and present land use changes and practices.

7. Roads: Paved and unpaved roads cause destructive watershed impacts such as: salting and toxic runoff, habitat fragmentation, road kill, fish passage issues, and direct delivery of sediment to active channels. According to Danny Hagens of Pacific Watershed Associates, roads need to become "hydrologically invisible," and "nothing in nature mimics a road." Road drainage must be disconnected from direct discharge to waterways. All creek crossings need a critical dip to avoid diverting the flow from its natural channel. Critical dips have a reverse grade on both sides so that when the culvert backs up the overflow only washes out the crossing fill instead of being diverted onto the road network to discharge disastrously

downhill. Rural dirt roads can be safely outloped with no outside berms and graded with numerous rolling dips to divide the road into a series of sub-watersheds that discharge small volumes of runoff. Berm material can be used to fill the inside ditches and often results in greater road widths. Where a road section absolutely needs to be insloped then adequate ditch relief culverts should be installed so that they discharge at the base of the fill into water spreading structures. More culverts discharging smaller volumes are preferable with insloped roads.

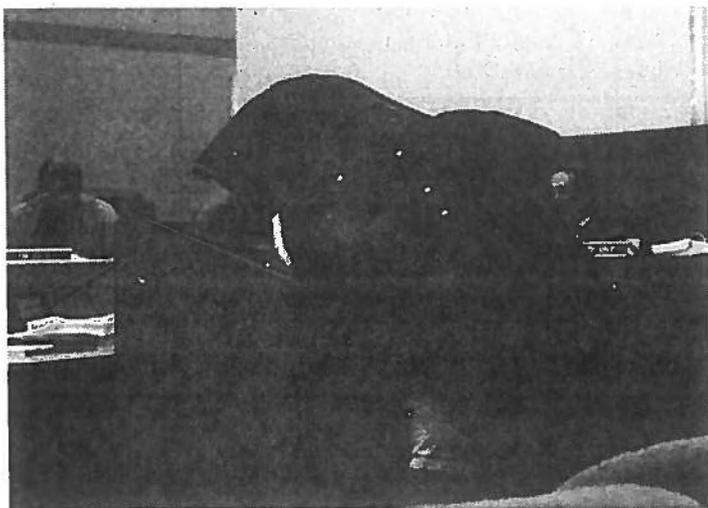
8. Instream Restoration: Use biotechnical methods whenever possible to stabilize failing streambanks and gullies. Use locally harvested willow and cottonwood sprigs for woven walls, mattresses, and bundled fascines. Using biological intelligence is cheaper, provides habitat and food for animals and shade for streams, sequesters and buffers pollutants and sediments, and is more aesthetically pleasing. Also, hands-on community groups and students can do the work with minimal technical supervision. Increasing woody debris for structural complexity and installing boulder clusters to create pool habitat and sort spawning gravel has proven effective for many salmon streams. An important caveat is that until we stabilize the hydrologic condition of the uplands, functional restoration of the active channel will be impossible, though some critical bandaids may be justified to mitigate specific situations.

9. Cost Share/Grant Programs: Numerous federal, state, county and city programs provide cost share/grant funds to landowners or watershed councils to perform restoration projects or educational programs. Federal agencies include: Environmental Protection Agency (EPA), Natural Resources Conservation Service (NRCS), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USF&WS), and Forest Service (FS), to name a few. Call the National Service Center for Environmental Publications at 800-490-9198 to request the "Catalog of Federal Funding Sources for Watershed Protection," EPA #841-B-99-003. Contact state, county, or municipal agencies that provide support for agriculture, forestry, and natural resources. These include fish and game, wildlife, water quality protection, flood control, environmental quality, and education departments, stormwater management and regional water supply agencies, road departments, cooperative extension services, and resource conservation districts.

9. Political: Become involved in the democratic process. Work with political officials at all levels. City councils and county boards of supervisors are especially pertinent for watershed issues. Become involved in your county general plan or similar process, and support the development of watershed-based general plans and regional planning units. Because politicians and their planning staffs may be reticent to accept the watershed idea, you need to make a convincing case that it is in their best political, economic, and legal interests to think like a watershed. All counties have to deal with the Endangered Species Act (ESA) through USF&WS and NMFS 4d rules, also with the Clean Water Act (CWA) regulations enforced by the EPA such as their new Phase II Stormwater Management program, National Pollutant Discharge Elimination System (NPDES) permits, and non-point source pollution issues. Where streams or lakes are on the impaired water bodies list, counties have to comply with

impending total maximum daily load regulations (TMDL's) for watershed specific pollutants. Obviously at the state level numerous regulatory agencies are also pressuring county, city, commercial, and private authorities and landowners to comply with a barrage of seemingly impossible and costly regulations. Absent a holistic, watershed-based strategy, these myopically frustrated entities will be right in concluding that compliance is impossible. You will actually be helping them do their their job, save money, and support improvements in watershed function and health.

10: Impervious surfaces: Imperviousness presents the most insidious impact on watershed health. By addressing impervious surfaces the majority of the agency issues above can be mitigated. Increased frequency and intensity of flooding is directly correlated to increased area of impervious surface in the drainage basin. Lack of ground water recharge and thus compromised water supply are directly related to imperviousness. Water quality degradation and its ecological consequences from toxic or sediment-laden agricultural, urban, and industrial runoff is again related to excessive impervious cover.



Totem Salmon addresses Sonoma County officials

This may be where the permaculture movement is most advanced in its understanding and strategic application of solutions. Increasing roof catchment and infiltration of runoff into groundwater recharging, wildlife friendly, botanically diversified, phytoremediating, aesthetically pleasing swales, contour ditches, detention ponds, or settling basins are simple and cost-effective solutions. Daylighting (bringing out of pipes) urban streams increases quality of life and connections with nature for starved denizens of the concrete jungles. The East Indian proverb "Catch rain where rain falls" is most relevant here. We must stop using storm drains that are connected to sanitary sewers that eventually overflow and pollute the ecosystem. Many permeable paving options are available that infiltrate runoff and bioremediate the soup of urban chemicals, oils, and gasoline that it typically carries. These ideas are being mandated by water quality agencies—the time is ripe.

At an urban scale I would refer you to the Nine Mile Run Model in the Pittsburgh area. For a suburban model I would refer you to Village Homes in Davis, California, and at the rural scale Keyline principles can be further elaborated.

Waterspread Restoration

The challenge before us is to design development patterns based on principles of rehydration instead of dessication. Water is the ultimate resource not the problem. The old school engineering practices of capturing, concentrating, and removing water from a site as quickly as possible are now unequivocally recognized as disastrous. A new paradigm based on "Waterspread Restoration" is being heralded. Spread the water out, slow it down, facilitate its proper percolation, instead of shedding the water away to flood your downstream neighbors with topsoil-laden, fish-killing, toxic effluent. To quote David Orr "It makes far better sense to reshape ourselves to fit a finite planet than to attempt to reshape the planet to fit our infinite wants."

There is an old bumper sticker that reads "Minds are like parachutes, they only work when they are open." Watersheds are similar in that they only work when they are open and porous, permeable, and pervious to the bounty of falling water. Restoring a watershed state of being means we open up our mind-sheds so they become permeable to new ideas. Our brains must absorb the idea that biological understanding holds the best promise of solutions for the seven generations to come. Receptivity to water wisdom is the path bringing us closer to "living like a watershed." For those of us who share a watershed, our fundamental connection as a community is directly related to our shared existence amidst each Basin of Relation. Water movement over and within the land is a watershed's primary energetic commodity and our local currencies should carry the message "In Water We Trust." Water is the defining element that unrelentingly determines a community's ecological and economic carrying capacity. From living water all things spring forth: totem salmon, totem soil, totem forest, totem wildlife, totem watershed, totem planet. △

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***I found the water's bed
The water courses were my guide
I traveled grateful by their side,
The falling waters led me
The floodwaters fed me,
And brought me to the lowest land,
Unerring to the ocean sand.***

R.W. Emerson, from *Woodnotes*

Brock Dolman's Recommended Resources on Watersheds

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Designing Large Catchments

From Source to Sink

Max O. Lindegger

AUSTRALIA IS THE DRIEST of the inhabited continents. Crystal Waters, located in the SE of Queensland (about 110km NNW of Brisbane) is located in a relatively high rainfall area with a mean annual precipitation of 1350mm (53"). This sounds like a lot, but the problem lies in the poor distribution of the rain through the months. It is not uncommon for us to be tested with 500mm (20") of rain in two days. On the other hand we also need to prepare for up to six months of extreme dry. The El Niño years can be extremely difficult with a short wet season of below average rainfall followed by a dry autumn, winter, and spring.

Our conditions have forced us to become good observers of natural cycles and to learn how to store water when there is an abundance to go round. Understanding of the catchment and working with nature are things that are not just important to us, life depends on it. Indeed, in the case of Crystal Waters and many parts of Australia, population density is limited by the availability of water.

In this article I would like to explain some of the processes we used and which have a relationship with the catchments, and to illustrate some of the techniques and methods employed here at Crystal Waters.

Observing the catchment

In the state of Queensland we have a right to use water from the time it falls on our land (the source) until it leaves our property (the sink). With this right comes a responsibility which is especially important in the case of Ecovillage design. We have taken the responsibility as meaning that the same amount of water should flow past Crystal Waters after development as before and the quality should be positively affected.

In the case of Crystal Waters we own most of the land which forms part of the catchment for the dams which we constructed, but for the Mary River and the two creeks which form part of our boundary, most of the catchment is owned and controlled by private landowners or the Government. We surveyed large areas of this catchment on foot to ascertain the quality of its runoff. Most people would be interested to know about activities which have a negative impact on the water quality like mining, some farming activities, extensive road works, or industrial processes. Some pollutants may not be obvious and indeed require testing of soil and water. Chemicals used decades ago (DDT is a well documented example) can still be active. It is thus worthwhile to delve into a little of the history of the general area, the farming activities prevalent in the past, and the Council regulations now forgotten. In our case Councils used to insist on chemical spraying under house-slabs to prevent infestation from termites. While these chemicals are now banned and their detrimental effect on the environment well recognised, they will not simply disappear and we need to know how they may affect water flowing through a catchment. Talk to locals who have been living



Crystal Waters site - aerial view

in the catchment for some time. You will be amazed by the stories they will be able to tell you and how well informed they are.

But we should not only look at the negatives within the catchment. I'm sure that there are also positives to report.

When we walked up in the catchment, kilometres upstream from Crystal Waters, we found amazing stands of rainforest in deep, protected valleys and a considerable patch of palms. Research indicated that the Forestry Department, (which had been clearing eucalypt forest and replacing it with softwood plantations not far from here) had changed its policy, and would not clear any of the native forests within our catchment. This meant a lessened likelihood of soil erosion and contamination from herbicides. While our catchments are far from pristine, they are well above average in quality. So the "Crystal Waters" may sparkle but don't let this trick you. Most creeks now carry pathogens and the water is unlikely to be suitable for drinking.

Development means change— We are all living downstream

Any development will create some changes. But development need not necessarily be bad and we would expect that Ecovillage development creates more benefits than negatives. But it is true that any development which includes houses, roads, water consumption, and wastewater needs to be done with due diligence and care. One issue which is important is not to upset the amount of water that is leaving the property. By increasing roof areas and roads we are increasing the percentage of impervious surfaces. The result is that, mainly during high rainfall periods, water will leave the catchment quicker than before. As a general rule (but subject to soil conditions) a forest will be able to absorb more water than a grassed slope. Areas with tall grasses (like well managed pastures) absorb more water than a bowling green. On the other hand even a golf course will absorb more water than a sealed road or the roof of a house.

At Crystal Waters, with 83 houses, sheds, commercial buildings plus roads and paving, we probably created in excess of 5 ha (12.5 ac) of impervious surfaces (out of 259 ha/645 ac). To offset this potentially negative aspect we changed some grazing areas into forestry use. This should restore runoff from the land to its pre-development level. A much increased run-off would increase the likelihood of flooding downstream. This is a critical consideration where city fringe areas are developed on land which previously was used for farming. In some extreme cases densely built-up areas may result in 80% impervious surfaces. In such situations it would be impossible for individual developments to offset this excess run-off and any solution would become a regional land-use question.

Dams in the catchment

I'm a bit of a fanatic about dams, and I have to watch that I don't over do it. In Australia a "dam" is a pondage created by building an earthen wall across a small valley to catch excess run-off. While dams have mostly beneficial aspects—recreation, aquaculture potential, moderating climate, water for irrigation, habitat, and improved access, we have to remember that dams do cover land with water. We need to make an honest assessment of whether the benefits really outweigh the negatives.

How to build a dam

Dams need to be professionally built (see box) to be worth their money. Poorly designed dam walls may very well "breach"—break in the middle during flood flows and are then difficult to fix. All dam walls will leak a little. It is normal that a structure built with clay/soil leaks some water. Excessive leakage may be the result of poor construction/compaction, root penetration, or porous sub-surface soil formations.

While floating plants will always increase evaporation losses, trees planted to reduce air movement across the water can reduce evaporation. "Thirsty" trees like willows are best kept away from the water's edge. In a climate with a defined wet and dry season dams offer the obvious benefit of providing irrigation water. Dams which are drawn to a low water level do lose some of their habitat values, but on the other hand, they become useful

buffers during the wet season when massive rainfall may lead to floods.

Dams which have been used for irrigating crops during the dry season can then fill up with runoff delaying somewhat the flood effect downstream. Once full, and this point is often forgotten, dams will increase flood flows as the water surface will act very much like an impervious surface. We built a total of 17 dams during the establishment phase of Crystal Waters (some more since). The smallest ones are simply habitat areas giving frogs the place to do the things frogs do. The biggest dam, locally known as "Big Lake," has a constructed dam wall length of 118m and a height of 10m. People often comment that it must have cost a small fortune. The opposite is the case. What today looks beautiful from any angle is indeed hiding a substantial quarry where we "mined" sand and clay and material suitable for road building and house construction. Rather than costing, building a number of the



Wooded slopes restrain runoff.

dams saved us money and had a positive environmental impact by reducing the distance road material had to be transported.

Many of the dams at Crystal Waters are used for recreational purposes like swimming. With many of the houses here situated within the catchment of these dams the potentially negative impact of toilets and greywater systems on water quality needs to be considered with great care. We test our water not frequently enough and we don't have sufficient direct involvement with the quality of the effluent treatment (it is a local government responsibility). During the design stage we did incorporate buffer zones between private lots and the high water mark. It is quite likely that this area is adequate to deal with modest effluent escapes but water quality should never be taken for granted and design of ecovillages needs to

include a management plan for the catchment in the long term.

Critical Time of Concentration

This is a technical term but quite important to be understood in the design of structures like dam walls, bridges, or indeed storm water pipes. The critical time of concentration refers to the time the last drop of water falling in the catchment where the structure is located will take to travel to the structure. The time is influenced by factors like:



Big Lake at Crystal Waters

- soil type - sandy soil will absorb water and slow down run-off while clay soils speed up the process.
- vegetation type - heavily forested slopes compared to heavily grazed.
- slope - steep compared to gentle.
- length of catchment - the distance between the edge of the catchment and the structure.

Rainfall intensity, the way the rain falls also affects the impact the water may have on the structure. Tables exist (check with your friendly civil engineer) for each area, but using a common sense approach will allow a useful estimation. Observation during storms too will give a good indication of critical times. The critical flow is only reached if the duration of the storm (in minutes or hours) exceeds the critical time of concentration period. In other words—when the last drop of water is reaching the structure and it continues to rain at the same intensity.

Design for Disaster

I'm thinking here of any situation where an unexpected risk of water levels could result in loss of life or property. In many parts of Australia people live with the expectation of floods every wet season. We can't control rainfall (the volume), but we can change the velocity.

continued on page 16

DAM CONSTRUCTION

1. Clear the embankment (dam) and spillway areas of trees, stumps, and roots, but leave the spillway return slope (downstream) undisturbed except for careful removal of trees to encourage heavy grass growth. Cut trees near ground level. Do not grub out roots.

2. Mark the works, showing the extent of the embankment and the spillway.

3. Strip topsoil to a depth of 75mm (3") from the spillway, embankment, and "borrow" areas, and stockpile for use as cover on the bank. (Don't strip the spillway return slope.) Stockpile in four places as indicated.

4. Excavate cut-off (key) at least 300mm into permeable material or onto fresh rock and place material in downstream batter zone. (The cut-off should extend the full length of the embankment and to above top water level to provide a complete seal.)

5. Backfill the cut-off with suitable impervious material obtained from the borrow area. This material should be placed in layers not more than 200mm (8") thick, and compacted by rolling with at least 8 passes of a sheepfoot roller or heavy tractor or wheels of a grader. It should be as wet as can be handled by the roller, and is wet enough if it can be rolled out by hand to the thickness of a pencil without breaking. Compacting with a bulldozer is insufficient.

6. Install outlet pipe work, and hand pack moist clay around pipes through the core. Pipes should have seep collars (external baffles) to prevent leakage.

7. Build embankment including impervious material clay core or blanket (placement of material in this core or blanket should be as described in point 5 above).

8. Cut the spillway around the end of the bank 0.5m-1.0m below the crest level (The spillway inlet width shown in Section B is necessary to prevent flood runoff from the catchment overtopping the dam.) Oversize spillway if possible.

9. Any fractured impervious rock or

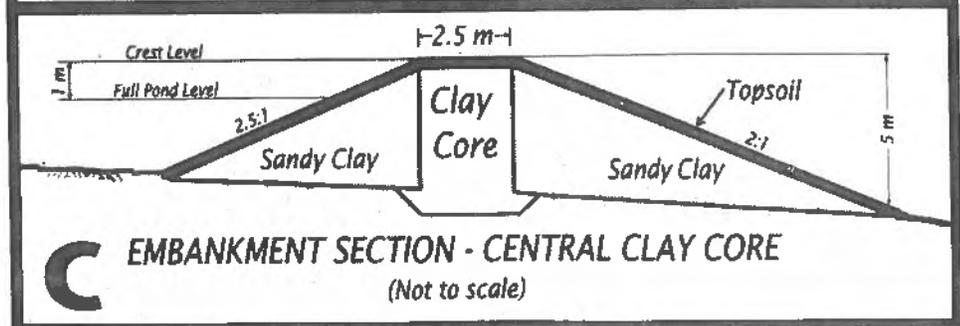
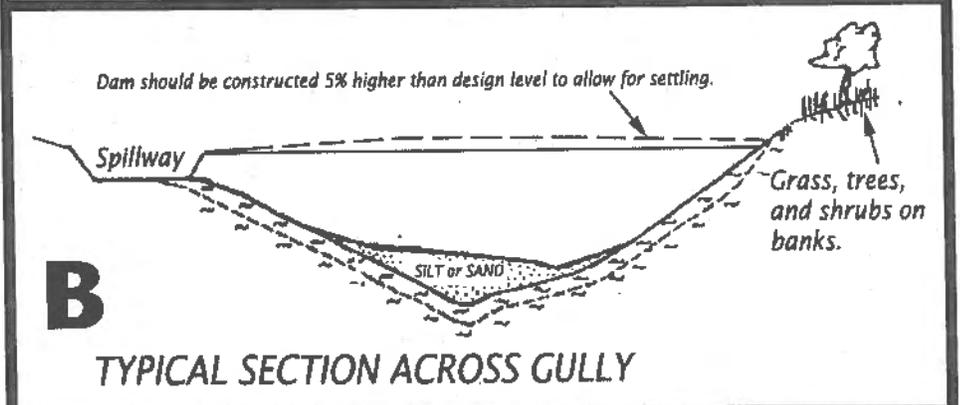
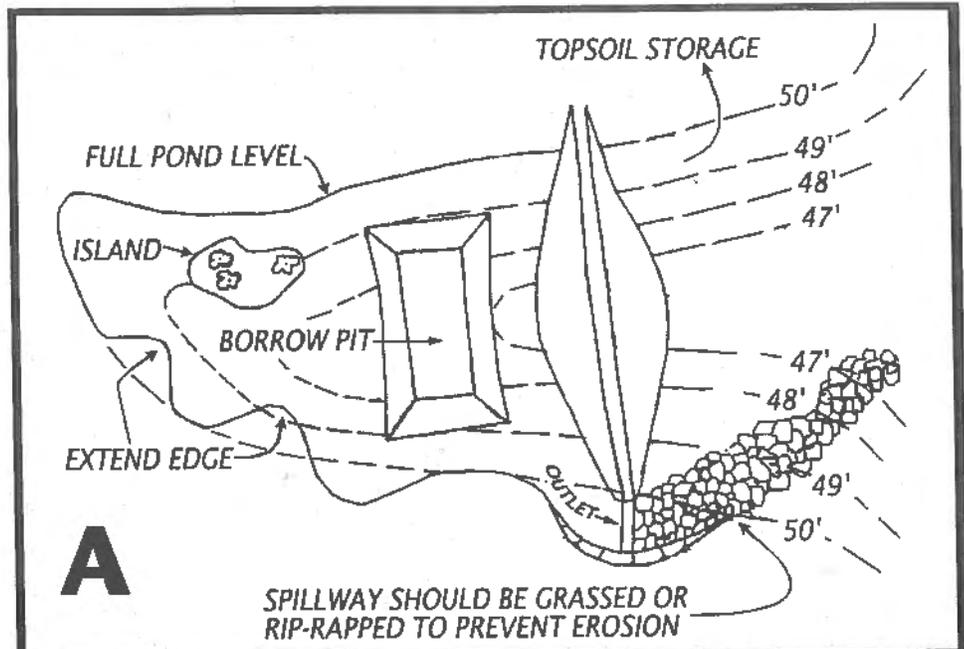
gravel exposed in the water storage area should be sealed by covering with 300mm of compacted clay.

10. Incorporate islands, extend length of edge. Allow for varying depths, create terraces.

11. Spread topsoil over the bank

and spillway, and plant with an appropriate holding grass. Fertilize, and water to promote growth. Make sure the spillway return slope is fully grassed also.

12. Finally, fence the entire embankment and spillway areas to prevent stock from damaging the area and causing erosion. Plant trees along dam, but not on the wall. Δ



drawings rendered by Keith Johnson after a sketch by the author

Also, being aware of the way water is likely to behave we often can minimise damage.

Let's look at some examples:

The bridge at the boundary to Crystal Waters is critical to the flow of traffic in and out of Crystal Waters. It has gone under water on many occasions but it is not the critical structure between us and the nearest towns. Other river crossings will flood well before the Crystal Waters bridge floods. During the design stage the Council insisted that we build the bridge to a 1-in-100 storm occurrence (meaning that it would only flood in a storm which theoretically should occur once in 100 years) but we argued that such a bridge would be well above the surrounding land and during such a severe storm might actually be lost as large logs would hit the bridge itself. We preferred a bridge (designed to 1-in-50) which would flood more often but during extreme flows logs would float over the top of the bridge. This indeed is what we built and this is indeed what has happened on a number of occasions. The bridge always emerged again even after severe floods—maybe half covered with debris but able to carry on as our link to the rest of the world.

Dam walls are equally critical artificial elements in our landscape. The overflow level (and thus the maximum water level in the dam) should be up to 1m below the crest of the dam wall. It is important that the crest under no circumstances goes

under water as this would likely lead to a loss of the entire dam wall. The extra height is the safety factor, the insurance premium for those occasions when the unexpected will happen. There is no end to the observation we can make in a catchment and there is no end to learning



Healthy water is the aim of all our work.

about the behaviour of water. So, next time heavy rain makes you feel like snuggling up with a good book, go out and watch the trickle of water turn into a river, watch how dense vegetation or mulch

protects your soil from raindrop impact and how bare soil mixes with water and is lost forever.

In our dry continent rain is always welcomed with excitement because we know that without water there is no life. Every raindrop is hope for new growth. Δ

Max Lindegger has been a consultant and teacher in the field of ecologically sustainable design since 1981. He has taught Ecovillage and Permaculture courses in 24 countries and made presentations at international conferences in many more. In addition, he has designed and co-designed a number of ecological communities, and was (in partnership with his co-designers) the developer of the UN Habitat Award-winning Crystal Waters Permaculture Village. He is experienced in design, consultancy and—importantly—in the implementation of proposals. Many of his past students have been inspired to go on to create livelihoods in sustainable design. He has lived at Crystal Waters for 10 years, where he runs a small farm whilst still maintaining a full schedule of consultancy and teaching work. Global Ecovillage Network Oceania/Asia Inc (GENOA Inc), 59 Crystal Waters, 65 Kilcoy Lane, Conondale Qld 4552, Australia. Tel: +61-7-5494-4741, fx/4578. lindegger@crystalwaterscollege.org.au gaia.org/secretariats/genoceania/index.html crystalwaterscollege.org.au

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The Wisdom of the Beaver



Toby Hemenway

YOU KNOW what a stream looks like. It has a pair of steep banks that have been scoured by shifting currents, exposing streaks and lenses of rock and old sediment. At the bottom of this gully 10-50 feet down—the water rushes past, and you can hear the click of tumbling rocks as they are jostled downstream. The swift waters etch soil from first one bank, then the other as the stream twists restlessly in its bed. In flood season, the water runs fast and brown with a burden of soil carried ceaselessly from headwaters to the sea. At flood, instead of the soft click of rocks, you can hear the crack and thump of great boulders being hauled oceanward. In the dryness of late summer, however, a stream is an algae-choked trickle, skirted by a few tepid puddles among the exposed cobbles and sand of its bed. These are the sights and sounds of a contemporary stream.

You don't know what a stream looks like. A natural North American stream is not a single, deeply eroded gully, but a series of broad pools, as many as 15 per mile, stitched together by short stretches of shallow, braided channels. The banks drop no more than a foot or two to water, and often there are no true banks, only a soft gradation from lush meadow to marsh to slow open water. If soil washes down from the steep headwaters in flood season, it is stopped and gathered in the chain of ponds, where it spreads a fertile layer over the earth. In spring the marshes edging the ponds enlarge to hold floodwaters. In late summer they shrink slightly, leaving at their margins a meadow that offers tender browse to wildlife. An untouched river valley usually holds more water than land, spanned by a series of large ponds that step downhill in a shimmering chain. The ponds are ringed by broad expanses of wetland and meadow that swarm with wildlife.

A Madness for Hats

Until the arrival of Europeans in North America, this second vision was, almost without exception, what streams looked like. They were transformed into the gullied channels we mistake for the natural state of streams soon after the killing of millions of beaver. Most European settlers never saw the original condition of our watersheds, because the trappers came before them, a deadly colonial avant-garde that swept relentlessly from Atlantic to Pacific coast and hunted the beaver to near extinction. Deeply gullied ravines had been the norm in an ancient beaver-cleared Europe, and they quickly became the norm here too. Removing the beaver drastically altered and simplified the landscape.

Before Europeans arrived, there were an estimated 100 to 400 million beaver in North America. Today there are roughly 9 million, with their numbers having rebounded from an historic low at about 1900. Early records show that beaver lived in nearly every body of water in New England.

The first white settlement in New England began with the arrival of the Mayflower in 1620, and in the decade following, 100,000 beaver were skinned in Massachusetts and Connecticut. Having quickly depleted the coastal stocks, trappers moved west

into New York and killed another 800,000 beaver from 1630 to 1640. In 1638 England's Charles II declared beaver fur to be mandatory in the manufacture of hats, to the animal's further misfortune.

As the slaughter spread westward, the numbers increased: The French port of Rochelle received 127,080 beaver pelts in 1743 alone (beaver were not the sole target—pelts of 1267 wolves and a staggering 16,512 bears were also shipped to Rochelle that year). By 1850, beaver were nearly extinct from the Atlantic to the Oregon Territory. Entire deciduous riparian forests disappeared from the west coast. Without the beaver's omnipresent influence, streams in every watershed eroded into the deep channels we know today, and soil washed to the sea.

Keystone of the Watershed

As Bill Mollison has observed, everything gardens. The beaver, however, goes far beyond simple gardening to feats of complex ecosystem transformation. Beaver don't merely build dams that create ponds. They control the flow of vast amounts of energy and material. With tough incisors and keen instincts, beavers create a shifting mosaic of moist and dry meadows, wet forests, marshes, bogs, streams, and open water that changes the climate, nutrient flow, vegetation, wildlife, hydrology, and even geology of entire watersheds.

One of permaculture's core principles advises that we intervene at the point of maximum effectiveness—"Achieve the greatest result with the least effort"—and beaver epitomize that axiom. The beaver understood how to hold water and soil on the land long before Keyline originator P.A. Yeomans, and the stunning increases in diversity and sheer biomass achieved by the beaver confirm the wisdom of Yeomans's vision. We can learn much that is useful to permaculturists from a closer look at how beaver work, and how their actions reach deep into the heart of ecosystem health and function.

When a beaver fells an aspen—their favorite food and building stock—the tree sends up suckers. It also responds to cutting by producing in the new shoots bitter alkaloids that beaver don't like. This negative feedback promotes a dynamic balance between aspen growth and beaver felling. However, the young suckers are just right for moose and elk, and these large mammals prosper in the tasty browse where inedible tree trunks once grew.

Tree-cutting by beaver changes the course of ecological succession by opening the canopy and removing certain plant species. Light-loving plants, such as alders, hazels, and spruces, thrive and multiply. The chips and abandoned brush from the felled trees offer shelter and food to insects, small mammals, and birds. Most of the tree, though, is used by the beaver in the building of dams and lodges.

Working toward complexity

Beaver choose the gently sloping lower reaches of valleys for their work. A small dam on flat land impounds more water behind it than one on a steep slope, doing the least work to create a large pond. The water that backs up behind the dam saturates the soil beneath it, creating a blend of anaerobic and aerobic pockets, varying with water depth, vegetation, soil type, and distance from the pond edge. Decomposition at the anaerobic sites is slow, preserving organic matter. Dead trees and snags left by the beaver or killed by flooding become home to a wide array of animals and microbes. The structural, biological, and chemical complexity of the region increases.

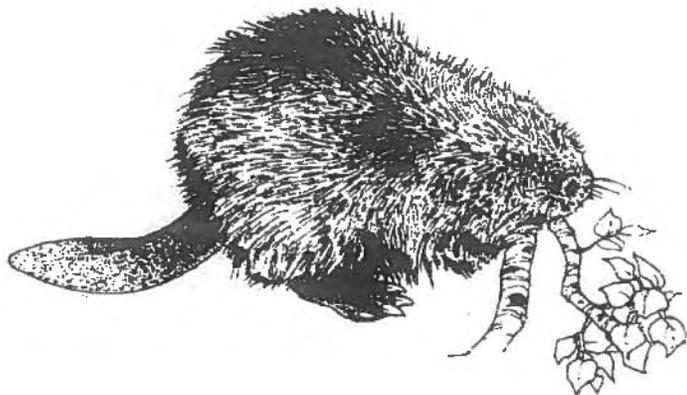
Vegetation drowned by the pond rots, releasing vast flows of nutrients into the water. The pond bubbles methane into the atmosphere. Erosion caused by the lapping of the expanding upstream shoreline pulls more nutrients into the water. In the pond and downstream from the dam, biomass now surges because of the water's increased fertility. The growing plants and animals trap these nutrients and begin to cycle them.

Ecosystems that retain nutrients recover more easily from disturbance than nutrient-losing ones. This means the pond communities and those around them are likely to persist for a long time.

Because the pond has slowed the once-rushing water, it can't carry as much sediment. The released burden settles onto the pond bottom. The small dam's ability to collect sediment is enormous: An average beaver dam, containing four to eighteen cubic meters of wood, will eventually retain 2000 to 6500 cubic meters of sediment behind it. That's tremendous leverage, and a very effective use of resources! Paleoecological evidence shows that entire valley floors have been raised many meters by beaver pond sediments.

These sediments contain carbon, potassium, phosphate, and other nutrients, which are slowly released into the pond, or provide food for burrowers and other burgeoning denizens of the soft bottom. The burrowing worms and other creatures alter nutrient flows as well. They stir up the sediment, releasing soluble chemicals into the water, but they also trap and retain nutrients, storing them as bodies and food, and coating their burrows with organic matter.

Huge numbers of tubeworms and clams are nurtured by the slow water-speeds and the sediments that result; dragonflies and other predatory insects abound. Because of these predators, fewer blackflies and mosquitoes infest beaver ponds than man-made ponds.



Sediments in beaver ponds and wet meadows at their margins are warmer than those in dry meadows and forests, which means faster growth of plants and soil organisms. In many cases, beaver ponds also raise the water table, making moisture more available to roots and soil life. Shrews, voles, and other small mammals thrive in the warm, verdant growth.

More fish species are found in and near beaver ponds than in open streams. Overall, the diversity and biomass of plants and animals in beaver ponds is two to five times that of riffling streams.

A vast mosaic of life

The ponds themselves can vary hugely, creating many different habitats. Some ponds are squeezed into deep, narrow uplands, and others spread across broad, low valleys. Downstream ponds are closer to permanent aquatic habitats at river mouths, and thus trade species with them. Dams regularly collapse, and some are not repaired, so ponds are often in various stages of conversion to dryer habitats.

But just as significant are the varied habitats that ring beaver ponds. Upstream and down are open stretches of flowing water, home to stream species. At the pond edges the beaver have created bogs, marshes, wet meadows, and riparian forests. The new wetlands and meadows contain more nutrients than the older uplands, and so support more types and numbers of living beings. Edging the wetlands are dry meadows and woodlands. And beaver meadows are very persistent, because previous flooding has acidified their soil, helping them resist invasion by shrubs and trees.

All these habitats are flooded in a very complex pattern that varies with both the flow of water over the seasons and the beaver's activity. This means the conditions in all these communities vary widely over time, allowing yet more biodiversity.

Beaver create a stunningly diverse mosaic of habitats that shift over both space and time. Scientists in Minnesota found that returning beaver transformed a section of uniform deciduous forest into 32 different aquatic, emergent, shrub, and forested wetland communities at various successional stages.

A beaverless watershed will most likely contain a deeply gullied stream with a dry edge. A watershed with beaver will have open, shallow streams, many ponds both active and abandoned, wet and dry meadows, drowned, riparian, and dry forests, and different wetlands of all sizes, types, and successional phases. This whole network and the many species living there will shift and repattern as beaver move out of ponds or return to abandoned dams. These animals and the work they do are the key to biodiversity in the watershed.

Busy little engineers

The importance of the beaver hasn't gone unnoticed by ecologists, and these creatures also offer both conceptual tools and affirmation to permaculturists as well. Recently, ecologists have coined a phrase to describe animals like the beaver: Ecosystem engineers. These are organisms that directly affect and regulate the availability of resources to other species, by causing physical changes in biotic and abiotic materials. In doing this they create and/or modify habitats.

I'm not wild about calling animals "engineers," as my

personal view of engineering is that it is not as creative, inspiring, or appropriate as what nature does—but the term is well established and will have to do here.

Ecosystem engineers fall into two camps. In the first are creatures like the beaver and the earthworm, which work their magic by manipulating living and non-living materials (they are called allogenic engineers, for those who like fancy terms).

The second group are those which alter the environment by changes in their own bodies (autogenic engineers). Trees are the consummate example of autogenic engineers, and Mollison has written brilliantly of the way trees interact with and affect their environment. However, he focuses mainly on the effects of trees on the non-living world: how they affect rainfall, hydrology, soil, clouds, and wind. One could deepen his essays by describing how trees regulate the other species around them. They create habitat for many species amidst their trunks, branches, water-filled crotches, leaves, and roots. The roots provide cavities and aeration, and change soil texture and infiltration rates, which

on them, and for ecosystem processes. They damp the wild flows passing through their homes. They usually enhance biodiversity and make environments more complex.

Harvesting beaver medicine

Sound familiar? The whole idea of ecosystem engineers drops neatly into the permaculture toolbox. These species, like good designers, create and improve habitat for many species as a by-product of enhancing their own environment. They cooperate with ecosystem processes and energy and matter flows, directing them with minimal, efficient intervention, and they benefit themselves and others by doing so.

By understanding ecosystem engineers like the beaver, we can shine a bright, critical light on many of the practices and principles of permaculture. The effects of beaver on a watershed sound to me like nature's application of P.A. Yeomans' Keyline concepts, and support permaculture's belief that earthworks and ponds are critical for restoring ecosystem health. In sites where beaver have returned after a century or more of absence, we have natural models that demonstrate the hugely beneficial effect of holding water on the land.

Trees, as Mollison understood, are another ecosystem engineer to learn from. Others that could be integrated into the permaculture corpus of knowledge are:

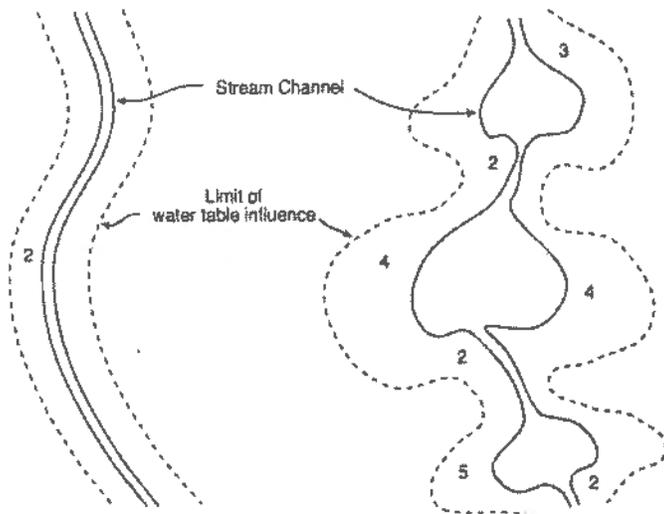
- Reef-building corals,
- Earthworms and other burrowers (the whole class are called bioturbators for their churning of sediments),
- Certain key fungi and other microbes, which mobilize nutrients,
- Algae, which change how light and nutrients are distributed in water,
- Elephants, which uproot, trample, and eat whole forests and then deposit huge manure loads elsewhere, stimulating new growth,
- Woodpeckers, which alter insect abundance and create nest sites and shelter in trees for many species, and
- Alligators, which dig wallows that create new habitats.

The final and most drastic ecosystem engineer is, of course, *Homo sapiens*. We're not very good at it. Usually the effect of our ecosystem engineering is to reduce the possibilities for every other species, rather than to enhance them. But by looking more carefully at the many ways in which nature's ecosystem engineers improve their own homesites while boosting the productivity and diversity of the larger environment, we can become wiser in our own manipulations.

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Toby Hemenway is associate editor of Permaculture Activist and the author of Gaia's Garden: A Guide to Home-Scale Permaculture (Chelsea Green, 2001). He lives in southern Oregon.



The left drawing shows a stream before beaver damming; the right shows how, after beavers built three dams, edge area of both stream and water table margin was significantly increased, and habitat types (shown by numbers) quadrupled. Redrawn from R.J. Naiman et al. (1988), *BioScience* 38: 753-762.]

affect both underground and surface dwellers. Leaf litter changes the drainage, moisture level, and gas and moisture exchange rates in soil habitats, and creates barriers to or protection for microbes, seeds, seedlings, and animals. Trunks, branches, and leaves drop into streams, altering flow and otherwise providing new habitat. This list could go on: The ways that trees "engineer" habitat are multifold.

The principal point to grasp about ecological engineers is that they act at points of maximum leverage to change the flow, availability, and pattern of energy, nutrients, and other resources that are used by other species. They often are not part of these flows themselves, thus their interactions are on a very different level from the predator/prey relations (trophic level) upon which so many of ecology's precepts are based.

Ecosystem engineers "design" their own habitats and those of others, and exert a great deal of control over them. This means they create stable, predictable conditions for themselves and for the ever-increasing numbers of creatures who become dependent

Romance of the Raindrop

William O. McLarney

I GREW UP in an unusual place. Most people probably don't think of southwestern New York in terms of large swamps, but some of my earlier memories are of traveling through hardwood forests in a small outboard-powered boat. My "natal" watershed, the Conewango Creek, drains, via the Allegheny, Ohio, and Mississippi Rivers, to the Gulf of Mexico. Its middle watershed includes the uppermost extension of the vast hardwood swamps which once graced much of the Ohio Valley.

At a suitable age, this information, coupled with an indoctrination in sport fishing, probably would have been sufficient to spark what began as recreational and aesthetic pursuits and became the driving force in my life and career. But what really caught my imagination was a barn. One day our family drove from my home town of Randolph through the neighboring town of South Dayton. There my father pointed out Ray Markham's barn, perched on top of Dayton Hill, safely above the annual floods. He explained to me that if a raindrop hit exactly on the peak of the roof, half of the water would end up in the Gulf of Mexico, while the other half would flow toward Cattaraugus Creek, into Lake Erie, over Niagara Falls and eventually into Canada, reaching the Gulf of St. Lawrence. When the two half raindrops each encountered salt water they would be some 2,000 linear miles apart. When we got home, I looked this up in the atlas, and the romance of that raindrop has stayed with me ever since as a fascination with the concept of the watershed.

My involvement in conservation began when I was in high school, trying to prevent channelization and drainage schemes which would have destroyed my creek and swamp. Some 45 years later, protection for most of the area was finally achieved. By that time I had moved away, and my participation has been minimal, but I like to think of the occasional letter I have written, the occasional conversations I have when I visit home, the canoe trip I took with a Nature Conservancy staffer, as raindrops falling on the Conewango side of Mr. Markham's barn, making their small contributions to a healthy watershed.

Today I live and work in two more widely separated watersheds. One is part of the same Mississippi system in which I grew up—the upper Little Tennessee River watershed in North Carolina and Georgia. The other is the Sixaola River watershed which drains into the Caribbean Sea on the Costa Rica-Panama border. Not all of us are lucky enough to have two active "home" watersheds, or to live near anything so glamorous as Mr. Markham's barn, but, unless we are at sea, each of us is located in some watershed at every moment of our lives, and the romance is there for those who want it.

Taking the pulse of the watershed

In my North Carolina home, I work with the Little Tennessee Watershed Association (LTWA), and through them with multiple local conservation and community groups, schools and government agencies. The main thrust of my part of the work is biomonitoring stream ecosystems.

Biomonitoring is a sort of "ask the experts" discipline. Who are the experts? To a degree, I might be one. Yet another scientist might be more expert in some aspects of stream ecology. And an observant angler might know something neither of us knows. But the ultimate expert is the guy who has to be there 24 hours a day, 365 days a year—the fish. So what we really do is ask the fish and other aquatic critters about conditions.

Once we acknowledge who the real experts are, anyone can participate in framing the questions. The Little Tennessee project runs on volunteer labor—out of economic necessity, but also because it provides the opportunity to educate. Not only do we get information about our streams, and try to put it to work in land management decisions, but we treat each sampling day in the field as an educational experience. The goal is for each volunteer to become an informed land steward and watershed advocate.

In some of my unguarded moments, I have been heard to utter that land is nothing more than a support system for the waters. Such blatant chauvinism aside, the law of gravity sees to it that the importance of stream monitoring transcends the importance of streams. If we pollute a stream we do not cause immediate damage on the hilltop above it. But if we perpetrate a disaster on the hilltop, the result will soon enough be reflected in the stream. So to a large degree the health of the stream serves as an indicator of the state of the whole watershed—and a report card on the quality of our management of the land.

The LTWA uses this realization to promote better land management practices. One of our programs involves working with farmers and other land owners to stabilize stream banks and other sources of soil erosion. In many parts of the world, including the Little Tennessee watershed, farmers and others are losing not only topsoil but acreage. And the damage to the watershed is mirrored in damage to the waters. Worldwide, soil, so valuable on land, is the most significant pollutant in waterways. Farmers, home owners, sport fishermen, biologists, and many others have a common interest, and monitoring the health of our streams over the years lets us know whether or not we are protecting that interest.

The meaning of biodiversity

Of course it is easy to evaluate the spectacular cases without recourse to sophisticated biomonitoring methods. The farmer who has lost an acre of pasture to the river and the recreational user disgusted by gross sedimentation of once clear, rocky streams don't need an ecologist to define their problems. But we are seeing other, more subtle (and maybe more easily reversible) effects. One has to do with the concept of biodiversity—often, and lamentably, seen as a matter of "More is better than less."

It is common knowledge that tropical ecosystems tend to have more species, and are therefore more "diverse" than their temperate counterparts. This is exciting to biologists, but a moment's reflection will suffice to show that it does not make the tropics intrinsically "better" than the temperate zones. A similar

relation exists between large and small streams in a given watershed; the mainstem river will almost always have more species of fish and other organisms than a headwater tributary. Does this make the Little Tennessee River "better" than a sparkling mountain stream full of native brook trout? Clearly not.

One of the things we are learning is that we are homogenizing our watersheds, and thereby losing the uniqueness of our smaller streams. As we deforest our watersheds, and especially stream banks, as we disturb the soil and even pave it over, as we add excess organic matter ranging from sewage to agricultural fertilizer, smaller streams become more fertile, warmer, and more sedimented. They begin to look like miniatures of the mainstem rivers (which are naturally more fertile, warmer, and carry heavier natural sediment loads). By the crudest measure (species count) many of our small streams are becoming increasingly diverse—and at the same time less "natural" and less unique. It is just possible that, with sufficient public awareness, this realization can inform a management goal which will be easier to achieve over the medium run than the restoration of our most degraded waterways.



L-to-R, Julio Barquero, the author, and Winston Bent of ANAI staff electrofishing in the Río Watsi, Costa Rica.

This thinking feeds into a new initiative (as yet unfunded) to monitor environmental conditions along the length of the Appalachian Trail. The AT is a ridge trail; most of its length is along watershed boundaries. In the Little Tennessee watershed we note that the tributary creeks which arise along the relatively well protected trail corridor are healthier over their entire length, than their counterparts with less protected headwater areas. Our watershed has been chosen as the prototype for what we hope will become a network of watershed programs heading up on the AT, to be monitored from the top down. Perhaps in the process some of my neighbors will perceive the AT as I saw Mr. Markham's barn, and be inspired to greater effort.

Changing attitudes

When I first moved to North Carolina, "environmentalism" was very suspect in many quarters, and even presenting myself as a "conservationist" was fraught with risk. Today, in part because of the positive attention we have focused on the Little Tennessee River, a solid majority, including county governments, are lined up behind our conservation goals. When I participated in the founding of Asociacion ANAI in the Talamanca region of Costa Rica, beginning in the 70's, traditional environmentalism was

seen, with some justification, as the concern of a small, largely foreign, elite. A full court press on conservation would have been not only ineffective, but inappropriate in what has long been economically the poorest region of the country.

Talamanca is a spectacular region. Politically it is a county, but within that county one can go from Mt. Chirripo on the Continental Divide, with a view of both oceans (at 12,533 ft. the highest point in Costa Rica) to sea level. But even in such a place, the reality of human poverty virtually dictates a focus on economic concerns first. This can lead straight to the horns of the "jobs vs. the environment" dilemma—or we can be guided by the concept of sustainability. To telescope a whole lot of history, ANAI and the people of Talamanca have had remarkable success in approaching sustainability while revitalizing a rural economy through such practices as organic agroforestry and locally controlled ecotourism. Talamanca is still far from an economically "rich" area (and maybe it never should be), but by the standards of rural Latin America its people are well off.

And in the last few years we have introduced the idea of biomonitoring, with watersheds as an organizing concept and streams as one of the focal points. Not entirely to our surprise we have experienced an oversupply of local volunteers. When a group of farmers from an isolated community seek you out at your office to ask that their river be monitored for fish and benthic macroinvertebrates—and then provide lunch and all the labor apart from your technical staff, you begin to suspect you are doing something right.

Empowering popular science

Another memorable moment occurred on our first sampling trip to Yorkin, one of the more remote Bribri Indian communities. When we worked with fish, we discovered (not unexpectedly) a wealth of local knowledge. But when we began to look at benthic macroinvertebrates (insect larvae and other tiny creatures which inhabit the stream bed) we found that our hosts were virtually unaware of their existence—and totally ignorant of their diversity and role in maintaining the fish community. Our first few days in the field created an excitement, which has not abated, about the new information which was being made available. For me personally, as a scientist, it was a clear example of the need to

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combine "traditional" and "western" knowledge systems in the search for a sustainable future.

The Yorkin area is in relatively little need of monitoring services, but the people are proud of their macro-invertebrate community. If a small problem is perceived, they are quick to bring it to our attention. Most of all, they love documenting the health of their watersheds and are pleased to serve as a source of the reference sites we use as standards against which to compare other streams.

Portent of things to come

Our goals are immodest. We hope to see Talamanca become the first region on earth where biomonitoring ceases to be the exclusive province of "experts" (other than fish) and becomes part of the culture. Our hopes were buoyed in May when Walter Rodriguez, a Talamanca native and director of APPTA (Talamanca Small Producers' Association), the organization which serves as the link between small farmers and world markets, addressed a conference of organic growers in London. In his address he cited data from our biomonitoring work, particularly the stream work. To paraphrase Walter: "Today the consumer chooses organic produce from some combination of concern for personal health and a loosely defined environmental ideology. Tomorrow, he will choose to purchase products based on a concern for sustainable communities located in healthy ecosystems and watersheds." He

backed up his point with data from our stream (and terrestrial) biomonitoring work suggesting that those agricultural practices which produce the most economic benefit for small farmers and isolated rural communities are precisely those which to some degree mimic nature, and best protect streams and watersheds.

I have been asked to write a piece focusing on watersheds, and I do so gladly because of my personal and professional interests and, yes, my biases. Of course watersheds are not the be-all and end-all of conservation. Many of our problems transcend watersheds, as surely as terrestrial animals (including our own species) pass from watershed to watershed without remarking on it. We have, for example, the phenomena of air pollution and global warming. And, in what amounts to a direct violation of the integrity of watersheds as evolutionary units, we transport aquatic species across watershed lines and release them, thus demonstrating that *Homo sapiens* can erode natural diversity and hasten the process of homogenization in streams without altering water quality.

With all limitations acknowledged, the watershed remains one of the fundamental units by which the biosphere is organized. And in many places watersheds correspond to political units. For example in western North Carolina, the county lines are largely watershed boundaries. In Talamanca, rural communities tend to be defined by their watershed.

But perhaps most important, the

watershed is an easily grasped concept which captures people's imagination. It can be dramatized by appealing to the sense of responsibility: What do you want to be the fate of the raindrop which falls on your property or in your community? It can be linked to evocative landscape features—Mt. Chirripo, the Appalachian Trail, Mr. Markham's barn. Not to gainsay for a moment the importance to our future of disciplines such as hydrology or ecology; or concepts such as sustainability and their relation to watersheds, it may be that the greatest importance of watersheds is as a motivating factor for conservationists. Never underestimate the romance of the raindrop. △

Bill McLarney is the author of Freshwater Aquaculture, and helped found the New Alchemy Institute in Massachusetts as well as its counterpart, ANAI, in Costa Rica. He writes from Franklin, NC and may be contacted at anaiinc@dnet.net.

To Support Watershed Restoration

Apart from a concern with watershed conservation, the Little Tennessee Watershed Association and ANAI have several things in common:

- Both are strongly dependent on volunteer assistance.
- Both are increasingly involved in providing training opportunities in watershed conservation.
- Both are 501(c)3 nonprofit organizations supported in large part by private donations.

If you would be interested in volunteering some of your time, learning about aspects of watershed conservation or making a charitable donation, here is contact information for the two organizations:

Little Tennessee Watershed Assn.
Sharon Taylor, Chair
phone: 828-369-6402
sftlitt@dnet.net

Asociacion ANAI
Diego Lynch, President
Apdo. 170-2070
Sabanilla de Montes de Oca
Costa Rica
phone: +506-224-3570
anaicr@racsa.co.cr

Or contact the author directly at:
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Where the water doesn't drain

Peat Bogs: Preservation or Peril?

Sissi Grohmann

Peat bogs hold approximately 460 billion tons of carbon worldwide—three times more than the tropical rainforests. Most peat bogs are situated in the northern hemisphere—in Europe, Asia, Canada, and the northern parts of the United States. This gigantic reservoir of carbon has been threatened by industrial exploitation for the last decades.

What created these landscapes full of mystery and austere beauty?

DURING THE LAST ICE AGE, great heaps of gravel and unconsolidated rocky debris—called moraines—built up at the sides and the ends of the glaciers. Lighter material, such as clay and sand, formed sediments in the valleys between these mountains of gravel. After the ice thawed, the clay remained as an impervious layer. This stratum prevented water from trickling away—and still does, resulting in the creation of lakes and ponds. Because of the rough new topography of the glacial landscape, many of those lakes had no outlets and so began silting up.

As nutrients leached into these lakes from the surrounding vegetation, emergent plants slowly established at their margins.

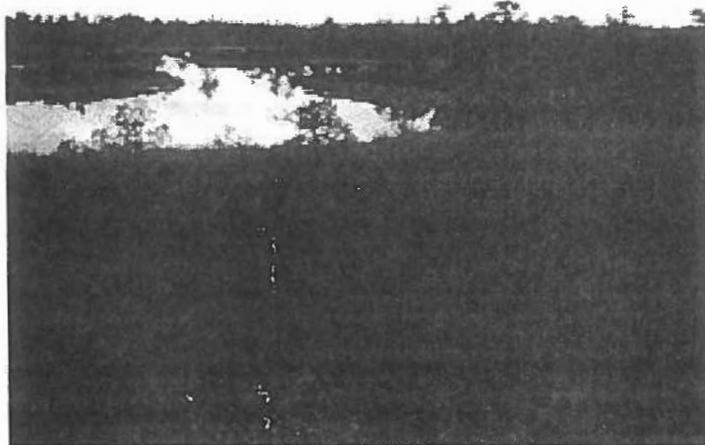
During the next 12,000 to 15,000 years as nitrogen and phosphorus gradually built up in the water, oxygen was depleted, so the plants growing out of the shallows decayed anaerobically. Also, the surface water remained warm and did not sink, so no oxygen could reach the decaying plants to complete decomposition. Minerals leaching into the water from the clay bottom, such as Sodium (Na), Calcium (Ca), and Potassium (K) were conducive to changing the alkaline environment into an acidic one. Eventually the organic matter built up as peat.

The Irish word *feign* describes the bog in the early stages as the lake silts up, when plants are still watered by mineral ground water. In these bogs grow about 30-50 species of sedges, black elder, and a few trees. In the final stages of this evolution, the nutrients are so bound up that rainwater is the only source of nourishment for the the hardy community of plants that remain: some species of moss, a few grasses and sedges, and small brushy specimens of *Pinus mugo*. Sometimes the two types can overlap: these are called complex bogs.

Clay is not the only impermeable layer creating these conditions. In the far northern parts of the world, where the subsoil layers remain frozen even during the short period of vegetative growth, bogs form over the permafrost. These conditions support even fewer species, as no minerals can be dissolved from the soil; they can come only through rainwater.

Opening Pandora's Box

In Europe and Russia, peat had been the fuel of farmers for centuries. Its use persisted through the two world wars and beyond, but in the 1960s, with the gradual extension of the urban industrial economy, most traditional users of peat abandoned it for the more convenient wood or oil heating.



Plants in the bog are stunted because nutrients are bound in the acidic soils. These ecological communities are unique.

Across much of western Europe, beginning around the turn of the century, peat works became industrialized, but these were largely abandoned by 1930. The Irish, who gained their independence from Britain in 1922, and lacked forest cover or any reserves of coal, oil, or gas, were among the last to harvest peat as an industrial fuel, doing so into the 1970s, when entry into the Common Market changed the structure of their economy.

While cutting the bricks of peat, water runs continually from the walls of the pit, which has to be drained by ditches. Eventually lakes developed, and higher, already dryer levels of the bog became covered with trees, which drew more water until the moor was almost dried out or, if the isolating layers were high, the area turned into marshes. The sensitive fauna and flora, which are highly specialized with few but rare species, were destroyed. Because of the changed conditions, oxygen now reaches the lower levels, stopping the anaerobic decomposition, and turns the carbon into CO₂. This leads to the same greenhouse effect that we know from burning rainforests. While burning forests only sends gas from one plant generation into the atmosphere, from peat bogs the accumulated carbon of thousands of years—approximately a billion tons per year worldwide—turn from assets into liabilities. Beyond this, rivers are contaminated with nitrogen, which runs from drained peat bogs (800,000 tons of N in Germany's rivers alone) into the sea.

The mismanagement of bogs also disturbs the mineral balance

of seawater. Iron is carried into the sea, where it otherwise would be scarce. This element is a necessary fertilizer for algae and plankton, the main nutrition of many fish, which later on will fill the nets of fishing fleets. The fluctuation between an oversupply of iron and then the lack of it proved to be devastating for the salmon population at England's shores when 90% of bogs and swamps were drained after WW II. Overfishing cannot be the sole reason, otherwise the population would have recovered after fishing was regulated.

The chemistry of peat has other important if poorly understood effects. Peat absorbs PAH (polycyclic aromatic hydrocarbons) and binds them in humic substances. If the bog burns, PAH contaminates the air. Adding peat and clay can mitigate soil contaminated with PCBs (polychlorinated biphenyls). Copper also binds with humic acids and therefore sudden new cultivation and amelioration of peat bogs causes an acute lack of copper for people, plants, and especially sheep for which otherwise bogs make available enough nutrients.

conditions, and will have died out.

Peat in Horticulture

Most of the peat imported to the western European states is used for mass production of seasonal potted plants, which after their short period of bloom are thrown away, contaminated with fertilizers. While landscapers and market gardeners waste an awful lot of this precious commodity, environmentalists have not been idle. Most hobby gardeners have been convinced to use less peat, to compost their garden scraps and mix their own potting soil. What is sold in the supermarket usually contains peat, even when labeled "natural, organic, ecological." Unless you see the label "peat-free," you cannot be sure. For those who want to prepare their own soil, here is one of a variety of recipes: take two parts of mature compost, two parts of garden soil, one part of black compost (of leaves), one part of thin sand or lava granulate, mix well, and plant.

In modern greenhouses, plants never feel soil around their roots. Containers filled with peat are furnished with seeds, and then moved through the greenhouse on conveyor belts to receive the appropriate amount of water and fertilizer. There is definitely an environmental advantage to this system because the contaminated wastewater can now be caught and cleaned as opposed to earlier practices, where the contaminated water disappeared in the ground water. Therefore, the government of the Netherlands has drafted a bill containing provisions that all market gardeners will have to use the container system in the near future. This idea is contested among scientists. They argue it might mean the deathblow for the remaining undisturbed peat bogs. This is not to say that cultivated peat bogs should be totally destroyed instead. However, in former centuries a culture and economy developed from ecological interaction and interdependence between the inhabitants of the area—plants, animals, and humans.

Holding the Dead

Bogs have tremendous preservative properties for organic materials through the humic acids—which bind nutrients that might otherwise support decomposition—for example the remains of our ancestors. Archaeologists and historians complain about the brutal industrial exploitation of bogs. Some 1,800 bodies have been found in bogs. Boats, weapons, tools, hairpieces, clothing, and many miles of pathways made of logs, more than 2000 years old have been preserved. The famous "Man of Tollund" looks like he is sleeping, better preserved than the best mummy. When people cut peat in earlier times, before machines came into use, it was not devastating for archaeological evidence.

The bogs tell stories about a close relationship with our ancestors and their multi-level understanding of ecological processes. Teutonic and Celtic tribes perceived the moors as a spiritual entity, as they buried executed delinquents there and even pinned them down to hinder them from returning. The spirits had to be appeased; the bog was considered an unerring judge in their *ius talionis*. There is also a female quality attributed to the bog; it seems to be both entrance and exit to the underworld. The laws of time seem not to apply. The bog resembles a primordial condition of the earth, the earliest dawn of life—it gives a faint sensation of eternity. The bog also granted



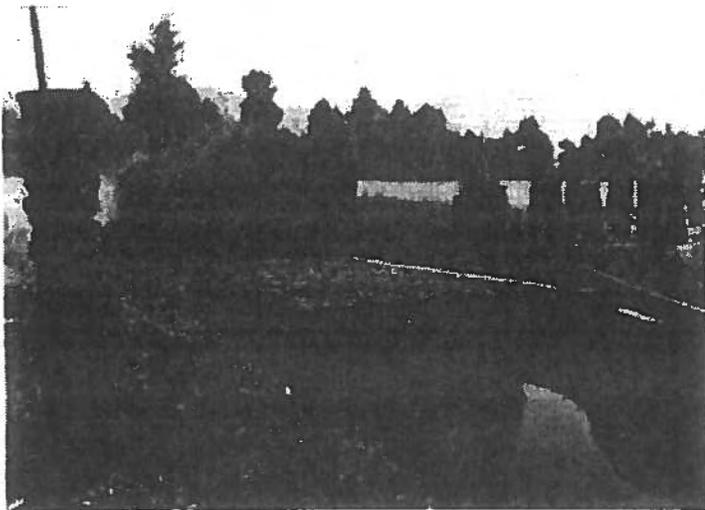
Industrial stripping of the bog leaves devastated landscapes, lowered groundwater, and often smoldering ground fires.

In northern Europe there were vast undisturbed peat bogs, just as in Canada and wide areas in the U.S. In Latvia and Estonia, the Soviets destroyed thousands of acres of bog by scraping immense areas with gigantic machines. This lowered the groundwater level so much that not only peat bogs were desiccated but also wells ran dry. In hot summers, the self-inflammable dry peat burnt for weeks and the fires often spread to adjacent forests, smoldering just below the surface. Germany's resources are almost depleted and most peat bogs there are now protected.

Thus, after 1990, the industry turned to the Baltic countries and bought large areas for peat works. The advantage: there were few impeding laws for environmental protection, and even those existing were not enforced. Additionally, workers in the eastern countries receive extremely low wages. In Latvia, over one million cubic meters of peat is used in heating power plants yearly. The government is at pains to point out that after mining is finished the bog will be "restored" and set under water again, but recovery will take thousands of years: Peat bogs only grow one millimeter per year! In the meantime, rare animals and plants will have lost their appropriate environment and living

gifts, such as the precious iron ore, contained in the acidic grasses growing on the edges. After extraction by burning, this was smelted in ovens made of clay. Women, who related in a special way to the moor, collected healing herbs and all kinds of berries; and finally the bog gave the healing blue-black silt, which was applied to aching parts of the body.

All over the world people tell about mysterious lights that can be seen flickering over the moor on dark nights. Wasn't this proof enough that the bog is full of secret life? And people did treat the bog with awe and respect. They had an innate affiliation and special knowledge of its mysteries gained from personal experience—not from books and television. This ancient wisdom and knowledge extended far beyond modern science and included spirituality, community, creativity, and technologies that sustained the lives of these peoples. Our discoveries provide a glimpse of a sensual participation these people had with the bogs and with nature in general. Although the perceptual mode in modern man has changed, some dim memory must still be lingering in us even now. If we once again learn to feel, hear, see, smell, and taste the natural world as our ancestors did, we might be able to establish a similar connection. It takes an alert mind and alert senses, free from abstraction and free from mawkishness.



Peat blocks are cut by hand from the bog "face," and stacked on sticks to dry in the traditional way.

Traces of the Past

In areas where traditionally Celtic and Teutonic tribes had settled, at the margins of mainstream western life, an unconscious pagan memory of the power of bogs has remained alive until recently. One example is a vast area south of Salzburg, Austria. The "Untersberger Moos" covers an area of approximately 4500 acres between the city of Salzburg and the Untersberg mountain. Legends tell that the sinful inhabitants of a Roman settlement there were chastised for debauchery and disappeared in the bog. Thus, the Teutons who had reached this area at the end of their migration around 600 A.D. kept alive their custom to pray for protection from bad spirits. Every year in December young men of the community dress up in fierce-looking masks and costumes, representing various evil characters of ancient pre-Christian mythology and knock at the doors of the town to receive gifts so that the bad spirits may pass by without harming the owners.

Eventually, after 1600, the ruling archbishop decided to cultivate the "Wild Moss" and a few peasants were convinced to settle there. In 1739 the first fiefs for peat works were allotted, tax-free in lieu of the hard work of amelioration. By 1825 a road had been built through the bog, as well as a grid of drainage ditches, and more than 300 people lived and farmed on somewhat dried up areas. Peat for fuel provided very good income and when in 1830 a spa was established, the Untersberger Moos became famous for its healing qualities. So many people traveled from afar seeking relief through the black silt from all kinds of ailments, that by 1842 three spas were at work. After WW II, the old buildings were not renovated; from then on, the peat was sold to the big new spa in Salzburg. In the seventies only a few people used peat for fuel any more and since then peat has been mainly produced for gardeners.

Living with the Bog

"The bog has changed—and our lives too," the farmer reflected on the old times. "Our work used to be so very hard." Horses had to wear wooden shoes, like snowshoes, to keep them from sinking into the bog. On some fields, no teams could be used at all. People had to carry bushels of peat and hay to the road with forks. It used to be part of everyday life to pull horses and carts out when they threatened to sink in. When they were down to their stomach, it took many people to help. Some areas have become dry enough to use tractors since the last two decades. "When I was young, we heard the frogs every day at dusk, and we had a lot of blueberries and other berries, so many good herbs...they are gone now," the old man regretted.

When peat was cut for fuel, the farmers started in spring, after the soil had thawed. The surface layer and humus was removed and thrown in the ditch of the year before. This light brown material did not burn very well. About one foot deep the real "blue sod" appeared, very black, very wet, without pieces of wood. Here the farmer drew exact lines and then cut vertically a grid of 12" x 8" in rows. About 8" deep the bricks were cut horizontally and removed, carefully put in a wheelbarrow, then skewered on a three-foot stick and set on the high ground where sun and wind could dry the peat over the summer. Only two tools were necessary: a straight, spade-shaped knife and a straight shovel—everything was done by hand.

The burned peat gave as much heat as hardwood and left a lot of very fine ash, which was spread in the garden as fertilizer. Nowadays nobody uses peat as fuel anymore, but still farmers cut peat for gardeners and sell peat silt to spas for medicinal use.

Peat cutting starts in late fall now, when all the other work on the farm is done. After the bricks are cut, the farmer builds small pyramids, starting with four bricks on the ground. They all have to be arranged loosely to allow the wind to dry them. Over the winter, the peat has to freeze. This process expands the volume and allows the bricks to dry. Several times the pyramids must be turned over until they are ready to be ground in a mill the following spring. Although most of the water evaporates, peat never really gets dry. The ideal structure is fine, crumbly and moist. If the customers want bags, it takes two people to do the packing. One has to shovel, the other one has to pound and press the bag before it can be tied. "Our generation will probably be the last to make peat this way—it is such hard work, all manual work, but we get our exercise," the woman laughed. "Our

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children have a big machine for exercising in their basement, where they work their muscles—we can do this with live material in fresh air," she added.

The people do not make much money with peat, but they need some peat anyway for their chickens— "It is the best for them," the woman said. Around bogs, everybody who has chickens uses peat for their bedding beneath the perches where the chickens roost at night. The peat must be turned over monthly, and changed about two times per year. When it is finally thrown on the compost, it turns into the best potting soil because of the droppings, and can be used as pure, very rich compost. Peat serves as a disinfectant in the bedding because the humic acids repel parasites and bugs, and bind odors. In other areas, where the soil is very heavy from clay, people mix it with peat and small-scale market gardeners prepare their soil with it.

Wildlife had to adjust to the changes in the bog too—many birds, such as partridge and snipe, left. Muskrat and otter were deprived of their food sources since the only creek through the bog has been regulated, and they moved away too. Deer moved in and enjoy the drier fields; pheasants proliferate in the ideal conditions of the many brush lines alongside the drainage ditches and attract all kinds of raptors.

Hope for the Future

Recently three remote areas of the Untersberg Moos have been declared a wildlife refuge and are protected; the groundwater level is being raised gradually. The first rewards can be seen: a few hares have survived in these areas. *Leporona gallus greissalia* is their scientific name and this spot is the only one on the globe where they can be found. When I first approached the old couple to learn details about their life in the bog, they were embarrassed and only reluctantly answered my questions. However, soon trust developed when I honestly regretted that all the riches of this life—admittedly, together with the hardships—are going to vanish. I walked through their backyard where the soft swinging sod began and I looked on the peaceful land. Some permaculture principles have been applied naturally, unknowingly, here—maybe some other principles may now be helpful, if

intentionally used to preserve this culture and the rich gifts of the bog. I decided to return and keep my new acquaintance alive. After all, they might not have to be the last generation who live with the bog? △

Sissi Grohmann completed permaculture training in Michigan and No. Carolina. She has worked with native peoples in northern Minnesota and in Austria, and can be reached via D & D HAG, Johannes Damisch Firmianstr. 5, 5020 Salzburg, Austria. Tel: NEU: +43-6991-325-0352. sigroh@compuserve.com

Turning Problems into Solutions on Lake Champlain

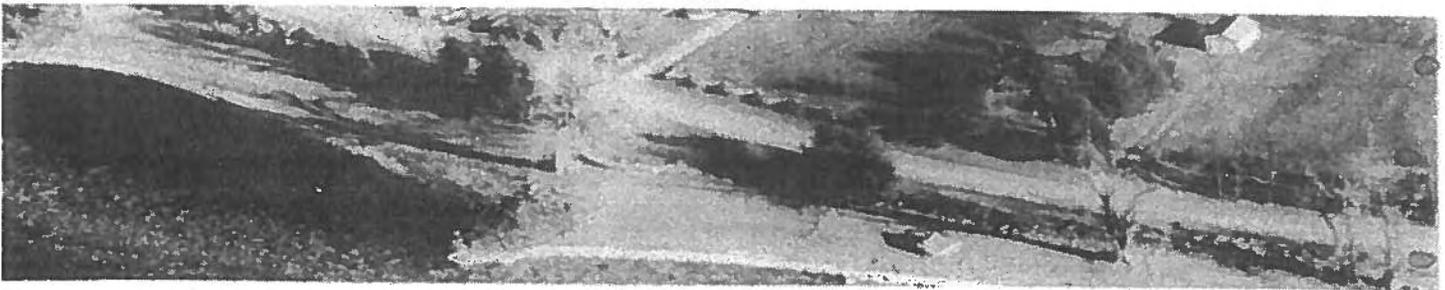
Where the Water Meets the Land

Claude Genest

THE MOST BEAUTIFUL Pines I have ever seen..." wrote Samuel de Champlain in his diary about Isle LaMotte, where I live in northern Vermont. He was describing giants whose first branches might start 200 feet in the air. Much has changed here since the great French explorer penned his memorable words. Those noble sentries, which once guarded the island's shore, are gone, and without them, the lake is steadily claiming ground, undermining the placid face of domesticity cultivated by the island's residents.

and in some places already gone, the soil beneath it eroded by the lake. Suburban style development and an insistence on rigorously unobstructed views have felled all but a few ornamental or renegade "junk" trees along the water's edge—mostly old, sick poplars, victims of a freak ice storm in '98. In their place are barriers of rock and poured concrete.

People here assume that the shore erodes quite "naturally" from the pressures of winter ice upon it. But old timers will tell you the culprit is the steady and sometimes violent wave action



Isle LaMotte's West Shore Road shows narrow shore barren of trees: no filtration of runoff—an unstable situation.

Attached to "mainland" Vermont like a pendant by a narrow bridge and causeway, Isle Lamotte resembles a great boat riding at anchor in one of the northern arms of Lake Champlain, where its waters flow toward Canada and the Richelieu River. The smallest and most remote of the "Grand Islands" of this tiny inland sea, Lamotte, named for Champlain's loyal lieutenant, faces across a freshwater channel to New York and up the lake towards Quebec a few miles away. Part of the St. Lawrence valley and the Great Lakes bioregion, Isle Lamotte is home to some 400 people. Its laconic pace of life as a New England backwater village belies the confluence of dynamic events that gave it shape: immense glaciers draining half a continent, followed by the migrations, wars, and settlement of aboriginals, Huron, Iroquois, and competing tribes of Europeans. Nor do the white clapboard houses and trim hedges along its main thoroughfare give any hint of the island's close relation to the metropolitan hub of French Canada—Montreal, just an hour north. Taciturn and sheltered by the waters of the lake, the islanders cling determinedly to a familiar way of life if not so well to the ground under their feet.

E-road-sion

Today, where that road meets the water's edge, which is around most of the six-mile-long island, the road is going, going,

licking up underneath the expensive rip-rap barriers and concrete sea walls shoreside residents have built to safeguard their real estate. The incessant wave action carries away soil from further and further inland until one day, a hole "suddenly" appears in the road.

But between you, me, and the Permie next door, I reckon the chief culprit, considering what factors necessitate expensive sea walls to begin with, is the lack of tree roots to bind the soil in place. "Good riddance road!", say you, and I, Car-Hater-at-large, would mostly agree.

However, we here at Green Mountain Permaculture (that'd be me, pleased to meet you) feel urged to intervene in this scenario with remedial design work for two reasons. First, I surmise that when it comes time to build a newer, bigger road, it will be moved AWAY from the threat of water, and ONTO precious lakefront property (a part of which I have the good fortune to steward) meaning there'd be faster roads, closer to our existing homes and future children. And second, as a dedicated Permaculturist, I can't abide seeing all those good resources ("wastes") being wasted. Rubs me all wrong.

Lake Champlain, like most other freshwater lakes, has an input of water from "somewheres," and an output of water to somewheres else. (People live somewhere, but pollution, around here, just goes "somewheres.") And between the time that water

falls, flows, melts, or runs off from the hills and towns above, and the time it reaches the lake, it can be (and most often is) fouled in a number of sadly predictable ways. Meanwhile, and of equal significance, the forests and wetlands that capture, hold, filter, and otherwise "treat" this water, are steadily disappearing.

"Where the water runs (-off), make it walk"—Uncle Bill



Even these meager planting have a visible effect on wind and snow. More trees would be much more effective.

Thus, on Isle Lamotte, as with all ecosystems now in the throes of exponential urban growth, an ever-increasing amount of bad stuff is battering the shrinking capacity of natural systems to process it. Worse, our leaders, authorities, and experts give evidence to an endemic paralysis and confusion by failing to address these problems in any but the most fragmented and reactionary ways. We may be powerless to change the actions or thoughts of others, but we can, as permaculture designers choose to change our own thinking, and seek solutions where others see only problems.

So instead of asking, "How do we deal with this mess?" our question becomes, "How do we make best use of this resource?" In other words, how can the problem become the solution? And while our thinking may be grounded in the permaculture principles, which are universal, the solutions we design will vary in different locales and at different scales.

What's the problem?

The objectives for the design sounded simple, if somewhat ambitious—to prevent erosion along the lakeshore by planting trees. Preliminary research showed that the general idea had already been extremely well articulated by conservation departments almost everywhere as "Riparian Filter Strips." In other words, our first ethic—To Care for the Earth, could be met by merely following the suggestions of a nicely detailed one-page public document, and planting "vegetated buffer strips" along the waterfront.

Fulfilling the criteria of Caring for People and Returning a Surplus would (we hoped) result quite naturally from applying Permaculture principles to the choice of elements, methods, and strategies to be used in the plantings.

So, "the problem" then wasn't a lack of know-how and

resources, but that the concept remained virtually unheard of by the average island homeowner, and evidence of its implementation at a larger scale is absolutely nowhere to be seen in the region.

Why not? What factors are preventing people from seeing riparian filter strips as desirable?

Objections

How could anyone object to saving money (on road repairs), preventing erosion, and keeping pollution out of the lake in one fell swoop?

I was about to find out. Optimistically, I went to a town meeting keen to introduce this splendid idea, and promptly learned how strong were the feelings AGAINST it.

Hoo-boy...

Turns out there is a ferocious disdain for that king of all erosion-stopping, water-filtering trees, my beloved Willow! (which I like to think of as "Northern Bamboo") "A messy junk tree," they said. "A lawn-mowing, maintenance headache," they protested. "A leach-field clogging nightmare," they moaned. But worse, much worse, they agreed, "TREES BLOCK THE VIEW OF THE LAKE!!"



How to turn this problem into our solution?

The conservation district's good work essentially covered the "Care of the Earth" ethic by furnishing the Why and the How-to. Perhaps now we needed to turn our attention to caring for people and returning a surplus?

Easy to do really, as short-, medium-, and

long-term yields are to be expected in any good permaculture design, which by definition has multifunctions and multiple yields. Also inherent in the design are low-tech, easy-to-copy, and versatile solutions that catalyze and empower individual action.

But the aspect that ices the cake, at least to me, to fellow permaculture enthusiasts, and to a growing number of people everywhere, is that the solution can be not only economical, profitable, ecological, beautiful, healing, but also—that's right—downright delicious to boot!

DRIVE 'N' PICK—Who'll be first in the nation?

Conventionally, it has been assumed that land suitable for agriculture should be big, square, flat, and treeless. However, as permaculturists are quick to point out, that formula came from the needs of the ever larger machines upon which monocultural agribusiness depends.

What if we changed our minds about those totally overlooked, long, slim, and usually barren strips of no-man's-land known

collectively as “the roadside”? What if the very same eroding shoreline road was planted to species that on top of caring for the earth, cared for people and returned a surplus in the form of short-, medium-, and long-term yields? Think of it, could the harvesting of tree crops be any easier than from the back of a slow rolling truck? Just Drive ‘n’ Pick!

Can’t you see it? “Pick-Nicks”—we put the “pick” back in pick-up truck.

And just what would we be picking?

Well, amongst a wide variety of fruits, nuts, and timber species would be that very same “junk tree” willow, and here’s why...

To market...

It turns out that coppiced willow cuttings have at least two viable markets. First, basketry willow whips sell for about ten bucks a pound. To put that number in perspective, compare it to our state’s main agricultural product, milk. By the skin of their teeth, New England dairy farmers were able to negotiate a shaky “Dairy Compact” that guarantees them (for another year or two) a survival price of about ten bucks per hundredweight of milk.

In other words, in our crazy system, pound for pound, “junk tree” willow cuttings are worth a hundred times more than our agricultural sacred cow’s udderings.

But wait! There’s more. That’s the wholesale price, Mister. Now compare the costs of production, both financial and ecological.

Dairying needs massive infusions of energy, capital, and maintenance, while producing large quantities of hard-to-manage waste; Willow grows like a screaming banshee whether you like it or not, and sucks up all kinds of poop including that of H.R.H. Prince Charles himself (so there).

The second and concurrent market is as close as our nearest big city, Burlington, Vermont where the McNeil energy plant processes biomass from their willow farm to create electricity.

The third, newly emerging market, and one of personal interest is that of Biotechure. And as the picture below attests, the propensity of some kinds of trees to fuse together leads to interesting Permaculture possibilities indeed.

The next species of “junk tree” that needed an image makeover was our native poplar, known locally as cottonwood (*Populus*) and held only slightly above the despised willow in people’s esteem.

For the following information I am indebted to Dan Hemenway of Barking Frogs Permaculture in central Florida. Poplar, it turns out, has leaves that contain 20% protein, and is the only tree that contains most of the amino acids essential to the human diet. Since leaves can be harvested three times a season, it’s one of the cheapest proteins to produce. In the USSR, 100,000 pounds of leaves, bark, and ramial wood (twigs and small branches) are processed into cattle feed annually. And why not? A report in the 1870 USDA Yearbook of Agriculture assessed elm and poplar leaves as containing twice the feed value of alfalfa, clover, or honeysuckle!

And finally, the last piece of the planting puzzle comes courtesy of Robert Kourik’s *Designing and Maintaining Your Edible Landscape Naturally*. In that book, there are wonderful drawings of the roots of apple trees, as minutely studied by Soviet researchers. Shattering the myth that roots of even an apple tree stay within or near the dripline, these drawings clearly

show just how appropriate apple tree guilds could be to our earthcare objectives of binding the soil against erosion while providing delicious yields.

Cheap, safe & easy...

Apparently we now keep roadsides rigorously bereft of vegetation because it’s (perceived to be) easier, cheaper, cleaner, and safer.

Let’s see if we can’t change our minds about that too.

Easier

While it’s true that driving a lawn mower is pretty easy, how much harder can it be to whack off willow branches and pick apples from the back of a truck? Despite the disparity of size, the truck is quieter than the lawnmower, and creates less pollution. As my Aussie friends would say, “You’ll be right.”

Cheaper

Considering the money saved and the yields accrued over the next hundred plus years, the corollary effects of shoreline plantings—like protection from winter winds, and deflection of winter snows—makes this design a wise investment indeed. Who knows, maybe the maintenance of these plantings could lead to a sustainable employment that literally funds itself.

Cleaner

As long as people see leaves on a lawn as “messy,” they will see regularly mowed roadsides as “clean,” which in our culture means “aesthetically desirable.” Again here, the solution is to change our minds and understand how much of a mess our obsession with clean is causing. Our million-dollar views do not come free.

If it’s good for us, good for our pocketbooks, our communities, our health, and our planet, how edible and useful tree plantings could be perceived as “ugly” is beyond the scope of this article because it’s frankly beyond me.

Safer

One of the knee-jerk reactions one hears in response to planting trees along roadsides is that they are dangerous to cars in the event of an accident. Yet in the same way that we can plant rows of vegetation in successive order of height to lift the wind, why not plant rows of shrubs and trees in successive order of soft-to-hardness to slow a wayward vehicle?

If attractive, bushy, and forgiving plants like Lilacs and Red Osier Dogwood slowed a car’s kinetic force, then obviously the impact would be dramatically diminished. Hell, go-kart racetracks are lined with rubber tires. Personally, I’d prefer a face full of lilac flowers.



One of the thousands of uses for willow.

Zen View

And now, for the Grand Finale, we revisit the question of people's sacred views, this time with the support of Christopher Alexander's *A Pattern Language*. Pattern number 134, "The Zen View," makes a succinct case for "framing" the view rather than opening it up.

"(The view) ... is a beautiful thing. One wants to enjoy it and drink it every day. But the more open it is, the more obvious. The more it shouts, the sooner it will fade... its beauty will no longer be accessible to the people who live there... If there is a beautiful view, don't spoil it by building huge windows that gape incessantly at it."

Allegory of the Movie Theater

And finally, while still in Zen mode, Grasshopper, consider: Is it not true that when you go to the movie theater and a tall, big-haired person sits in front of you, you think to yourself, "%0000* & @ # \$! !", there goes my view." But then, is it not also true, Grasshopper, that somewhere before the third trailer ends that dilemma disappears all but completely because, well, your eye adjusts?

This is because a) the mind's eye does that, and b) the Movie Theater, like most lakefronts, is sloped down and away from your line of sight. In other words, when you think you've lost your view, simply look up!

Postscript

As of this writing, the complete report has been submitted to town council for their perusal and I am preparing a slide show to present and explain the design publicly. Δ

Claude Genest is a Permaculture designer who lives and works in Northern Vermont. Green Mountain Permaculture is in its third year of offering consultancies, tours, and introductory PC courses. Please contact him by email at: genest@together.net

*Photo credit, pg. 29:
Living Willow Sculpture by Jon Warnes -
Search Press - Available from Permanent
Publications UK permaculture.co.uk.*

Using Willow Cuttings for Erosion Control

CHANNEL erosion is a serious problem in many areas. For years, researchers have tried to stabilize streambanks with planted vegetation. This technique is usually cheaper, better for the environment and more aesthetically pleasing than artificial structures made from concrete and stone.

For four years, Agricultural Research Service hydraulic engineer Doug Shields at the National Sedimentation Laboratory, Oxford, Mississippi, and University of Memphis wetland plant physiologist Reza Pezeshki investigated the survival or effectiveness of willow cuttings when planted along streambanks to control erosion.

Planting willow cuttings 3 to 8 inches in diameter and 4 to 8 feet long in winter when they are dormant is an attractive option for rapidly eroding sites. The posts hold and stabilize the bank until the young trees become established. Then the willows create conditions favorable for natural establishment of native vegetation. However, in many cases, willow posts planted in streambanks have died within a year.

To find ways to enhance willow survival and growth, the scientists conducted a series of field and greenhouse studies that showed that

cuttings are very sensitive to moisture and soil type. They're currently developing a simple site evaluation protocol to assist streambank restoration planners in deciding where to plant willow posts. Site characteristics used in the protocol will include typical groundwater elevations and soil type.

Recent greenhouse studies have shown that survival rates can be doubled by soaking cuttings for 10 days before planting. Soaked cuttings outperformed those planted immediately after they were cut, growing higher and producing more biomass and greater numbers of roots.

This finding will be of great interest to all who are working to create forested riparian buffer strips, control streambank erosion and restore the nation's 3.5 million miles of rivers currently considered degraded by erosion, sedimentation and excess nutrients.

From ARS News Service Agricultural Research Service, USDA Hank Becker, (301) 504-1624, hbecker@ars.usda.gov. ARS is the chief research agency of the U.S. Department of Agriculture. Scientific contact: F. Douglas Shields, Jr., ARS National Sedimentation Laboratory, Oxford, MS. phone (662) 232-2919, fx/-2915, shields@sedlab.olemiss.edu. Δ

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Restoring a Northern California Watershed

Skywater Center—

Permaculture's Newest Experiment Station

Interview by Capra J'neva Devi

IT IS THE MIDDLE of a week with unexpected snow when Penny Livingston and James Stark of the Permaculture Institute of Northern California first take me to their land at Skywater Center in Trinity County. I've been hearing about the history and restoration of the land and have seen countless pictures of it, but nothing could convey as elegantly the sacredness and power of this place, as stepping out onto it this clear, fresh morning. The giant pond at the top of the land is frozen, and Penny tests it by tapping on the surface with a branch from a large oak nearby.

As we work our way down the property, checking on the progress of each of the works they've put in place to restore the land—catch ponds and gabions, terraces and native plantings—Penny points out rivulets of pure clay on the drive, in a rainbow of colors that would make a ceramicist drool: pinks and whites, yellows and greens. And I scoop some of it up and begin sculpting as they launch into deliberations over where to put the artisan bread oven so that it doesn't block the view of a valley that extends in uninterrupted forest from the opposite mountain range to the south and downriver to the west.

They point out a grove of baby madrones, explain the fine points of star thistle, and we end by checking the progress of some cherry trees down by the original pond, where an open-air structure with all the amenities of home sings: "Relax!" And we drink water collected off the roof that tastes as if we were drinking the land itself, it is so pure. Which brings me to my first question.

Capra: How did you get the name Skywater Center?

Penny: When we saw this land, we recognized that everything was here, from timber to clay—there's incredible clay here, great coarse shale that's good for making cob. And it's got a very complex and diverse geology, and lots of pole timber—everything we'll need for building materials. The elevation is about 1500-2000 feet, so we're in the banana belt, right where the inversion layer lands, in a warm pocket along the ridge, which, with the coastal influence, is a good thing. But there was no water. The springs were too dinky, and we didn't want to drill a well. But we knew that the area had six to nine feet of rain every year. Up here we know we have a lot of water coming from the sky, we just needed to build storage for it. So that's how we got the name, because all of our water comes from the sky.

CD: What was the land like when you bought it?

James: When we got it in 1995, about 30 acres of the property had been clear-cut and overgrazed and there was bad soil erosion. Slumping, ditch erosion, logging road problems, culvert problems. Although it is located at the convergence of three creeks, it was known as a property with no water. People were surprised that we would have bought it, because there was no water, except at the bottom in the rivers, but it is so energy

intensive to pump water up that elevation. The rest of the property was in forest that had been logged. Sixty years ago, all the tanoaks had been taken out when there was a big industry for tanning.



A wire cage gabion begins the reclamation process in this gully.

CD: And how did it get that way? What's the history of the land?

JS: The area was inhabited by the Wailaki people and they did traditional hunting, fishing, and managing the forest with fire. Then they encountered the white people who came in and fundamentally wiped them out, and began the process of logging the area, clearcutting, grazing, and road building. The settlers built logging roads which became a very destructive element in the watersheds, causing erosion and silting up the creeks.

PL: The (native) people who lived here—in their language, they didn't develop a concept for taking. The idea of taking just wasn't in their world view. They were very peaceful, and their agriculture was so in tune with the natural world that the Europeans didn't even recognize it as agriculture. People regarded them as hunter-gatherers, but the way they cultivated and harvested their food, they enhanced and increased the production of the forest and the meadows. They maintained the meadows and cleaned the forest using fire, and that provided increased forage for animals, cleaned out infestations of insects and funguses, and developed strong, straight shoots for arrows and baskets. In the spring they would tank up on greens; in the summer they would fish and hunt and collect bulbs; and in the fall they would collect acorns. And they would hunt all year. There was an abundance of meat and lots of acorns, so the people never went hungry and their diet was very, very diverse. They ate over 1500 different food items.

Then the settlers came and annihilated them. We have met a

couple of Wailaki people who will return to this land. The bulldozer operator was Wailaki. But there really are only a dozen of them left on the planet. We are very interested in bringing the people back to the land. You could say that the land has been suffering from a profound grief. And it was never very easy for the settlers who came here—they had an adversarial relationship to the land. Because it is very difficult to graze cattle on land this steep. It causes all kinds of problems. And clear-cutting the tan oaks, and other trees—it destroyed the complexity of the ecosystem.

The land is responding very positively to the restoration work we are doing, and it has seemed effortless in a way—things have gone very smoothly. I think it is because we have an agreement with the land.

CD: Let's talk a little bit about the damage to the land. It's fairly obvious how extractive forestry can damage land, but why is grazing cattle on this land so destructive?

PL: The primary reason is that it is very steep here. It's got a clay-based soil, and it was traditionally hardwood and conifer forest. The cattle compact the ground, especially when it's very wet. They create nick-points that then result in small slides when they try to walk across slumpy areas, and those points create gully erosion. When the land is grazed, a proportionate amount of roots die back under the soil, so there's a constant die back, re-growth, die back, re-growth cycle that occurs. When it's done properly with bunchgrasses, it can enhance the soil structure, but with the annual European grasses that have taken over—and when the cows eat the grass down to the last nub—it is very damaging. And what they leave in their wake is star thistle, a plant that is trying to heal the ground, but it's poisonous to horses.

CD: And how about the state of other wildlife? Were there fish in the streams?

JS: There were salmon and steelhead. Mud Creek is spawning ground for steelhead. I've seen steelhead in the creek. I haven't seen any salmon. The silt covers the streambed and makes it difficult if not impossible, depending on the level of siltation, for the salmon and other fish to lay their eggs.

The big objective is to get the creeks cleaned up and abundant with fish. Everything we do on the land is about getting the fish back into the rivers. That's the bottom line.

CD: Can you talk about what you've done to accomplish that? What sort of restoration are you doing on the land?

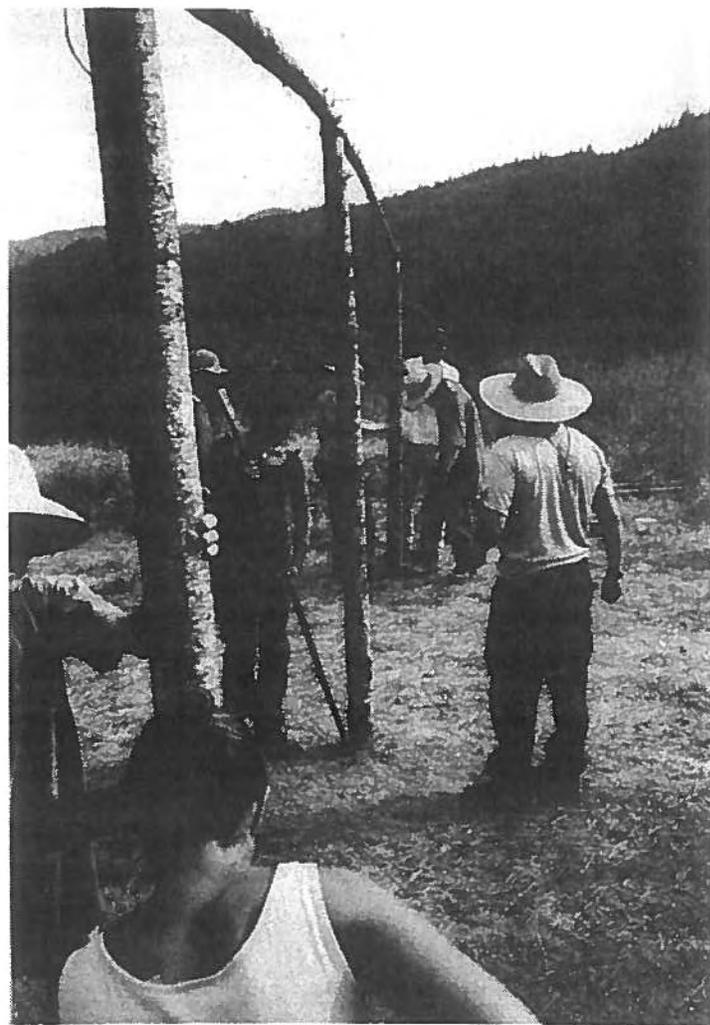
PL: We've been connecting with our neighbors around watershed-scale restoration. One of our neighbors is a veteran restoration ecologist, and he gets grants for watershed-scale restoration projects. He put together a watershed restoration assessment plan for our watershed. So we're working cooperatively with our neighbors to prepare the land to burn, as well as creating erosion structures like gabions and swales to mitigate siltation of the creeks. And we're seeding the area with native bunchgrasses, the species that were here historically. In the areas that we're planning to garden and have food forests, we're seeding with clovers.

JS: We started out by testing some earthworks. We hosted a workshop on pond building with Bill Mollison, the founder of Permaculture, and he brought along the pond builder he uses in Australia. Bill and Doug were here doing the workshop, and he had time between workshops, so we arranged to get a bulldozer

up to the land. We built our first small pond and one swale to see how the soils would react to interventions.

After two years of observing we found that the ponds and swales were stable and that the swales had native plants coming up in them. So we determined that the land could support both of those kinds of structures.

So then we approached the National Resource Conservation Service (NRCS) and applied for funding to address the erosion issues on the land.



Base Camp students help erect an outdoor kitchen.

The first project we undertook was to build a fence at the top part of the property along the road to stop cattle that were being run. It was supposed to be a closed range but that was not being respected by some of the cowboys. So our only option was to fence the cattle out—they were causing erosion on some of the areas that were prone to slumping.

PL: I objected radically. I didn't want to have the deer scrape their skin when they crawled underneath it. I did not want to build that fence.

JS: Fish and Wildlife designed a fence configuration that minimized the dangers to wildlife, primarily deer. The day that we completed the fence, they stopped running cattle in our area. Of course, if we take it down again, they'll be back.

Then we built some sediment basins under a couple springs that we had discovered on the land. This helped to reduce

sediment loading in the streams below as well as retain water higher up on our land, and this also provided habitat for frogs and other wildlife.

We created a transfer ditch across the top of the land to move water away from an area below that was slumping, which has helped to stabilize that area.

PL: The highlight for me in doing the work we did was introducing these concepts to the NRCS, and watching the light bulbs go off when we talked about doing keylining—they'd never heard of that. The land has been disturbed and eroded, and water has been directed by roads into areas where it hadn't been historically. In one place there's some really hummocky soil and we have the potential for a rotational slump, because the water keeps eating out the toe of the hill. We have taken the water that would be flowing and saturating that area and we've moved it into catch basins in a more stable area. So we used the keyline system of moving the water very slowly into three catchbasins with spillways. We have taken this water and slowed it down, settled out the silt. The bottom of that slumpy area, we stabilized with willow, to help reinforce the bottom of the slope.

To Jim Spear of NRCS the idea that water isn't a bad thing was revolutionary enough, but the idea of taking water and putting it where you could actually use it was really novel to him.

CD: So in addition to ending erosion and recharging your groundwater, you're catching water to be used on the land?

JS: Yes. At the top of the land, we built a twenty-foot deep, one hundred-foot diameter pond to act as our irrigation water supply storage.

PL: We figured out that our pond holds 587,000 gallons, which is about 1 2/3rds acre-feet of water, which is plenty. We'll have 5000 gallons of potable water at the beginning of the season from the springs. We're water rich here now, and it's a secure form of water. We won't have to worry about our aquifers going dry, and even in a drought we'll have plenty of water stored.

CD: Tell me about some of the other projects I see on the land.

JS: We removed a logging road culvert that was inappropriately installed and had caused water to go out of its traditional drainage path and create another drainage, resulting in a huge blow-out and a large amount of soil ending up in the creeks below. So we installed a rolling dip in that road. At the same time, we built four major swales on the property with the bulldozer. Then we planted about one hundred fruit trees: apples, cherries, peaches and some grapes.

We built the structure that was our "nature observatory" that had a roof, floor, one full wall, and two partial walls beside the first pond. The building collects our drinking water. It has a small kitchen, wood stove and sleeping area, and it's our base camp when we're on the land.

We also did terracing for creating a training area site, a site for a barn and camping, a house site and parking lot. After all that bulldozing took place, it was seeded and covered with straw.

PL: We've defined the disturbed areas as intensive and extensive management. Intensive management is more zone one-two and maybe into zone three providing food for us and the animals, timber, forage, fuels, and the extensive is more zone 4-5, and we keep it native. The star thistle that we're trying to get rid of is only in the areas where we're planning the gardens and food forest gardens. Although, it makes great honey. We're not demonizing the plant, it's not that we feel that the star thistle is

bad, it's just that we're going to transition those areas to other things. That's what we're hoping to deal with when we do the burning. We're observing native plants that appear to be choking out the thistle, such as the *Nisella pulchra*, the native bunch grass, but we haven't done enough to say definitively yet. We think the burning will help finish the job.

Right now in parts of the forest Doug Fir is coming up very thick. It is so thick that it's causing stem exclusion, meaning that the younger branches are not growing out because there's not enough light. It's creating fire ladders. If there is a fire, fire can climb up these dead branches into the tops of the trees and burn the forest much hotter, creating a more devastating fire. So our relationship to the land is an advantage—we can go in and clear out the Doug Fir poles, thus harvesting them for building and cleaning out the forest for fires, simultaneously.

CD: So now what's going to happen to the land?

JS: After six years of observation, intervention, and healing, after all that work was done and the plants had taken hold, we were ready to have our first course.

We discovered a need to have training in how to set up ecological base camps for forest actions or in response to ecological disasters, so we decided to do a base camp workshop. We covered setting up a base camp, how to provide clean water, how to deal with waste, how to set up a temporary kitchen, how to deal with safety. It was six days, and twenty-five people participated.

That workshop created the infrastructure for our first two week certificate design course, that will take place this June 1-15. We now have abundant water for drinking, irrigation, and bathing. We have a solar operated water purification system. We have an outdoor kitchen with greywater treatment. We're presently building a wood-fired bread oven that will be completed at a workshop in April and will be ready for the design course to provide fresh baked bread and pastries, not to mention pizza. (James gets a impish grin on his face at his own mention of pizza).

PL: The primary vehicle for learning is going to be hands-on and experiential. There are so many projects we can do here to give participants hands-on training. So we're going to be building a hybrid toilet system using the worm bin, rock'n'reed combination system for the water and solids treatment. We're going to be focusing a lot on diverse arboreal conifer forests, and the local ecology of that area. We're going to have restoration ecologists who do watershed restoration and forestry management here as part of the course. Brock Dolman, my colleague from Occidental Arts and Ecology Center who will be co-instructing the course with us, is a fabulous wildlife biologist and permaculturist. We will have a tracking guide, Scott Brinton, from the Wilderness Awareness School, and he is going to be teaching us the language of the forest, and bird language, and tracking skills, and a level of observation that is very profound. We'll be building with cob—all the materials needed for cob are right here on the land—we'll be optimizing the "onsite resources" principle of permaculture. There will be solar showers—everything is heated by the sun. Everything is off the grid. We'll do solar cooking in our outdoor kitchen, plus we'll have the brand new wood-fired oven. So it's really kick-starting this site as a full-on permaculture site and the people who come to this course will be getting in at the beginning. We'll be doing a lot of water design and mapping.

And we'll be playing music at night. We could do slide shows but we want to keep the evenings open for discussion and music and grounding what we did all day. **CD:** Sounds great! How does Skywater fit with your overall vision for the Permaculture Institute and the Center for Ecological Living?

JS: Skywater is a model of restoration and stewardship and a training site for permaculture principles and for creating abundance. That's where we conduct research and do trainings.

PL: We want to set up a demonstration through this process of regenerative design and show how we can turn it into an ecological paradise, not only supporting the people and animals living on the land, but our neighbors as well. △

Skywater will be the site of a Permaculture Design Course June 1-15. Contact Penny Livingston at penny@permacultureinstitute.com or visit www.permacultureinstitute.com.



Holding the runoff water high with these small earthworks brings the land back to life.

Examples from USA and Europe

Urban Stormwater Management

Tom Liptan, ASLA

MOST LANDSCAPE professionals have been trained to compartmentalize the various aspects of the built environment. Architects do buildings, landscape architects do softscape, and engineers do infrastructure (including stormwater management). As stormwater in the urban environment becomes more of a problem, in terms of both water quantity and quality, it becomes apparent that part of the problem is this very separation of stormwater from the landscape. Thirty years ago Ian McHarg urged us to *Design with Nature*. The concept is to integrate nature and natural processes into the built environment, instead of ignoring them. When applying this concept to stormwater, we must go one step further and try to replicate the processes of nature as nearly as possible. Seen this way stormwater management and landscape design become inseparable.

This paper will urge the use of landscape design as a Best Management Practice (BMP) for urban stormwater. It

will briefly look at some current problems of urban stormwater management, describe some basic elements of landscape-based solutions, and then present examples of the integration of buildings, landscape, and stormwater management in the urban environment.

Current problems

Problems associated with urban stormwater can generally be divided into two categories: water quantity and water quality. Floods from major storms can cause widespread damage to the built environment, of course, and will continue to do so as long as we continue to build in harm's way. Natural river systems themselves sustain no long-term damage from flooding, and in fact are dependent on floods for overall ecosystem health. Small storms, however, usually do not cause flooding under natural conditions.

The extensive areas of impervious surface in our urban areas, linked to conventional methods of stormwater management, quickly convey larger-than-

normal amounts of runoff to local streams during small storms. This diversion also reduces groundwater recharge, limiting the water available to local streams during dry periods. These extreme fluctuations in water volume and flow cause abnormal erosion to stream beds and banks and often lead to property damage and wildlife habitat destruction.

The other urban stormwater problem is the pollution washed from those same impervious surfaces (and some pervious areas) into storm drains and then piped to the nearest stream. Small storms, of less than 0.5 inches of rainfall, convey 68% of the annual pollutant load (a combination of approximately 15 constituents) and storms in the next category (up to 1 inch) convey another 19%. These figures are based on City of Portland monitoring data collected as a requirement of its National Pollutant Discharge Elimination System (NPDES) permit. It should be noted that the Portland Study shows some constituents do not follow this trend and are at higher concentrations in the larger

storms. Conventional management of stormwater from small storms, then, contributes to the serious degradation and pollution of local streams. Environmentally sound management of this everyday, small storm runoff is extremely important and can be approached by integrating stormwater into the landscape design.

Elements of a solution

The most direct way to solve the urban stormwater problem, following McHarg's advice, would be to replicate, as closely as possible, the pre-development hydrologic cycle. In this natural condition, most of the rain that falls is either captured and held (or evaporated) by the vegetation, or soaks into the ground. Very little is conveyed to streams in the first minutes or hours of the storm event. Rainfall that permeates the ground takes days, weeks, or even months to reach surface streams. To approach this condition in our built environment requires us to reduce runoff by capturing as much rainfall as possible on site for temporary storage, evaporation, or discharge into the ground.

Studies of a variety of factors, including impervious surfaces, retention ponds, green roofs (see below), detention and infiltration show that the difference between pre-development and post-development runoff volumes, and therefore the effectiveness of on-site stormwater treatment, is greatest in the smaller (less than 1 inch) storms. It can be seen from this that landscape design integrating rainwater into the softscape can be a valuable Best Management Practice (BMP) for stormwater management. Several elements of stormwater-sensitive design are described below, though there are of course many others. The combinations, and effectiveness, of these and other elements are limited only by the site itself and the imagination of the designer. It is also important to mention that as the stormwater problem accumulates from countless small sources throughout the urban environment, so the solution can be approached by even small mitigations on individual sites and projects.

Trees: The importance of trees for stormwater management cannot be overstated. Forest Service studies on the interception of rainfall by trees show that trees catch and hold surprising quantities

of water. A Douglas fir, for example, can capture as much as 43% of the annual rainfall. This water is either absorbed by the tree or evaporated back into the atmosphere. I did an experiment on my own property measuring rainfall in the open and under a mature lilac shrub showed that it intercepted between 21% and 35% of the precipitation from six storms.

"A Douglas fir can capture as much as 43% of the annual rainfall. This water is either absorbed by the tree or evaporated back into the atmosphere."

Replacing hardscape with softscape:

This is perhaps the simplest and most obvious solution. Replacing impervious surfaces wherever possible with natural vegetation or porous paving materials will substantially increase rainwater infiltration. This reduces runoff, recharges groundwater, and allows more evapotranspiration to occur.

Swales: Besides directing stormwater flow across the landscape and increasing infiltration, swales also remove pollutants from the water that flows through them. Tests in Florida show that suspended solids and phosphorus concentrations dropped more than fourfold when runoff passed through an appropriately sized swale. However, even greater absorption is possible if the receiving swale is "dry" and can thereby reduce total runoff volume. Integrating stormwater with a dry landscape can provide significant pollutant removal benefits. An example of this in Portland is the Oregon Museum of Science and Industry parking lot.

An integrated approach

Working with these and other factors, a landscape could be designed that would be practical, visually pleasing, and effective in managing stormwater quantity and quality. A group in Maryland has experimented with these ideas in a residential subdivision and has developed the concept of "rain gardens" as an alternative stormwater management technique. Each 10,000 square foot lot has a 300-400 square foot rain garden,

designed so that rainwater forms a small pool and then evaporates or infiltrates within 48 hours. The rain gardens are carefully planted with appropriate vegetation, tolerant of wet and dry conditions. The combination of soil and plants is also designed to mitigate the pollutants captured in the rain gardens. These areas, along with roads that drain into roadside swales instead of curbs and gutters, completely satisfy the stormwater management requirements of the project, at a considerable cost savings over conventional methods.

A similar approach can be taken to commercial parking lots, where the runoff can be directed to swales within and surrounding the area. Several such projects in Portland have shown a very high degree of pollutant and runoff capture. When plants are incorporated into the design, infiltration rates increase, and pollutant capture is enhanced. Vegetation, of course, also adds to the visual appeal of the landscape. Rooftop gardens have a similar effect, though to a lesser degree. When designed primarily as a visual and recreational amenity, they often require additional irrigation and maintenance. They are expensive to build and usually include significant paved surfaces for human access. To the extent that they capture and use rainwater, though, roof gardens do provide significant stormwater benefits. A more sophisticated, and yet ultimately more natural, approach to rooftop vegetation has been pioneered in Europe.

Green roofs, or Eco-roofs

Because Europe has experienced dense urban populations and the associated pollution problems for many centuries, it is in some ways ahead of the United States in finding solutions to these problems. An innovative approach to "building green" that is becoming more common in Europe is the green roof or eco-roof. This involves covering all or part of the roof of a building with soil and living vegetation, usually grasses or other groundcovers. These are not roof gardens, which are primarily designed for human enjoyment, but practical, cost-effective environmental tools. Green roofs integrate stormwater management with many other environmental benefits, including:

- Controlling stormwater peak flows
- Reducing stormwater runoff volume
- Reducing runoff temperature

- Improving stormwater quality
 - Improving air quality
 - Providing wildlife habitat
 - Enhancing thermal and acoustic insulation
 - Reducing urban "heat island" effect
 - Producing oxygen
 - Storing carbon
- In addition to these measurable attributes, green roofs provide sociological and psychological effects by adding more green space and nature to the city.

Europe is ahead

One of the most impressive projects to incorporate green roofs into an ecologically sound building is the Ecover factory in Oostmalle, Belgium. Ecover manufactures ecological cleaning products, and when they planned and built a new factory, they explored every possible way to use and demonstrate environmentally-friendly products and techniques. The most interesting feature for our purposes is the roof, which consists of over two acres of native grasses and other vegetation. Ecover predicts that the vegetation will eventually separate into diverse gradients: plants adapted to dry soil with fewer nutrients will colonize the upper slopes of the roof near the peak, while other species will thrive in the more moist soil downslope. This diversity of vegetation will also provide forage and habitat for a variety of insects and birds. Stormwater that is not used or evapotranspired by the roof vegetation is collected and distributed in a secondary water supply system for use in toilets and certain manufacturing processes. Wastewaters from these activities are filtered through a wetland system on site for re-use. In dry seasons, some of this wastewater is used to irrigate the green roof, completing the cycle.

Another European firm, Grodan, of Denmark, manufactures a growing medium specifically designed for green roofs. This material is lighter than soil, can be applied in sheets, yet supports long-term natural growth of vegetation. This product has been used throughout Europe to retrofit green roofs to existing buildings, usually requiring little or no structural upgrading.

Many buildings in Switzerland, Germany, and Holland have green roofs, from small cottages to apartment complexes, silos, even an airport in

Holland. These structures are valued for the visual and social benefits they bring to the urban environment in addition to their ecological contributions. Green roofs are even said to extend the life of the roof's waterproofing material by protecting it from sun, storms, and other hazards. The value of green roofs for stormwater management is not overlooked; studies in Germany have determined that as much as 75% of the rain that falls on a green roof is absorbed.

Some local examples

Many examples of roof gardens exist in Portland, but there are few, if any, eco-roofs or green roofs designed for stormwater. To do some local, first-hand study, I created a small eco-roof on my garage. The roof is 180 square feet (10 x 18) and relatively flat. First, the structure was reinforced to support the expected weight of the wet soil. Then a protective layer of paper was placed over the existing shingles, a waterproof membrane was laid over that, with another protective paper layer on top. Finally, approximately two inches of soil/compost mix was applied. The roof now supports a variety of sedums, volunteer grasses, and other species. Preliminary monitoring of two storm events showed that even this simple project was effective in capturing and metering runoff. Following the first storm of 0.4 inches of rain (approximately 40 gallons of rainwater on the 180 square foot roof) only three gallons of runoff was discharged. After the next storm event of over two inches of rainfall, runoff continued to flow from the roof, slowly, for three days.

Conclusions

From a small garage in Portland to a huge factory in Belgium, each of these projects works toward solving the problems of stormwater in the urban environment. From green roofs, to rain gardens in Maryland, to a simple tree, each improvement moves toward replicating the

native hydrologic cycle. If we use integrated stormwater management techniques, and incorporate them into our landscapes and buildings, our Best Management Practice can be more effective, and much more attractive, than pipes, gutters, and ditches. We may even find, as the developers using rain gardens in Maryland did, that integrated, nature-based stormwater management is less expensive than conventional methods. The questions that remain to be answered are ones of degree. Just how efficient are these systems? How much water per cubic foot can a green roof hold? How many square feet of landscape do we need to mitigate for how many square feet of impervious surface? And perhaps most importantly, how many other ways can we find to integrate stormwater management into the fabric of our urban environment? Δ

This paper was presented at the ASLA Oregon Chapter Stormwater Conference, Portland, November, 1996. Excerpted and reprinted here by permission of the author. Tom Liptan works for the City of Portland in the Bureau of Environmental Services, and may be contacted at toml@bes.ci.portland.or.us.



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Amazing Gabions in Arizona

Where Rocks Have Made the Water Flow

Brad Lancaster

NESTLED IN the western foothills of Arizona's Chiricahua Mountains at about 6,000 feet sits a ranch called El Coronado. The surrounding grasslands are mottled with oak, juniper, and pinyon pines. It is often dry here as the rainfall varies from 7 to 30 inches (175-750mm) per year. Yet El Coronado is a lush oasis in this high desert, with flowing streams, thick grasslands, and abundant wildlife. But things weren't always so.

When Joe and Valer Austin bought El Coronado 18 years ago erosion was severe on the 2,000 acres. Water only flowed in the drainages during the rainy season, and many of the creekbeds showed bare bedrock. Surveying the land just after purchase they wondered, "What do the cattle eat?" Barren outcrops of reddish soil and rock were more prominent than grassy areas.

Today, if you look across the land following rains you'll see water flowing and seeping in and around most of the washes—and in some areas the water now flows year-round. Much of what was once exposed bedrock is now blanketed with a thick, spongy carpet of fertile soil and grasses. The streams are full of waterbugs, fish, ducks, and turtles, who have returned with the water. Even cottonwoods and seep willows are volunteering where 18 years ago there were none. No hunting is allowed on the ranch, yet local hunters complain that that is where all the deer live. "Well," Joe explains, "that's because we've got water and life here."

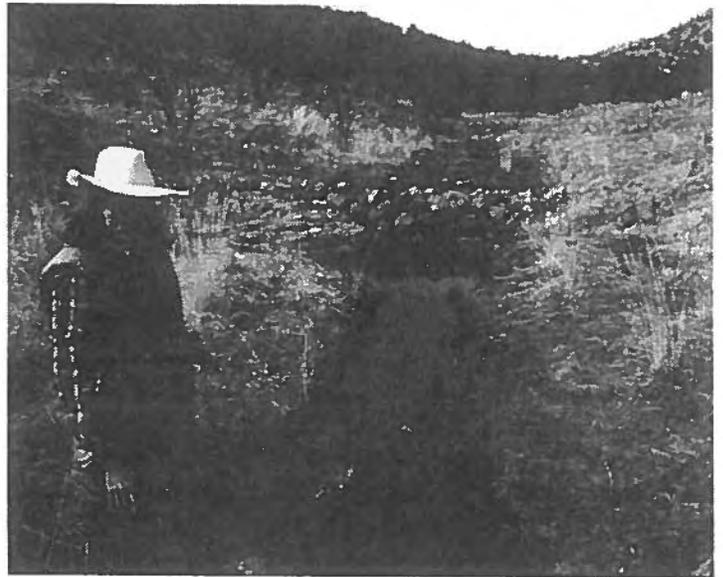
What has brought about this dramatic change? Simply put, the Austins laid rocks perpendicular to the slope. Specifically, they built gabions, lots of them.

Holding back the water

A gabion is a low, permeable stone structure laid across a drainage. Commonly, rough rocks are held in place by wire fencing or baskets, yet the Austins use only carefully laid, unmortared stone. Gabions don't stop the flow of water, but they do slow it down, allowing more of it to sink into the soil. Once below the soil's surface the water continues to percolate downslope, but without the destructive and erosive force of water flowing above ground. In big rain events plenty of water still flows over and through the gabion, but its force and speed are checked. This reduces erosion downstream while holding resources high in the landscape, as soil, silt, and organic matter ordinarily washed away by the flowing water settle behind the gabion, slowly forming a level terrace. By harvesting runoff water and soil, a gabion creates a very fertile and well irrigated growing zone around itself.

Over time it can also create a very stable and level bed of soil in what was previously a deepening gully or arroyo. That level bed of soil can make a great path or road crossing. For example, a car cannot pass through two feet of flowing water, yet with an 18" high gabion in the same arroyo that flow is spread and the water depth reduced to a very passable six inches or less. In fact it was a driveway with ambitions of becoming an arroyo that originally sold Joe and Valer on the idea of gabions.

About 11 years ago the road leading up to their mobile home



Valer Austin showing drystacked gabions in a small watershed. Work began at the top (ridgeline right rear). Photo in winter.

would get washed out every time there was a good rain. Rain, repair the road. Rain, repair the road. "Enough!" they proclaimed. They gathered up rocks, chunks of an old concrete footing, broken bricks, whatever they could find. All was roughly placed on the downhill side of the road. It wasn't pretty, it didn't cost a cent, and it worked. It's still working, and in more ways than one. The road not only stopped washing out during rains, but as soil slowly accumulated on the backside of their structure the road began to improve itself. The Austins also noticed that below their roadside rubble a seep started to form, which lingered long after the rains and supported a lush growth of vegetation. Upslope of the rubble gabion the soil also stayed moist long after the surrounding land had dried out.

"Hey," they thought, "if a gabion can do this much here where it's dry, let's see what they can do where MORE water flows!"

Thinking Big

And so they did. Within 10 years they'd put in more than 20,000 gabions—most on their 2,000 deeded acres, with still more on the 14,000 they lease! Two watersheds have been thoroughly checked with stepped gabions running from the very top of the drainage to the very bottom, and many more scattered all over the minor drainages, dips, and slopes leading into the main waterways.

The results—The Bedrock watershed (180 acres), which would only run one month out of the year before the gabions, has now run for 34 months straight. The Turkey Pen watershed (2,000 acres) used to run only three months of the year. Now pools of water linger where before there were none, and water flows almost all year long. All of it quietly working and building

on itself without any further input or cost.

The whole system has become more stable and productive as silt and organic matter gradually settle behind the gabions. With more moisture held longer in the watershed, more vegetation gets established on the landscape, drawing in more wildlife to add yet more fertility.

Gabions act to spread and slow water. This is the polar opposite of eroding gullies or many man-made culverts. An unstable gully cuts itself deeper with every rain. As the bed of the gully or arroyo is cut, the water channel narrows. Water flowing down the drainage is constricted as it hits this narrowed channel, but it will NOT stop flowing, so pressure builds. The water must either speed up or cut a new path. Such constrictions can create rifle barrels that make calm flows destructive or already fast-moving flows even more damaging. Often the channeling of waterways and the placement of culverts in drainages form cannons that erode what lies downstream. The thinking behind such strategies is usually to drain a landscape, not to feed it.

A drainage with gabions feeds the surrounding landscape as it harvests water and soil. Runoff is calmed rather than sped up as the flow is dispersed in a WIDENED drainage made shallower by the spreading gabions and the accumulating soil and plants. It is a wonderfully regenerative strategy, because once in place it grows itself. The fertile soil gathering behind the gabions will support vegetation, eventually creating living gabions. "Set up the right conditions," Valer says, "and both the plants AND the soil will volunteer."

I asked Joe what he plans to do once the gabions are all silted up. He replied with a relaxed and knowing smile, "I'm going to let the vegetation take over." It is well on its way now that the landscape has been stabilized.

Stabilized, but not sterilized. The original impact is light, as the gabions are small, ranging from six inches to three feet in height. At this scale water is not diverted out of any existing watercourse, just slowed and spread. Working with small structures made it possible for the Austins to build everything by hand. All the gabions built since their first rubble heap have been constructed entirely of local stone. No wire, no baskets, just well placed rock that blends seamlessly into the landscape.

Skilled help from Mexico built most of the El Coronado gabions. These men and their ancestors had a strong heritage of working with stone. They taught Joe and Valer how to build gabions that would last. The keys are to build with care, and to start at the top of the watershed, then work your way down. By working from the top down, you reduce both the velocity and volume of overland flow BEFORE it gains the momentum and force that make it destructive. Thus you never need to build a large structure. As Joe says, "The bottom of the watershed is just the tip of the iceberg. Start at the top and you can keep all the work you do at the bottom."

Working Small

When asked how big he makes his gabions Joe replied, "I'd rather make them smaller and put in more total gabions than make them bigger and put in fewer."

All too often water harvesting structures are placed at the bottom of a watershed with nothing upslope. This necessitates huge, engineered, machine-built structures, which can bring on disaster if they fail. The Austin's gabions are too small to cause

much trouble if they fail. Only 1% have actually given way and that was mainly due to their dogs, which disturbed some structures by going after rock squirrels.

Not only is a smaller gabion safer, but it's also a heck of a lot cheaper. The Austins didn't spend a cent on materials—they only used what was found on the land. But they did hire skilled workers to build the gabions and to share their knowledge. An experienced four-person team can put in about ten structures a day. Many would say that labor costs would make such work unaffordable. Valer would argue that you can't afford NOT to do the work. If you don't do anything you LOSE more topsoil, organic matter, water, and productivity each year. If you put in these small water-harvesting systems you GAIN soil, organic matter, water, vegetation, and greater productivity each year.



Heavy flow in this large watershed has become perennial.

These strategies don't drain the system over time—they feed it.

The Austins run 200—300 head of cattle under an efficient system of rotations, which has also helped heal the land. Animals are only allowed into sensitive riparian areas during the dormant season—never during the growing time. Young trees are fenced to insure they will grow into large trees and help protect and encourage more young trees and vegetation. Healthier land has promoted better grass and forage production. Good land management coupled with numerous water harvesting strategies has spread water and lush grass all over the land. The cattle now expend less energy in search of food and water, maintain more weight for better health, and return higher profits for the ranch.

Harder to measure, but no less valuable is the benefit of a growing diversity and density of wildlife. Such life will improve the system and further its potential for achieving still higher levels of succession and health. Cottonwood and willow trees have returned to once-barren drainages, and with them have come a plethora of birds and other wildlife. The benefits run deep.

Twenty miles west, down in the Silver Spring flats the Austins manage two stretches of land (7,000 and 9,000 acres respectively) where they have implemented water harvesting earthworks. Not

only has the work there checked erosion, increased vegetative cover, and improved the health and productivity of the land, but the water table appears to have risen. After putting in the earthworks the Austins and their neighbors noticed that well levels went up. Water levels also rose in nearby miners' holes.

Choosing the right technique

So what was done in the flats? Some gabions, but in the flats there's almost no rock, though plenty of soil. When rocks were first laid, they sank into the deep sandy beds of the drainages due to heavy water saturation. The sunken rocks were then used as foundations for other gabions. This has worked, though Joe wonders if wired gabions might've worked better in such sandy areas, as their snowshoe-like footprint could increase stability.

Where they have little soil and plenty of rock the Austins stick with gabions, but where they've got lots of soil and very little rock, as on the Turkey Creek flats, they prefer the gully plug.

A gully plug is a low earthen berm in the bottom of a gully. It creates a barrier—like a gabion, but doesn't stop the flow, as would a dam. A small amount of water is held behind the berm, while in big rains, most of it flows over the plug to continue down the drainage. Where the Austins have used gully plugs much of the captured water infiltrates the soil and continues to travel downstream below the surface.

The gully plug can be built by digging a trench across the gully, then piling the spill dirt just downslope of the trench to create a berm perpendicular to the drainage. Earth easily erodes, thus extreme care must be taken when using such a strategy in a drainage. The berm must be made thick enough with the overflow stabilized by rock or vegetation. The berm must be lower than the gully banks as you want overflow water to stay in the existing drainage—not to cut a new drainage. When building gully plugs or any water harvesting earthworks, it's important to start at the top of the watershed and work your way down. Water flow must be controlled before it hits the gully plug or the structure will be washed out.

A few gully plugs and swales are used in the foothills up at El Coronado, but not many due to the limited soil. At the upper ranch, gabions do the main work of taming flow, " 'cause you've got to calm

the water above if you want to keep what's below."

Won't holding all that water high in the landscape dry out the land below?

Nope. You're not impounding the water, you're just slowing it down by putting it in the soil where less will be stolen by evaporation, and more will be available to plants and soil-building microorganisms.



Joe Austin pulls back a carpet of sod growing on once bare bedrock. Water is Life.

When the Austins had gabioned most of a small watershed leading to a series of ponds below, folks said the ponds would never fill again. Well, they filled the first year and have become more reliable ever since. As Valer says, "Never underestimate the flow and volume of water on the landscape."

Today, the same amount of water flows through the El Coronado landscape as did before the gabions were built. The difference is that today, with the gabions in place, that flow takes more time. Rather than ripping through in a matter of hours, water now gently meanders over many months.

Thus periodic flows of water in this dryland environment are turning into healthy yearround flows. This is truly wondrous, and if you think about it most of the work is being done by nature.

"Yeah, but 20,000 gabions, THAT'S AN EFFORT," you may say.

As Joe sat on a thick cushion of vegetation with water bubbling by he reflected. "Had I been told I needed to put in 20,000 stone structures I'd still be thinking about that. You just have to start."

The good news is that even one gabion near the top of the watershed begins the healing process. At El Coronado they just kept going! △

Brad Lancaster's fascination with water began with his flooding of sandbox civilizations. High water bills and angry parents temporarily put an end to all that, but later in life he learned to play a bigger and more productive game called "harvest!" That led him to teaching, consulting, designing, and living with permaculture and integrated water harvesting systems in drylands, which he has done since 1994. He is at work on a book titled "Rainwater Harvesting in Drylands—How to Welcome Rainwater into your Life, Landscape, and Soil," to be published in October. The story of El Coronado Ranch is one of many presented in the book, of real people around the globe successfully harvesting rainwater in drylands. Along with the inspirational stories are lots of resources, how-to information, guiding principles for efficient and integrated design, and more! Please contact Brad at bradlank@aol.com.

Truly Conservative Investment

Christopher Peck and Michael Kramer

OUR CURRENT energy system is irrational and dangerous. Current investments degrade the biosphere, wreak havoc on business and community life, and create wealth for a select few. We are all familiar with the results: global climate change, extreme weather, energy blackouts and price extremes, threatened wildlife refuges, smog and its negative health effects.

There are great rewards to be gained from investing in conservation. Everyone can save and make money, contribute to avoiding global climate change and improve their quality of life by investing in conservation. As a part of our mission to create sustainable abundance that honors humane principles, we offer some suggestions on how to create profitable, rational, and ecologically sound conservation investments.

What are conservation investments?

A conservation investment is a little different from an ordinary investment. When we think of investments we usually think of securities such as stocks, bonds, and mutual funds. According to the *Merriam-Webster Dictionary*, an investment is an "outlay of money usually for income or profit." A conservation investment is an outlay of money that creates profit by saving money. A simple example would be "investing" \$20 in weather stripping to save \$100 in annual heating costs. Like a house or real estate, a conservation investment is generally illiquid, meaning that it's difficult to turn the investment (such as rolls of insulation) easily back into cash. Some conservation investments however, such as solar panels or a fuel-efficient car, can be turned into cash without too much difficulty.

We also normally think of investments as assets. Some conservation investments are assets, such as photovoltaic panels or trees planted around a house. Others are not. Weather stripping is not an asset per se but it does add value to your home, something that is an asset. Some conservation investments appreciate and some depreciate; a fuel-efficient car will decrease in value but trees and other landscaping features become more valuable over time. The costs of many home improvement conservation investments can be realized from a higher return on the sale of your home.

The financial reward from conservation investment can be very attractive, especially when you figure in the tax savings. If you spend \$1000 on weather stripping and insulation and it saves you \$250 a year in home heating and cooling costs, that's a 25% return, tax free. As energy prices rise, and they will, your investment return increases. You save money, conserve resources, and improve your standard of living.

There are other benefits to conservation investments. It feels good knowing that you are making money by saving resources and reducing your impact on global warming. We all need shelter that is reasonably comfortable; you can enjoy that with minimal environmental impact. Conservation investments can also help

support sustainable businesses such as the small companies that make highly efficient appliances or solar panels. An often-overlooked benefit of living in an energy-efficient house is that it's more comfortable.

Conservation investments come in all shapes and sizes, including:

- Home energy - insulation of all types, weather stripping, efficient windows.
 - Highly efficient appliances - Sunfrost™ refrigerators, on-demand water heaters, compact fluorescent lightbulbs.
 - Appliance substitutes - clothes rack instead of dryer, etc.
 - Permaculture design - house design to reduce or eliminate the need for furnace or air conditioner; orientation for solar gain.
- If you look through a Real Goods or similar catalog you will find thousands of examples. Let's look at two great examples in more detail: home insulation and photovoltaic utility intertie systems.

Rule of 72 and "payback" periods

Occasionally you will hear representatives of oil companies or their policy makers downplaying the viability of renewable energy sources. "Payback periods" of ten to twenty years are thrown out as stumbling blocks to dissuade people from investing in renewables. But what does a "payback period" mean? A payback period of ten years means that if you spend \$1000, it takes ten years to earn that \$1000 back. If the payback period is 20 years, it takes 20 years to get your \$1000 back. This is disingenuous. When you buy \$1000 of a municipal bond fund, and it has a rate of 3.6%, no one complains "Oh, those bond funds have a 20-year payback period." Because that is what you are doing with a conservation investment, you are saving money, or making money available that can then be invested in other income-producing ways. If, like the average American family, you spend \$1500 a year on energy for your home, that is real money. You have to work to earn an income, pay taxes on your income, and then pay your bills.

To overcome the smoke-and-mirrors of the conventional energy company, use the rule of 72. The rule of 72 is a simple way to figure out rates of return, or how long it will take for an investment to return what you paid for it. If you want to know how many years it will take to earn your initial investment back, divide 72 by the rate of return. In the bond fund example above the rate is 3.6%. Divide 72 by 3.6, and the result is 20, meaning it would take 20 years to earn your investment back. If someone tells you that the payback period is 15 years, divide that into 72 to figure the rate of return, 4.8% in this example. Make your own decisions; does a 7.2% return sound better than a 10-year payback period? Which would you invest in?

Home insulation

Insulation is a great example of a conservation investment. Everyone needs shelter of some kind and usually needs heating

and cooling. The average American household spends more than \$1500 a year for energy. That's a lot of dollars and a lot of carbon in the atmosphere. Spending \$1000 on insulation can easily save \$300 to \$400 a year in home heating and cooling costs. That's a 30% to 40% return on your investment, and you don't have to pay taxes on it. When analyzing home energy losses the best returns at the beginning usually come from the small efforts, such as weather stripping around doors and windows. A \$20 roll of weather stripping can easily save the first \$100 dollars of that yearly savings. It also makes a dramatic improvement in the comfort of a house. The \$300-400 that you were spending on energy can now be spent on more conservation improvements and other investments.

An important point needs to be made here: spend the least amount of money and effort first to get the most savings. Or put another way: get the biggest bang for your buck. It makes more sense to spend \$5 on a can of insulating foam that'll save you \$50 a year, and then spend \$20 for weather stripping that'll save you \$125, before spending \$500 for insulation that'll save you \$200. This "biggest bang for the buck" principle applies to any investment you may consider.

Here in California electricity prices have been moving all over the place. Stories abound of people having to choose between electricity and food. Limiting your exposure to expenses that fluctuate greatly helps contain the effects of inflation on your budget, and creates a more resilient financial plan. This is particularly important for those on fixed incomes. This strategy applies to most expenses, and will encourage a more rational and sustainable use of the world's resources. The security of the returns offered by conservation investments is another appealing feature. The returns on most securities fluctuate greatly, the savings from conservation investments are locked in, and will probably increase with time.

Of course you cannot put your entire portfolio into home conservation efforts—insulation and weather stripping won't take many dollars—but you do want to invest in it as soon and as much as you can.

Photovoltaic utility intertie systems

Here's an interesting idea: mount an array of photovoltaic panels on your roof, plug them into a sophisticated inverter and grid-intertie system, and sometimes you'll be able to run your electricity meter backwards! The electric company will pay you for the electricity you generate. Of course there are limits, but to make it even more enticing most states currently offer a rebate, grant, or buy-back of up to 50% of the cost of such systems. This is an almost irresistible investment.

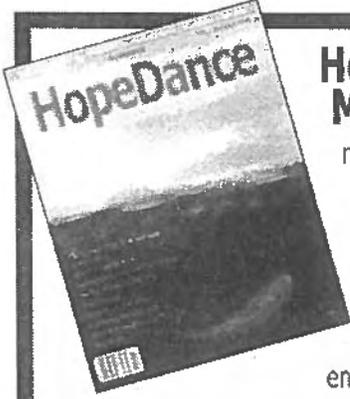
Let me back up and explain some of these terms. "Photovoltaic" refers to special silicon panels that are able to turn the light of the sun into electricity. They are sometimes referred to as solar or solar electric panels. A "utility intertie system" is a renewable energy generating source, such as photovoltaic panels in this example, that is connected to the electricity grid through a special inverter and utility connection. The inverter converts the electricity to the same form as the electricity coming into the house. The inverter is connected to the electric meter and the electric wires that bring power into your home. When the sun is shining the panels generate electricity, which is converted to the proper form, and then fed into the utility power grid. If you are

generating more electricity than you are using, your meter turns backwards! Obviously we're leaving out several important steps and technical details, but you get the idea. Under most rebate programs the renewable energy source can also be a wind turbine, fuel cells, or a few other kinds of devices.

Let's look at an example: a 2500-watt photovoltaic utility intertie system can produce, on average, 13.3 kWh per day and would cost about \$18,500. In California there is currently a \$10,730 rebate for such a system. This system would save a homeowner approximately \$60 a month in electricity charges. At \$720 a year, and including installation costs, that represents an annual return of 8.3%, and you wouldn't have to pay taxes on the savings. Where else could you find an investment with this kind of a return, with such low risk? If you know, please contact us immediately! Even without the rebate program, this is a good investment, competitive with current money market fund rates.

Utility intertie systems are easily scalable; that is, you can add more panels without difficulty. A 5000-watt system—twice the size of the system mentioned above—produces approximately 25 kWh/day of electricity, which represents the amount a frugal household might use. This system would save approximately \$125 a month in electricity costs, or \$1500 a year. Assuming it cost \$17,000 to buy and install such a system, \$1500 represents a return of 8.8%. We must mention again that you don't have to pay taxes on these savings, or go out and earn money that you then pay taxes on, to pay this bill.

This type of conservation investment only makes sense, however, if you have reduced your electricity needs to a low level. As was mentioned previously, compact florescent light bulbs provide a much better return. The refrigerator is a big energy hog; more



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- FoodForests
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- Ecovillages
- Natural Building
- Globalization
- Affordable Housing

"What a breath of fresh air," writes Barbara Kingslover.

efficient models can save half the electricity of a normal fridge. Take care of the "big bang for the buck" conservation investments first, then move on to more ambitious projects like this.

The next frontier

As all of us know, permaculture design puts a premium on conservation investments. Permaculture pushes the economic envelope by eliminating expenses and internalizing costs. It could be argued that permaculture design is simply the natural, holistic extension of the above concepts of sound investment policy.

Good design creates opportunities to completely eliminate many expenses. A well-designed house, even in cold climates, can eliminate the need for a furnace. The home and office of Hunter and Amory Lovins in Snowmass, Colorado has no furnace. With good insulation, proper overhangs, ample shading from trees, and a few other strategies houses in very hot areas can be comfortably free of the air conditioner. You save the fuel expenses and the cost of the appliance too.

As we expand outward from Zone 0 to the outdoors, the same principles apply. The situation rapidly gets more complex

as we move outside, but so do the savings and the possibilities for regenerative investment. A shelterbelt is a great example of a conservation investment. A shelterbelt can provide a host of benefits: wind buffering, protection from hot afternoon sun, privacy, reduced heating costs in the home, and useful products if appropriate species are selected. According to Mollison, shelterbelts can save 20-30% in heating costs in moderate winter areas, and are 50% cheaper than fences to protect roadways from snowdrifts. Animal weight gain is greater in wind-protected areas, mortality is up to 15% lower, and the animals use as much as one-third less feed. Crops too yield significantly better within well-designed shelterbelts.

It is difficult to quantify these benefits in precise financial terms, but real savings exist. And don't forget to use the "biggest bang for the buck" principle when staging the work. The permaculture literature is filled with myriad examples of regenerative investing, the time is ripe to start spreading these ideas and shifting the financial foundations of our world.

As rational, regenerative investment thinking takes hold we can slowly change the way we impact the living fabric of the

world. We can profitably reduce the amount of carbon being dumped into the atmosphere, develop gardens and farmscapes that help us build wealth and heal the damage we've done, and we can enjoy a high quality of life. We hope that our suggestions on how to create profitable, rational, and ecologically sound conservation investments will help you to create sustainable abundance that honors your principles.

Resources

Rocky Mountain Institute has a great website with downloadable articles. rmi.org

This database of state rebates for renewable energy programs has every state and local program in an easily searchable form. dcs.ncsu.edu/solar/dsire/dsire.cfm

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REVIEWS

Local Trade, Local Wealth Review by Peter Bane

THOMAS H. GRECO, Jr.

Money:

Understanding and creating alternatives to legal tender

Chelsea Green. White River Jct., VT. 2001. 295 pp + xxiv. paper. illustrated.

Was there ever a more arcane subject than this? Money makes the world go round yet few people understand it. This book reminds us that this ignorance, like the issuance of currency itself, is political and serves the interests of wealthy elites and the governments they control.

Tom Greco has written an important and necessary book demystifying the creation of money. A former professor of business, a creator and designer of community-based currencies himself, and for 20 years a student

and scholar of money, banking, and community currency systems, he is admirably suited to this difficult job. His aim is to democratize the creation of money so that local economies everywhere can shake off the yoke of oppressive globalizing power.

We are fortunate that he is not only knowledgeable, but a clear thinker and a careful writer, for the subject is challenging.

The book is organized in four parts of nearly equal length, beginning with a detailed look at "Monetary Realities and Official Illusions," which explains the functions and use of money, how it is created, what is wrong with the present system of government monopoly money, and what role new money (community currency) plays in the evolution of Gaian consciousness: quite a bold start!

He explains how money systematically pumps wealth from the poor to the rich, and how the banking system colludes with the



government in issuing "counterfeit" money, currency not backed by any real value, hence a source of inflation, an insidious tax on all users of money. Money is the principal means by which economic power is exerted in the modern world, and it is kept artificially scarce by banks and governments for the purpose of enriching the powerful and controlling the masses. Properly understanding money, a cause to which Greco has dedicated the prime years of his life, and which he would have his readers understand as well, is one of the keys to human liberation.

Part II, "Complimentary Currencies: Past and Present" is a thorough exposition of modern historical examples, drawn from around the world: Swiss business trading groups, Railway Notes, Argentine provincial government bonds, LETSsystems, Time Dollars, Service Credit schemes, Ithaca HOURS, and many more. Greco explains how each has worked, and what type of currency it is, commenting on the advantages and disadvantages. This is valuable because there is such a paucity of imagination about money and currency. Learning of the existence of successful community currency systems is empowering.

Part III, "Monetary Transformation and Community Empowerment," is more

GAIA'S GARDEN

A Guide to Home-Scale Permaculture

by Toby Hemenway

A practical and user friendly guide to back yard permaculture with examples from US sites. Soil Building, Water Management, Choice of Plants, Guilds, Forest Gardening & more. Excellent tables and references.

(2001) \$25.00, 238 pp., paper, illus.



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edited by Fernando Funes, Luis García, Martin Bourque, Niida Perez, and Peter Rosset

Cuban researchers describe a successful nation-scale conversion to organic agriculture after their economy kicked its petroleum "habit" cold-turkey in 1991. Detailed, thorough, and amazing. With valuable lessons for the U.S.

(2002) \$19.00, 307 pp., paper, illus, tables.



THE POWER OF DUCK

by Takao Furuno

Ducks and Rice were made for each other. Careful, well illustrated, meticulously tested and documented description of a working integrated organic duck-rice-azolla-fish polyculture for paddy, yielding \$75,000/yr. from five acres in Japan. A pattern for domestic food security for half the world. Large format.

(2001) \$24.00, 94 pp. + 4 color plates, paper, illus.

The WOODLAND WAY

A Permaculture Approach to Sustainable Woodland Management

by Ben Law

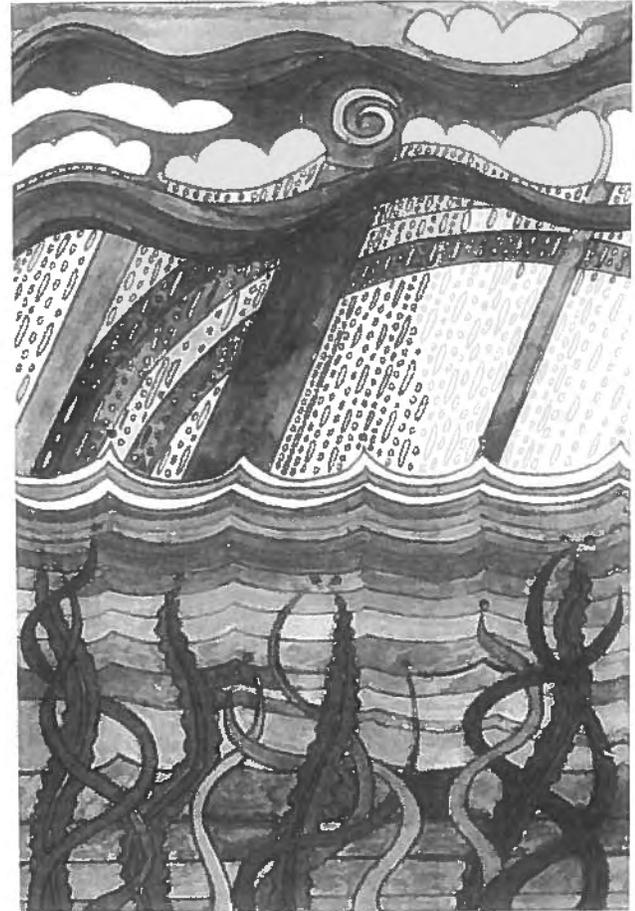
The author writes of his life as a coppice woodcutter, charcoal burner, and craftsman in Britain. He offers an appealing and low-impact way of caring for woodland while deriving a living from it.

Valuable for its example and for documenting little known traditional arts.

(2001) \$25.00, 231 pp. + 8 color plates, paper, illus.



Books from The Permaculture Activist



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A Do-It-Yourself Guide to Cultural Manipulation

by Sandor Ellix Katz

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(2001) \$5.00, 33 pp., paper.



MONEY

Understanding and Creating Alternatives to Legal Tender

by Thomas H. Greco, Jr.

An essential reference to money and currency systems furnished with worldwide examples. Time dollars, LETS, mutual credit.

(2001) \$20.00, 295 pp., paper, illus.

THE NEW INDEPENDENT HOME

People and Houses

That Harvest the Sun, Wind and Water

by Michael Potts

Inspiring stories of home energy pioneers and how they did it. Good analysis of all sources, plus site design. Makes technology accessible. The best single sourcebook for energy design.

(1999) \$30.00, 392 pp. + 16 color plates paper, illus.



THE HUMANURE HANDBOOK

by Jos. C. Jenkins

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(1999) \$19.00, 301 pp., paper, illus.

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INTRODUCTION TO PERMACULTURE

by Bill Mollison and Reny Mia Slay
The basic argument for permanent agriculture: how to feed and house yourself in any climate with least use of land, energy, and repetitive labor. Follows the design course syllabus. Replaces Pc I and II.
2nd ed. (1994) \$24.00, 218 pp. paper. illus.

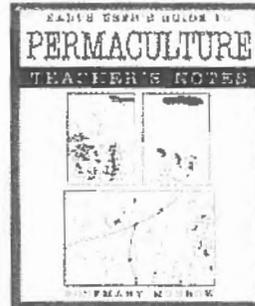
PERMACULTURE A Designers' Manual

by Bill Mollison
A global sourcebook for creating cultivated ecosystems in all landforms and climates. Lucid illustrations by Andrew Jeeves bring Mollison's concepts to life. Offers essential, in-depth treatment of earth repair and practical design in spare & powerful prose.
(1990) \$60.00, 576 pp. hardbound. illus.



INTRODUCCION A LA PERMACULTURA

por Bill Mollison con Reny Mia Slay
Principios y ejemplos para diseñar pueblos, casas, y huertos sostenibles. Traducido de la edición inglesa original, contiene las mismas ilustraciones y listas de plantas y también un glosario de palabras que son únicas en la Permacultura.
(1994) \$28.00, 202 pp. paper. illus.



TEACHER'S NOTES Earth User's Guide to Permaculture

by Rosemary Morrow
This essential guide supplies overview, learning objectives suggested graphics, syllabus content, activities, resources, and references for 40 subjects from ethics, ecology, and climate through creative problem solving, bioregions, and suburban Permaculture.
(1997) \$17.00, 160 pp. paper. illus.



PERMACULTURE TEACHERS' GUIDE

edited by Andrew Goldring
Invaluable essays on Permaculture teaching curricula and methods with many sample lesson plans for a wide range of subjects. Written by Britain's best teachers, this well-organized compendium is easy to use and will be helpful to new and experienced teachers alike. Many valuable resources are listed.
(2000) \$45.00, 312 pp. paper. illus.

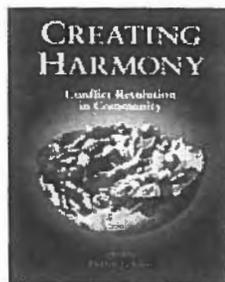
THE LOST LANGUAGE OF PLANTS The Ecological Importance of Plant Medicines to Life on Earth

by Stephen Harrod Buhner
A brilliant exploration of plant medicine and a startling exposé of the costs of our alienation from and ignorance of the living world. Personal, elegaic, and captivating.
(2002) \$20.00, 325 pp. paper. illus.



CREATING HARMONY Conflict Resolution in Community

edited by Hildur Jackson
Assembled from pioneers in the ecovillage movement, this may be the best single resource on creating community yet. Much of this information is not well documented elsewhere. More than the title suggests...
(1999) \$30.00, 269 pp. paper. illus.



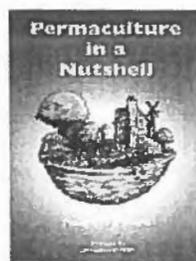
BOUNDARIES OF HOME Mapping for Local Empowerment

edited by Doug Aberley
Mapping is the first step towards reclaiming the territory. How to envision the landscape of home: 19 passionate essays on bioregional mapping, theory and examples from city and country. Info on GIS, resource assessments.
(1993) \$10.00, 138 pp. paper. illus.



PERMACULTURE IN A NUTSHELL

by Patrick Whitefield
A back pocket gem, this book draws on the best examples in Britain and elsewhere to show how and why permaculture works. Excellent primer for introducing Pc to friends.
2nd ed. (1997) \$9.00, 80 pp. paper. illus.



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analytical, examining currency fundamentals, the basis of issue, what gives a currency credibility, etc. This section explores Mutual Credit systems, the different roles money plays: as a medium of exchange, and as a store of value; it also looks at how these conflict and why. A chapter here examines interest and usury; another looks at basic currency types.

The last section of the book, "Currency Design, Improvement, and Innovation," builds on the rest of the work and goes beyond present examples to recommend systems and innovations that may work better than anything seen heretofore. Greco offers a friendly critique of the much-touted Ithaca HOUR

system, explaining why it has succeeded despite some structural flaws, and how these might be corrected. It's tremendously useful to have this kind of advice from someone who's studied the subject so widely and so long. To say that currency systems are an esoteric field of knowledge is a gross under-statement. Even most conventional economists are dramatically ignorant or are operating under false assumptions about the nature of money.

I believe this is the best book now in print on money and ranks with the best ever written. As such, it deserves its blunt title. It will be an essential reference for all serious teachers of permaculture design and for many community

organizers. Every community development agency, Chamber of Commerce, and credit union manager in the U.S. and Canada should have a copy. It would also make a good primer in political economy for college students, who would find reading it a better education than taking the basic courses now offered in business or economics.

It's difficult to express the full measure of importance this book carries or to adequately appreciate the service its author has rendered the cause of local self-reliance, but a down payment on the debt we owe Tom Greco would be for many of us to read his words and put them into circulation in our own communities. Δ

The Poetry of Ecology

Review by Peter Bane

STEPHEN HARROD
BUHNER

*The Lost Language of Plants:
The ecological importance of
plant medicines to life on earth*

Chelsea Green Publishing.

White River Junction, VT. 2002.

325 pp. paper. \$19.95.

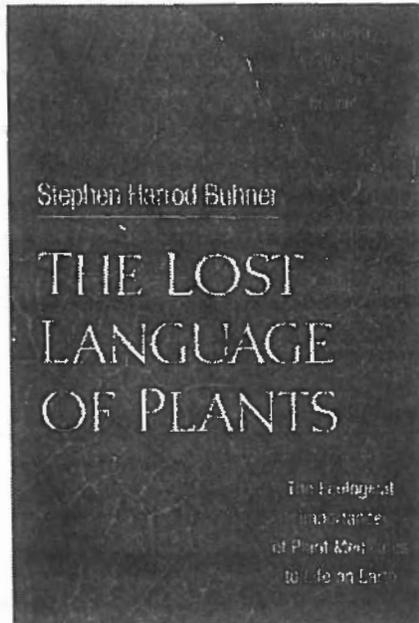
This complex and beautiful book attempts to convey the profundity of our biological communion with the living earth. Buhner is a fine writer but he has also invited into his text scores of other contributors, just, as he points out, our own bodies are interpenetrated and inhabited by vast numbers of other organisms.

He begins with an exploration of *biophilia* and *biognosis*, love and understanding of life, respectively—one growing from the other—and how our civilization's cosmology has turned our attention, our thoughts, our dreams, our senses, our actions, our very bodies, away from the stream of life upon which we depend for our survival. It is good that Buhner writes gently, for the message he delivers is devastating.

Biophilia, which he introduces in very familiar and unarguable terms, is our empathy with all other living things. It is, he asserts, our native and natural heritage, and was the experiential condition of all our ancestors until the modern era. Out of this empathy grows certain understanding—biognosis—of living processes. This is confirmed in the near universal understanding of the properties of many traditional herbal and plant medicines across cultures and eras. How could these understandings have arisen in widely separated cultures? Not because the humans communicated to each other—they certainly didn't, but because the plants communicated to the humans. No other rational conclusion is possible.

Buhner explores the loss of biophilia in

modern culture and identifies four key vectors: The mistaken belief that the Earth is not alive (a toxic meme continuously reproduced by most of our religious, scientific, and educational institutions); the loss of access to wild places with a diversity of life forms; public schooling; and television.



With this grounding Buhner takes us on a truly horrifying journey through the halls of modern medicine, laying out in understated terms the immense pollution and until recently little seen or understood toxic effects of modern medical practice. This, he argues, is a pressing case of the loss of biophilia and the denial of our communion with the living world. Modern medicine is the quintessence of World-as-Machine. Millions of tons (yes, tons) of pharmaceutical waste are discharged every year, mostly unregulated into the air, water, and land around us. Most of our bodies carry toxic chemicals from medical treatment and antibiotics that resist degradation in the biosphere. These persistent pollutants pass through our sewage systems into rivers, lakes, and on to the sea. These substances accumulate

and pass from one organism to another: from humans to wild and domesticated populations of animals and back again. The implications are chilling.

The author explores the increasingly rapid development of bacterial resistance to drugs, acids, and even elemental chlorine. This resistance has been brought about by massive exposure of the biosphere to our anti-life attitudes and substances, and it has brought us in less than 60 years to what may be the end of antibiotics. He shares insight and a profound respect for the extraordinary adaptive intelligence of bacteria, and reminds us that we share a common ancestor with all microbes.

Having made, in the first six chapters of the book, his epistemological argument, focused on a critique of modern medicine that would seem to be beyond rebuttal, Buhner turns his pen to describing plant chemistries, and opens up a world of wondrous creativity. We see how plants regulate the health of ecosystems, protect themselves from predation, selectively suppress bacterial activity, and play essential roles in the reproduction of other species. I so enjoyed the beauty of the scientific learning he offers to support his arguments—gems of ecological insight, really—that I found myself wishing for more. Plants, it seems are orchestrating the music of life itself, speaking the very words of God, while our modern medical/pharmaceutical industry yammers blasphemous obscenities louder and louder and louder. If this were happening in a theater we'd throw the jobs out in the street. Will our society wake up from this nightmare in time to save itself?

In the last sections of the book, the author tells us stories of plant healing, describes how animals use plant medicines, offers an elegy to the herbs, sets out some simple methods of self-healing to deepen biophilia, and introduces the work of four contemporary plant healers: Carol McGrath, Sparrow, Rosemary Gladstar, and John Seed, each in their own words.

The Lost Language of Plants is a moving, intelligent, and compassionate plea for loving the living world, something each and all of us must do as if our lives depended on it...because in fact they do. Δ

Observation is Key

Look Before You Leap

Chris Anderson

REMEMBER those childhood adventures? Creek stomping? Looking for four-leaf clovers? Finding cool bugs everywhere you looked? This type of observation—following one's enthusiasms into the essence of a place—is elementary to Permaculture design. By revealing a lot of information about the landscape, an uninhibited course of discovery greatly speeds the process of arriving at design solutions.

Observation is the foundation of design, and—as we elaborate on it, critiquing and analyzing our first impressions, it supports the development of thorough, thoughtful plans.

Many designers recommend observing a landscape for at least a year before undertaking permanent changes. Similarly, manufacturers recommend measuring wind speed and direction for at least a year before choosing a wind generator for your site. Why? Because to choose the right wind machine you need information about wind speed and direction, duration and variability both day and night and at all seasons. A year is the minimum cycle that begins to show the possibilities. Landscape is much more complex: there are many subtle and intricate relationships that can make a big difference. Minimum and maximum temperatures and daily ranges, variations from one location to another, wind effects, animal interactions, plant diversity, rain, dew, frost, and drought are all important to assess and will affect your choice of building sites, technologies, and species for cultivation.

Avoidable mistakes can cost a lot of time, money, and stress.

Wind speed and direction are relatively simple variables to measure. But the interplay of wind with landscape requires more observation and more time. It's taken me nearly three years to understand the landscape on the windward side of my house well enough to design an appropriate windbreak. The challenge is to shelter the house from winter winds but not divert wind from the wind alternator ("generator"), which stands just windward and uphill of the house. Design considerations include slope, a curving driveway, and maintaining sunset views from the house. Integrating the conflicting demands of this situation has taken a great deal of thought. The longer I've watched the site though, the more connected I have come to feel with it and the more I've considered how all the Permaculture principles apply to the situation.

So, how does one observe a landscape? The best way is to visit it many times during each season, at different times of day, and in various weather conditions. How better to understand the movement of water through your landscape than to walk about during a rainstorm? Where snow melts quickly and where slowly tells much about microclimate. This kind of observation can pay handsome dividends in long-term energy savings or crop

successes when it comes time to locate a home or plant a fall garden.

While walking your land, pay attention to slope, pathways and other signs of animals, the plants alongside the trail, spots in the forest canopy that may open up to provide younger trees with sunshine, and potential building sites or pond sites. Notice which plants attract the most pollinators, which have pleasant smells, and which would be good mulch or fodder sources.

Learning with children

During environmental education programs, I like to take young children on "wildlife hunts," in which we search for "evidence" of animals and their sources of shelter, food, and water. Sometimes we cup our hands around our ears so that we can hear wildlife sounds more clearly. We also go on "penny hikes," in which each

A challenge: shelter the house, but let the wind turn the mill.

student looks for tiny things and stacks as many of them as possible on a penny, helping them to appreciate easy-to-overlook elements of the landscape. These activities also provide good lessons for the adults who lead the children in the adventures. Children are often amazed by things that adults take for granted, and they notice patterns that we sometimes miss. Are there ways children could help you learn about your site(s)?

In temperate climates, each season offers unique opportunities for landscape observation. In fall, you can keep track of which leaves fall early and which fall late, which leaf colors complement each other, and when particular fruit and nut trees are ready for harvest. Notice the patterns of the wind tossing and



redistributing leaves. Notice how people connect to nature in fall by taking back roads more often to see leaf color, decorating their homes with pumpkins and fake cobwebs, and eating more whole foods during the Thanksgiving season. Fall is also a great time to harvest soil samples for testing.

Winter is a good time to observe many patterns, including waves. Snowdrifts help us understand how landscape elements affect, and are affected by, wind. Even though we tend to see wildlife less often in winter, it can be a good time to find tracks. I enjoy playing a guessing game in which one person names a local animal, and others name the animal's winter tendency: hibernate (sleep), migrate, or adapt (grow more fur, for example). Watching a thermometer during the coldest time of year is helpful when choosing what trees to plant later. During winter thaws, listen for spring peepers and other early signs of spring. Collecting sap from maple (or other) trees is a great way for kids and adults to learn about weather and tree cycles.

In Japan, television news shows celebrate cherry blossom season and provide daily updates on where trees are blooming. Similarly, I maintain a log of dates when I notice specific spring events, such as first crocuses, buckeye trees leafing out, and raspberry canes budding. Each year, I take note of where I see the first of a given species sprouting or growing, which helps me learn a lot about microclimates. Collected year after year, this kind of information is invaluable for knowing what to plant where in the spring, and for more accurately estimating your last frost date. It's also great fun.

Summer reminds us of the dramatic influences of sun and shade! Notice how sunny or shady your main garden is, and ponder ways to use your garden space more efficiently. For those of us late-planters who always end up with small storage onions, it helps to be mindful that days are longest in June! We also have good opportunities in summer to learn about the principles of Succession, Energy Planning, and Relative Location by asking ourselves questions such as 1) What plants are dominant? 2) Which areas do we want to encourage to re-forest themselves? 3) How does energy flow in the landscape? 4) What plants work well in relation to

each other? and 5) Which plants hold soil better than others?

Some principles for observation

In terms of where and how long to observe a site, it makes sense to follow the principles of Appropriate Scale and Energy Planning. Observation is energy, after all, so it's useful to spend it intensively where it will have the greatest impact. In the beginning, put most of your observation energy into Zones 1 and 2, and, once your inner zones are up and running, move out from there, gradually reaching throughout the property, community, watershed, and bioregion.

Within this framework, traveling to the outer zones at any time can be of great value. We can learn a lot about our own sites through making observations in other areas. Likewise, by inviting designers and other observant folks to view our sites, we can learn to see things we might have otherwise overlooked. Diversity of observation style and different perspectives can lead to creative and exciting solutions.

Being observant of the landscape also requires that we be observant of ourselves. After all, we are actors in the landscape, shaping and changing it. Our comings and goings are important energy vectors. Being self-observant enables us to create unexpected solutions in the landscape and in our lives. Allow yourself to rethink where Zone 0 (home or self) should be located, and what scale of home, garden, or enterprise is appropriate for you. Most families in my community have chosen to build their homes in places other than their original home sites, and several of us have scaled back at times our great intentions for the world in order to take better care of self, family, or home, and to keep from "burning out".

Observation, in Permaculture design, means, "planning with nature (used broadly here), not against it." It also demonstrates our respect for the planet, for all living things, for our clients, and for ourselves. Observation is a web woven throughout our Permaculture work, and is key in learning how to align our visions, ideals, and values with proactive, practical solutions. Δ

Chris Anderson is a budding Permaculture designer and educator

living at Edges Community in Morgan County, Ohio. He co-founded a K-6 environmental education program at Rural Action, a grassroots sustainable community development organization based in Trimble, Ohio. He can be reached at activehope@yahoo.com.

REVIEWS

A Buzzing, Blooming World Review by Peter Bane

ERIC GRISSELL

Photographs

by Carl Goodpasture

Insects & Gardens:

In Pursuit of a Garden Ecology

Timberline Press. Portland, OR. 2001.

345 pp, 106 color photos, 1 color chart, hardcover. \$29.95

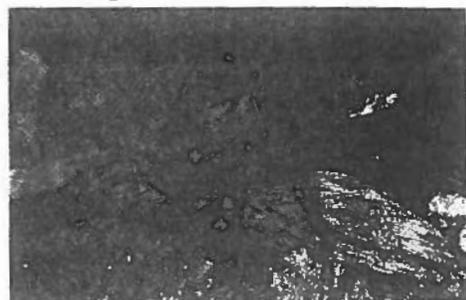
Eric Grissell's charming sense of humor and engaging prose, and Carl Goodpasture's amazing photographs make this an excellent basic reference on insects for all ecologically minded gardeners. The information on feeding habits, mouth parts, breeding, and survival strategies of different insects will prove useful for analyzing garden problems and responding with ecological solutions.

Grissell takes us "under the skin" of insects as we see how they live and breathe. His metaphor of the Tin Man representing what a human might be like with the body of an insect delighted and brought to mind some other friends of Dorothy. We learn why insects can't get (too) big: the world's largest is 19" long (there's a limit to the strength of their exoskeletons).

The book gives a very accessible classification of the Phylum Arthropoda, including some "close cousins" of the insects such as spiders and crabs, but dives into more detail of the Class Insecta, describing the orders with emphasis on their garden habits. I love this kind of stuff anyway, but I think most gardeners would find this overview of insects very informative.

The rest of Part I goes over the various pathways of insect development, called metamorphosis, and their survival mechanisms and strategies—very helpful for troubleshooting outbreaks in the cabbage patch. The second part of the book is all about garden ecology: the role of insects in the garden, why and how they do what they do. (Wow! A carrion beetle chewing on a mouse haunch...) The author describes which parts of plants each

group of insects are prone to feed upon, how balance can be achieved and maintained, and the many ecological benefits of insects (most of them are helpful; a few have a bad reputation). The section on plant/insect interactions is very useful, as is the following chapter on insect/insect interactions. Grissell then takes on the way we think about gardens, our expectations and how they often differ from reality. He concludes this part of the book with a discussion of diversity in the garden and its meaning.



Blueprint for New Forestry review by Peter Bane

BEN LAW

The Woodland Way A Permaculture approach to sustainable woodland management

Permanent Publications.

East Meon, Hampshire, UK. 2001.

\$24.95. 231 + xx pp. paper. illustrated.

Like a bottle washed up on the shore and found to contain a map of hidden treasure, *The Woodland Way* delivers to us the anatomy of a lost economy—one based on the forest. Known well to our ancestors, it was built of “thatching spars, hurdle rods, bean poles, and pea sticks,” as well as firewood, rustic furniture, charcoal, honey, and a plethora of edible delights. That this economy persists today and is even enjoying a renaissance in the British Isles offers hope for the world’s beleaguered forests.

Generations of British countryfolk derived a sustainable living from the woods, cutting and managing coppice, harvesting all manner of wood products, bodging furniture, burning charcoal, gathering honey, berries, and flowers, and hunting game. These activities created the countryside as millions have come to know and imagine it: a mosaic of parks and glades rich with a diverse plant and animal life, near at hand, intimately known and named, a generous source of life. Today the growth of American-style monocultures, motorways, and bigbox merchandising in Britain threatens the pastoral quality of the landscape to which so much of the British soul is wed. At the same time the

The concluding section addresses insects and humans. In another sense it is about designing our landscapes to include insects (which will be there one way or another), to increase diversity, to invite insects into the garden, and how—once they have arrived and we notice them—to appreciate them. Grissell offers an excellent three-page list of books for additional reading.

There are a few moments when Grissell wanders off into an obviously entomological harrumph about the way humans relate to insects (as when he talks of those “pollen-pigs,” the honeybees), but mostly he’s a delightful companion and a great teacher. I just kept wanting to read more, the stories were so charming and the images of insects so lively.

Mostly, people—even gardeners, don’t know the second thing about insects, and for that reason alone this book is to be highly recommended: it makes learning about insects a pleasure. And that can only be to the good of the reader and the world. Δ

evident failure of plantation forestry based on scientific silviculture begs a fresh look at the way the countryside is managed.

In this unique addition to the Permaculture literature, Ben Law addresses these challenges out of his lived experience. He demonstrates his keen sense of the woods by relating several examples of assessing properties for renovation: Here would be suitable for nuts; these old coppice stools (stumps) would be better cut for charcoal burned in the woods; these rides (lanes) need restoration; this stand is too far from the road to harvest economically; etc. He sees the woods as home to myriad creatures, future buildings, furniture, or musical instruments, and has made it his business to know something of these markets. In writing about his life and work, Ben has given us a manual for technical and cultural transfer, showing us the sophisticated understanding that sustainability will require of us. This depth of understanding and richness of information contrasts with the material simplicity by which he lives. His tools are few, well-chosen, and often self-made. Shelter comes from the forest itself, as a simple “bender,” or bentwood and canvas hut, or a framed house of planks and poles.

The woodland way Ben Law describes has deep roots in the British landscape yet these never transferred to the New World. The small woodlot owner or self-employed woodworker barely registers in the American economy. Our cultural archetype is of struggle against the forest primeval, dark and deep, a place of dread and danger, home to “savages.” Here the trees were huge and represented an immense obstacle to settlement, preventing the growth of crops, an alien environment. Only in New England, where the tapping of maple syrup gave rise to a cottage industry that persists today, did

woodwork take hold in notable form.

American readers may, as I did, have difficulty making sense of this book at first glance. For all its clarity of language and organization, it seems oddly foreign. Certainly its greatest value will be for a British audience. The cultural context and experience do not translate entirely. Britain is a small nation, long inhabited, and densely settled. Its woodlands are at once more limited in extent than ours and more closely integrated with towns, villages, and farms, giving woodworkers ready access to markets for craft and product. The traditions and customs of the woods survive and are being renewed. The greatest challenge facing coppice workers in Britain today is getting planning permission to live where they work. Understandably the book’s chapters on Forestry Law and Planning Law and its appendices of resources and organizations, which together make up about 1/7 of the text will be of limited value to readers in the US and Canada. Nonetheless, *The Woodland Way* merits careful study. It will yield its riches to the slow and thoughtful reader.

THE WOODLAND WAY



A Permaculture Approach to
Sustainable Woodland
Management

BEN LAW

Law provides invaluable descriptions of coppice management, for which published sources are rare. He gives examples of woodland holdings and plans, including some of his own devising, which encompass decades, if not centuries of harvest. He describes, and the b/w and color plates illustrate weaving, joining, splitting, bodging, steam bending and burning of wood for charcoal. British coppice workers are far ahead of their colleagues on this side of the Atlantic in carving out an economic niche for themselves. Law describes organizations that are marketing substantial quantities of product. Lists of woodland species, while focused for Britain will be useful in many regions of the US and Canada. The

book addresses woodland dwelling, edible species, wildlife and domestic animals, assessment and planning, woodland establishment including nursery work, management and harvest including cutting, milling and extraction, and is especially useful for its look at craft and marketing. Example projects are showcased with photos and descriptions. The book is handsomely printed on heavy stock with ample margins and well-drawn maps, charts, and tables.

Not only is *The Woodland Way* a valuable and well-written case study of a pioneering subculture, it gives us a template for sustainable woodland management, an essential companion to sustainable agriculture and a support for local economy that has enormous implications for the future of the world. It will be for enterprising North American readers to create their own way forward from this inspiring example. △

Rabbits Love Roses

...and other rabbit research

And why you might raise rabbits even if you are vegan—

Jane Hunnicutt

RABBITS PRODUCE manure that is arguably the BEST for the gardeners' purposes. It is ready for use with absolutely no composting: no building bins, no heavy work turning the piles, no trucking in loads of manure from animals who may be heavily medicated. Just park an old wheelbarrow under the cage if you like, wheel to the garden, and dump. If you want to water houseplants or tender seedlings, make a manure tea using a quart or more of rabbit droppings soaked in five gallons of water. Let it sit for a day or two, stir a few times, then strain the tea into your watering can to avoid clogging with the fine fibers. You can dump the fibrous remainder around your berry bushes or other shrubs as mulch.

When the whole of the manure is mixed into soil for growing vegetables, its combination of available nutrients and well broken-down fiber mulch gives incredible results. I've gardened in large plastic pots using intensive polyculture methods (basically a major plant and a few smaller ones), and have produced lots of food more reliably than most family gardeners in gopher and deer country like California.

So what's the cost? Well, wherever you live, there are probably discarded "pet" rabbits at local animal shelters, many of which may be nearly impossible to handle. These animals could be rescued from "euthanasia" and allowed to finish their lives in a cool shady corner of a garden or in a cage hanging from the north side of an outbuilding, or maybe inside an old horse stall or garage if the winters are harsh. Rabbits die from heat and wind, rarely just from cold temperatures. Choose the large rabbits, as the tiny ones cannot live outside even in milder climates. With some used cages and less than \$25 in watering equipment, rabbit manure can be produced right in your own garden.

What does this splendid organic manure cost? Rabbit pellets sell for about \$9 per 50-pound bag. Growing your own fodder will be cheaper. You can cut costs by feeding the rabbits organic waste from tree prunings and vegetables, but you must first learn which plants are okay for general use, which for a small portion of diet, and which are deadly, like swiss chard and other oxalic acid plants.

And there would be double satisfaction: at first, saving some small animal lives that would otherwise be wasted. Then later, the great joy of raising top-notch vegetables and fruits, and using less water too!

Why raise rabbits—some generalities

Rabbits are the most economical, labor efficient, and practical way to produce protein. This protein production also has some terrific by-products. I've always been very interested in feeding the hungry—it was my motivation from the beginning. It was why I started out as a vegan, and how I've become a rabbit raiser. I nearly cried for relief when I did my own conversion rates and realized that with rabbits as clean and resilient as they are, that is, needing no antibiotics, and as well as the manure works, that THIS was the way we could feed everyone a non-chemical diet without chemical "fertilizers," especially in remote areas where nothing grows but brush, and the soil is dry and depleted. I can grow veggies in almost any soil using rabbit manure, and it holds moisture about as well as those little "water pellet" granules made of cross-linked polyacrylamides, which look like jello.

Rabbit, chicken, and turkey all have similar protein percentages by weight, with beef, lamb, and pork being from 4-9% less. Rabbit meat has nearly one gram more protein per ounce than chicken, and nearly one gram less fat. It has 15 calories less per pound, and here's the important one for lots of people: the cholesterol is much lower, even than chicken white meat. All other meats range from 220-259 mg/100g, while rabbit has 164 mg/100g. Also noteworthy, rabbit is the richest source of zinc except for oysters, which are bottom feeders, difficult to farm, and very slow growers.

Stock selection

After going to several rabbit shows and studying the various breeds, I came to understand that stock selection was a most important factor. The type of rabbits I raise are called "Satins." They are a large breed, derived from a genetic mutation in the fur of some New Zealand Whites back in the 1930's. This mutation caused a hollow hair shaft, which gives a beautiful shine and quality to the color of the coats of this "heavyweight" breed. They come in lots of colors, and are generally calmer and easier to handle without conditioning them into pets than the smaller breeds. It's similar to dogs...the little ones are hyperactive, the larger ones calmer. Of course, in both animals this is not a rule, but a generality.

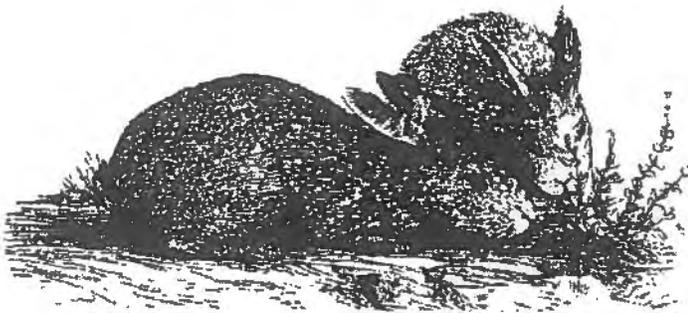


The Satin of today a very different breed from the New Zealands because in order to put color on that fabulous hollow hair shaft, the white NZ mutation was crossed with many other breeds, and then the body was reestablished. Sounds amazing, but as the gestation for rabbits is only 30 days, you can go through quite a few generations in a couple years. The Satin is genetically diversified the natural way. Right now in the USA, I have heard that the New Zealand breed has only six breeding lines! That is way too few; we all understand the disadvantages of monoculture and lack of variety. A majority of the stock in such a rabbitry can develop the same faults, or get sick from the same disease.

Here's what I did in breeding: I took great stock from very distant strains, and then bred the best I could get. I did not travel the rabbit show circuits, but my rabbits got well known. My favorites are the red Siamese. I personally developed that particular color and they have the quality of hybrid vigor. That is when two diverse strains are crossed, and unusual strength, beauty, size, or vigor is noted. (Though no one talks about it that way, you can see the same results in humans with far-reaching "crosses" like Chinese/Puerto Ricans, or dark Africans with Swedish.)

How to set up rabbit-raising equipment

Another important aspect of raising rabbits is good equipment. Clean new cages are wonderful, but many people start off with used ones and clean them up. A Satin should have six square feet of space, and such a cage costs \$35 here in California. There is an easy and cheap way to set up automatic water systems—a kind of "drip irrigation" for rabbits, so you never need to fill water bottles, or bleach them from algae. Yippie! Misterters can be set up off these systems and turned on when temperatures are too hot. Remember, rabbits die from sun and heat, almost never from cold.



Hang the cages with their floors about at waist level. Cages can easily be put onto walls with just a few 16- or 20-penny nails, and a cut sapling or wooden two-by-two to stabilize the front edge. They can also be hung by chains from rafters. The cages can be purchased in groups of two to four, called "holes." If you plan on one pair of breeding rabbits, you can order a three-hole cage—just hang it on a wall, and your rabbitry is finished. Lay some old lightweight interior doors or discarded plywood on top, and complete with feed bags hung around the edges for shade or for wind and rain shelter. My first rabbitry was built along a fence line, using the posts for supports—the fence kept stray dogs out.

If your rabbits live outside, you will need to keep foxes, dogs, and raccoons away from the cages. I did that by using regular stock fencing and a common garden gate with a spring hinge to close it automatically. Outside of that fence, my dogs kept off predators. In fact, one dog who would never stay home was on a line that let her guard both the chicken house and the rabbitry.

She was very proud of her job, well cared for, and praised daily. I never lost any animals in over ten years.

Well, on to details! What most people think they "know" about rabbits is that they have a hot sex life. I think that is very funny, once you really know how it works for this small mammal.

The sex life of rabbits!

RABBITS ARE HIGHLY TERRITORIAL. I would type this ten times down the page if not for space constraints. Never ignore this when raising these small, often fierce creatures. Rabbits, like dogs, cats, and other small mammals, mark their territory by scent. Rabbits do two things: they always try to pee in the same place, and they mark things with a little gland located under the chin. This marking is not noticeable to humans, but other animals will sniff these spots. Understanding scent marking gives clues to the animal's behavior, especially around breeding. Realize that each rabbit owns its cage and that space is its only defense other than claws. Rabbits do not usually bite, but they do kick and scratch when threatened.

When breeding, ALWAYS place the female (called a doe) in the male's cage, or else she will fight him, sometimes to the death. The safest technique is to back the female into the male's cage to avoid her leaping in, leaving claw marks on you from her hind legs. It's a good idea to wear a long-sleeved shirt when you plan to breed your rabbits. The male (called a buck) mounts the female immediately she enters the cage, and the "act" is finished in less than ten seconds. You can tell when he has finished because he usually falls over onto his side, and this is often accompanied by grunting, spasming, and gripping the female's body. She does not usually move during this time. A good buck will repeat within two to five minutes, so usually this is allowed in case the female pees immediately and so eliminates the sperm (this is rare).

If the female does not lift her rear end up to allow entry, he bites her on the shoulder (just a grip if he is a good production stud; a nasty puncture wound if he is mean and rough). This bite allows him to stay in place, and causes her to move forward, which means her rear end lifts and then...see details above.

The first time I had a buck six months old that I had raised, he did it nine times in less than 15 minutes and didn't seem to be able to stop. I was laughing and amazed at his antics. Suddenly I remembered that they can have heart attacks from too much, and snatched the doe out. He never did it more than twice in 10 minutes ever after that. He was a very noble and reliable fellow, steel and black coat, named "GREYLORD."

Within 12 hours the doe knows she is pregnant. If you aren't sure a doe "took" a breeding, then you put her back in the next day. If she is pregnant, she will press her bottom to the floor and vigorously say "nunnnh- aaahhh." It sounds like "No way buster, just back off," and some more aggressive does, who bred instantly the day before, will rear up and strike at the buck with their forelegs. They may even vigorously resist your taking them out of their own cage on the second day, when the day previous they were only shy and skittish.

Gestation, birth, and weaning

Gestation is 30 or 31 days. One hopes for eight "kits" because the doe has eight nipples, and most nurse once a day. The milk is very rich. Some can nurse up to 12 young but usually it is better to breed two does at once, especially an older and a younger doe,

and to foster the young doe's extra kits over to the older, experienced nurser. Some old does can be kept nursing almost constantly and don't care how many babies and mixed ages they have. Usually fostering is done within five days of birth (before they get much hair—their eyes open day 8-10).

If you leave 14 babies in the box, the doe gets stressed out, and more than half will die. Sometimes the babies will bite at the doe trying to get more milk, and she will carry them out of the nest box. Sometimes their crying when they don't get fed or when they get stepped on by the bigger ones will so upset the doe that she will stomp all of them to death, fearing danger in an instinctive way. So, even if you have only one rabbit, look carefully at the bunnies on the first day. If they are even in size, and the next day two are smaller and six are larger, it's best to remove the two small ones. Otherwise, those will get skinny and rot away, or can get maggots in the summer. A count must be made on day 1 or 2, and checked every day or two thereafter to monitor conditions.

The does have no interest in the bucks, and do not "need companionship." Sometimes a buck or doe will kill the other when they are confined together and the doe is pregnant. Bucks will try to mount does when they are pregnant, but again, the good production animal will stop when told by the doe, and actually looks kind of surprised, like, "So why are you in my cage then?"

Most bucks will kill the babies if the buck and the doe are left together. This is only done by people who have read nothing about the animals they are keeping, or who don't realize that one is pregnant, or else by those who think the "experts" are wrong; they are soon very disappointed with their results. (I have heard of one case when this did not happen, just for the record.) In the wild, the doe would fight the buck and keep him out of her nesting territory.

At two weeks, bunnies can run and hide, and at three weeks, the young rabbit can eat and be on its own. However, it is not recommended to separate the babies from the doe until they are five weeks old. If there are six bunnies, move the four largest ones to their own clean cage, and leave the two smaller ones with the mother for another week or so. It is amazing to watch those two grow much faster without competition. This allows the doe to "nurse down" so that she isn't suddenly without bunnies to nurse, which could cause mastitis, or hardening of the breast tissue and possible subsequent infection.

The transplanted young bunnies will nibble for a day or two, and then suddenly start eating with vigor. It's a good idea to press the water nipple a few times each day for the first three days until you are sure that at least one bunny is taking water regularly. The others will learn very quickly! Actually, observation of the young rabbits will show that most have started drinking water at three weeks. They look very sweet drinking and washing their faces afterwards at that age. If a production animal or a pet is to be selected from the litter, three weeks is a good time to start handling it once or twice a day, for about ten minutes at first, then gradually increasing up to 30 minutes at six weeks old. It's good to return the animal to the cage so it can urinate, otherwise it may learn a bad habit—peeing on you to get put back into the cage!

Understanding animals and selecting a pet

"Do you recommend rabbits as pets?" asked a friend recently. Well, yes I do, but there are lots of considerations. I like rabbits, but I have a great dog for a pet, and a beauty of a singing canary,

which I adore. Really lifts the spirits to hear his throaty song! I also have an aquarium with a few goldfish. They are good for moving meditation. Chickens are great for that, too. More than one person I know calls it "Chicken television." It's fascinating. Very absorbing.

If you plan to have a pet, and will spend a lot of time with the young rabbit, you can take it from the litter to a separate small cage in the kitchen or hall or some other quiet cool spot, at about 35-40 days of age. (This is for larger rabbits—the tiny ones develop slower.) By six weeks, with no handling at all, young rabbits are quite rowdy, will kick and scratch vigorously, and some-times "scream" in fear. Most cannot be truly tamed after eight weeks of age if they have never been touched as babies.

When I lift them out to check them, once they have a little hair, I usually blow gently on each one so they get used to my scent and handling.

Here's a little "trick" for taming a bunny. Remember—they defend themselves by scent marking. Take the little bunny (begin at three weeks old or when-ever you get it as a pet) and rub its face on your face, especially if you are sweaty. Do this every time just before you return the bunny to the cage. This makes your "scent" one that

is familiar to bunny when she is

relaxing in her own space, and thus is a "safe" scent. Rabbits dislike perfume, and I have had very sensible does and bucks freak out and race in circles when a person comes to the rabbitry in a strong cologne or perfume.

One great "handling technique" is called

"BUNNY HYPNOSIS." Here's how you do it: Hold the young bunny



with your left thumb in the center of bunny's chest and the rest of your left hand firmly holding bunny's upper back. With your right hand under the bunny's bottom, roll the bunny over so he is belly up, all four feet upwards. He may begin to struggle in this position. Sometimes you can practice this with a towel over a table, so the table helps support the rabbit's weight, until you are skillful enough to do it in your arms. With the buttocks supported, grasp the bunny around the waist and stroke gently and slowly downward, causing the bunny to elongate. "How LOONNNGGG can bunny get?" I say softly as people watch this taming technique. After two to four relaxing passes, I gradually let the bunny's weight hang from my left hand, and the bunny hangs with eyes half shut. Then I gently swing his hips, and bunny does not notice...he is hypnotized! The people burst into laughter...bunny promptly wakes up and is ready to race away!

This may seem a silly technique, but it really does build trust with the rabbit. If a rabbit will become tame, this is one good way to do it, because all rabbits nurse on their backs, and it is their

most vulnerable position. Probably one cannot use this system with an adult rabbit. I have never tried, because most are far too defensive and scratchy.

If you want something to pet, a rabbit is nice but probably won't come when called, you will usually have to get it out of the cage. A few people have been able to let them run free without problems. Most people keep them in a well-fenced yard, with a protective cage on ground level. Some feed bunny at night and lock him in, and some bunnies will come if it is routine. Others are loose, and that is that. Goddess help you if you have roses!

Rabbits love roses, eating thorns and all. They chew all young fruit trees, eating the bark like candy. For the indoors, the biggest hassle: They EAT plastic, including computer cords, telephone wires, and anything else at their level. Sometimes they get electrocuted, or get constipated and die, in addition to ruining equipment. Biggest advantage: rabbits train easily to a litter box, as they are very scent oriented. Also, their treats are certain fruits and veggies that you have around, thus are inexpensive and convenient. And they are vegan, so do not require the inefficient meat industry to produce their food.

If you had a six-week old puppy, kitten, and bunny in a large empty room, and a human sat down in the middle, within an hour (even if totally unsocialized), the puppy would be on your lap; the kitten would be if the puppy wasn't. Days later the bunny would still be hiding in a corner. Rabbits are a lot like birds.

If you condition a bird by feeding and repeated handling, especially when it is young, you can get it to sit on your shoulder, eat from your hand, do various tricks. Most birds will NOT do that with someone else. They are conditioned to the sight, smell, touch, and voice of the trainer. Rabbits are like that too. Basically they want to eat, f**k, and be left the f**k alone! It never ceases to amaze me when people come to my home, and go up and tap on the canary's cage and say, "HI HI BIRDIE" and the bird is freaking out, banging his head on the cage wall and fluttering. Sometimes the person says "What's the matter with your bird? Hey bird, CALM DOWN!" As if the bird speaks English and will listen to some stranger giving orders! Just amazing ignorance.

For birds, and rabbits too, direct eye contact and relating face and body directly towards them means that YOU are a predator and plan to eat them. When I go to clean the bird cage, I approach slowly and quietly, not looking at the bird, and not talking much either except very softly. "Hi Tweety, Hi Tweety. Just changing your cage paper...it's okay," because he is accustomed to my voice in normal tones. It is the most common sound he hears except water running, which he loves, bursting into song from the high notes of the pipes rushing. Eye contact works the same with chickens too, but they have quite a few words of language which one can learn to speak. My children at daycare are learning a few words of chicken. Manuel came back this week, having given the chickens cantelope seeds (a big favorite) and I asked "Well, what did they say?" He replied "They were happy, and ran over and said 'Awww ta dut dut dut too'." (Kind of hard to write chicken! Never tried it before!) That phrase means "Hey looky, great things to eat," and is usually said by the rooster if he is there, or by the senior hen in any group.

For ten years I sold pets under the name "The Bunny Trading Club." People could buy a bunny for \$15 with a small bag of food. (You can't switch foods real fast, especially with babies, it's like formula.) Before bunny was six months old, it was

returnable and a new bunny could be had for a five dollar trade-in fee. KIDS LOVED THIS! The small child loves the baby bunnies. Parents get attached to the known individual, but the kids would say "Bye-bye Georgie" to the old rabbit and march off with their new friend. The parents could ALWAYS give me back the rabbit, even years later, which everyone said was a great advantage if they had to move, or go on a long vacation. This avoids the animals being "euthanized" or worse, being turned loose in the wild "...so they could have their freedom." That means these domestic creatures die a terrified death from dogs, cats, raccoons, hawks, foxes, or automobiles. They are the lowest in the natural food chain, even with their 18 razor sharp claws, because they get scared very easily, and die really fast.

A very convenient thing about a rabbit pet is you can take a rabbit in a cage to a friend's porch when you go away, and it just requires feeding and watering 2-3 times a week. This is WAY LESS hassle than cats, and much less time than caring for dogs.

One other tip about selecting a pet. The largest, most beautiful rabbit is often the most dominant, and the least likely to make a good pet. The shy little runt is usually a far better choice. Pick up the rabbits, handle them, watch how they behave with another person, and select by feel and behavior, not by appearance. (Hmm...this is good advice for any relationship in my opinion!)

Raising fryer rabbits for meat production

After the young rabbits are caged by themselves, they will still behave as a litter. If you are weaning several litters at a time, you may want to "sex" and separate the rabbits at weaning, bucks in one cage, does in another. Because if the litter develops quickly and you let time slip away from you, you can have a few very young does pregnant at four months old. Also, the young animals will be very rowdy and the bucks will be fighting by that time.

Young rabbits should be fed nearly "free choice" which means there is feed in front of them most of the time. Some people say feed less, and feed twice a day, but I had the best fryers and I fed once a day and packed the feeders full, and the bunnies "dressed out" at three to three and one-half pounds of clean, pink, meat at about 12 weeks old.

Here's the amazing protein production statistic:

One mature female rabbit produces a litter in 30-31 days. A litter of eight can yield 28 pounds of clean, all-white meat in just 12 weeks of growth. (The animals themselves will weigh over five pounds each.) Therefore, a ten-pound doe can triple her body weight in edible protein in just four months! Rabbit meat is higher in protein, lower in cholesterol, and the highest known source of zinc besides oysters. I'd like to know if anyone has any protein production figures that equal or top this, thanks.

Specifics for the small rabbitry

In all cases below, animals are on the Edstrom water nipple system, which means you only need to put in pelleted feed.

In a large commercial rabbitry, which might contain 200-1000 working does, modern methods in use include a spray water system below each cage which removes all urine and droppings once an hour. The resultant nutrient-rich water is piped directly to adjacent agricultural use. One other system has large trenches under the rows of rabbits, where red worms thrive and are sold as a separate business. A front-end loader is used to handle the worm-filled manure. I don't know much about the capital

investment or the profits from such businesses, but there are plenty of books and the ARBA magazine for advice at this level. That's the American Rabbit Breeders Association, PO Box 426, Bloomington, IL 61702 Email address: arbapost@aol.com.

About numbers: I had about 25 working adult does and 5-7 bucks when I had my little farm near the coast in Northern California. It took about 50 lbs.—one bag of food a day to keep them all. I made about \$100 a week from them, sometimes more if I sold breeders or pets (the famous "BUNNY TRADING CLUB" was beloved of the local children there. Once, it was even on local TV at Easter time!)

Right now I have three does, one senior buck, and one younger buck. This is a family-sized rabbitry. I just started this rabbitry in March of 2001, searching around for my old stock. Luckily a friend had quite a few. I check my rabbits three to four times a week, filling their feeders full to allow free choice feeding. Many people feed their rabbits twice a day, in very small amounts, to keep track of their production costs and how well the animals are eating. I value my time, so I just fill up the feeders.

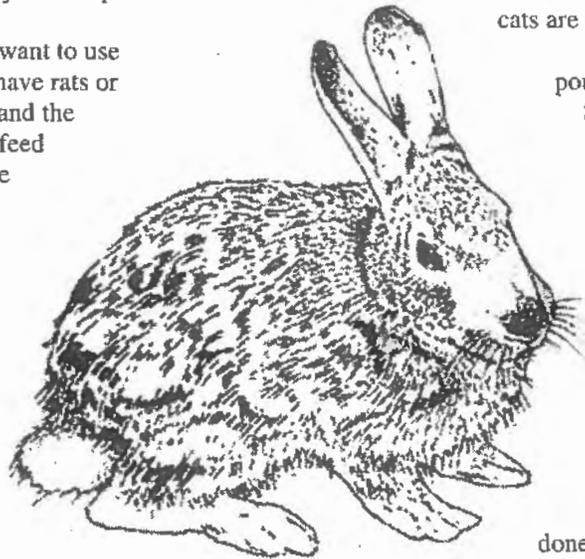
There are times when you might not want to use my system. One reason could be if you have rats or other predators competing for the food, and the other is if it is raining a lot, because the feed can get damp, lose nutrition, and become unpalatable to the rabbits. Rabbits will not eat dust, so it's good to use the drop feeders with wire mesh bottoms, so that the dust falls out and the pellets roll down into the feeder inside the cage. A great way to keep the feeders dry is to hang an empty feed bag over the outside. Feed bags have a very thin layer of plastic in between the layers of brown paper.

I keep excellent track of breeding days, usually by keeping a marking pen and a roll of two-inch wide masking tape handy. I write a note every time I put a doe in with a buck, with the date clearly marked. Nest boxes go in five days before birth. Be sure to get the correct size box. The doe must have room to turn around without stepping on the bunnies. I place about three to four quarts of pine shavings in the nest, which is one to two inches deep in the bottom of the box, and two big handfuls of straw, any kind. Never use redwood shavings or redwood resting boards or make nest boxes from redwood. It is toxic to rabbits. They love to gnaw on wood and eat fruitwood twigs and saplings as a natural part of their diet.

Be very careful not to let curious people "check" to see if the baby bunnies have come. The does get very nervous. Only the regular person should be near the rabbits when bunnies are due. And for the next ten days until the eyes are open no one else should touch them. I do sometimes allow a child, sworn to silence, to peer into the nest box, filled with fur and moving gently. The doe pulls all the fur from her nipples and leaves them nude so the bunnies can nurse. She sometimes will rip fur from other parts of her body, until the box nearly overflows with fur. Do not remove any of this, unless temperatures are very high, 90° F. In fact, if you know of an upholstery shop, buy a few pounds

of kapok, which is a kind of pillow stuffing from the inside of a kapok tree. It is the best substitute for fur, in case it gets very cold or the doe fails to pull enough fur.

About sanitation: This takes less than two hours a week. Do not allow matted hair and urine or wet droppings to build up anywhere. Use a wire brush to clear away accumulations. Brush the cage floor from both sides. Use water and a wide paint scraper if the buildup is too much for the wire brush. For a really messy cage, put the rabbit in a holding area and scrub the entire cage with soap and bleach, then rinse thoroughly. Generally, healthy animals do not have these problems. Often a temporary case of somewhat wet droppings can be fixed by giving the animals a handful of clean straw, which adds fiber to the diet. A rabbit with consistent diarrhea may be seriously ill, possibly with "wool block" which happens more with long-haired animals, and is similar to furball problems in cats. By the way, one strange bit of information: any medicines that are good for cats can also be used on rabbits, such as ear mite medicine, etc. It's odd because rabbits are completely vegan, and cats are carnivores.



Selling three large fryers, about ten pounds of cleaned meat, brings about \$35.

So selling three of them can cover feed costs for about six to eight weeks, at \$9 for 50 lbs. There will still be plenty of meat to feed your family, and an occasional pet to sell. Financially, this is the most economical way to raise domestic meat. It is also the most land-conservative, both from the small size of land used to house the animals and the amount of acreage needed to provide food for this valuable source of protein.

With research, which I hope will be done in various Permaculture enclaves all over the world, we could determine just which plants to feed for creating a completely recycled system, needing no cash money at all, past equipment costs. The best hint I have so far (from Bill Mollison) is that the fiber plant called kenaf (seeds available from Texas International Kenaf Center) contains adequate nutrition and needs no preparation at all. The leaves, stalks, and flowers are simply cut and placed in the cages. I have not had opportunity to observe this however, so I don't know from personal experience just how this fresh food system affects rabbit production and general health. Comfrey can be fed to rabbits as a supplement, though not as a staple. Small pressed blocks of alfalfa are fed by many rabbit raisers, and give rabbits something to gnaw on.

Please share new information about rabbits, especially relating to permaculture. If enough people send me information, I will start an email update quarterly. Also, we could share information about who has rabbits in various locations, and help design a working rabbitry near each permaculture course location. Δ

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REVIEWS

Around the World in 80 Ways review by Peter Bane

GUNTER PAULI

UPSIZING:

The Road to Zero Emissions, More Jobs, More Income, and No More Pollution

Greenleaf Publishing, 1998.
Aizlewoods Mill, Nursery St.
Sheffield S3 GG8, U.K.
222 pp. paper. illustrated.
ISBN 1-874719-18-7

Like Phineas Fogg in Jules Verne's novel about globalization, Gunter Pauli has undertaken to do the impossible in less time than anyone can imagine. This text and a small host of his other hastily written tracts form a series of trial balloons sent up, up, and away toward the celestial regions of global capital in hopes of snagging the attention of the world's economic movers and shakers. The intriguing title of the book remains somewhat enigmatic, however, even after 222 pages. It refers to Pauli's conception of eliminating waste by turning unused production materials and process energy into new products. The publishers presumably added the subtitle to clue potential readers into the book's subject matter.

In the author's words: "Humankind cannot expect the earth to produce more. We must do more with what the earth produces." This is a succinct statement of the economic dilemma facing humanity. We have reached or already exceeded the global limits of primary resource extraction, yet human populations, and even more, standards of consumption continue to rise. What is to be done?

This book outlines some early steps toward industrial transformation. Pollution can be avoided and new jobs and profits created by capturing economic values presently going out the tailpipe of industry. Others, Harden Tibbs and Paul Hawken among them, have written of industrial ecology in a similar vein. Pauli's approach, however, places primary emphasis on applying concepts of biodiversity to industrial processes. Using first mushrooms to breakdown lignins in spent brewery wastes, then earthworms to digest spent mushroom spawn, and finally fish or livestock to transform the worms into protein for humans, he sketches the shape of a basic agro-industrial "refinery" that could be set up almost anywhere on the globe. He gives examples

where this has been started in Fiji, Namibia, and Sweden. Interestingly, Pauli draws his examples from agricultural processing industries and from marginal regions of the world, territories Permaculture readers will find familiar. He, like Permaculture, has found these backwaters more receptive to new ideas than the cosmopolitan regions of the global center.

The concept of linking yields to needs of the system will be very familiar to readers of this magazine. Matching the outputs (wastes) of one industry to the inputs of another is a requirement for eliminating pollution while creating further economic value. It also requires the application of the first Permaculture principle: relative placement for beneficial function, translated by Pauli as "industrial clusters." In the above example, beer represents only 8% of the volume of material required to produce it. The remaining 92% is essentially thrown away. Therein lies the way through. Make money on the discards. Ruthlessly. Doing so, says Pauli, demands that we draw on more of the diversity of life, bringing earthworms and fungi out of the dark and into the center of commerce.

The same principles can be applied to palm, coconut, sisal, rubber, or any of the other plantation industries which have mushroomed in tropical countries over the past half century. Sisal can't presently compete with petrochemical fibers for rope making, yet when analyzed, "wastes" of sisal processing prove to be rich in citric acid, furfural (a kind of alcohol with industrial applications), and more that can yield many times the economic value of the "primary" product. Pauli points out the irony that the petrochemical industry has done the most thorough job of recapturing its own wastes and converting them to products of any industry in the world. The molecular dexterity of oil refining has propelled it to the forefront of the modern economy. The same kind of thinking could transform more traditional sectors.

Coconut and palm oil processing, now taking place on huge tropical plantations (up to 100,000 ha) have the potential to yield economic quantities of vitamin E worth as much as the oil crop, yet the extraction processes themselves are mired in antiquated methods. Coconut, for example, is still dried into copra, wasting its wealth of antioxidants because, when it first became a commodity in global trade a century ago, processing took place in the industrial regions of Europe and America. Copra was then a necessary intermediate stage to preserve the material during ocean transport. Today, copra isn't needed anymore, but because these secondary products (vitamin E, citric acid, etc.) have neither been recognized nor valued, no thorough redesign of the extraction process has ever occurred.

Amory Lovins made his reputation cutting the Gordian knot of industrial stagnation by this kind of analysis: negawatts—energy saved

not doing unnecessary work—have become a near household word among educated Americans. Gunter Pauli, a flamboyant Swiss entrepreneur, bears comparison. Trained at INSEAD, the high-powered European business management school, he was President of Ecover, the Belgian detergent company which made such a splash in the early 90s with bio-friendly dish soaps. Pauli, 42 when this book was written, has leapt beyond his early career into broader perspectives. He now uses the Ecover model as an example of Northern hubris and the same business-as-usual that has created so much of the ecological crisis.

Ecover makes biodegradable dish soaps from palm and coconut oil. While this helped in some small way to clean up European and American rivers, the product represents only 5% of the biomass used to produce it. For every bottle of "green" detergent sold in Europe, bushels and bushels of plant material and process waste are discarded in Indonesia and Malaysia. Pauli is determined that the world should no longer content itself with such shallow solutions.

We welcome all sincere contributions toward transforming the global economic system: it's seriously in need of change. But Pauli is not a guru to be followed, nor is this book a blueprint of the future. The author is a globetrotting whiz kid with a big ego, even though his respect for culture and biology sets him apart from most of his American counterparts. Pauli writes in continental business-school English, a jargon with little linguistic restraint and no grace. The book is laden with gibberish that masks a prodigious intelligence: "The subsequent results of the re-use as value-added study are similarly examined for process excesses that will continue to boost returns autocatalytically through a complex, but very enriching network of feedback loops." Examples are repeated ad nauseum—we hear about Ecover's mistakes in detail at least four times. We have to wonder who edited this text.

Though the author's ideology is correct—model nature, eliminate waste, link outputs to inputs, examine the details of process to see how to do this—he is hampered in his attempts to articulate a system for implementing his ideas by an inadequate understanding of the core model, ecosystems. The 20 principles of what he calls "Generative Science" are—excepting the quote in paragraph two above—nearly worthless. Tables of data in the book are incomprehensible, confusing, or superficial.

I believe Holmgren and Mollison have made not only an earlier, but a more useful synthesis of ecology and design than Pauli offers here. This author's insights are most interesting when he addresses the underlying issues of power and culture, about which the Permaculture analysis has less certainty. To an American reader, Pauli's near total dismissal of U.S. business and culture is telling. Its strategy

of downsizing has been a dead end and forms the very antithesis of this book. He refers to the extractive industries now being established in SE Asia as "cowboy economies." Clearly he doesn't expect the U.S. to take a lead in putting his ideas into practice. And he sees Europe's largely family-owned small and medium enterprises as far too conservative to adopt the innovations *Upsizing* prescribes. He holds out a carrot to the new plantation pirates who have carved fiefdoms from the rainforest, and he particularly praises the Japanese, whose big business groups have attained a kind of transcendent corporate identity and foster the kind of innovation-positive culture he believes can make his recommendations happen.

Pauli points to interesting trends we should want to watch, among them the development of distributed intelligence—something he calls Immunity Management (because it models the

body's immune system, not its brain), and the effect of the Internet to increase access to information and therefore make markets more efficient. His proposal to institute free trade in organic agricultural goods is novel and might succeed except that it won't get the attention of policy makers who rightly mistrust organics as subversive of the reigning economic powers.

Pauli is a perplexing character, part privileged "enfant terrible" whom one might expect to encounter on the ski slopes, part homeless waif, a man in a sense without a country. European in his appreciation of culture and biology, American in his trans-cultural perspective, successful in business, but too much a maverick to be accepted in the ranks of Europe's elite, he seems to be going where the weather suits his intellectual clothes: to the Third World, where he's playing to the new billionaires, and to Japan, where he thinks

the business culture and the pressure on land and raw materials will make his arguments more attractive. Creative but not consistent, the book flatters, persuades, threatens, teases, cajoles, exhorts, and shames the economic powers in an attempt to get their attention. Look, it says, you can have your cake and eat it too, but only if you don't throw it away!

Pauli appears to be a fast learner. He's obviously learned from and now champions the work of the Mauritius-born Chinese, Dr. George Chan, whose tireless promotion of integrated aquaculture will be familiar to all participants of the international Permaculture conferences. Despite this book's failures, Pauli holds promise as an advocate of integrated ecological development. We can hope he continues to delve into the nature of the ideas he espouses. △

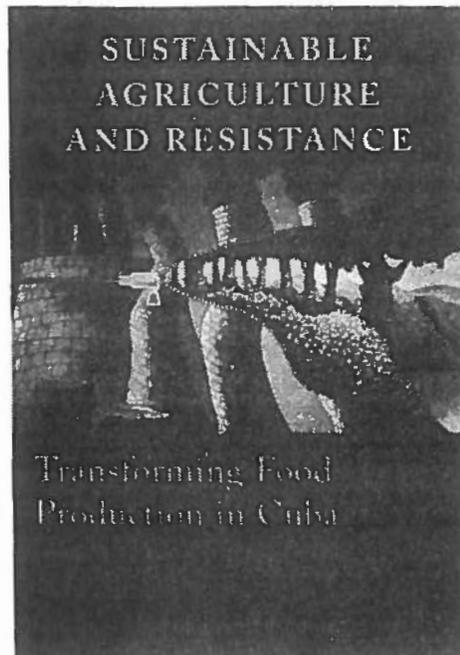
The Future of Farming review by Peter Bane

**FERNANDO FUNES
LUIS GARCIA
MARTIN BOURQUE
NILDA PEREZ
PETER ROSSET, eds.**
*Sustainable Agriculture
and Resistance:
Transforming
food production in Cuba*

Food First Books, Oakland, CA. 2002.
\$18.95. 307 + xx pp. paper. illustrated.

This important book merits wide recognition. Food First have studied hunger and economic justice for over 25 years since Frances Moore Lappe and Joseph Collins published their seminal work, *Diet for a Small Planet*. *Sustainable Agriculture and Resistance* is the fruit of over a decade of careful engagement with Cuban agriculture. Edited by an international team, but written primarily by Cuban scientists, agronomists, and researchers, this book presents in great detail an invaluable case study of large-scale organic agricultural development. Despite the density of information and the technical professional focus of the writing by over three dozen authors, the book is a breath of fresh air in a world maddeningly dominated by corrupt and toxic institutions.

In the Introduction, Peter Rosset and Martin Bourque describe the global struggle against hunger and injustice in terms that will ring true and familiar to all permaculture activists. "Around the globe, farmers, activists, and researchers are working to create a new model for agriculture that responds to the multiple facets of the (global hunger) crisis. The goals



of the model are to be environmentally sound, economically viable, socially just, and culturally appropriate. The Cuban experience presented in this volume offers many new ideas to this movement."

Cuba has much to teach the world, but because of the regressive and imperialistic policies of the U.S. government, that experience has largely gone unseen. I feel as an American particularly ignorant of the reality of Cuban life, yet am aware that most of my fellow citizens are even more blind in this regard. Through its detailed presentation of agronomy and rural sociology, this book goes a long way toward redressing this politically enforced blindness. We see the extensive and democratic nature of Cuban science, serving the commonwealth of the Cuban people rather than the economic interests of wealthy elites. One in 50 of Latin Americans is a Cuban, but of the region's scientists, one in nine. This

striking achievement, together with comparable advances in public health and education forms the basis for what received wisdom claims is impossible: self-directed, self-reliant, and successful organic agriculture meeting the needs of an entire nation without significant use of fossil fuels. These foundational advances grow directly from the commitment of the Cuban government to socialist goals including universal literacy, free higher education, and gender equality. The many photographs accompanying the text amplify our impressions of popular science generating appropriate technology as they show laboratory and field operations, many of them being performed by women.

Discussions of tax policies and credit structures, normally a dry subject, are revealing in unexpected ways. Cuba is today a modern society that was much influenced by four decades of US colonial domination and over sixty years of intimate economic and cultural linkages between the two nations. Thus, despite the 40-year rupture of the embargo, our southern neighbor is shown here to have a substantial heritage of ideas and social and economic elements that will be familiar to US readers. Enterprises contribute to a social security system for workers. Individuals and businesses borrow money from and pay interest to banks.

Land ownership is a mixture of state and private holdings. Several forms of cooperatives link private smallholders into economically more viable units while retaining the incentives and flexibility of owner operation. Land reform following the 1959 revolution and subsequently has transferred ownership of two-thirds of the country's agricultural land to private owners while guaranteeing by law its protection from foreclosure: land may not be used for collateral or speculation, only production.

Chapters on Green Medicine, Ecological Pest Management, Soils, Intercropping, and

Livestock Integration offer valuable detailed information on agronomic, industrial, and commercial developments. For example, we learn of the historic roots and current innovations of the extensive Cuban botanical pharmacopoeia. Interestingly the embargo and antipathy of the United States played a key role in stimulating interest within the Cuban armed forces to study the possibilities for home-produced, simple, and effective medicines that would be needed in the event of complete economic isolation. This research allowed the rapid growth of a successful green pharmaceuticals industry when the country underwent the economic shock of the "Special Period."

Case studies within the book present stories of the growth of urban agriculture and the transformation of the sugar industry to produce valuable processed foods, animal feeds, fibers, and energy.

Almost every page of this book has fascinating and thought-provoking information. Well-designed tables are used throughout and give added statistical detail to this rich picture. Unfortunately for the hope of its broad dissemination, the density of the text precludes casual reading. Though the story is of immense import for the world and its human dimensions are dramatic, the writing itself is professional, and mainly dispassionate and impersonal, placing the book's accessibility somewhat at odds with its authority. This criticism is small and the serious reader will not be deterred. Extensive references, a list of acronyms, a directory of authors and institutions, and a thorough index support repeated use and extension of the text.

In 1959, Cuba diverged from the capitalist model of development. US policies drove it into some decades of dependence on the economic support of the Socialist Bloc. But in 1991, collapse of the Soviet Union and the loss of its oil subsidies thrust Cuba cold-turkey into the post-petroleum era. The earlier investment in human capital gave it the reserves on which it has drawn to create an ecological society, and without which it would, in the face of severe challenges, have likely collapsed. This is an invaluable lesson in real economics, completely contradicting the propaganda published in the daily and business papers of the U.S. Transforming labor, land, and capital to conform to the needs and possibilities of the Cuban countryside and its people, this valiant society has, unexpectedly, shown the world a desperately needed path toward a humane future.

In his summary chapter, Richard Levins, writing of Cuba today, portrays a vision of that future:

"A mosaic pattern of land use is developing in which each plot of land contributes direct products, but also contributes to the other plots: forests give lumber, charcoal, honey, and nuts, but also shelter many species of wildlife,

provide refuge for the birds and bats that consume pests, regulate the flow of water (thus reducing the dependence on fossil fuels to pump irrigation water), serve as wind breaks and barriers to the spread of pests, and create special microclimates at their edges to a distance of about ten times the height of the trees. Pastures produce the usual livestock products but also retard erosion as compared to row crops, collect manure, offer a diversity of nectar sources for bees and for parasitic wasps that infect pests. Livestock graze on the weeds

Shower with a Friend Review by Peter Bane

AMY VICKERS *Handbook of Water Use and Conservation*

Waterplow Press, Amherst, MA. 2001.
PO Box 2475, Amherst, MA 01004-2475
www.waterplowpress.com
446 + xvii pp. hardbound. illustrated.
\$99.95

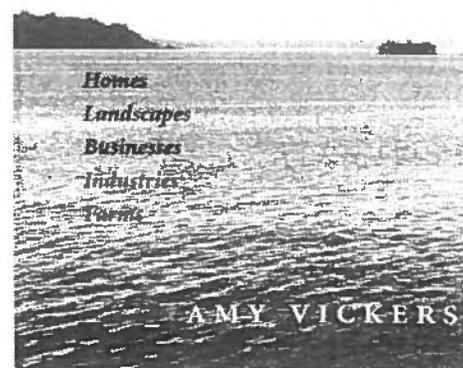
Wags have often said that P.A. Yeomans' *Water for Every Farm* is the driest book on water ever written. Aimed at the professional market, Amy Vickers' *Handbook of Water Use & Conservation* is quite the opposite. Because this is essentially a book about economics and engineering, two subjects guaranteed to bring a glaze to the eyes of most lay readers, you might think it would be dull, or worse, myopic. Not so this splendid handbook. If you're looking for information related to water, it's probably here, and it will be well displayed, illustrated, clearly described, and annotated. This large-format reference work has everything the discriminating reader, scholar, or professional could want. Furthermore, it's comprehensive, thoughtful, professionally circumspect yet supportive of new ideas and appropriate technologies, and spiced throughout with a lively sensibility which shows itself most conspicuously in the piquant quotes from unexpected sources found in the wide and graceful margins: from Rachel Carson to Bill Shakespeare, to Margaret Roach, the garden editor of *Martha Stewart Living*—Vickers has them all talking. This is likely to be the definitive North American resource on water systems design for quite some time.

Amy Vickers, whose pert and youthful face adorns a prefatory page about the author, has been a pioneer in water conservation for more than a decade. She wrote the water efficiency standards for plumbing fixtures adopted by the U.S. Energy Policy Act of 1992, and four years earlier had authored an amendment to the Massachusetts Plumbing Code requiring 1.6 gallon per flush toilets. This was the first such state statute and was copied by 16 other states before national legislation mandated that

of fruit orchards, and so on. Farming takes place in the countryside but also in suburban and urban areas where it ameliorates the harshness of the city landscape, brings perishable foods closer to the consumers, provides jobs, and strengthens the neighborhood-sense of community."

Now, realize that this is happening by conscious design and with the full and organized support of the Cuban government and society at every level—90 miles from Florida. Then look about you and weep. Δ

HANDBOOK OF Water Use AND Conservation



standard in 1994.

The book is organized into six sections beginning with a brief introduction called Planning Water Conservation Programs. Subsequent sections cover Residential and Domestic Water Use and Efficiency Measures, Landscape, ICI (Industrial, Commercial, and Institutional) uses, and Agriculture, while the final short section assembles resources, references, and access to further information. The text is handsomely designed, with graphic features on most pages. Tables are numerous, easy-to-read, and well-placed.

Vickers makes a logical presentation of the case for water conservation, and backs it up with a thorough set of choices in technology, materials, processes, and behaviors. While she covers the waterfront, so to speak, of technical choices, she tends to emphasize those strategies, such as low-flow toilets, which will achieve the greatest overall reduction in water use by the largest number of consumers, over those, such as composting toilets, which, while even more conserving of water, may be more difficult to adopt. This pragmatic but fair-minded approach is consistent throughout the book. And who can argue with success: by replacing a million older units with low-flow toilets, New York City completely eliminated a projected need for new investment in water

supply, and saved \$1 billion on wastewater treatment facilities.

I liked this book. When you realize that water is arguably the most serious limiting factor to the development of human societies over the next generation, it is easy to value the

well-researched information in this seemingly expensive volume. As I tell my design clients, "I'll probably save you more money in the first 30 minutes than you'll spend on my fee." Conservation works that way. Seen from another perspective, the alternative to adopting

this book's recommendations may be war, famine, and ecological catastrophe, even for the relatively water-rich nations of North America. It's hard to imagine a more timely or practical book. △

More than a Duck Review by Steve Diver

TAKAO FURUNO
The Power of Duck:
Integrated rice & duck farming
Tagari Publications, Tasmania. 2001.
\$24.00. 94 pp. paper. illus. large format.

This book is really impressive for its summary of this sustainable farming method, but also for the creative farmer-friendly layout with crop calendars as to "when" you perform interseeding of cover crops, etc.

It is as if Furuno and Tagari sat down and did a permaculture design on how to present information in a book format. It is laid out so well that it is easy to follow, even though rice-duck integrated agriculture is fairly complex when you think about it. It's got plenty of illustrations, tables, and photographs.

Weeder geese generated a lot of interest in the early 90's. One time I was digging through the university library to find information on this topic and I came across a curious blurb about "Agaimo ducks" as biological weeders in addition to weeder geese. Well, this book is about the Agaimo duck, the work bird of the Orient.

Here's a few book descriptions I found on Google.com

• asahi-net.or.jp/~it6j-wtnb/

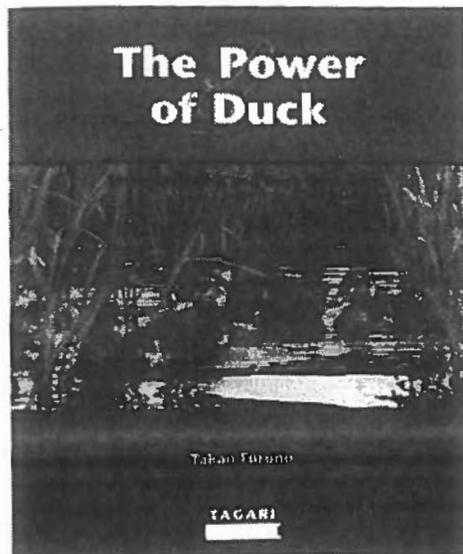
PowerDuckChapter.html

• ecwa.asn.au/info/news0104.html#Duck

• www.5b.biglobe.ne.jp/~Aigamo21/

Furuno%20book/Book1.html

Quack, quack... △



Permaculture in the Alps Review by Peter Bane

VIDEO: *Farming with Nature:*
A case study of successful
temperate permaculture
Crystal Lake Video.
Hagelberg, Germany. 2001.
www.crystal-lake-video.de
\$21.95. VHS. 37 minutes.

Sepp Holzer is an unconventional farmer in a very conventional region of Austria. His 110 acres in the Lungau valley near Salzburg grow cherries, figs, and even lemons at altitudes where one would expect only conifer forests (3,300-4,900 ft.), and on slopes the European Union deems too steep for agriculture. Despite scorn and opposition from government authorities he has persisted for 40 years in transforming rugged mountain terrain into a Garden of Eden, acquiring additional land to expand his original 18 ha (44.5 ac) family holding. Building ponds and terraces with earthmoving equipment, he reshapes the landform but never again tills the soil.

This video documents his successes with a host of methods familiar to permaculture: mulch, swales, ponds, south-facing stones to develop microclimates, foraging animals, keen observation, and multiple yields in a small area. With his wife Vroni, Sepp has embraced Permaculture principles and has successfully overcome opposition to create a kind of mecca for students of sustainability. Emphasizing both the unique aspects of their land design and a kind of agricultural tourism, the Holzers give seminars and tours to city folk and ecopilgrims from far and wide.

The footage in this short film is of good

Farming with Nature

A Case Study of
Successful Temperate Permaculture



A visit to the Farm of Sepp and Veronika Holzer:

The Krameterhof in Lungau

an EXPO 2000 Project for Austria

quality with many lush floral scenes and breathtaking alpine vistas forming a backdrop to the garden. The film opens in snow with Holzer's Chiropodia pigs (a traditional Croatian breed) rooting for turnips, and unfolds through the seasons of the year. The sound quality is good and we get a full look at the farm. The editing might have been a bit crisper by shortening some of the long pans of willowing wildflowers, which though beautiful, don't edify enough. The narration is in clear, British-accented English, and the musical accompaniments lend a graceful note.

This obvious success story is well worth seeing for its inspiring beauty and for the dramatic evidence that conventional agriculture offers but a feeble and pathetic reflection of the potential productivity of land, a richness we can tap with the imagination and intelligence of permaculture design. △

Bubbling in the Dark review by Peter Bane

SANDOR ELLIX KATZ
Wild Fermentation
A do-it-yourself guide
to cultural manipulation
Self-published. Liberty, TN. 2001
\$5. paper. 32 pp.

There is an upwelling of interest in traditional and fermented foods as the try-

anything-once generation of the 60s slides into the more demanding years of middle age. Fad diets have worn thin, vegetarianism has left people too hungry, and the horrors of modern medicine loom larger with every passing year: it's time to figure out how to eat!

Sandor Katz writes for none of these reasons, however, but from a passion for all things wild. Ferments are a splendid and mysterious hybrid of the wild with the cultivated, allowing us humans—an edge species if ever there was one, to indulge in them and at the same time gratify our deepest urges to explore the pleasures, temptations, and richness of that sublime boundary. Writing in a

delightful and sparsely intelligent style, Sandor gives us in this small pamphlet, a taste of his larger work to come, and a primer (with recipes) in all the basic ferments: sauerkraut, miso, bread, wine, vinegar, yogurt, buttermilk, sour cream, cheese, tempeh, brine pickles, even compost! And for good measure he includes a few exotics: kimchi, injira (an Ethiopian skillet bread), chocolate, and, well, I won't tell you everything. You should get this booklet for

your kitchen shelf.

The author, whose early years were spent sampling the international smorgasbord of New York City, and who later tramped across Africa from village to village picking up more material for his memoirs has, impressively, tested all of the methods and recipes he presents.

The sanitized American society of the 50s, when many of us were tots, has come seriously unstuck in recent decades from lots of

agitation, a cultural ferment—generally a good thing. Of course, reactionaries are working overtime to stuff the genie back into the bottle as we speak, but between you and me, I don't think the stuff can be capped—not anyway if we know how to harvest the wild energies all around us to transform food, life, ourselves. Take this book and start the revolution at home. It's time more of the dark, bubbly, and zesty things came out of the closet. Δ

I Did it My Way review by Peter Bane

TONY WRENCH

Building a Low-Impact Roundhouse

Permanent Publications, 2001.
\$14.95. paper. 108pp + xii.
b/w & color photos, drawings.
ISBN 1-85623-019-8

Tony Wrench is a maverick musician and communitarian living on the fringes of British society. This book describes his process of building an appealing, low-cost, mushroom-shaped "den" of poles, cordwood, cob, turf, and recycled materials on a sensitive site in west Wales.

Paying homage to Ken Kern, whose *Owner-Built Home* fired the opening salvo of the post-modern self-build revolution, and to the cult classic, *Shelter*, which brought awareness of traditional building methods to the West 30 years ago, Wrench lays out the story of his own research into and creation of an original 21st century British vernacular dwelling. In doing so, he tells us gobs about his life.

The author lets us know early on that, "this is about doing things that are not regulated and predictable." He confesses that the book may be as much historical document as builder's guide: its subject was put up without planning permission and might yet be demolished by the authorities. For his sake and for the sake of a broader transformation of building practices, we hope not.

Tony and I have never met, but he sounds like someone I'd enjoy knowing and who'd be a lot of fun at a party. He seems to be blessed with good friends, 20 of whom helped him put a turf roof over the wooden frame of this house one fine October day four years ago, and it's not hard to imagine why. His writing style is intimate, easy-going but thoughtful, and he doesn't take himself too seriously. Giving lots of detail, popping in shots of humor, and peppering a very "ethnic" text with plenty of photos of himself, his partner Jane Faith, their cat, their bathtub, their musical instruments, and composting loo, he makes you feel right at home: pull up a chair or sit on the floor.

What are we to make of such an exotic and

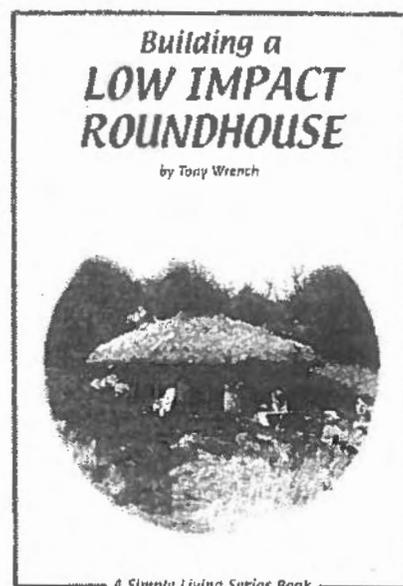
personal story? What does a building this far outside the box have to offer mainstream readers, or even green builders? Actually, for a slender book by a first-time author it tenders quite a lot of value. I read this tale simultaneous to perusing a report on climate change by *The Ecologist* magazine, "Time to act," and the recently published, *Eco-Economy* by Lester Brown of the Worldwatch Institute. There can be no doubt that broadscale action of many kinds is urgently needed to reduce carbon emissions, lower the demand for energy and materials, and meet the needs of a burgeoning world population. Since energy and materials consumption is most excessive in the industrial societies, and a great deal of that goes into inappropriate housing and settlement patterns, we need this and many more stories of people creating their own comfortable, low-impact shelter.

The key-note of Tony's building work is "Low Embedded Energy." His materials, earth, straw, poles, cordwood or "log-ends," come from the site itself or from nearby, with the exception of a few industrial items (rubber, glass, nails, caulk) that extend the value and capacity of the earthy, local materials forming his walls and roof. He goes into the energy costs of the various materials, regretting the unavoidable use of transport, and detailing how an electric milk van helped them get the poles down to their remote site. These are the materials of choice for a sustainable future. We can't afford to house the world's masses or even our own growing populations with steel, sawn timber, and other industrial goods, even where these can be made climatically suitable, let alone ship these materials cross country or around the world. Cheap bulk materials that are widely available must become our staples. We need many new examples of building with natural materials because the knowledge of working with them, once common, is increasingly scarce. Even more rare is evidence of the innovative temperament required to merge these ancient materials with new understandings of solar design and appropriate technology.

A thoroughly non-professional yet experienced builder, the author describes every phase in the life of his house from design through construction of all major subsystems, to occupancy and maintenance. He documents a number of important items of interest to natural builders, including the turf (or living)

roof, and the reciprocal roof frame, a method used traditionally by the Miwok (California) and Mandan (Dakotas) tribes of North America among others, whereby the roof rafters are laid upon each other in a radiating spiral form that becomes partially self-supporting.

This is a valuable technique for creating a large, strong, open circular building



inexpensively. With a lighter-weight roof than the straw-bale and sod covering Tony used, the reciprocal roof frame could support itself without internal verticals. He used two 13-sided "henges" or circles of connected uprights, to spread the weight. (This 13-sided meme seems to be spreading on its own—I'm writing this review inside a similar structure started the same year in North Carolina.) His drawings are invaluable for grasping the concept of this unfamiliar system: words alone wouldn't have done it for me. A small criticism, the reciprocating roof frame requires a vertical prop to support itself during construction. This "Charlie Stick," which by his own admission is the most demanding element of the framing system, is not well explained.

Wrench describes his methods of visualizing the unfoldment of the house and laying its shape out on the ground. Both as a self-builder and as a reader of Christopher Alexander's *Timeless Way of Building*, I

recognize these as essential. You can't really build a thing until you can see it in your mind's eye clearly. Getting inside the author's thought processes inspires confidence that the reader can build in a similar way.

Tony and Jane's house cost them £3,000 (\$4,400), including a high-quality wood-stove with water-heating attachments. That works out to about three dollars per square foot (round foot?), an astonishing accomplishment. To do this Tony used poles from thinning a small piece of woodland he already owned.

Cordwood and cob from local earth made up most of the walls. No cement was used. Unframed, doubled-paned glass went into the windows, while high-quality safety glass bus windshields formed the skylight. With the help of a local electrician a simple inverter was hooked up to a couple of PV panels, a used radiator and some salvage materials made a water heater, and a whisky barrel was converted into a batch reservoir for hot water. The single greatest expense may have been the 40' x 40' rubber membrane used to cover the roof. Scraps from this went into shingles, waterproofing for the rear wall, and various vapor barriers. Willow poles, straw bales knitted together into a mat, and baling twine made up roof and insulation.

Tony tells how he designed and built the house, which parts he did himself and when he had help. The whole project took an estimated 600 person-hours. He includes useful sketches, photos, and descriptions of his home-made electrical, plumbing, and energy systems, the composting toilet (with useful figures for making your own), even the cat-flap! He writes about planting the turf roof. (I found myself questioning the wisdom of letting brambles colonize the sod. He may find trees growing over the house in a few years.) But with few reservations, I learned a great deal from this small tome.

I enjoyed Tony's frank admissions: On the metric/imperial dilemma, "It's a mess, isn't it?" and the life of the house, "This whole building will rot anyway, one day," and was delighted with the distinctly British flavor of his language. Not only does he challenge your dictionary with archaic words like "snedding," "snigging," "haulm," and "henge," but his language reminded this American reader that there's a small world of linguistic difference spanning the Atlantic. I figured out that a "bender" is a tent with bent poles for support, a "JCB" must be some kind of backhoe, but I never did decipher the meaning of "workmate," probably some familiar tradesman's implement. Expressions like, "Eaves are fiddy," or "just pootling around," are clear enough, if not heard often on these shores. They add charm and don't seem to detract much from the utility of the book.

The text is laid in a plain sans-serif type with small margins and minuscule indents and takes on the visual form of a ramble, which in

some ways it is, being a story as much as anything else. There are sectional headings for each part of the process, so one can navigate in this manner, but there's no index, and I found it a trifle hard to go back to many of the things I remember seeing or reading. A serious reader wanting to use the book for reference would be well advised to highlight passages in pen. Sadly, there's not much room for margin notes.

The permaculture literature abounds with information about plant systems, but students at permaculture courses are always asking the question, "How do we apply this design

science? How do we live with this knowledge?" In answer, Tony Wrench has given us a very practical and useful look at a whole household system, how a place to live can be created out of simple earthy materials and recycled scrap from the consumer society around us. Perhaps not all people in Britain or the States could live as Tony has done, but more could than do, and if more applied this kind of ingenuity and thoughtfulness, ours would be a richer, more interesting, and cleaner world. I hope this book will encourage others to build their own low-impact shelters. Δ

Spirit of the Blue Ridge

Review by Peter Bane

CHARLES FRAZIER

Cold Mountain

Atlantic Monthly Press, New York, 1997.
356 pp. cloth. \$24.00

One measure of a well-written book is the pleasure to be gained from reading it over again and again. *Cold Mountain* stands this test well. Charles Frazier has written a beautiful first novel of the Civil War, compellingly authentic in voice and richly descriptive of the ravaged moment, at war's end in North Carolina, where it is set. Drawing from local histories and family recollections he achieves a truly wondrous recreation.

The main character, Inman, is a Confederate soldier escaped from hospital confinement in Raleigh and moving amidst a tide of desperate humanity westward towards his pre-war sweetheart Ada and his home in the Blue Ridge Mountains. Inman is a man without illusions travelling amidst a society cast loose from its moorings. We see his struggles to navigate a devastated world and a rugged wilderness set in counterpoint to those of Ada, an aging Charleston debutante transplanted by

her minister father into the mountains, to hold home and hearth together without a husband, with help scarce, and money almost non-existent.

Frazier twines these two lovers, bound by chance meeting and mythic engagement alone, into an exquisite fugue of remorse, longing, hope, regeneration, and transcendence. Their reunion, so improbable and so necessary, is finally, astonishing.

The treasures of language and of storytelling which the author brings to this splendid tale are fitting introduction to the world he so richly evokes. Scenes of Ada's farm, of an old medicine woman high in the mountains, of Ada's helper Ruby, a feral child of the earth whose practical sense and knowledge of the land are as vast as her vision of abundance: all these and more convey an intimacy with place that few moderns can claim to have known.

I enjoyed this especially because I live in the region *Cold Mountain* transfigures. Literary pleasures notwithstanding, the book is a trove of traditional knowledge from the culture of this place, cut from whole cloth and exceedingly fine. It also models the noblest form of bioregional literature and so serves readers everywhere. If permanent culture is our aim, then this book can help us set our sights. Δ

The Self-Fertilizing Garden

Review by Peter Bane

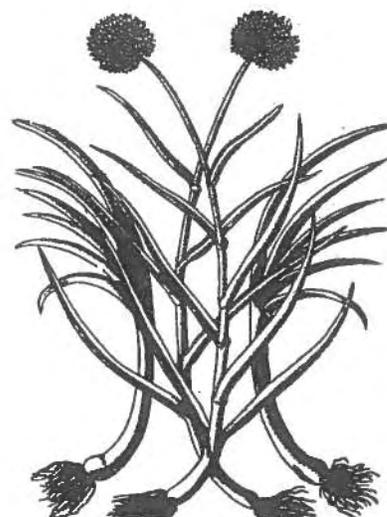
EMILIA HAZELIP

VIDEO: *Synergistic Agriculture*

Permaculture Pyrenees.
Limoux, France, 1995.
distributed in N. America
by Permaculture Activist
available in English, French, or Spanish
\$20.00. VHS. NTSC. 30 minutes.

Emilia Hazelip, a French teacher, author, and organizer, has championed the soil fertility methods of Masanobu Fukuoka and Marc Bonfils along with the design insights of Holmgren and Mollison. For many years she has been a leader in the Permaculture movement in Latin Europe, offering courses in

The Synergistic Garden



Emilia Hazelip

France, Spain, and Portugal, as well as in Canada and the U.S.

In this film, made in her own garden in the south of France, she explains the practical science of soil fertility and how it can be maintained without external inputs. She employs raised beds and keeps the soil mulched, never turning it after establishment, but only harvesting and reseeded according to the season. As she explains, all parts of the plant not eaten are returned to the soil and this forms the basis for accumulating fertility.

A Builder's Guide review by Peter Bane

DANIEL D. CHIRAS

*The Natural House:
A complete guide
to healthy, energy-efficient,
environmental homes*

Chelsea Green Publishing, VT. 2001.
\$35.00 paper. illustrated. 238pp.

This book is a thoughtful and carefully written compendium of advice for building a natural house. It is also an encyclopedia of information about building methods and materials with an emphasis on their environmental consequences. Daniel Chiras is the author of nine other books on science and sustainability and a long-time campaigner for environmental issues. His language is clear and his aim is to offer the reader a good basis for making informed choices about materials, design, energy systems, landscaping, and construction details, as well as for the connections between these elements that make and support the house. If you're planning to build a house and want to incorporate environmental principles into the design, choose healthy, low-impact materials, achieve large energy savings and efficiencies, keep costs down, and make sound decisions that will result in a long-lived, functional, and comfortable dwelling, this would be a good book with which to start your inquiries.

The book begins with an overview of design aims. This is how to set the program for your home. Exploring the meaning of sustainability as applied to buildings, Chiras gives us good information on the environmental impacts of the housing industry. Charts showing the embedded energy of selected building materials appear in later chapters.

This short chapter is followed by an examination of eight major types of natural materials and their elaboration into housing: Rammed Earth, Straw Bale, Earthships, Adobe, Cob, Cordwood, Log, and Stone. A ninth chapter takes a quick look at so-called "emerging" natural methods: Earthbags, Papercrete, Cast Earth, Light Clay, Bamboo,

The film gains much of its strength from Hazelip's personal authority and the evidence of her work. We see a vibrant garden in all seasons and in great detail. The visuals are clear and the narration is careful and well-modulated. The text is intelligent and uses the entire duration of the film. The author's command of English is good (she studied with Alan Chadwick in Santa Cruz, California), and though her accent is strong and the syntax influenced by French (I have only viewed the English version), the narrative can be followed

and Hybrids. The information in these chapters is well-selected, and though not exhaustive, gives a good picture of how these systems work, how they compare in different circumstances, and helps the reader to make further investigations.

The third major section of the book covers systems design: Passive Heating and Cooling, Electricity Generation, Water, Green Building Materials, Site Considerations, and How to Build an Alternative Home. The Green Building Materials chapter covers many modern composite and high-tech materials that offer valuable energy conserving features.

Illustrations are good throughout the book with both line drawings and many black and white photographs of construction details and completed homes. Fascinating margin quotes and good page design make the book easy to dip into and pleasing to the eye.

Written primarily for the owner-builder, this would be a good reference for permaculture designers. Hefty but satisfying, informed by a literary consciousness and a holistic perspective, this book deserves to be widely read. If you're going to build a house, it'll be invaluable.

My colleague Mollie Curry, who teaches natural building at Earthaven, offers additional comments about the book:

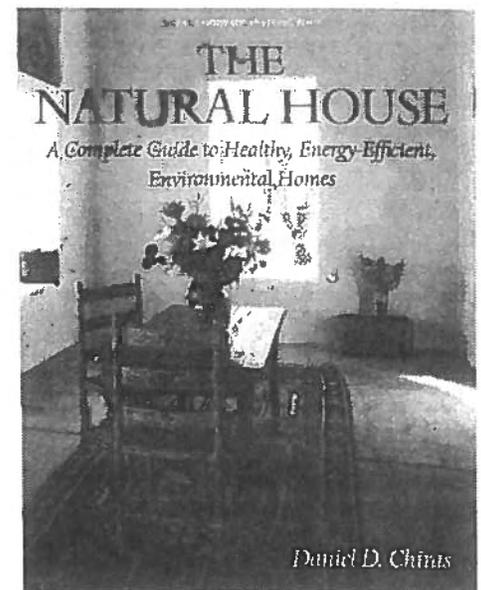
With a chapter for each of the eight methods, the author goes into gratifying depth, giving detail on how they are done, as well as laying out options and requirements for foundations, floors, and roofs. I found the "Emerging Natural Building Techniques" chapter very interesting and was glad he included these options, though I was surprised that light straw-clay didn't get a chapter of its own...

The third section of the book ("Sustainable Systems") basically explains every component of a more sustainable home. I found it especially interesting that he surveys passive and active solar design, alternative electrical systems (solar, wind, and hydro), water catchment, greywater treatment, composting toilets, site selection, landscaping for different

climates, and financing. Chiras supplies good information on these topics and more, he gets across the idea of what an undertaking it is to meet the high ideals of sustainability in today's culture. He seems to want you know what you are getting into while supplying enough information to give you the confidence that it can be done. And you could be one of the ones doing it!

The film, which has been distributed in Europe for several years, is now more readily available in North America as Permaculture Activist has agreed to distribute it in three NTSC versions, English, French, and Spanish. Δ

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Daniel D. Chiras

He also encourages people to do whatever they can, even if they are building a basically "conventional" building. This was one of several moments when I found myself confused about the book's target audience. Clearly Chiras is aiming wide and somewhat mainstream, but I was surprised that he was also apparently addressing people who would never build a "natural house" though might consider some energy-saving or more environmentally friendly materials for a conventional house. On the other hand, he often presented the more radical strategies that some people are taking (around code non-compliance, house size, and financing, for example) without blinking an eye. Despite my sometimes discombobulated feelings (and I'm a person who is already immersed in the natural building field), I think it's great that he lays out the range of alternative building methods and sustainable systems in a way that

is accessible to a wide audience, and all in one book. In fact, I certainly learned things in every section, and consider it a valuable resource for helping me build my own house.

A topic of some discomfort for me was the author's apparent enthusiasm for foam insulation and "engineered" wood. I think there are appropriate uses for these products, but when Chiras addressed their environmental pros and cons, he seemed to ignore the trade-off between their embodied energy and the energy they conserve. Chiras is keen on →

Building on the Edge Review by Mollie Curry

VIDEO: A Sampler of Alternative Homes: Approaching Sustainable Architecture

VHS 1 hr, 55 min. 1998, \$29.95
Hartworks, Inc.
P.O. Box 632, Crestone, CO 81131
www.hartworks.com

This video is not high-production, but it is good. Only live, up-close, and in person beats video, but it would take you quite a bit of travel and effort to cover the ground this video does. Definitely worth the price, though some information is already a bit outdated (things have changed fast in some areas of natural building). Kelly and Rosana Hart cover adobe, strawbale, earthsheltering, earthships, cordwood, ferrocement, papercrete, sandbag buildings, hybrids, and recycled containers and vehicles in this almost two-hour video. The case carries a good index so you can skip to what you most want to see, or review a section without lots of fiddling with the VCR.

We see finished as well as in-process buildings, and get to see and hear some of what the builders as well as the people who live in the houses think about it all. Most if not all of the buildings are in the arid Southwest, which is a hotbed of natural building innovation.

Some of the methods are pretty "out there," which is definitely interesting. On a sad note, when I visited the beautiful catenary arched dome straw-and-clay hermitage in Crestone, CO, water had gotten into the bales. I recommend NOT using bentonite and gravel as a foundation! Most things in this video seemed pretty sensible, though some of it is definitely not suitable outside a desert climate.

I visited the Harts' earthbag/papercrete stucco home in Crestone—it was very comfortable. Amazingly good-feeling and reported to be working very well. The Harts look "normal" while being interested in changing the world—my favorite form of subversion! Write or check out their website to order the video or find out what else they are up to. Δ

energy-efficiency and seems to approve of petroleum-based or manufactured materials for more uses than I would sanction. This is the point at which "green" and "natural" building, which overlap so heavily, seem to diverge.

An appealing aspect of the book is that Chiras himself is an owner-builder with very high ideals about creating sustainable shelter as a way to lessen human impact on the world. He brings in lots of anecdotal and experiential information about his own house-building experience, which helps personalize the detailed text. He is definitely present as the author of the book, in a way that is often enjoyable, though occasionally poses an awkward contrast to the weight of factual

information. The research and synthesis that went into writing this book is truly astounding.

I loved this simple sidebar about different materials' relative embodied energies (the amount of energy used in their manufacture—but not including energy used to transport them, as far as I can tell). It so helps to clarify our choices.

Lumber = 1
Brick and Cement = 2
Glass = 3
Fiberglass = 7
Steel = 8
Plastic = 30
Aluminum = 80 Δ

... from the Regions

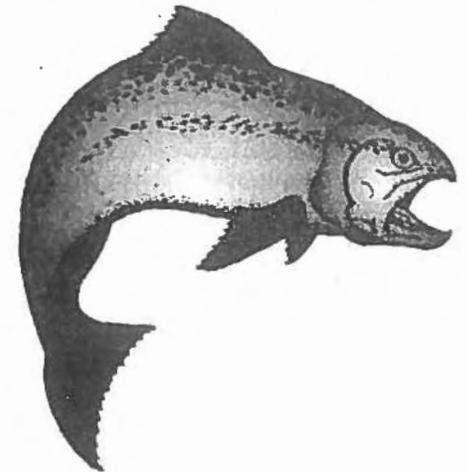
A Watershed Council Success Following the Salmon Upstream

Randy Carey

To live in a place where there are still wild salmon and where the residents see watersheds as a whole system is a blessing. To observe the links between elements in nature can be truly amazing. When we start to see these links, we realize the importance of whole systems design and implementation. When one correctly applies whole systems theory, most of the permaculture principles are present.

Williams Creek flows north out of the Siskiyou Mountains into the Applegate River which in turn flows into the Rogue. The Rogue River travels through the Kalmiopsis Wilderness into the Pacific Ocean at Gold Beach. There are no dams on this entire stretch and Williams Creek has been identified as having some of the greatest potential for salmon recovery in the Northwest. Its watershed is relatively healthy, with most ecological functions intact. A large number of its inhabitants realize the importance of a healthy watershed.

Oregon's Governor, John A. Kitzhaber, set up the Oregon Watershed Enhancement Board (OWEB) about 10 years ago to oversee and dispense funds for watershed restoration. OWEB was formed to establish watershed councils, education and outreach programs, and to set priorities for funding watershed restoration projects. These projects focus on saving endangered salmon populations and improving water quality. The watershed councils must be approved by a government body—such as a County Commission, or must be a 501(c)3 non-profit organization, and should represent many different people from that watershed. On our council, we have a small sustainable operations logger, a cattle



rancher, an organic farmer, an environmentalist, a retired businesswoman, and several small business owners. Agencies such as the Oregon Department of Fish and Wildlife, U.S. Bureau of Land Management, and others participate regularly. The idea is that a voluntary program that makes financial assistance available to landowners will work better than a regulatory process with fines. We are starting to see accelerated restoration efforts, with results on a watershed scale.

In the past, OWEB somewhat randomly gave out funds for what they thought were the better projects. A few years ago, OWEB adopted a process similar to the Permaculture methodology of assessment before design. For example, fifth-field watersheds (40,000-80,000 acres) now must have a completed "assessment" with an "Action Plan" that sets priorities in a methodical way. This is intended to get the greatest effect for the money spent.

The first few watershed assessments presented to OWEB were somewhat narrowly focused on streams and fish. The Williams Creek Watershed Council (WC2) expanded its focus to include inventories of vegetation and animal species other than salmon, measuring sediment from roads, and most importantly, evaluating the uplands of the watershed. Our organization was recognized by OWEB as having completed one of the best watershed assessments to date, and our "Action Plan" is used as a model for the Pacific Northwest.

As a founding board member of the council, I bring Permaculture ethics and principles to the process, and I find that there is a great opportunity in WC2 to draw Permaculture projects into the mainstream. In addition to providing Permaculture counseling and design for private landowners, OWEB has funded many classes and workshops through our WC2 Education and Outreach project where we teach free or inexpensive Permaculture classes to the public. We have sponsored workshops on

- Introduction to Permaculture
- Water and Soil Conservation
- Keyline Principles and Design
- Healthy Riparian Zones and Healthy Farms

Some of the projects we have funded in the last few years have gotten government agencies and the general public to look at whole systems. We have completed several phases of a "Flood Management" project for one of our smaller sub-watersheds. This tends to flood during the winter months with damage to our general store and other local businesses. We have partnered with the County Public Works Department on this project. Traditionally, the County would "pipe and ditch" the water as fast as possible off the landscape, both wasting water and creating huge amounts of sediment. Instead, we have asked them to assist with funding and to participate in a "Hydrologic Assessment" with a design that will restore degraded stream channels, re-introduce wetlands, increase the holding capacity of that sub-watershed, and reduce sediment loads to adjacent salmon habitat. There are many benefits for people, fish, and wildlife when we approach a project in this way.

The same County Public Works Department has transferred an old 40-acre aggregate pit on Williams Creek to the Southern Oregon Land Conservancy. The site, once mined for road gravel, has not been used in over 40 years and had recovered into a mature Cottonwood and Alder forest with braiding side channels for salmon habitat. That land will never be mined again, and a monitoring site for salmon is being established with a long-term management plan to enhance and protect salmon refugia.

In the upper reaches of the watershed, we have been funded by OWEB and the

Department of Environmental Quality (DEQ) to make a sediment analysis of the roads. This will allow us to retrofit the road system using Keyline principles, so that the roads harvest water and reduce sediment. Another very successful project involves riparian tree planting and fencing. Almost 20,000 native trees and shrubs have been planted along the streams, and ranchers have been given fencing to keep the cows out of the streams. Sixty percent of the planted trees have survived, and our monitoring program visits all the sites every two years to replant where necessary. We have also joined efforts with the agencies to replace many culverts and irrigation dams with fish-friendly structures. Most of this is very positive and we remain optimistic!

There are still many challenges and some important areas that need a lot of change. The Oregon State Forestry Practices Act is very weak and is not up to speed with the Governor's Plan. It still allows clearcutting on private

lands with very small stream buffers. Also, some ranchers are reluctant to change their ways so we just have to keep working where we are wanted. Progress is slow yet we feel there is a net gain in watershed health. All in all, there are many positive actions taking place in and for the watershed. As long as we stick to our pragmatic methodology and remain non-confrontational and optimistic, we will have funding and many opportunities to restore our watershed. We can only hope this effort will support the wild salmon runs and continue to give us a clean and sustainable source of water!

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- 1) *Applied River Morphology* by David Rosgen
- 2) *Watershed Management* by Robert Naiman &

Randy Carey is an Organic Farmer, Permaculture Counselor, and founding member of the Williams Creek Watershed Council. He has lived in the watershed for over 15 years. Contact him at williams creek@alpro.net



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... from the Regions

Clever Aid in East Timor

From Black to Green

For almost four hundred years until 1975 East Timor was a Portuguese colony, actually a penal colony. In that year, after Portuguese dictator Antonio Salazar was deposed in a bloodless coup in Lisbon, E. Timor, along with Portugal's African colonies, gained its independence. Only a short time later it was invaded by Indonesia with the tacit support of the U.S. government. The Timorese refused to recognize Indonesian rule, and a guerilla war was waged by the resistance fighters for 25 years. The East Asian economic crisis of 1997 weakened the Indonesian government, allowing the Timorese resistance to increase its efforts. Pressure was put on the United Nations to allow the Timorese to regain their sovereignty. On 30 August 1999 the people of E. Timor voted for independence in a UN-sponsored referendum.

The Indonesian government was extremely unhappy about losing what it considered to be part of its territory. As a result militias organized and trained by the Indonesian military in West Timor launched a campaign of terror in the East. They destroyed 75% of all housing and infrastructure and killed thousands of defenseless civilians. The whole country was trashed and the already poverty stricken population was left desolate. In September 1999 the U.N. intervention force INTERFET arrived, spearheaded by Australian troops. They drove the militias out of East Timor and opened the way for an international relief mission to aid the world's newest nation.

Steve Cran, an experienced permaculture trainer, traveled to East Timor in November of 1999. After seeing the plight of the farmers there, he decided to stay for two years and to introduce Permaculture as a way for the Timorese to help themselves rebuild their food security and infrastructure.

Steve Cran

The island of Timor is a huge mountain rising over three km (10,000 ft.) above sea level. At night as you approach it by sea, Timor appears as a mountain of lightning and cloud—like some angry god. I arrived by high-speed military catamaran in the capital Dili on 3 November 1999, several weeks after most of East Timor had been destroyed by rampaging militias.

After walking around the smoking ruins of Dili for a couple of days I got a good idea what the end of the world would look like. Local people were tense and afraid but still managing a smile when I greeted them. At the market only large piles of kang kong (*Ipomoea aquatica*) which had been cut from the gutters were for sale. The first commercial products to appear in the markets were cigarettes and tinned fish. Maybe you need a lot of cigarettes just after a war. Military from many countries were everywhere. Helicopters were clattering overhead and armored vehicles patrolled the streets. The smell of burning plastic hung in the air.

As luck would have it, I met a wonderful East Timorese man, Ego Lemos, who was an activist in sustainable agriculture.

Before the ballot (UN referendum) the Indonesian military controlled the agriculture sector. Many farmers were forced into buying chemicals from the army. With low literacy levels and no instructions many farmers became sick from the misuse of pesticides and artificial fertilizers. Ego had been working with a clandestine group learning low external input sustainable agriculture (LEISA).

With the help of some UN staff and soldiers we set up a base at Hera, an hour east of Dili. Hera was mostly destroyed, with few houses surviving. In the ruins, as the wet season began, a billion mosquitoes bred, adding further misery to the situation. The mozzies biting you in the daytime gave you dengue fever and at night you got malaria.

The first months were difficult, having our own survival to worry about as well as assisting the community of Hera. Militia were still around. Ego and I registered our own NGO (non-government organization), the East Timor Permaculture Development Institute. Our plan was to train East Timorese with five Permaculture Design Courses per year for two years and to start as many projects as possible.

We had very little money, a few tools, and

an old Toyota Ute. At first most of our energy was spent bringing aid supplies into Hera using a tip truck loaned to us by USAID. We'd drive into Dili and visit all the aid warehouses.

Always on friendly terms with the warehouse managers, I asked them what I could have. Sometimes I'd cut a deal, like sign for 1000 buckets but only get 800 in order to help the guy with missing stock. Weekly we'd harvest sleeping mats, medicine, clothes, tarpaulins, pumps, tools, and food, then race back to Hera and distribute it through the chief, Pedro, to those in need. We'd also pick up pallets, drums, wire, sandbags, whatever wasn't nailed down, and bring it back for the farmers.

Ego and I worked ourselves to exhaustion every day for months. A lot of confusion, fear, and general weirdness affected everyone. Nothing was normal, many people dead or missing and no infrastructure or law.

Despite conditions, we ran our first Permaculture Design Certificate Course (PDC) there. We held it outdoors, and we had 18 students, mostly from Hera. They sat on pallets covered with plastic sleeping mats, and Ego translated while I used a whiteboard given to us by the Australian Army. As I taught, about 10-20 children would sit on the wall and listen in.

You wouldn't say farmers in East Timor were good at farming, as they had been interested mainly in survival. Poverty makes people cruel to their environment. They must resort to stripping the natural systems for their basic needs. We quickly saw that permaculture was just what E. Timor needed. The ethics and principles of Permaculture reminded them of their "Old People's" ways. Hungry for information, the farmers on our courses couldn't get enough.

After our first course I began canvassing international NGOs for sponsorship. At first we used military ration packs to feed our students, but that wasn't sustainable. Then we convinced Oxfam to sponsor eight students at AU\$100 (US\$50) per head. From then on other NGOs began to increase their support. Our courses grew to over 40 students.

In a country where 70% of people lived from the land it seemed crazy that we were the only trainers in sustainable agriculture. Care International hired us to train their field staff. After we trained Care they created 35 farmer field schools.

Here we introduced a new idea. Hadomi Rai, or Love the Land. The farmers were taught basic permaculture and then networked with other groups to share their successes. Farmers training farmers is very effective, and gets results.

Next we trained the government forestry field and office workers. As our training progressed we localized our content more and more. Sometimes in a new batch of students we would have farmers who said "What can you foreigners teach us? We've lived on this land since we were born." By the end of the course

they'd have changed their tune.

Most farmers knew nothing of soils or nutrients. All training to do with agriculture under Indonesian rule missed out on soils. The only thing they were taught was to use artificial fertilizers. Most farmers used nothing as they distrusted chemicals. Liquid manure, mulching, chop-and-drop were all new concepts. The locals thought I was mad when I used seaweed on the garden at Hera.

For a demo we mulched one garden and left an identical one bare. In the midday sun the plants in the unmulched beds wilted, whilst the mulched plants stood strong and healthy. The farmers became very interested.

Pit gardens were a winner. Every dry season begins with a huge burn off. The mountains disappear in a smokey haze and the green of Timor turns black. We showed them how to dig pit gardens instead. We dug 2m-wide pits with a berm around them like a donut, and planted the round raised bed with bananas, papaya, or cassava. We then cut all the grass and biomass that would usually be burnt, and threw it into the center which would be dug about 1.5m deep.

We then calculated on the white board how much money each pit would earn a farmer in a year. When they realized they could turn what they normally burnt into money they couldn't wait to get home and start digging.

Many of our students were ex-freedom fighters. These people tended to be our best students. They were tough and knew how to get things done. One of our students, Eduardo Soares came to us from World Food Program. Eduardo helped us out as a part-time trainer and activist as well as a director of our organization.

Most farming in East Timor is done on steep slopes. On one coffee plantation I saw men picking coffee whilst standing on planks laid across the trunks. The coffee was growing out of a cliff. In Australia we wouldn't dream of farming some of these gradients. Unfortunately a lot of annual crops are grown on steep land, which, combined with the yearly burn off, creates a massive erosion problem.

Between courses Ego and I would help farmers/students with their projects. Many farmers grew more rice than they could sell because the market was flooded with food-aid rice or subsidized imports. We showed them how to sprout the rice and feed it to animals or poultry. There is always a market for protein in East Timor.

On each course it was a battle to get women to participate. We'd struggle to get 20% women in each class. Because women did the majority of work in the communities they found it hard to leave their families. We'd sometimes get the chief of a village to recruit women for training because he had the clout. Always we'd have a prominent village woman as a chaperone.

Our NGO was small, just two of us and a

volunteer now and then. We looked like a large NGO because we were always working on real projects in the field. In contrast, a million meetings happened each week in Dili. Too much admin and not enough real action with the UN and its agencies resulted in little real effect on the ground. I realized early on that if this was going to work it would have to be my way as there were no effective models to learn from.

Our final project was a nursery up in the mountains a kilometer above sea level (3300 ft.). The village was called Hula Rema. What was once jungle were eroded clay hills dotted with deformed gum trees. Napalm and Agent Orange had been used to deny the East Timorese guerrillas effective cover from air strikes. Twenty years later the chemicals are obviously still in the food chain. With the help of ten students we built a funky set of shade houses using only local materials. Split bamboo replaced shade cloth. The only outside input was polybags and a few tools. We grew pioneer trees that were proven in the contaminated soils, such as casuarina, mother of cocoa, and acacias. We also grew fruit trees,

herbs and passionfruits, for the home gardens.

Once the nursery was up and running, we arranged with Care Intl. to bring their farmers to Hula Rema so our farmers could demonstrate the nursery. This worked out brilliantly as the farmers from Hula Rema began to build their self-esteem. You can't imagine what it's like to be oppressed as these people had been. It's still hard for them to believe they are free. When I left East Timor in mid-December 2001, there were 17,000 trees over a meter high ready for planting.

The biggest struggle for the Timorese now is to become truly free, and to avoid becoming another third world debt nightmare. The East Timorese are a brilliant people and will need our help for many years to come. The best thing that I left in Timor was a fully trained teacher, Ego Lemos.

It was no easy thing leaving Timor, there was a lump in my throat the size of a football as I waved to Ego at the airport gate. I will return next year sometime, to offer more training and support.

Good luck, East Timor. *Questions or comments? Contact stevecran@serv.net.au*

Restore the Earth, Restore the People

Educational Design to Regenerate Local Ecologies and Economies

Andrew Faust

At The Center for Bioregional Living we help people to understand that the Earth needs to be healed from the wounds that we, the human race, have made. We need to learn how to enhance the biodiversity of our local landscapes and reconnect humans to their proper role as stewards and caretakers of the planet. By enhancing local biodiversity we increase nature's ability to provide everyone with clean air, clean water, and healthy soil. Our own well-being is inseparable from that of the whole life community.

Here in the West Virginia mountains we are creating a new model for education, operating from the premise that learning is a spiritual quest for the right way of living. Education must address contemporary issues and pay attention to what will enhance the quality of life for humans in the long term. We all need to learn more about ecologically sound and locally adapted ways of living and procuring our livelihoods.

Community centers and schools can help to rebuild local communities, economies, and ecologies while engaging our children in meaningful work and play which has ethical integrity and will enhance the well-being of the earth for future generations. Children's cognitive abilities are enhanced by direct experience and contact with nature. Our school buildings and learning processes must begin to reflect this wisdom.

Mainstream schools in the G-8 nations



today are training their students to keep a very complex and high-impact technocratic society on its feet and running. At the same time we have a lot of blood on our hands and much of it is from the unborn lives of our own children: the entire global ecosystem is contaminated with carcinogens, mutagens, teratogens, endocrine disruptors, and biologically engineered organisms which have the capacity to disrupt Earth's web of life. We know this society cannot continue on its present course. Nor can we in good conscience export or propagate this model. We need to help developing nations and future generations sidestep the pitfalls that we have already encountered. Quality of life is fundamentally measured by access to and availability of clean water, healthy food, a caring and loving community, shelter and clothing, and the right to meaningful work and self-determination. We

need to create economic designs that value quality of life over "standard of living."

Education must help people develop their capacity to enhance their own quality of life. Education must also incorporate living cooperatively with the earth. We must acknowledge that native ecosystems are diverse and can provide abundantly, setting the model for our cultivated ecosystems. We must also acknowledge that native or tribal cultures of the earth know a great deal, particularly about growing food, which we need to rediscover and apply to address many of our global hunger issues. Education must emphasize ecological literacy so that our settlements and economies protect and enhance public rather than corporate interests.

In order to promote ecological literacy in our society we need to:

- Design systems of education, transport, energy, and housing that are densely, organically clustered around geographical and cultural nodes.

- Expose students to food, water, energy, and shelter systems fueled by biological processes, i.e. black- and greywater treatment with constructed wetlands, composting, and harvesting fuel (methane) from these processes.

- Plant trees, as many native and edible varieties as possible.

- Keep things small, localized, and attentive to the real needs of the individuals involved.

- Garden intensively and compactly in cooperation with the local ecosystem, using local heirloom varieties of fruits and vegetables, and making many small earthworks to catch rainwater and increase aquifer recharge.

- Do everything organically, including energy production.

In short, teach people everything that will help them live in harmony with the earth and prosper. As much as possible, community centers and schools need to demonstrate these designs. This way of learning which I have described can help each person become more native to their place, empower them to be more intentional in their activities and pursuits, and thus to experience greater joy and happiness in the human condition.

The following courses are offered at the Center for Bioregional Living:

Bioregionalism

We study permaculture, self-sufficiency, organic gardening, biodynamics, energy systems and restoration ecology. We work on local organic CSAs, a biodynamic Camphill orchard, and participate in restoration ecology projects and gardening on campus for school lunches.

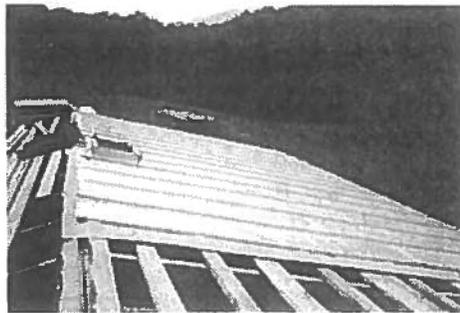
Humans from Earth

Evolution of the entire web of life, earth and humans from the perspective of Gaia theory, and how to create healthy regenerative human settlements. We study the history of

many cultures and civilizations to learn from their mistakes and to borrow ideas from healthy societies.

Transforming World Views

This course is an investigation into the broad array of factors shaping the public mind and pop culture in the consumer society. The goal is to understand the role of the individual in shaping society and to learn how to apply our personal power in intentional, creative ways.



The Center's other projects focus on regenerative homesteading, polyculture perennial forest gardening, and natural building. We are located in Pocahontas County, WV near one of the largest roadless areas on the east coast. We live in the Greenbrier River watershed at 2600' on 17 acres with a perennial spring: 12 acres of forest, and five of meadow. My wife Karlene and I designed and with the generous help of many friends, family, and neighbors have built the exciting beginnings of our dream dwelling. The structure is oriented due south for maximum direct gain. The frame is rough cut hemlock, which we bought from a

second-generation small family sawmill that sustainably harvests their own woodlot. The walls are of oat straw, 600 bales purchased from a local third-generation farmer down the mountain from us, for the walls, floor, and ceiling insulation. We dipped each bale in clay slip before stacking it. We then applied a thick single coat of earth straw plaster directly to the bales, before putting nailers on for the horizontal wooden siding exterior. All the clay for our clay-straw plaster and slip was dug from a shady location where we plan to build a root cellar.

This year, from May through October, we will be establishing more gardens and fruit and nut trees. Last fall we laid out our annual vegetable garden by mulching the beds thickly with straw. We plan to use mulch extensively in these beds each season, as well as growing green manures such as comfrey and cover crops. We will be building our road and water system, plastering the house interior, insulating the floor and ceiling with straw mixed with clay slip. We want people to work with us in exchange for food and camping. The Center for Bioregional Living is actively spreading and pursuing the bioregional permaculture biodynamic homesteading vision.

Andrew Faust has been offering these classes at Upatinias (PA) High School for the past ten years. He is a certified permaculture designer and bioregional educator. He received a B.A. in comparative religions from Guilford College. Faust is also a certified alternative school teacher. His wife Karlene has been working at a six-acre certified organic CSA since 1998.

Urban Permaculture Report

A Garden by the Lake

Claudia Joseph

The horticultural demonstration gardens in Oakland, California are an urban retreat for the city's inhabitants. Located on the shores of Lake Merritt, and open every day, the gardens provide a diverse plant show for all tastes. The offerings range from *bonsai* to succulents to hothouse flowers.

Tucked into the fruit and vegetable demonstration area, there is a permaculture section—which I established in 1998. Small but exceptional, it explodes in a wild tangle of native trees and shrubs, medicinal and culinary herbs, flowers and edibles. For three years I struggled with the heavy soil, poor drainage, and uneven frost pattern there, questioning the value of this seemingly unpromising terrain. But as raised beds grew where I had sown sheet mulch and the paths gradually narrowed, I began to comprehend the implications of gardening within sight of Lake Merritt.

The lake itself is in need of shoreline restoration. Formerly connected to the Bay, the lake undergoes regular dredging to maintain open water where once was fertile inlet and swamp. Its hydrology has been transformed by intensive urban development all around, and the edge of the lake today is completely bare of vegetation.

Though Merritt is the oldest bird refuge in America, only the inner islands still host nesting sites. The resident herons, cormorants, egrets, and ducks have become wards of the Park Service, which supplies their food. Quite accustomed to the urban scene, Canadian geese wander into the gardens, munching and fertilizing, but they were never a problem in the permaculture area. Perhaps the seedlings in the straight open rows of the adjacent gardens were easier to find!

Despite the artificiality of the landscape,

the setting has much to recommend it. The climate of the East Bay is magnificent and pests in the garden are few. When aphids and snails did appear, they told me a great deal about soil drainage. In the wake of one especially wet spring, I noticed that several beds were being devoured almost nightly. That's when I discovered that the water table was only a foot below the surface. Waterlogged spring turned into the typically rainless California summer. Facing difficult but different challenges each season, I learned to broadcast seed and let the plants choose their own time and place. I deliberately selected plants that would self-seed in order to lighten my load. Most of my work went toward improving the soil for better drainage and moisture retention. Adding organic matter was the answer for both conditions, and the results were splendid! With regular rains, the winter garden was terrific and almost labor-free. Timing was a critical factor at all seasons.

The most fabulous asset of a city is, of course, its people, and I saw the whole parade in microcosm at the Lake. Diverse styles of gardening were practiced in the demonstration plots, all of them organic. Flood irrigation from Sudan, academic horticulture from Merritt College, womens' and Asian gardens, and a probation project for errant youth each showed distinct personalities. The permaculture site had many volunteers and visitors, including school children. It was the only non-linear use of space in the park and many were drawn to its natural feel. I believe that spirit is the most sought-after quality in an urban place, and hundreds lingered in my garden just for the fun of it. Many hours I sat nursing my baby while fielding endless questions of the most basic nature regarding compost, soils, pests, and growth requirements. These impromptu garden seminars were also a great opportunity for me to learn about the city. The permaculture plot brought me into contact with many practitioners and others of like mind, and inspired me to galvanize our community.

Out of the garden experience I organized an annual convergence and hosted the East Bay Permaculture Exchange, a resource list. Parallel projects are prevalent, as the Bay area is rich with permaculture interest. And since I asked around I became aware of this wealth of activity. In time I was able to link up some folks doing brilliant work, and it seems that collaboration will make them even more effective. We are often so busy in our own work that it is easy to forget the benefit of contact with others.

The strength of this community became apparent when it was time for me to move on. Two capable practitioners came forward to continue the work I had started at the demonstration site. It seems that folks have continued to communicate through the email

network that was set up at the convergence, and a salon has evolved as well.

One of my fellow gardeners at the demonstration site was Tom Branca, chair of the Horticulture Department at nearby Merritt College. After puzzling for two years over my approach to the garden, he kindly asked me to teach a course on permaculture fundamentals. It drew 25 students, including AmeriCorps volunteers, and was a great success. The class will continue in Spring 2002 with Chris Shein instructing. I found him thanks to my outreach activities. As we remain in contact, I hope to establish an east-west coast exchange list of sites to visit and folks to contact.

I cannot overemphasize the usefulness of looking outside one's own project and taking time for other people. Working in public provided the opportunity to interact with the "unconverted"—those whose gardening relied on pesticides, herbicides, and perfectly weeded beds. It was enlightening to acknowledge their preferences, embrace the ornamental, and to continue to talk about living soil. I think I won a few converts within the Park service and EMUD, the local utility company. I also did talks at local nurseries. It was informative to see who expressed interest in permaculture ideas and to note their concerns and interests.

I have now moved to Brooklyn where the ecological community is less visible but even

more needed. I belong to a food co-op with over 5,000 members and I'm learning more about group dynamics. The events of 9-11 created an environment of public dialogue in which I was able to participate. There is much work to do here and I look forward to discovering how to be "green" amidst the concrete of New York. Permaculture has provided me a framework for positive thought (thanks to Brock Dolman and Penny Livingston) and the possibilities here are great. I have some space to share in a near-by community garden and have offered to teach there as well. The greenbridge program that assists community gardens has an annual teach-in to which I have been invited and I am making a plans to teach at New York's only ecological book store—Ecobooks. There is a bio-dynamic farm near-by that I will contact. And the Brooklyn Botanic Garden is on my list as a possible new demonstration site. I miss my garden by the lake but I'm comforted to know that it remains a permaculture space and that many wonderful folks continue to enjoy it. Δ

To participate in the East Bay Permaculture Exchange, go to www.permaculture-exchange.org or contact Chris Shein at (510) 594-4000 ex. 138, email: cwildseed@hotmail.com Contact Claudia Joseph in Brooklyn, NY at joseph11215@earthlink.net or (718) 832-3004.

German Permaculture Academy Launched

We are starting a new Permaculture Academy for the German-speaking countries: Germany, Austria, and Switzerland. We will work in cooperation and with a similar concept as the Permaculture Academy of Britain.

One of our aims is to issue a course program, which we will publish twice a year, circulating 1500 copies. It will be a printed A5 (14.8 x 21 cm) booklet, one colour inside and two colours for the jacket. It will be sent by post to people from the permaculture scene in Germany, Austria, and Switzerland. We will also send copies to Local Agenda 21 groups as well as other environmental and social groups and institutions in these countries.

We would be grateful, if you could help us start this project, by placing an ad in our program, which we only offer to businesses and institutions with a clear ecological and social focus. Since there is no German permaculture magazine this would be a good opportunity to make your projects, products, or services known to a German-speaking

audience.

If you have any other ideas of how to help us with our project or how to cooperate, please let us know as well. We are open to all kinds of suggestions and (permaculture) solutions. The first program will be issued in April/May.

All the best,
Die Permakultur Akademie
Jascha Rohr (Permakultur Designer)
Birkenallee 35
26197 Huntlosen, GERMANY
Tel: +49-4487-999690
Fax: +49-4487-999691 (nach Absprache)
info@pk-akademie.de
www.permakultur-akademie.de
Feste Bürozeit: Mittwoch von 8-18 Uhr. Sie können uns jedoch auch zu anderen Zeiten erreichen. Anfragen werden so schnell wie möglich bearbeitet. (Regular office hours: Wed. 8am-6pm. You can, however, also reach us on other days. We will respond as quickly as we can.)

**Visit our Website:
PermacultureActivist.net**

Movement Musings

Working Towards the Diploma

After two years of applied work (may take 3-4 years), students can forward an application for a diploma of applied design. This must be accompanied by affidavits from co-workers, field reports, photos, journal articles, or supporting evidence. \$30 Australian.

Fields which qualify for diplomate work:
ADMINISTRATION - Directing, conducting, or assisting consultancy groups, associations, and institutes, and developing strategies in Pc work.

ARCHITECTURE & BUILDING - Designing or building low-cost and low-energy use dwellings or structures.

COMMUNITY DEVELOPMENT - Planning, assisting with, or implementing community development projects, urban systems, villages, or work with disadvantaged groups.

DESIGN SERVICES

/IMPLEMENTATION/SUPPLY

EDUCATION - Working on curricula, teaching, or course work in Pc education.

FINANCE & BUSINESS - Setting up or operating financial systems for ethical investment, community revolving funds, or other self-financing systems for communities.

MANUFACTURING - Establishing or creating strategies or workshops producing hardware or goods for Pc design use, or essential technology; researching and marketing such technology.

MEDIA & COMMUNICATIONS - Creating or operating publications or audio-visual aids to communication and education in the Pc system. Software development.

RESEARCH - Making a significant contribution in the area of field or academic research into Pc systems and needs.

RESOURCE DEVELOPMENT

SITE DEVELOPMENT - Designing and working on their own or another site as a demonstration of Pc principles.

SITE DESIGN - Completing designs for others in Pc systems (usually not less than 10 designs).

SOFTWARE DEVELOPMENT

SYSTEM ESTABLISHMENT &

IMPLEMENTATION - Setting up or operating nurseries, earth moving systems, soil conservation strategies, or the supply of goods or services to the Pc system; working on the implementation of design systems.

TECHNICAL DEVELOPMENT

TRUSTEESHIP

VILLAGE DEVELOPMENT

"Each diploma issued will have one or more of the above categories written in the

space provided; thus, the diploma will indicate just where the graduate is considered to be competent. At any time, graduates may apply for new diplomas carrying additional categories in which they have been involved for at least one year. Trainees may apply for diplomas after the completion of two years applied work; diplomas will be issued by the continental institutes, which will keep a register of graduates. Trainees can be nominated for a diploma by the teachers, or by a group of two or more teachers, or by a group of two or more graduates of the college who can attest to their work. For those working in remote areas, an account of work completed or in progress should be forwarded to the local (continental) institute. Trainee designers are expected to keep in contact with a graduate group.

Diplomas may, in special cases, be issued to people who have shown competence in one or other of the above areas, but who have not completed a course. However, such people are not to assume teaching positions without completing formal courses of 72 hours under a

qualified teacher.

Higher degrees may be applied for through the Research Supervisor of the local (continental) institute. Such work must make a significant contribution to design processes in the fields of Pc."

Quoted from page 81 of the *American Permaculture Directory*, also listed on the website, permaculture.net. This information is from Bill Mollison's *Foundation Year-Book of the Permaculture Academy*, printed in 1993, so one would still have to contact him for updates and procedures.

As far as I know, he is the only one granting diplomas, but even though I have been told I have earned one, and have applied for it over two years ago, I am still waiting.

John Irwin jwirwin@permaculture.net

Guidance for the Diploma

The Permaculture Academy of Britain produces an Action Learning Manual for Permaculture Design Course graduates seeking registration with The Permaculture Academy of Britain for the purpose of acquiring support and assistance in their quest to qualify for the Diploma of Applied Permaculture Design. For more info, visit the following link: <http://www.permaculture.org.uk/academy/index.html>

Sustainable Land Use Curriculum Debuts in New Zealand

Joanna Pikarski

A unique one-year course in sustainable land-use systems is being piloted in a remote corner of Aotearoa / New Zealand.

Entitled P.L.A.N.E.T. (Permaculture, Low-impact Agriculture, and Natural Ecology Training) Organic, the practically oriented course for up to 20 international students will be based in Golden Bay, in the northwest corner of the South Island, an area bordered by the Kahurangi and Abel Tasman National Parks.

Renowned for its natural beauty and internationally important conservation areas, Golden Bay's main income is derived from tourism, dairy farming, and arts and crafts. The population of some 4500 triples in January with an influx of visitors drawn to outdoor recreational opportunities and festival culture. The Bay's many areas of high natural value include Farewell Spit and Te Waikoropupu Freshwater Springs, among the clearest in the world. The sunny climate supports a wide range of temperate and subtropical plants, and the availability of locally sourced materials makes it an ideal location for studying bioregional sustainability. According to

PLANET Organic coordinator Robina McCurdy, "Participants will use the whole region as a learning centre including many demonstration organic properties, with their worker-managers acting as on-site field tutors in specialised subjects."

Practice in permaculture design analysis will happen on every property, as participants learn to manage projects which empower the local community, culminating in the last term of the course when they are placed in projects and businesses around Aotearoa/New Zealand to apply skills relevant to their vocational direction.

The course aims to teach people how to grow their own food organically and commercially as well as how to organise the wider community for food security.

"PLANET Organic is intended for a range of committed individuals, from those who want to manage their own properties organically to those who want to help reverse the trend of global degradation caused by unsustainable practices. It is for highly motivated people who want to make a positive contribution to change, with potential for impact at a planetary level,"

said McCurdy.

The depth and breadth of the subjects studied will enable participants to move comfortably between manual labour and managerial work, to lead and inspire groups, to initiate and manage sustainable land-use projects which strengthen local communities, and to reconnect with the natural environment.

Teaching methods employed will be through a combination of hands-on activities, in-class teaching, group work, individual research projects, work experience, practical field trips, tuition with mentors, multi-media presentations, and creative expression.

The course is organised around four ten-week terms, with the possibility of entering and completing at different stages, dedicated to the following broad themes: applied permaculture in sustainable land-use and organic food production, small-scale commercial organic production, applied permaculture in community development, and practical "in-project" training.

Five learning areas run throughout the course: permaculture design, organic production, holistic resource management, business and project management, and self- and community development.

Assessment is through a combination of written assignments, oral presentations, practical projects, self and peer assessment and tutor observation. Full-time course graduates will be awarded a Diploma in Sustainable Land-Use Design and Management from the Institute of Earthcare Education Aotearoa, a national non-profit NGO working with community development.

PLANET Organic is a fee-paying course, not funded by government, business, or any other agencies. It has been developed and organised jointly through two non-profit organisations: Earthcare Education Aotearoa and Te Wharerangi Trust, responsible for the course's venue, the Golden Bay Community Gardens. Course content has been developed entirely by a team of skilled volunteers based in Golden Bay. "These volunteers are deeply concerned about the poor state of the planet and unsustainable practises and they wanted to share their knowledge and skills to make a change," said Robina.

Explaining what inspired the group, a factor Robina highlighted was scientific evidence demonstrating a strong link between the decline of small-scale agriculture and environmental degradation. To redress the impact of globalisation on the environment and the economy, there are diverse vocational opportunities in facilitating sustainable food production at the community and regional level; however training programmes to prepare people for this work barely exist.

In addition, there is a demand for more hands-on professional courses from farmers and growers wanting to make the transition to organic production, as acknowledged at the

Soil and Health Association of New Zealand's Organics 2020 Conference.

PLANET Organic was also a response to requests from overseas students in sustainable agriculture to obtain the hands-on experience required to complete their degrees. A need for such a comprehensive in-depth course had also been expressed by graduates of courses in permaculture design and seed saving, and by WWOOFers (Willing Workers on Organic Farms) in New Zealand, said Robina.

So far, enquiries from as far afield as

Zimbabwe, Brazil, and the UK as well as New Zealand have been received for the pilot course.

The course runs from 1 February to 13 December 2002, with the possibility for participants to enter at any of several points during the year. Please contact: Robina McCurdy, coordinator, PLANET Organic, PO Box 130, Takaka, Aotearoa/New Zealand ph: +64-3-525-8488, fax: +64-3-525-8659, planetorganic@excite.com <http://earthcare.nelson.org.nz/>

Trademark Controversy Stirs Permaculture Worldwide

In May of last year, Bill and Lisa Mollison, acting as the Permaculture Institute, applied to government officials in Australia for trademark protection of the terms "Permaculture Design" and "Permaculture Design Course." This set off a small firestorm of controversy as veteran permaculture teachers from around the world responded to what most perceived as a move to privatize a concept long associated with grassroots education. Here are a selection of comments gleaned by *Activist* editor Toby Hemenway from the Permaculture listserv.

Robyn Francis,
robyn@integratedlearning.com.au

It was brought to my attention today (10 July 2001) that XAF Pty Ltd (trustee company for The Permaculture Institute), applicants Bill Mollison & Lisa Mollison lodged applications to trademark the following:

Trade Mark 877106 PERMACULTURE DESIGN COURSE lodged 28 May 2001 and Trade Mark 877449 PERMACULTURE DESIGN lodged 30 May 2001.

In light of the changes in Pc Institute's policies over the past year this is somewhat disconcerting as the only people who would receive permission to use these words would be those personally approved by Lisa and Bill. This is a far cry from the long-held policy of the institute that all PDC holders have the right to teach & design and use the word Permaculture in their work.

There is opportunity to lodge objections but I do not know when the deadline is. The application is for Australia—it may be worth checking if a similar application has been lodged elsewhere e.g. USA. △

Robyn Parry,
The details for 'Permaculture Design' trademark application:
Trade Mark : 877449
Word: Permaculture Design
Lodgement Date: 30-MAY-2001
Class/es: 16, 41, 42
Status: Indexing Approved Type: Word
Owner/s: XAF Pty Ltd ACN: 009521260

Bill Mollison, Lisa Mollison

The website can be accessed through pericles.ipaustralia.gov.au/atmoss/Falcon.Result. As yet there are no oppositions registered for either application. △

Toby Hemenway, hemenway@jeffnet.org

Although trademark and copyright are not identical, I think it's time for me to share my copyright horror story, as it may give some insight as to what is going on with Bill and Lisa Mollison and their recent efforts to privatize permaculture.

Last October (2000), I had my publisher send Bill a copy of my book manuscript (since published as *Gaia's Garden*), and asked him if he would consider writing a foreword for it. We received from Bill a letter saying that I had used a lot of material from his publications, I didn't adequately acknowledge him, he would not endorse plagiarism, and I must omit all material derived from his work. He listed many pages in the *Pc Design Manual* where, he claimed, I had used his work. Needless to say, I was flabbergasted.

I couldn't figure out where I was in copyright violation. Copyright protects the "work of expression" of an author—the wording or artwork they use—and I had used my own words everywhere. Also, I had cited my debt to Bill in my acknowledgements and listed his books in my bibliography as sources for my work. Either of these is considered sufficient legally and ethically to acknowledge a source, but I had also stated in the preface

and in the text that few of the ideas in the book were mine and came from permaculture and other sources, and included a 2-page sidebar describing Bill's development of permaculture. I described all this in a letter, and said if I had accidentally used his wording anywhere in my text, I would gladly remove or alter it.

In reply we received a letter from Lisa demanding that I remove roughly 35 pages of my book that they claimed were infringements because they were paraphrased versions of Bill's work, as well as some illustrations. They claimed I was in violation of their copyright, and threatened legal action if I did not remove the material. They said they had prevented others from infringing in the past.

It took a couple more rounds of letters and some escalation of rhetoric (my behavior was called "improper") for me to realize that they didn't mean places where I had copied his words, but places where I had referred to anything mentioned in his books. Lisa and Bill sent a list showing that they wanted me to remove all reference to guilds, keyhole beds, mandala gardens, certain aspects of patterning, herb spirals, Zone and Sector, and a host of other concepts basic to permaculture. But US copyright law says "In no case does copyright protection...extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery." You can't copyright ideas; once you've published them, no matter how much work it took to come up with them, anyone can write about them.

My publisher was incredibly supportive, and offered Bill a very generous fee for the foreword plus a royalty on my book (an amazing thing, considering I had written it, not him), with the understanding that he and Lisa would drop any legal charges. We were sick of being hassled. In response we got a demand for triple the royalty, plus a renewed demand to drop all reference to anything in Bill's books. Again, I was stunned.

At that point we said we were sorry that we couldn't find common ground, and went ahead with publication. Lisa said we'd hear from their attorney. Our own attorney told us we had nothing to fear. And that, back in February 2001, was the last we heard from Bill and Lisa. I assume they learned that I had in no way infringed copyright. This was a tremendous hassle, all completely unnecessary.

The whole episode makes me believe that Bill and Lisa wish to control who writes about and who teaches permaculture. They used threats of legal action to try to prevent me from publishing. I am deeply grieved that such a great man is reduced to such actions.

A quote here from the US Supreme Court seems apt: "The primary objective of copyright is not to reward the labor of authors, but 'to promote the Progress of Science and useful Arts.' To this end, copyright assures authors the right to their original expression, but encourages others to build freely upon the

ideas and information conveyed by a work. This...is the means by which copyright advances the progress of science and art."

If what I take to be the Mollisons' view of copyright prevailed, no one could build on the work of anyone else. I hope their view of trademark is a great deal more reasonable (as well as more legally correct) but I am not optimistic about that. I am cheered by the presence of "permaculture" in the dictionary, as that should make it impossible to trademark. Why Bill is paradoxically wanting to exert control after 20+ years of giving it away is a mystery, unless he is under the influence of someone else. Δ

Scott Pittman, pci@permaculture-inst.org

I recently discovered that the word "Permaculture" wasn't trademarked in the US, though the trademark had been given to someone in Baltimore in 1983 but had lapsed due to no registered use with the US Dept. of Commerce. I applied for the trademark to protect my and other PC design course graduates' exclusive use of the word. The Patent and Trademark office turned down my application because the word is now in the dictionary as "A system of perennial agriculture emphasizing the use of renewable natural resources and the enrichment of local ecosystems." *American Heritage Dictionary of the English Language*, 3rd Edition, 1992. I have until August 2001 to appeal the decision. I'm a bit lost as to what I should do and for whom and why?

In the meantime Bill and Lisa have been in contact with me through their lawyer threatening to sue me unless I turn the application over to them. I had trusted that Bill had protected all graduates, as he has stated over and over in courses and interviews, with his copyright. It turned out my trust was misplaced and no one is or has been protected for the past 28 years, the use of the word permaculture is available to anyone who chooses to use it. But how do you turn over an application for trademark? Trademark hasn't been granted so I can't assign it to Bill and Lisa. I applied in the name of the Permaculture Institute and have agreed to give the trademark to the Permaculture Institute in Australia once it is granted. Now I am told to withdraw my application, filing which cost close to \$800. I am not a patent/trademark attorney, nor do I have the resources to hire one, which would seem to be necessary if I want to appeal the decision of the reviewer at the Patent and Trademark Office. Δ

David Holmgren, holmgren@netconnect.com.au

I was a late opponent of a previous, now withdrawn attempt to trademark Permaculture in Australia by persons unconnected with the movement. I am not surprised by this current claim by Bill and Lisa Mollison although it is obviously most unfortunate.

Various contributors to these list serves have made useful practical and philosophical points and Toby Hemenway's and Scott Pitman's stories are particularly instructive.

I am head down on completing the manuscript of my own book which could infringe Bill's sense of copyright/trademark even more than Toby's. I have no intention of engaging in any such exchanges and will publish my work regardless.

I agree that the work goes on whether it is called permaculture or not and as long ago as 1980 considered not associating myself with the promotion of permaculture. Over time the good work emerging from the movement convinced me the term permaculture was more useful than not and I have become more solid in that conviction.

My main concern is that others who have devoted so much to promoting and developing permaculture are being treated in this way.

Although I think Intellectual Property Australia should reject this application as invalid by their own assessment, a formal opposition would greatly increase the likelihood of a favourable outcome and provide an insurance that any future claims would be rejected.

Ideally the opposition should come from the widest representative body in Australia such as Permaculture International Limited.

I would like to acknowledge the work of permaculture colleague Michael Dehan in mounting my previous objection which was done at very short notice. I am prepared to submit an objection to this current application if necessary. Δ

Skye, florar@terra.com.br

Been spending most of my time teaching in-situ-style with three indigenous communities here in central western Brasil. Working in helping improve food security, protect the remaining biodiversity in their reserves and rescuing their traditional knowledge of medicinal plants. Guess its Permaculture—but then who cares what its called as long as it helps.

We have had time to form the Instituto de Permacultura Cerrado-Pantanal, and to buy a hectare of land on the edge of our city. We plan to create a Permaculture Centre and a school dedicated to Permaculture. We plan to teach PERMACULTURE DESIGN COURSES, and, as indicated by Ian Lillington, people will come because of our local reputation, not because we have approval from someone on some island that no-one here has ever heard of (assuming we bothered to apply).

Someone in this discussion mentioned the charge for diplomas for students in third world countries—which previously were gratis. Maybe my story can clarify that one.

Some time back, a number of permaculturists in Mexico asked about receiving their diploma from the International

Institute. I checked with the Institute in Australia, and duly received a copy of the *Academy Handbook*. These people had received their diplomas from the Instituto de Permacultura de Mexico AC, but felt that the international certificate would have more influence—the Mexican authorities are very impressed by documents that are NOT Mexican—a strange anti-nationalism. Anyway, seven of them finally said they wanted to apply—found the money (which represents quite a deal for them) and gave me their details. Few were my students (most had undertaken a course with teachers from US long before I arrived on the scene), but all were friends, so I was familiar with their work. I wrote to the Institute—Tasmania—with the details, my recommendations, and of course a cheque for the whole group—obviously I wrote the information in English. After some delay and an email of enquiry, I received an email from Lisa acknowledging my letter and the cheque, and informing me that it would take a little while to process as she was preoccupied with her father, who was ill at the time. A year and a half later and many emails to which responses were never received... I have to face the fact that we have “done our dough,” as they say in Oz. I can't help but wonder what the Mexicans now think of Bill Mollison. Of course, maybe its not that big a deal for them—they have a long, long history of being abused, cheated and lied to, by their leaders.

So, my advice to anyone who has to have second thoughts about investing the \$35 in a Diploma—think a third, fourth, and fifth time—if \$35 is a lot of money for a certificate—its going to be a GREAT deal of money to invest and get ZILCH in return.

One quote from Bill just to wind up... GET OUT THERE AND DO IT, YOU DONT NEED PERMISSION FROM ANYONE. Δ

Toby Hemenway,

A bit belatedly I'd like to mention that my reason for going into detail earlier about my copyright tiff with Bill and Lisa Mollison was only in small part simply to vent my spleen publicly about a frustrating and disappointing experience. Only a little. My main reason was to provide evidence that the efforts to secure trademark, in my opinion, are not motivated by a benign desire on their part to simply protect permaculture from corruption or to uphold high standards. For years I felt Bill's assertions of copyright were unselfish, and I often leapt to Bill's defense about this issue. But my experience, and those related to me privately by many others, have shown me I was wrong. Δ

Larry Santoyo, santoyo@earthflow.com

I am probably the last person who would want to defend Mollison but... the only reason that any of us have ever heard of “permaculture design” is because of Bill... it IS his for all intents and purposes (with all due respect for

David Holmgren)... if he wants to control it, I say, LET HIM TRY!

If we don't want to play the way Bill wants then don't... nothing changes. Keep doing what you're doing, call it something else if you have to. Yes, that is unfortunate, but I think we can get on with the task of earth repair without getting fixated on who wants to control a new name for techniques and technologies that are thousands of years old anyway.

Bill is too late now. I even want to believe that that is his point—that even if he wants everyone to stop—even he can't control it. Keep going troops! Don't stop for anything!

I see it as evolution or, more to the point, natural succession. Bill DID say to spread it far and wide, but now he wants to rein it in for all kinds of (predictable) reasons—some of them good... again, let him try.

The point is that we already have evolved and have, in fact, each changed the curriculum in some way... psycho-spiritual crap, consensus building, etc; people have added and deleted all kinds of things from the original course (I think that is the root of Bill's concerns and recent actions). Correct me if I'm wrong but I don't think that building with straw or cob or sandbags is even in the book—we have evolved, you see. We already make it ours. Just keep going... don't stop.

I suspect that many of us can do what we do without a collective name. I am still going to teach my students to care for the Earth and each other, and I am going to go right on designing my clients' sites and plant trees today and tomorrow and hopefully the next. I don't think I will call it anything—just productive...

Fight the good fight instead. Δ

John Irwin, jwirwin@permaculture.net

Another reason Bill Mollison's attempt to control Permaculture is not worth worrying about: Lisa and Bill really can't keep track of all Pc Certificates, courses, literature, and ideas! The Mollisons don't have a tenth of the necessary resources they would need.

- It would be a bureaucratic nightmare, even if everyone were cooperating with new procedures. The Mollisons would need about a handful of full-time people just to keep decent records. Since most of us are naturally independent, and may not cooperate, maybe you could triple that number. Imagine keeping data for all certificate holders, courses, publications, activities, and references: Endless updates, clarifications, questions, lawsuits...

- Consider... How would they avoid a hierarchy? How would they know teachers are following the course outlines as submitted? How would they avoid appearing too rigid/ exacting/meticulous/precise? How would they communicate with those out in the field and away from a phone, computer, post office? What about translating back and forth from language to language? What will happen when

Bill is compost? Most Permaculture practitioners will continue in their own style as they do now.

My experience in trying to put together a directory and get all the names of people who have taken a course in North America proved to be nearly futile. Even if I had worked full-time and had a nearly free phone expense, I would not have done much better. Too many people were hard to track down. For one reason or another it was hard to get anyone to supply information.

On the other hand: Bill Mollison co-invented the term “Permaculture,” taught Pc to more people than anyone else, and has written the *Permaculture Designers Manual*, which is the Pc “Bible.”

As long as he is alive, he will be considered the leading authority. When the nature of Permaculture is in question, the *Manual* and the basic principles will be be encyclopedia and the reference. So, although Permaculture has taken on a life of its own, there really isn't a way for him to be any more influential than he already is, except by continuing to write and interacting with us in a positive manner.

We all know Pc NEEDS TO EVOLVE. Mother Nature has all of the answers, and we are just beginning our journey of sustainable homesites to sustainable villages to sustainable societies. We HAVE to allow differences, we HAVE to work together, and we HAVE to keep learning and experimenting. In other words, its natural that the OUTLINE will grow and change, as ecosystems, climates, and especially people do.

In my experience, the majority of people devoted to Permaculture are decent, caring, conscientious, and doing their best. I expect that to continue. No long-term worries here, mate, but we need to support anyone who is threatened or is concerned about this development. Δ

Robyn Frances is a former editor of Permaculture International Journal; she lives in New South Wales, Australia. Toby Hemenway is the author of Gaia's Garden: A Guide to Home-Scale Permaculture and an associate editor of Permaculture Activist. Scott Pittman directs the Permaculture Institute USA, located in New Mexico. David Holmgren is the co-author (with Bill Mollison) of Permaculture I and author of Hepburn Permaculture Gardens and several other titles; he lives in Victoria, Australia. Skye is co-author of Teaching Permaculture Creatively; he is an Australian presently working in Brazil. Larry Santoyo is former secretary of North American Permaculture, and a prominent teacher and designer in central California. John Irwin is the publisher of the American Permaculture Directory; he lives in eastern Pennsylvania. These comments were excerpted from the permaculture listserv at <http://www.ibiblio.org/ecolandtech/documents/permaculture.faq>

International Call to Action— *Cacerolazo Global*

In Solidarity with the Resistance of the Argentine People Against the Exploiters (Transnationals, Banks, Corrupt Government Thieves)

Neighbors and Citizens of the World: Let's make our *Caceroles* sound together! All of the world's *Caceroles* sounding off at the same time in a Huge *Cacerolazo Global*. As we shout together with the people of Argentina in Rebellion, "Down with them all; not even one will remain!"

What is a *Cacerolazo*?

When hundreds, thousands, or hundreds of thousands of people get together and bang on their *caceroles* (pots and pans) as loudly as humanly possible, moving forward or standing still, in collective protest. The *Cacerolazo* has become the symbol of Argentine popular rebellion against the neoliberal order, and is fast becoming associated with the global resistance to transnational capitalism.

Why Argentina?

Argentina is not a poor country, but rather a country that has been destroyed. It is the latest example that transnational capitalism works like a "neutron bomb": destroying all living things, while leaving the capital of a country in the hands of the aggressor. A large part of the population of Argentina, once the "breadbasket of the world" with tremendous natural resources—the hope and destiny of many millions of poor immigrants from around the world—is now going hungry.

Fifteen of the 36 million Argentines are living below the poverty line. Five million live in extreme poverty. Argentina is a global mirror of neoliberal capitalism. **Argentina is your future.** Argentina is a global scenario.

The current crisis in Argentina, the "top student" of the IMF and the Washington Consensus, is the culmination of 25 years of the neoliberal economic model imposed through significant bloodshed by the military dictatorship in Argentina (1976-1983; 30,000 disappeared, hundreds of thousands tortured, jailed, or exiled), which was supported by the IMF and the government of the United States.

But Argentina has also been, during the past few years, and especially since the popular rebellion on December 19 and 20, 2001 (that forced the pseudo-democratic government of de la Rúa to resign), an example of a society, a people, and a citizenry that has said ENOUGH: No more victims! The *cacerolazos* have produced an irreversible and irreparable rupture in the established order. Local, self-generated calls to action are coming from the grassroots through neighborhood assemblies, which are totally self-managed, horizontal, and democratic. A profound transformation of the political culture is rapidly emerging among wide sectors of the population.

Many solidarity actions with the Argentine people have been carried out or are about to be carried out in diverse cities throughout the world, such as Barcelona, Bilbao, Paris, Toronto, Montreal, Oviedo, Berlin, Madrid, London, Porto Alegre, and New York.

Why a *Cacerolazo*?

The *Cacerolazo* is globalizing as a form of protest; as a method it has many advantages: It is absolutely non-violent. It is loud and clearly visible. It is an extremely simple and grassroots method; it does not require expensive technology, training, or special abilities.

The entire family can participate, and any community or city can organize one. It is festive, carnivalesque, and it symbolizes the

social response to the big winners in the Argentine crisis and the global neoliberal order more generally.

Proposal for Action in Each Locale:

- 1) Organize a *Cacerolazo* shaming those who are responsible for the crisis.
- 2) Write a text to denounce the situation.
- 3) Spread the word throughout the mass and alternative media.
- 4) Communicate progress and results through the Internet and other global networks.

Neighbors and Citizens of the World: Because we are all Argentine... Let's create the sound of a Global *Cacerolazo*. May our Resistance and Solidarity be as Global as Capital! Δ

We Are All Argentines!

Peter Bane

From December, 2001 the political and economic crisis in Argentina has deepened. Popular demonstrations brought down the neoliberal government of President Fernando de la Rúa and in quick succession several other figures appointed by the legislature to take his place. Currency controls imposed by the central bank effectively froze the assets of millions of ordinary citizens. Devaluation of the peso, which had been artificially tied to the US Dollar for several years, led to further hardship as many Argentines had taken out dollar-denominated mortgages on their homes and were hard pressed to meet repayments.

I was scheduled to help lead two courses in Permaculture Design and Ecovillage Development at Gaia Ecovillage near Buenos Aires last February and March, but the crisis, led to the cancelling of my planned trip.

Permaculture in Argentina

My colleagues at Gaia Ecovillage live some 110 km from the capital near Navarro in the province of Buenos Aires. We have reported on their teaching and development work in previous issues (*PCA* 42: 50, "Latin American Pc Congress Comes to Argentina," and *PCA* 43:71, "CoIntelligence to the Rescue.")

About eight years ago a small group purchased an abandoned powdered milk factory on 50 acres of pampas and has been rehabilitating the structures while adding new buildings and planting a food forest on the land.

Silvia Balado and Gustavo Ramirez have taken a leading role within the Gaia community and have also become involved in the Permaculture and Global Ecovillage Networks. Gaia

has been the regional center for Ecovillage Network of the Americas (ENA) in southern South America. The village has also been a center for Pc courses and was the site of the first Latin American Pc Convergence in March 2000. The community has installed wind turbines to provide its own electricity, and has revolutionized methods of building with cob. It continues to be an important center of innovation and diffusion of permaculture to Latin America and beyond. Gustavo Ramirez has taught Pc not only in Argentina, but also in Chile and Peru and has consulted on design projects in several South American countries.

Now with the crisis in Argentina, Gaia's work is threatened.

In Silvia's words: "We are slowly going bankrupt at a personal and organizational level. So we'll need lots of help to be able to keep this project alive! It may be also a great opportunity to be creative and open to new paths and alternatives. We appreciate your support in diffusion, funding contacts, or whatever you may imagine."

We Need Your Help

The Permaculture Activist is launching an appeal for solidarity and support with our brothers and sisters in the South. In particular, we would like to offer financial support to Gaia to help them through this difficult period. Their cottage industry, producing and distributing essential oils as well as their outreach through courses and events are imperilled by the bank crisis and the political upheavals. We have established a relief fund for this purpose and ask readers to contribute if they can to an

important and worthwhile cause.

For each contribution of at least \$50 made directly to the Permaculture Activist, we will offer a one-year subscription to *Permaculture Activist*. All these funds will go entirely to Gaia. Send checks to Permaculture Activist - Gaia Fund, PO Box 1209, Black Mountain, NC 28711. For U.S. readers who would benefit from a tax deduction, contributions may be made to: Culture's Edge - Gaia Fund, 1025 Camp Elliot Road, Black Mountain, NC 28711. Culture's Edge is a

tax-exempt educational charity and a 501c3 organization. Contributions to it are tax-deductible to the fullest extent allowed by law. We regret that contributions through Culture's Edge cannot be matched by subscription, however.

If you would like to contact Gaia Ecovillage directly, write Silvia y Gustavo, Asociación GAIA, gaia@gaia.org.ar or visit their website: gaia.org.ar.

QUE LA PAZ PREVALEZCA EN LA TIERRA!

△

A Manifesto for Seeds

We Have Always Known This...

Woody Wodraska

WE ARE SEED users, seed eaters, seed growers
...all of us. We have been wrapped in a world of seeds for eons, since long before agriculture. In hunger we ate the bird that ate the seeds; in happy accident we brewed the beer from spoiled and worthless seeds; in unwitting service to the plant we transported its seeds on our trouser cuffs. We slobber over ear corn and eat our Wheaties. It's in our language: We are of our parents' seed, our ancestors' seed, Adam's seed ultimately. We are born into, thrive in, die in, a seed sowing, seed garnering heritage. To deny the status of the sacred to these time capsules, these enfoldments of life we call seeds is to court foolish disaster. We have always known this.

BUT...NOW THEY'RE MESSING WITH OUR SEEDS.

The power-grabbing corporations and governments propose in their arrogance and disrespect to irradiate...manipulate...defructify...monopolize and further commodify our ancient birthright, our real wealth: SEEDS. We are strong when we have our seeds, and they know this. They would enslave us and they would use as leverage the seeds we cherish, the seeds that nourish us. What we would pass on to the seventh generation as bridegift they seize as strategy. They would put a price on the priceless and sell it back to us.

LEAVE OUR SEEDS ALONE. Leave our seeds in the hands of the people who feed us...the family, the clan, the village group. The profession of "seedsman" was created only 130 years or so ago. Perhaps it was an aberration to try to centralize, and then commodify, a process that had before been disbursed in village gardens, homestead gardens, middens, and small fields. Grandmothers and Great-Uncles collected, watched over, cherished the seeds that came down to them. Grew them out with love and patience and infinite care. Grandmother's seeds... Grandmother's blessing...passed from generation to generation.

ANCESTORS' BLESSING. Reckon three generations to a century and 150 centuries in the history of agriculture and you have several hundred generations of seed gathering folk, seed saving grandcestors, passing on precious seeds to descendants. Seeds too precious to buy and sell; seeds that must be gifted, presented. There is memory encapsulated in this line of life stretching so far back. Feelings are there too...feelings of gratitude to Gaia, of holding dear, of well wishing to the future generations, feelings of faithfulness...feminine feelings.

THE MEMORY IS RIGHT THERE IN THE SEED, in our cells, in the mitochondrial DNA passed down the feminine line. When I touch my seeds I tap the memory that is there, instinctive wisdom almost lost, beaming itself into our consciousness just when it is most needed.

John Trudell said: "It's about our D-and-A. Descendants and ancestors. We are the descendants and we are the ancestors. D-and-A, our DNA, our blood, our flesh and our bone, is made up of the metals and the minerals and the liquids of the earth. We are the earth. We truly, literally and figuratively are the earth. Any relationship we will ever have in this world to real power—the real power, not energy systems and other artificial means of authority—but any relationship we will ever have to real power is our relationship to the earth." (1)

SEEDS ARE CONCENTRATED WEALTH. Seeds are worth far more than we pay for them now, in this aberrant commodity trade. You can pack in a suitcase \$10,000 worth of garden seeds in any variety you choose. The slavemasters and their propagandists would have us believe that money is power and, since they have money in plenty, that they are in control. They don't want us to have that suitcase, to be free to leave and plant elsewhere; free to stay and plant many gardens, feed many people with real food.

WE ARE STAUNCHLY OF THE EARTH. Her power is ours to neutralize and transmute the evil work of the authority-mongers, those without conscience. We can do this with life enhancing actions. Repeat. Life-affirming actions override, overwhelm, the lifeless. Always the great stone temples of the arrogant become topsoil for living systems. It's something the corporations and governments fail to appreciate. Their authority

rests on entropic processes, explosions, coercions, cultural lies. They cannot take into account the power of life, the connectedness of life. They would have us forget where we come from...so we can be entertained and exploited and addicted to their cheap dream, their gadgets and their ersatz food. If we are staunchly of the Earth we have access to the strength of the generations, the ancestry, to help us put life and affirmation in the places where death-dealing had been. We can REMEMBER whence our power comes.

LET US PLANT GARDENS. Let us plant trees. Let us tend cows. Let us join Wendell Berry's "Mad Farmers Liberation Front." No dues. No meetings. You just have to be clever. Don't be depressed, be clever.

OUR WEAPONS ARE OUR TOOLS...our ammunition is our seeds...our fuel is our sacred intent to do right by the future of life on the Planet...our marching song is the thrumming of memory in our cells.

We march in concert, but we do not march en masse. Our aim is not to dominate or overpower. There has been enough domination and power grubbing. Rather, our aim is service. Each of us has a plot of earth to serve, our own elementals and devas to consult...intuition that speaks in us. We know how to surrender to the task, to the plants and soil, in order to earn our harvest. We bend to it in joy and service, each individual one of us mustering pure intent, a gutsy laugh, with the power of life upholding us.

LET US BE CLEAR. There is no money in this, only sustenance. This passing forward of seed on the family or clan level is a matter of right livelihood, not of commerce.

And right livelihood brings joy. If I can feed myself, my family, a few others perhaps when surplus appears, then I have done something REAL. Something subversive. I am in touch with my power, and my delight.

JOY...What if the picture that's been drawn of medieval peasant life as basically "Nasty...Brutish...Short" is a cultural con job put out by the rationalists and the materialists, the ones who shortly would have something to sell us? What if life on a subsistence level has joys and satisfactions outweighing the challenges? What if people used to have time to laugh and sing?

What if there were still people in the world who could catch the memory of this and show it to us??

A friend tells me about life in the Philippines, far back on the rural islands...tells how, when two rice farmers or donkey drivers meet and begin to talk, they're laughing most of the way through the conversation. "They laugh and say a couple words and laugh some more. One starts laughing and then everybody's laughing." There is something boisterously entertaining about what is going on in their poverty-stricken lives.

John G. Bennett wrote of an encounter in Africa: "Following a lightly trodden path, I came upon a Basuto village. All the inhabitants were out hoeing mealies. Their ages must have ranged from seven to seventy, and they were singing and hoeing to the rhythm of their own music. As they saw me they all stopped and stood straight up in surprise. Then with one accord they began to laugh. I have never heard such laughter. It was pure joy and friendship, without malice and without thought. I joined in, and we all laughed together for several minutes. I waved my hand and walked on, and they resumed their gravity and their hoeing.

"This was one of the unforgettable moments of my life. A lifetime's experience had convinced me that happiness is greatest where material prosperity is least. I had seldom seen a happy rich man, but I had seen many happy people among the poorest villagers of Asia Minor or Greece. I had seen happiness in Omdurman, but this happiness that I saw before my eyes was beyond all the others. Here was a village totally lacking even the smallest of the benefits of civilization. They had not even a plough or a cart. And yet they were the happiest people I had ever seen. They were without fear and without pride." (2)

THE MEEK INHERIT THE EARTH, for the meek remember who they are and where their power comes from.

The meek overcome oppression by serving the Earth.

(1) John Trudell, on the occasion of a memorial service for Earth First! Activist Judy Bari.

(2) J G Bennett, *Witness*. Claymont Communications, 1983, pg. 229.

Woody Wodraska operates Aurora Farm, the only unsubsidized, family-run seed farm in North America offering garden seeds grown using Rudolf Steiner's methods of spiritual agriculture. kootenay.com/~aurora. This essay first was first published in ACRES USA, January, 2002. Reproduced here by permission of the author.

Editorial, continued from page 2.

gland. Fever, night sweats, debility, weakness, constant pain, myriad nasty symptoms, and not readily treated (at first). That persisted for five miserable weeks, and along with the crisis in Argentina put the kaibosh on my plans to teach two courses at Gaia Ecovillage outside Buenos Aires. Our friends there have rather bigger challenges than I have faced, and we are asking readers and the permaculture community in the North to extend a helping hand to them at this difficult time. Financial contributions are needed—please see details on page 68.

Gradually returning to health in early March, I began to regather threads of thought and planning for the issue that had been lost in October. Many stories had come in; some had been swept away in the aftermath of the bombing. Material enough, but the concentration required to organize it was scarce. Juggling my time between editing and fulfilling teaching and design commitments made the year before—when spring seemed blissfully free of other work, delayed production further. It's a regrettable fact that editing this journal, as much as it has been rewarding in many ways, has never made me enough money to be able to decline other paying work. In truth, teaching, design, and book sales subsidize the journal you hold in your hands. There is no trust fund.

I've now been more-or-less continuously in front of this computer screen 8-10 hours a day for the last month. And there you have it dear reader—the gory details. How anyone persists in small magazine publishing for a dozen years I'm not sure I could explain. Obviously it hasn't been as painful as the last eight months or I probably wouldn't be writing this today.

We have used the time since Issue #46 to sketch out the next several issues (for which see pg. 2) of the *Activist*. Thankfully, Toby Hemenway—taking time from his busy schedule of teaching and authorial duties—is still on board to edit #48 on *Activism: Making Changes*. This theme in particular seems to have elicited a good bit of excitement and several articles are already in hand. We encourage your contributions, which can be sent directly to Toby at hemenway@jeffnet.org, or through the usual channels of our North Carolina offices.

Our hope is to accelerate the frequency of publishing (couldn't get much slower...) with a mind toward reaching four a year by 2003. We plan to add staff to spread the workload. This may require, for a time, slimmer issues, until we can prime the pipeline with stories. Bear with us.

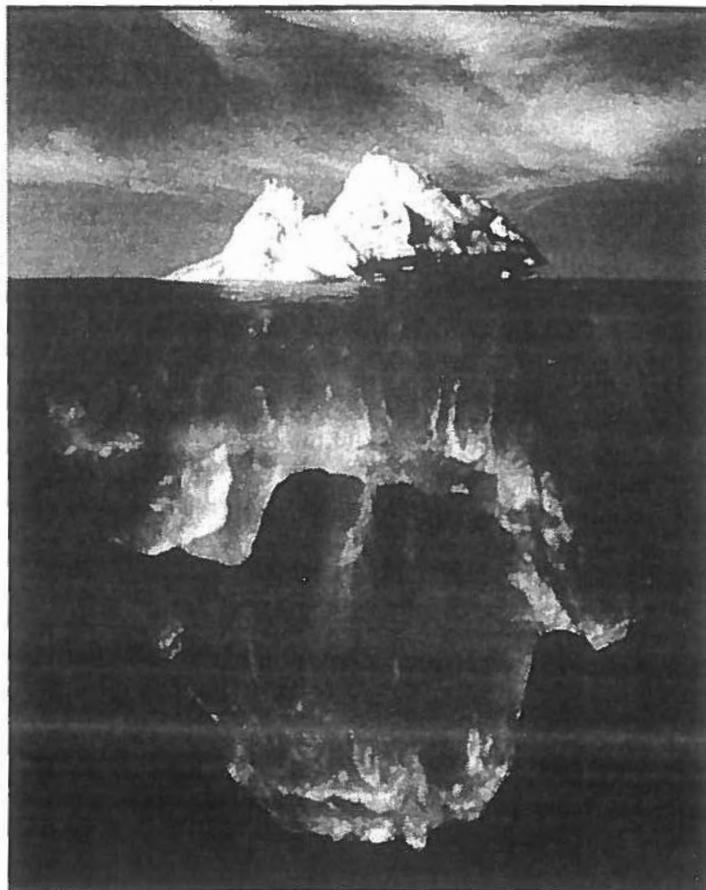
And for those of you who have kept the faith, we want to offer our thanks... tangibly. If you will renew your subscription by August 31st, we'll add a extra issue to it free. It's our way of saying thanks for helping to keep the door open and the lights on.

Changes in this issue include the cover, which is being printed in full color for the first time, and the book catalog insert in the center of the magazine. We've expanded our offering of titles, adding new videos and some excellent new books to our roster of standard resources. Please look it over. This issue runs 84 pages, a hefty edition, with room for a good range of Regional reports, letters, and a look at issues in the Permaculture movement. We did have time to read over this past winter (during our enforced idleness), and the book review section grew accordingly.

I'm pleased with the caliber of contributions to #47, especially honored that Max Lindegger, who helped inspire this issue,

responded so generously to our appeal for articles. His excellent overview of the Crystal Waters Village landscape design joins fine essays by Bill McClarney on watershed conservation work and Toby Hemenway on the importance of the beaver in the historic North American landscape and what we can learn from it. Brock Dolman delivers a workshop's work of information in "Basins of Relation." Maude Barlow's examination of the world's looming water wars offers a sobering perspective, while Sissi Grohmann takes us into a nearly lost world of the Peat Bog, plumbing the depths of our cultural psyche along the way. Capra Devi's interview of Penny Livingston and James Stark about their restoration work at Skywater Center in California is exciting evidence that permaculture design can turn around seriously degraded landscapes, and at the same time derive a rich yield even in the early years. And while it hasn't anything in particular to do with watersheds, I commend Jane Hunnicutt's valuable research report, "Rabbits Love Roses" to you for its humor and energy.

And lastly, I should make a few notes on style. The increase in web citations and email addresses has become dramatic over the last year or two. We have adopted with this issue a practice of dropping the [www](http://) and <http://> prefixes from web addresses. It seems to us that most browsers handle that routinely and omitting them spares us unnecessary repetitive work in typesetting. Both web and email addresses are underlined wherever they appear in our pages. Photo images where used are presumed credited to the author of the article, unless otherwise stated. Most of the rest of the digital artwork (this is the first all digital production of the magazine), comes thanks to Keith Johnson, who besides offering his skillful eye to the magazine, has helped keep me somewhat sane during the trials of the past year. △



Networks & Resources

Growers Consider Hazelnut Producers Organization

With the support of the USDA National Agroforestry Center at Lincoln, Nebraska, SW Badger RC&D, and New Forest Farms, of Viola, Wisconsin, a group interested in hybrid bush hazelnuts met in early April in LaCrosse to discuss the prospects for nut cropping to replace corn and soybeans as a mainstay of the region's farms. An informal dinner gathering of producers following the conference was set to explore possibilities for a union of producers of this exciting new staple crop.

Phil Rutter, of Badgersett Farms in Canton, Minnesota, whose research into hybrid and fast-growing nut trees has opened a window on woody agriculture for the Upper Midwest, gave a keynote speech on Marketing New and Alternative Products. Dr. Bruce Wright, from USDA-NAC, spoke to the conference on Opportunities in Agroforestry.

Prolific and early-bearing varieties of hazels and chestnuts hold great promise for a sustainable agriculture, offering high yields of oils, starches, and proteins that could meet human nutritional needs while eliminating soil erosion, chemical inputs, and many of the other problems of conventional farming.

Rutter's work and the implementation of his research by New Forest Farm's Mark Shepherd, were highlighted in a series of articles in *PCActivist* #40, "The Hope of Woody Agriculture," "Gone Nuts: . . .," and "New Forest Farm." Pc designer Shepherd will speak to the 2002 East Coast BioDynamic Farm Conference this spring.

For more information, contact Badgersett Research Corp., RR 1, Box 141, Canton, MN 55922-9740, ph/fax 507-743-8570, email NeoEdge1@aol.com or Woodyag@aol.com. Web: badgersett.com. △

ATTRA Highlights Phenology

Steve Diver announced in February that Appropriate Technology Transfer to Rural Areas (ATTRA), one of the Federal government's most effective agencies in support of sustainability, has updated its Phenology Web Links: (1) Sequence of Bloom, Floral Calendars, What's in Bloom; and (2) Birds, Bees, Insects, and Weeds at <http://www.attra.org/attra-pub/phenology.html>.

Phenology is the study of the annual cycles of plants and animals and their response to seasonal changes in their environment. For example, in botany this refers to the timing and sequence of bloom, fruiting, and leaf drop.

Phenology has many important implications and uses for sustainable agriculture. It studies linkages between pest emergence and crop conditions that enable growers to avoid many problems, use natural predators to suppress pests, and anticipate crop timing and shifts due to global warming. Orchardists can design pollination sequences and apiarists can plant bee forage using phenological data.

ATTRA provides the following links through the web address cited above:

- What is Phenology
- Uses of Phenology
- Floral Calendars for Wildflowers, Native Plants, Herbaceous Perennials
- What's in Bloom
- Floral Calendars & Bee Forage
- Bird Phenology
- Butterfly Phenology
- Phenology and Pest Management
- General Resources on Phenology & PlantWatch Networks
- Phenology for Kids & School Programs
- Web Articles on Phenology and Sequence of Bloom
- Nature Notes and Phenological Observations
- Phenological Sayings and Observations
- Climatic Information—Astrological Data, Sun, Moon, Climate △

New Garden Tool Offered

Sustainable gardeners may appreciate a fundamentally new and versatile long-handled garden tool developed over 20 years ago. It is half hoe, half plow, and its inventor calls it a hoe-plow, or the Idaho Plow.

"Everyone who has seen me using it has wanted one, and I have made several and given them to my friends over the years, who without exception love them and still use them often. I think this could encourage urban gardening. It's a 'backyard plow.'"

Contact C. Travis, 208-264-5361, 208-661-2689, idahoplw@mindspring.com, or visit www.hoe-plow.com or <http://hoeplowcompany.goemerchant7.com>. △

Coffee Company Funds Agroforestry to Sink Carbon

Northern California gourmet coffee merchant Thanksgiving Coffee (TC) had already expanded its recycling, changed its lightbulbs for compact fluorescents, and even started a worm farm to compost the waste parchment layer of the coffee beans it roasts, but it upped the ante recently by asking a non-profit group that measures greenhouse gases to evaluate its operations.

After considering transport fuel, propane for the roasters, and the electricity used for lights and computers, Maryland-based Trees for the Future determined that TC, located in Ft. Bragg, was putting 553 tons of carbon dioxide into the atmosphere annually. Then they added the CO2 released when the coffee is brewed—another 1,000 tons.

To offset these impacts, TC is joining with Trees for the Future to plant 69,000 trees in Ethiopia, where coffee is native. In the first year, at a cost of \$90/acre, TC will fund a local group called Beam of Hope to plant 21,000 trees in an area about 80 miles southwest of the capital, Addis Ababa. Most of the money will go to train local leaders in agroforestry.

In addition to offsetting greenhouse gases, the trees will provide multiple benefits to area residents: fruit, medicines, wildlife habitat, erosion control, shade, and wood. Since 1970, more than 70 percent of Ethiopia's forests have been lost burnt for fuel or cleared for livestock grazing and agriculture, including coffee production.

Thanksgiving may be a small player, but coffee is a big industry, representing the largest economic flow in global trade after oil. Coffee production is also changing as thousands of acres of traditional "shade-grown" coffee are replaced by coffee monocrops grown without tree cover. The result is accelerated deforestation and increased use of fertilizers and pesticides as the ecological functions of coffee's traditional companions are removed.

For more information, contact April Pojman at (707) 964-0118 ext.30 or apojman@thanksgivingcoffee.com, or visit www.thanksgivingcoffee.com. △

Internet Site Opens New Markets for Local Farms

Santa Cruz, California CSA farmers got together with local software engineers to put up a website where the farms could market their organic produce directly to consumers. Now the site is expanding to offer its connective facilities to small farms across the country.

LocalHarvest.com uses mapping software to link web-surfing consumers with CSAs, farmers' markets, farm stands, and U-pick farms in their own areas. By zooming in on a map of their region, consumers can pull up

and view a profile of any farm in the extensive national database.

The site also maintains a "Farmers Only" area where farmers can set their profiles, maintain customer lists, respond to inquiries, and even have farmer-to-farmer chats.

The service is free, and setting up a farm profile—similar to a brochure—takes about 45 minutes. Farmers can change their market profile on-line at any time. △

EVENTS

Permaculture Teacher Training Central California

Dates: June 19-25, 2002
Location: on the Bonny Doon, nr. Santa Cruz, CA.
Description: We will provide a forum to develop teaching skills, discuss strategies and techniques, and review the rewards and challenges of teaching Permaculture Design. We will take a whole systems approach throughout the course. Everyone will gain experience and confidence through practice teaching and supportive critique. Course topics include:

- Philosophy & Ethics of Instruction
- Teaching Systems, Principles, and Patterns
- Planning, Marketing, and Economics
- Adult Learning Styles
- Organizing Curricula, Modules, Resources
- Teaching Space Logistics
- Team Teaching
- Presentations and Facilitators Roles
- Time Management
- Exercises and Media Aids
- Interns and Apprentices
- Evaluations and Feedback
- Tricks of the Trade
- Keeping Up The Spirit
- Building Confidence through Practice

Graduates of the Permaculture Design Course may receive a Pc Teacher Certificate on completion of this course.

Instructors: Jude Hobbs and Tom Ward. Jude has practiced landscape design for 20 years. She trained in Permaculture in 1986, and began teaching four years later. Her curricula encompass diverse learning styles. She has written "A Guide to Multi-Functional Hedgerows," and tends a forest garden in Eugene, Oregon. Tom is an ethnobotanist, eco-forester, and Pc designer. The author of *Greenward Ho: An ecological approach to Sustainable Health*, he has extensive multi-cultural experience in the USA and overseas. Tom has developed Pc courses for Laney College and D-Q University in California, and has taught Pc Design since 1985. He is based in Ashland, Oregon.

Cost: \$230 tuition before May 19; \$305 thereafter. Includes instruction and course materials. Food and camping extra. Enrollment limited to 25. Price has been kept low to encourage broad attendance. Deposit of \$75 required—refundable until May 19.

Contact: Rain, TT
316 Main St
Santa Cruz, CA 95060
831-457-9469
raincascadia@yahoo.com

Permaculture Design Course Sonoma County, California

Dates: September 28-October 11
Location: Occidental, CA
Description: In this two-week intensive course in sustainable systems design, participants will learn how to design systems for sustainable, regenerative living. Hands-on topics include: permaculture principles, ponds, on-site water development, erosion control, forest farming, organic gardening, mulching, composting, plant guilds, pollination, alternative building materials, community economics, and much more!

Instructors: Penny Livingston, Brock Dolman, and guests
Cost: Residential, meals included. \$1200. \$100 discount for payment 30 days in advance.

Contact: Occidental Arts & Ecology (SEE BELOW)

Occidental Arts & Ecology Ctr. Programs in Sustainability Sonoma County, California

- **Organic Gardening Intensives**
May 17-19, August 9-1
Residential, meals incl. \$350 (\$300).
- **Building In the Round** - June 14-16
Residential, meals incl. \$350 (\$300).
- **Art in the Garden** - July 12-14
Residential, meals incl. \$350 (\$300).
- **Women, the Garden, Herbs & Healing**
July 19-21.
Residential, meals incl. \$350 (\$300).
- **Watersheds-Basins of Relations:**
Starting and Sustaining Community Watershed Groups - July 26-29
Residential, meals incl. \$100.
- **Starting & Sustaining Intentional Communities** - August 5-9
Residential, meals incl. \$600 (\$525)
- **Sustainable Forestry** - August 11
9am-5pm, lunch incl. \$110 (\$95)
- **Carpentry for Women** - August 16-18
Residential, meals incl. \$350 (\$300).
- **Seed Saving: From Seed to Seed**
September 6-8
Residential, meals incl. \$350 (\$300).
- **Democratic Decision-Making**
October 25-27
Residential, meals incl. \$350 (\$300).
- **Introduction to Permaculture**
November 15-17
Residential, meals incl. \$350 (\$300).

To register send a \$100 deposit.
Occidental Arts & Ecology Center
15290 Coleman Valley Road
Occidental, CA 95465
707-874-1557, fx/-1558
oaec@oaec.org
www.oaec.org

Applied Permaculture Technique Northern California

Dates: May 17-22
Location: Mendocino County, CA
Description: For those who learn best by doing, basic design principles and methods will be explored with an A-frame and a shovel in hand. Join us as we begin to develop an integrated food production system based on perennial food forest, annl. vegetable terraces swales, mulch and fertilizer crops, windbreaks and small livestock forage. Our site includes natural buildings, composting toilet, greywater reclamation, and alternative energy systems.

Instructors: Darryl Berlin, Sara McCamant, Michael G. Smith
Cost: \$350 incl. camping, meals
Contact: Emerald Earth (see below)

Introduction to Natural Building Two Events - No. California

Dates: July 5-11 & Sept. 6-12
Location: Mendocino County, CA
Description: Natural building is coming of age as a holistic design and construction system. Learn to assess the most appropriate techniques for a given project based on site ecology and climate, available resources, esthetics, and skill level. This practical course offers daily skill-building on real buildings under construction. Hands-on segments may include straw bale, light straw-clay, cob, round pole timber framing, natural plasters and paints, adobe floors, and more.

Instructors: Michael G. Smith, Darryl Berlin, Sara McCamant
Cost: \$400 incl. camping, meals
Contact: Emerald Earth
707-895-3302
lorax@ap.net

Permaculture Design Course 7th Annual On-Line

Dates: begins September 15; scholarship applications due August 1
Description: The six-month course includes weekly sets of "lectures" sent by email, reading assignments, four reports from each student including a full permaculture design report and class discussion of all the work via email. Detailed information on the course protocol, the course reading list, and the course assignment schedule is available via the contact web address below.

Instructors: Dan Hemenway, Cynthia Hemenway, C.N.M., and Dr. Willem Smuts
Contact:
<http://barkingfrogspc.tripod.com/frames1>

16th Annual

Permaculture Design Course Central Rocky Mountains

Dates: August 19-30

Location: Basalt, CO

Description: A full certificate course presented at our high-altitude demonstration site. This is one of the most mature forest gardens in North America and most of the food served at the course will come from our garden and greenhouses.

Instructors: Jerome Osentowski, Peter Bane, John Cruickshank.

Cost: \$900

Contact: CRMPI

PO Box 631
Basalt, CO 81621
970-927-4158
jerome@crmpi.org

Permaculture Design Course Northern California

Dates: June 1-15, 2002

Location: nr. Garberville, CA

Description: A certificate course in permaculture principles, ethics, and practices as they pertain to: water, food, shelter, energy, ecology, soil, plants, economics, social justice, land access, education, animals, care of the earth, and more at Skywater Center, a new, developing permaculture site 25 miles east of Garberville. You will be able to see a newly installed pond, water catch basins, swales, native bunchgrass plantings, solar showers, composting toilets, and more.

Instructors: Penny Livingston-Stark, Brock Dolman, James Stark, and guests.

Cost: \$950 includes tuition, camping, and meals.

Contact: Pc Inst. of No. California
PO Box 341

**Places
Still
Available!**

Point Reyes Stn. CA 94956
415-663-9090
pinc@svn.net

www.permacultureinstitute.com

Permaculture Design Course Northern New Mexico

Dates: May 26-June 9

Location: Hummingbird Ranch
Mora, NM

Cost: \$990

Contact: PO Box 732
Mora, NM 87732
800-336-3493
yalianr@yahoo.com

<http://cocreativeculture.com/pc.htm>

Permaculture Teacher's Training Southern Appalachians, NC

Dates: October 20-25

Location: Earthaven Ecovillage
Black Mountain, NC

Description: An intensive exposure to curriculum and practical methods for organizing long and short workshops. We will explore learning styles and team teaching, learn course logistics and economics, gain insight to prepare lessons, and practice teaching sessions with supportive feedback. Open to graduates of the Permaculture Design Course.

Instructors: Peter Bane, Chuck Marsh, and Patricia Allison

Cost: \$375 includes meals, camping

Contact: Culture's Edge (see below)

Women's Work: Creating Sustainable Futures Southern Appalachians, NC

Dates: August 29-September 2

Location: Earthaven Ecovillage
Black Mountain, NC

Instructors: Patricia Allison, Mollie Curry

Description: An introduction to permaculture and natural building as tools for a future that is economically, ecologically, and spiritually viable. Open to women only.

Cost: \$300 includes meals, camping

Contact: Culture's Edge
1025 Camp Elliott Rd.
Black Mountain, NC 28711
828-669-3937
culturesedge@earthaven.org
www.earthaven.org

4th Annual Permaculture Fundamentals Southern Ontario

Dates: July 14 - 21

Location: Orangeville, ON, Canada

Description: This course will cover the permaculture principles & techniques using lectures, discussions, hands-on, slide shows, field trips, and a design project.

Instructors: Gregoire Lamoureux,
Richard Griffith

Contact: Ecology Retreat Centre
519-941-4560
ecore@ionsys.com
<http://welcome.to/ecore>

Seedy Saturdays

Local Seed Exchanges across Canada
<http://www.seedysaturday.ca>
<http://www.seeds.ca>

Village Living Residency Training in Permaculture Design Blue Ridge Mountains, NC

Dates: July 5-August 19

Location: Black Mountain, NC

Description: A six-week program including full permaculture design course certification. Additional workshops, hands-on project experience, mentoring, ecovillage immersion, and other opportunities.

Instructors: Peter Bane, Chuck Marsh, Patricia Allison, Keith Johnson, Andrew Goodheart Brown, Shawn Sudhangshu Swartz, and Earthaven Ecovillage members.

Cost: \$2000 includes tuition, materials, meals, and camping

Contact: Culture's Edge
1025 Camp Elliott Rd.
Black Mountain, NC 28711
828-669-3937
culturesedge@earthaven.org
www.earthaven.org

Fundamentals of Permaculture

Dates: July 5-13

Location: Black Mountain, NC

Description: Eight-day intensive introduction to principles and practices of permaculture in a community setting at Earthaven Ecovillage. First part of the certificate curriculum in permaculture design. Natural systems, the built environment, observation and design skills, cultivated ecosystems. How to see, think, and do the future...NOW.

Instructors: Peter Bane, Patricia Allison, Andrew Goodheart Brown, guests

Cost: \$600 incl. tuition, materials, meals, and camping.

Village Design Practicum

Dates: August 9-17

Location: Black Mountain, NC

Description: Eight-day intensive practice in permaculture design for a developing ecovillage community: social design, governance, infrastructure, land use, water, waste & energy, presentations and costing; mapping & surveying. Presented by the Southeast's finest design team. Second part of the certificate curriculum in permaculture design. Prior training in Permaculture is a requirement.

Instructors: Chuck Marsh,
Keith Johnson, Peter Bane, guests

Cost: \$600 includes tuition, materials, meals, and camping.

Contact: Cultures Edge (see above)

Permaculture Design Course Southeast British Columbia

Dates: June 10 - 22

Location: Winlaw, BC, Canada

Description: This is the basic permaculture design course covering the principles and techniques of permaculture design. The course includes lectures, discussions, hands-on, slide shows, field trips & design projects. This course is presented in cooperation with Selkirk College.

Instructors: Gregoire Lamoureux

Contact: Kootenay Permaculture
250-226-7302

spiralfarm@yahoo.com

<http://www3.telus.net/permaculture>

Agroforestry/Forest Garden & Urban Permaculture Workshops Central British Columbia

Dates: July 28 - August 2

Location: Prince George, BC

Description: Two one-day workshops covering the basic principles with a slide presentation & discussion followed by a design exercise. Held at the Community Development Institute.

Instructor: Gregoire Lamoureux

Contact: cdi@sparc.bc.ca

<http://www.sparc.bc.ca/cdi>

Cours de Design en Permaculture (en francais / in French) Permaculture Design Course nr. Montreal, Quebec

Dates: 29 avril - 12 mai 2002

Lieux: Rougemont, Québec

Description: Le cours de base de 72 heures enseigne les principes et techniques de design en permaculture. Ce cours inclut des lectures, discussions, projets, pratiques, diapositives, visite de fermes et projets de design.

Instructeurs: Grégoire Lamoureux

Contact: Ketty St-Fleur
Nature-Action Québec
450-441-3899

info@nature-action.qc.ca

Continental Bioregional Congress VII Flint Hills of Kansas

Dates: October 7-13

Location: nr. Elmdale, KS

Description: Celebrations, small groups, workshops, art, music, theater, councils, and lively encounters of all kinds happen as we envision and develop a realistic, restorative way of life for the bioregions of the Americas. We earnestly invite the participation of all those actively employing ecological precepts in the many movements and endeavors necessary for the human species to reinhabit the Earth. The Congress plenaries will be translated English:Spanish. A range of accommodations will be available and the basic fees are set on a sliding scale.

Contact: Kansas Area Watershed Council, PO Box 1512, Lawrence, KS 66044 USA.

Networks & Resources

UN Environment Program to Map Solar & Wind Resources

Findings Should Boost Prospects for Renewable Energy Across the Globe

The United Nations Environment Program (UNEP) announced in December a three-year, \$9.3 million pilot project to map the solar and wind resource of 13 developing countries. Experts are convinced that the project, called the Solar and Wind Energy Resource Assessment (SWERA), will prove the potential for deploying solar panels and wind turbines to be far greater than currently supposed.

Klaus Toepfer, Executive Director of UNEP, said: "While the costs of solar and wind energy have been tumbling in recent years, obstacles remain to their widespread deployment. One of these is uncertainty about the size and intensity of the resource. SWERA aims to bridge this knowledge gap so potential investors can know accurately where they can secure a reasonable return."

"If we can accelerate the deployment of renewable energy we can not only bring down the costs, but also help in the fight against global warming and poverty," he added.

A G8 Renewable Energy Task Force report last year estimated that it might be possible to deliver renewable energy to over a billion people by 2010 if financial and other obstacles are overcome.

Meanwhile developed countries, as a result of climate change talks in Bonn and Marrakech, are searching for sites in poorer countries where wind and solar power can be deployed. Various funds and mechanisms have been agreed which will allow industrialized nations to offset their greenhouse emissions at home through green energy schemes in the developing world.

Solar and wind are highly dependent on local climatic conditions, however. Tom Hamlin, Climate Change Task Manager in the UNEP/Global Environment Facility's Coordination unit at Nairobi, Kenya, said: "The investment in a 200 megawatt (MW) solar thermal power plant is approximately \$400 million. An error of 10 per cent in

calculating the solar resource would amount to a difference of \$150 million in revenues over the life of the project—a heavy burden for its economic performance."

"Meanwhile the efficiency of steam turbines operated with concentrated solar thermal energy is strongly affected by fluctuating solar energy input. Such dynamic effects, which may easily reduce performance by 10 to 20 percent, can only be specified if the solar radiation intensity is known on an hourly basis. SWERA will, we believe, considerably reduce uncertainties about the resource," he added.

The project findings will be linked with a Geographic Information System (GIS) so prospective developers can pinpoint promising locations on-line.

The surveys are to be carried out in 13 countries of Asia, Africa, and Latin America: Bangladesh, China, Nepal, Sri Lanka, Kenya, Ethiopia, Ghana, Brazil, Cuba, El Salvador, Guatemala, Honduras, and Nicaragua.

SWERA is an international collaboration between UNEP and public and private research agencies including the US National Renewable Energy Laboratory, Grid/Sioux Falls, the German development agency GTZ, the State University of New York, the Danish National Laboratory, the Tata Energy Research Institute (India), and the space agencies of Germany and Brazil.

The belief that SWERA will discover wind and solar resources far larger than is currently supposed comes from work done in the Philippines. There a recent survey and completed national atlas of the wind resource has found the potential for commercial power generation to be tens of thousands of MW. A feasibility study for a 40MW wind farm, the first important one in the country, was carried out by the Philippine National Oil Corporation within six months of the completion of the atlas. Prior to the survey, the official Philippine projection for wind power in the coming decade was around 100MW. The survey could lead to 480MW in place by 2008, roughly half a billion dollars of investment, and as much as 2,000MW by 2015.

For more information contact: Tom Hamlin, Climate Change Task Force Manager, UNEP/GEF, Tel: +254-2-624146, fx/-623696, e-mail: tom.hamlin@unep.org, or Mark Radka, Division of Technology, Industry, and Economics on Tel: +33-1-4437-1427, e-mail: mark.radka@unep.fr. △

Permaculture, Natural Building & Ecovillage Design Middle Tennessee

Permaculture Fundamentals

Dates: May 24-June 1

Description: The first half of the complete design certification course. Learn the low impact methodologies that are creating a holistic movement.

Instructors: Albert Bates, Patricia Allison, Sizwe Herring.

Cost: \$600 incl. meals & lodging

Permaculture Practicum

Dates: June 3-9

Description: The Permaculture Design Course admits PC Fundamentals graduates for the second half of the certification process.

Instructors: Albert Bates, Biko Casini, Sizwe Herring.

Cost: \$600 incl. meals & lodging

Contact: ecovillage@thefarm.org.

P.O. Box 90, Summertown TN, 38483.
931-964-4475, fx/-2200.

Ecovillage Design

Dates: May 15-19

Description: Site selection, design for Ecovillages, consensus and conflict resolution, financial aspects, work issues, best practices. Live and work in an ecovillage for a week and get a sense of the issues.

Instructors: Greg Ramsey, Albert Bates, and guests.

Cost: \$600 incl. meals & lodging

Natural Buildings Immersion

Dates: July 15-21

Description: A week-long intensive. Wattle and daub. Mud and stone. Turf and timber. Build with straw, cob, wood and other natural materials. Architect and builders Howard Switzer, Katey Culver, Albert Bates.

Cost: \$600 incl. meals & lodging

Ecovillage Training Center

P.O. Box 90, Summertown TN, 38483.

<http://www.thefarm.org/etc/>

Friends of the Trees Workshops Pacific Northwest

July 5-7. Skalityte Retreat Center, Twisp, WA. 2nd Annl. Fairy & Human Relations Congress. \$125 before June 1. After 6/1, \$150. Teens \$30. Children \$20.

July 19-21. nr. Missoula. 5th Annl. Montana Herb Gathering. Kirk Norby, 406-244-5625. montanaherbathering@yahoo.com

August 24-25 (or Aug. 17-18), dates TBA. nr. Bellingham, WA. 7th Annl. Northwest Herbal Faire. Over 60 workshops, herbal vendors, two stages, entertainment and fun.

North Cascades

June 15-16. Upper Methow Valley, WA. Medicinal Plants Field Trip. Hiking in the mountains to look at medicinal plants. Identification, uses, harvesting and processing.

September 7-9. Methow Valley, WA. Sustainable Wildcrafting & Growing Medicinal Plants. A 3-day, hands-on workshop in the wild and at Sunny Pine Farm.

Contact: Michael Pilarski

Friends of the Trees,
PO Box 4469, Bellingham, WA 98227.
360-676-7704

friendsofthetrees@yahoo.com
www.friendsofthetrees.net

Permaculture Design Intensive Northeast Ohio

Dates: July 25- August 3

Location: Oberlin, OH

Description: Participants will produce an advanced-draft permaculture design for the workshop site. The workshop suits home owners who wish to learn permaculture design for their personal use, people seeking a superior preparation for the permaculture design course, and permaculture certificate holders seeking advanced work in permaculture design. Students may arrange in advance to use the design as the basis for the Elfin Permaculture Design Course Online. A one-day workshop and an evening lecture will be offered prior to the design intensive.

Cost: \$575 tuition; food and lodging extra.

Contact: Eric Stewart

Ecological Design Innovation Center
MPO Box 357

Oberlin, OH 44074

440-775-4047

fstewart@oberlin.edu

Permaculture Design Course Western Massachusetts

Dates: July 19-August 8

Location: Shutesbury, MA

Description: Held at Sirius Community, this course will combine experiential and academic learning. Graduates may receive 3-4 college credits through UMass—Amherst (Plant and Soil Sciences 297P) as well as permaculture design apprentice certificates. Learning sections include: land assessment; patterns and cycles of nature; seat-of-the-pants surveying; water catchment and storage; key-line management; aquaculture; grey- and blackwater treatment; soil fertility; the cultivated ecosystem; small livestock and wildlife; integrated pest management; appropriate technology and energy design for shelter; community support strategies; regional economics; urban-suburban restoration; village design; report writing and presentation.

Instructors: Dawn Shiner, Pc designer and teacher since 1987; John Gerber, Ph.D., UMass Prof. of Sustainable Agriculture; Sirius staff and members.

Costs: Tuition \$1,000, college credit \$225, room & board (for non-commuters) varies by type and use. Some work study available.

Contact: Daniel Greenberg, Ph.D.

Living Routes, 85 Baker Road,

Shutesbury, MA 01072

413-259-0025; fx/-1256.

<http://www.LivingRoutes.org>

daniel@ic.org or info@LivingRoutes.org

Permaculture Design Workshop Oregon Coast

Dates: May 23-27

Location: Otis, Oregon

Description: An intensive covering permaculture design principles that integrates ethics, patterns, ecosystems, water, soils, animals, plants, and natural building. The Sitka Center, an educational facility and working artists' studio, celebrates the relationship between nature and art.

Instructors: Toby Hemenway, Jude Hobbs, and guests

Cost: \$550

Contact: Sitka Ctr. for Arts & Ecology
PO Box 65, Otis, OR 97368

541-994-5485, www.sitkacenter.org
info@sitkacenter.org

Build Here Now 2002 A Natural Building and Permaculture Convergence

Dates: June 9-16

Location: The Lama Foundation,
Taos, NM

Contact:

www.strawhomes.com/build/here/now.html

International Federation of Organic Agriculture Movements IFOAM Organic World Congress Victoria, British Columbia

Dates: August 21 -28 2002

Contact: ifoam2002@cog.ca
ph. 250-655-5652

<http://www.cog.ca/ifoam2002>

LETTERBOX

We Are Not Alone

Dear Peter Bane,

Thank you for *PcA* #46, which arrived yesterday and which I read cover-to-cover, as usual. It was a rich and satisfying mix of information, ideas, and inspiration. I am writing to respond to Toby Hemenway's article, "Finding a Sense of Surplus."

In both Judaism and Islam (and probably some other religions), sharing wealth is obligatory. In Islam, the 1/40 of one's income (or of assets, interpretations differ) given to the poor is called *zakat* (sweetening), since this gift, according to the Prophet, sweetens and legitimizes the remainder of one's wealth. Mohammed, a brilliant social reformer, had extensive contact with the large Jewish and Christian communities in Mecca, and was probably influenced by the Jewish obligation of *zedakah* (righteousness or justice—the term for what Christians later called charity. The Christian term reflects the mindset of love that should accompany the giving, the Jewish term the fact that it is seen as owed rather than optional.)

The normal Jewish requirement is that one give a tenth of one's income, and more is admirable. However, the obligation to give goes beyond sharing one's surplus. The Rabbis have held that it is incumbent even on beggars. Beyond distribution of surplus or acknowledgement that good fortune is unevenly distributed and must be helped out by human effort, the obligation, in the end, is to be connected to others by actively helping them, even when we ourselves need help. None of us is merely a victim, none of us is entitled to be only a claimant of the gifts of others. I find this a profound insight, one that deserves to be part of permaculture.

Also, an objection to the comment that the human urge to sacrifice is related to angst about the loneliness of birth and death—"We are borne alone and we die alone." This curious piece of existentialist wisdom—I think it may come from Sartre—is a wonderful example of how culture distorts our vision. There is one time in life when we can guarantee that people will not be alone: when they are born. We emerge from the bodies of our mothers and are physically connected to them by the umbilical cord. Cutting that connection is done by one of the people, usually other women, who are invariably present at non-emergency births. A baby emerges from another human, is connected to that other human, is caught and held by another human, and is then usually given right back to its mother to be held and nursed.

Further, even in the bizarrely medicalized births of Western culture in the past 200 years or so, if the infant is removed to a nursery, it is still surrounded by other babies and constantly watched over by nurses. Not exactly solitude.

What about "we die alone"? Again, this is usually not true, even in the hospital deaths that are so often the lot of Westerners today. Nurses and visitors are present frequently, if not always when we want or need them. And in traditional cultures, of course, it is customary to stay with the dying and often with the newly dead—think of Tibetan, Jewish, and Irish customs, just offhand—precisely so they won't have to be alone.

Why is this piece of nonsense so often repeated? I believe it reflects the separation and isolation fostered by our individualist and self-centered culture. Seeing this cliché in an otherwise excellent article by a writer I respect and admire is a reminder of how carefully we must examine the "truths" our culture teaches us.

So why do we sacrifice? At least three reasons fit right in with Hemenway's main points. 1) Our lives and fortunes come to us from the bounty of the larger universe, and we want to give back, to bear our part in the exchange of energies that keep the whole system going. 2) Our lives and fortunes are at the mercy of much larger forces which we do not control. Sacrifice is sometimes a bribe to those forces—I'm being good to you, so you be good to me, please. 3) When we behave badly, we affect not only our immediate victims, but also the balance of the whole, which depends on everyone doing what s/he should. Sacrifice is an attempt to right a balance by giving up something we cherish to make up for something we took, damaged, or destroyed wrongly.

Thanks to Toby Hemenway for a fine article.

Ileana Grams
Asheville, NC igram@unca.edu

Seeing Through Fears of Money

Dear Friends,

Thanks so much for the issue on "Good Work and Right Livelihood." It helped me focus my fear of money and a concurrent job search!

Pam Olsen
Bryan, TX

More Kudos for "Good Work"

Keep up the Great work! That last issue was AWESOME!
Gerald Fritz - Sugarloaf Key, FL

Thanks for all the amazing, blessed work you gift us with in every issue and the nexus point you provide!
Marna Hauk - Portland, OR

Cowboy Independence No Answer

Dear Activists,

Steve Solomon's article, "Keeping Up With The Smiths," illustrated the financial trap inherent in pursuing the "American Dream." However, the lack of social analysis was disappointing. The cowboy myth of independence remains pervasive in North American society, and can limit our imagination and vision of a sustainable way of life.

The Smiths see themselves living their dream alternative in the sparsely populated hinterland. Mr. Smith has an independent and fearless attitude, secure in the knowledge that should he lose his job, he can rely on his wife's diligent efforts in establishing a robust garden, harvesting wild berries, milling flour, preparing meals, homeschooling his children, providing and mending the family's clothes, and continuously researching the information needed to keep the whole family healthy.

Solomon's vision doesn't recognise the added environmental costs of providing needed goods and services (gasoline, electricity, road maintenance, etc.) into the hinterland. Nor does it recognise the potential impact of increased human presence in these remote areas on sensitive wildlife populations such as cougars.

Mr. Smith's independent (and low-density) lifestyle is not the only alternative to keeping up with the Joneses, nor the most desirable. I think that interdependence—not independence—holds more promise of building sustainable livelihoods. Even Mr. Smith isn't entirely independent—he relies on friends to tow away his mobile home in the early morning fog.

Steve Solomon is accurate in pointing out how the debt traps of home and car ownership, and an upwardly mobile life will lock a family into stress-filled days balanced on the edge of financial ruin. But he fails to mention that many imaginative options exist for both urban and rural people willing to pool their resources and commit to each other's lives. Housing co-operatives, intentional communities, cohousing initiatives, car co-ops, and community gardens all show how people can work together towards sane living. Similarly, four-day workweeks and self-employment allow people to regain balance between work and personal/community commitments.

By living in community, people are able to develop and rely on resources for and from each other. As more is invested in community life, its greater resources can better support the people who live there.

Communities everywhere are in desperate need of this rehabilitation. Going it alone in the hinterland will, I'm afraid, fail to accomplish this.
James Saper
Victoria, BC, CANADA

Danish Group Seeks Permaculture Help for Afghanistan

Dear Friends,

Permaculture in Denmark greets you. We have formed a group to lend a perma-hand to Afghanistan. Two of us know how to raise money. One of us was born in there, and one has years of experience with projects in Nepal and North India. We seek people with knowledge of cold desert lands and damaged soils, who wish to create an international permaculture group for Afghanistan that will put some energy on the ground there. Please contact us. Judith Frennung
judith@frennung.dk

Nature Bats Last

Dear Peter,

Mr. von Uexkull had much good to say for "A New Human Story," but I wish to take issue with his prediction, "The present paradigm will not release its hold until a new one becomes more clearly visible."

That sounds sensible, but doesn't take into account two large forces hurtling down the track from opposite directions toward an unprecedented collision: nature as it "bats last" and the global petroleum economy in the process of initial collapse.

The present paradigm will collapse regardless of what "new one" may be in whatever stage of readiness to take over. What we can hope for is to save some knowledge, seeds, and human networks for sustainable living practices. The alternative paradigm we need for survival may be from our distant past, instead of something new.

Overpopulation based on petroleum dependence cannot be undone—even with a perfect new paradigm—if that latter must set itself up amidst the present unsustainable system.
Jan Lundberg
Arcata, CA culturechange.org

Supporting Healthy Lifestyles

Dear Peter and all co-workers,

Issue #46 is beyond anything I've ever read or seen! Jerome's golf article—INCREDIBLE! Jacob von Uexkull, same. I feel it's equal to a college education in developing healthy lifestyles for "Homo sapiens" and harmony between us and the rest of Earth's folks.

I lent a copy to our reference librarian in Farmington to consider getting a subscription for the library.

After just a fast read, I reworked my small summer plantings. The whole plan is upgraded. Suddenly I have a rapport I lost many years ago with all green life here.

To me #46 is a work of genius.
Janice Blue
Aztec, NM

Camel Pitter Aids Soil Restoration

Dear Toby:

Researchers at the Centre for Appropriate Technology in Alice Springs, Australia, have developed a Camel Pitter. Pulled behind a lightweight truck, this machine recontours the soil surface to allow water and nutrients to be held on dry plains. It consists of a wheel with several small cups. The design is based on the shape of the American buffalo hoof and its action as the animal races over the prairie: the hoof scoops out a small pit. Seeds and organic matter collect there, and runoff infiltrates, creating a micro-environment that allows better survival of seedlings.

I have used this earth-shaping pattern when removing blackberry from a dry hillside and it has resulted in a significant amount of water infiltrating, with improved soil and the survival of indigenous plants. Rosemary Morrow
Katoomba, NSW, AUSTRALIA
rowe@lisp.com.au

Forest Garden Project in So. Africa

In 1999 we moved from Europe with our three young children to live in South Africa. Last year we settled in a community on 4 ha of land outside the village of McGregor, two hours from Cape Town.

McGregor consists of mostly Afrikaans-speaking coloured folk, some Xhosa, a fair few English-speaking white people (many with alternative ideas) and, of course, some white Afrikaansers.

We are surrounded by mountains and a nature reserve. The land has two bore holes, a dam, and some dwellings. There are also 500 fig trees, 10 almonds, and a few other fruits. We are busy renovating our house whilst putting in the beginnings of permaculture gardens. In August (mid-winter) we'll plant a forest garden.

Our vision is to create a centre for self-sustainability in action. This will include some simple cob housing, a hot tub, a windmill, as well as wind and solar pumps for the water. It would be exciting to develop an educational project here so school children and others can come to experience permaculture, sustainable agriculture, and alternative technology. Raising awareness about recycling and managing resources also seems of fundamental importance here in South Africa.

This is a beautiful country with a long growing season and amazing potential for self-sufficiency. A multitude of edibles can be grown, from apples to bananas, including oranges, papaya, peaches, apricots, plums, grapes, olives, and many nuts and berries. Lettuce and spinach grow all year round.

We also plan to grow grains and some fodder crops: There are two donkeys here and we would like to learn to work with horses on the land.

The wounds of apartheid may run deep, especially amongst the coloured and African communities where alcohol abuse and domestic violence may be symptoms of years of suppression. Focusing on the children and working (and playing) with nature feels like a positive and empowering step for the future of a new South Africa.

There is a Waldorf school in the village, where most of the children are from the coloured community. A group from the school already come here to help with planting and the horses.

We will also be focusing on personal growth—especially vortex healing (vortexhealing.com) and rebirthing—celebrating the festivals of nature, creative awareness of the elements, and inspirations from anthroposophy.

We are looking for people who would like to get involved in the project or have ideas how we might attract foreign funding. With the rand's continuing devaluation, overseas sponsorship goes a long, long way.

Also anyone able to offer advice based on their own knowledge or experience would be much appreciated. Julian and Alexander Dasi
PO Box 420, McGregor,
6708 Western Cape, SOUTH AFRICA
serensgarden@hotmail.com

Permaculture: No Easy Way

Dear Peter:

It's interesting to track changes in the "Permaculture Movement," to see certain folks seem to fade, others come into view. I'm mostly interested in articles focusing on "how-to" and "stuff that worked or didn't work," and so on. As the years tread by, we've been quite busy sorting wheat from chaff. As the venerable old master sez: grasshopper, there is no easy way! (Although, there is an article in *Pc Activist* in which the writer described establishing a permaculture-based homestead as a "bit of work." HA! We still laugh when we recall that line.

This past year we've built a one-acre pond (needs rain!), developed sheep pasture (with tree crop), got serious about solar food drying, planting a zillion clumps of bamboo, raised a zillion muscovy ducks (wanna buy a dozen?) Definitely becoming part of local community (we hang out with lots of older folks). Take care,
Randall Nocton
Cypress Inn, TN

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Books & Publications

Hopedance Magazine, a journal of sustainability. Online at hopedance.org. -47

Introduction to Consensus. Useful information about participatory group process and sustainable decision-making. Includes 28-page Guide for Facilitators. Also available in Spanish. \$15 check or M/O to Beatrice Briggs, PO Box 25, Black Earth, WI 53515 USA. briggsbea@aol.com. -48

Portable Dwelling Info-letter; about living in tents, yurts, domes, trailers, boats, remote cabins, other mobile or quickly-made shelters plus plans for simple low-cost, low-impact comforts and conveniences. Sample \$1.60/\$5. Box 190-pa, Philomath OR 97370 -99

Miscellaneous

Modern quilts—traditional looks! Baby-size \$60, Queen \$200. No fillers, backed with fleece for cozy flexible feeling. jollyjane@playful.com -47

Marl, If I can't dance. I don't want a part in your revolution—Emma. -47

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Scythe Supply are the web's most comprehensive resource for the European style scythe. Their selection of blades, snaths, sharpening equipment, and accessories is unique and they offer instruction and information. Discover this very efficient human-powered tool. scythesupply.com. 207-853-4750, Maine, USA. info@scythesupply.com -47

How to be Happy: Now, Nature, and Love. The Permaculture of inner and outer peace. Chris4goodnews@yahoo.com. -47

Seeds and Plants

Grow mushrooms for home use or profit. Shiitake, oyster, reishi, morels & others. For a free catalog and cultivation info, write to Mushroom Harvest, PO Box 5727, Athens OH 45701. 740-448-6105. -49

Help Wanted

Market Gardener and Kitchen Manager positions available at Dacres Organic Farm in Dorchester, New Hampshire. Room and board included. Contact POB 98, Rumney, NH 03266 or dacres@cyberportal.net -47

Land steward/Ranch foreman (or woman)/ Permaculturist wanted to build, live on, and manage our beautiful organic California coastal demonstration farm. We are looking to work with a single person, couple, or small family to oversee large acreage overlooking coast range. Generous stipend, home, healthplan, benefits starting Dec. 1st. Must have maturity, good people skills, integrity, chem-free, be willing to work hard for the Good Life long-term. Send bios/ref's to Dr. D. Cunningham, POB 3684, Half Moon Bay, Calif. 94019 (650)726-3815. -47

Internships & Apprenticeships

OPPORTUNITY—LUGH LUNA EDUCATIONAL FARM, blossoming urban sustainability demonstration center. 2002 season has us offering 3 one-to-six month work-learnships. Room, good food, and good city livin'. Ongoing activities: greenhouse innovation, small livestock, forest gardening, rainwater collection, 15-member CSA garden, irrigation, more. LLEF, attn. Chris Heath, 1008 North Bend Rd., Cincinnati OH 45224. 513-505-1864. -47

Apprentices Wanted! Small-scale permaculture/herb farm in southern Oregon. Frog Farm, POB 2093, Cave Junction OR 97523. 541-592-3386. -47

The Center for Bioregional Living offers work exchange and classes in ecological literacy, organic vegetable gardening, permaculture, biodynamics, and natural building. Pocahontas County, WV. treefaust@juno.com -47

Instituto de Permacultura de Mexico offers internship program in Central Mexico. For information, email us at: permacultura@terra.com.mx -47

Herb Pharm offers an HerbaCulture Work/Study Program on our certified organic farm in southern Oregon. Program runs March 25th through July 19th. Work includes cultivation and harvest of medicinal herbs in exchange for classes involving many aspects of organic farming and herbalism. Must be prepared for hard work. No monetary fee. Communal housing

provided. For 2003 application write: Work/Study, Herb Pharm, PO Box 116, Williams, OR, 97544. Email: workstudy@herb-pharm.com or phone (541)846-9121. -47

Situations Wanted

Looking for Permaculturists interested in living sustainably in the New England area. Contact: jregens664@earthlink.net -47

Education

Lyceum School for Organic Horticulture, PO Box 254, Westhampton, NY 11977. greenguerrilla.com. Enroll now. -47

Renewable Energy and Natural Home Building Education! Hands-on workshops. Solar Energy International 970-963-8855. solarenergy.org. sci@solarenergy.org. -47

Accredited Permaculture Design Course. Brian J Weston BSc. Ag, PDC, host of the weekly permaculture radio program "Brian's Patch!" is now offering a full PDC by correspon-

dence. Special emphasis on small properties. Economically priced! Contact: Brian J Weston, Box 125, Takaka, New Zealand E-mail: bweston@ihug.co.nz. Homepage for detailed info: pohara.com/weston. -47

LIVE/WORK/LEARN at Northern California intentional community. Natural Building, permaculture, organic gardening, May-October. Contact Emerald Earth, 707-972-3096; lorax@ap.net. -47

Business Opportunities

Want to make movies about Permaculture? We can help! Progressive Cinema Convergence October 2002. StoneSoupStudios.com or call 866-874-1590. -47

Non-profit Web-based BB information service promoting social, environmental, community issues—starting, seek interested skilled coworkers, no \$ 2yrs. ap47@mindspring.com -47

Services Offered

SEWING—Repairs, tent housing, RV

covers, leather, quilts, custom work, designs. Write sewing@janeway.net or Box 833, Sebastopol CA 95473. -47

Sagewater Permaculture is a new business specializing in high desert & cold climates. Would love to network! 541-385-4911. waterfroggy@hotmail.com -47

Communities

Farm, ranch & work in Community. East Wind Community is a 60-member democratic secular community on 1045 acres in the beautiful southern Missouri Ozarks. founded in 1973, we've got several successful businesses that fund our agricultural and Permaculture work. Interns, visitors, and new members welcome! For info: East Wind Community, HC-3, Box 3370, Tecumseh, MO 65760; 417-679-4682; www.eastwind.org -48

Union Acres Intentional Community - "Ideal balance between community and private property." Homes & homesites available. One hour W. of Asheville, NC. Children welcome. home.earthlink.net/~jchristie 828-

497-4111 swasapp@earthlink.net -48

RAISE YOUR FAMILY IN PARADISE. Intentional sustainable community seeks buyer for 24.75 acres of land, on the Big Island of Hawaii. The acreage is pastoral with a year round creek, and amazing views of Maui, multiple valleys, ocean, sunrise, and waterfalls. Join our community conscious neighbors and create your dreams. Call for more info. 808-889-1083 or hvjiosie@aol.com. -47

LIVE YOUR VALUES. Ecology, Equality, Non-violence. Join our communities; no fee required. Federation of Egalitarian Communities, c/o Dancing Rabbit, 1 Dancing Rabbit Ln., Box PA-1, Rutledge, MO 63563; 660-883-5511; fec@ic.org; www.thefec.org -49

FOR SALE IN MEXICO IN PERMACULTURE COMMUNITY: small ranch consisting of 2.5ac of fertile land and two-bedroom house. The natural vegetation consists of leguminous trees, shrubs, and medicinal flowers.

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- II, 3 Aug. '86 Int'l PC Conference Program
- II, 4 Nov. '86 Fukuoka; Keyline; Genetic Cons'vn; City Farms; Oceanic PC
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- VI, 2 May '90 Insectary Plants; more Greywater; Land Use for People
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- VI, 4† Nov. '90 Urban Permaculture: Ecocity Conf, Soil Detox, Suburbs & Pc.
- #23† May '91 Politics of Diversity; Greenhouse Mkt Gdn; PC in Nepal.
- #24 Oct. '91 Creativity in Design: Examples, Index Issues #1-23;
- #25† Dec. '91 Design for Community: CSAs, Restoring Forest; Garden Ecol.
- #26 May '92 Soil: Our Past, Our Future: Fertility, Worms, Cover Crops
- #27* Aug '92 Integrating Pc: Deconstructing Utopia; Grassroots Organizing; Garden Polyculture; Pattern Learning; Living Fences.
- #28* Feb. '93 Structures: Comnt'y Dsgn; LETS; Industry; Strawbale/Timber-frame Bldgs.
- #29/30* July '93 Networks: Special Media Rvw; Rural Reconstr'n; Leaf Conc.; Comnt'y Food Initiatives; Pc in Palestine; Do-Nothing Ed'n; Feng Shui; Companion Gdng; Nature Spirits; Wilderness; Biogeog.; Network Theory; Pc Acad.
- #31* May '94 Forest Gdng: Energy & Pc; Mushroom Cultvn; Robt.Hart's F.G., Spp for N. Cal.; Alders; Agroforestry in Belize, China; Honeylocust; N-fixers.
- #32 April '95 Animals & Aquaculture: Rare Breeds; Animal Polyculture; Small-scale Cattle; Goat Dairy; Keyline; Ramial Woodchips; Feral Chickens; Bee Plants; Constructed Wetlands; Reed Bed Sewage Treatment.
- #33 Dec. '95 Cities & Their Regions: Green Cities; Independent Regions; LA Eco-Village; MAGIC Gardens; CoHousing; City Markets; City Animals; Micro-Enterprise Lending; Suburban conversion; Rails-to-Trails.
- #34 June '96 Useful Plants: Bamboo Polyculture; Medicinals; Pest Control; Root Crops; Oaks; R. Hart's For. Gdn; Russian Plants; Regl. Plants; Sources
- #35 Nov. '96 Village Design: Pattern Language; Consensus Democracy; Conflict; Historic & New Villages; Planning for Tribe; Earthen, NC; Design for Catastrophe; Youth; Vill. Economics; EcoForestry; Natural Bldg.
- #36 Mar. '97 Climate & Microclimate: Climate Change; Microclimate Primer;

- Weather; Windbreaks; Low-Tech Sun Locator; Drylands; Cool Slopes; Subtropic Forest Gdn; Straw-Clay Bldg.; Round Beehive; Water Catch.
- #37† Sept. '97 Tools & Appropriate Technology: Dowsing; Workbikes; New Energy Seythes; Japanese Saws; Nursery; Ferrocement; Greywater; A-frame & Bunyip Levels; Ram Pump; Solar Toilet; Log Yoke; Cockstoves...
- #38* Feb. '98 Economic Transformation: The Speculative Economy; No Middle Class Pc?; Worker-Owned Coops; WWOOF; No Money!; Global Warm-What Profits?; Holistic Financial Planning; Land Use; Adopt-A-Hive
- #39† July '98 Knowledge, Pattern & Design: Pc: A Way of Seeing; Sand Dunes; Native Conservation.; Language, Worldview & Gender; Patterning as Process; Land-Use Planning; Teaching Pc; Vietnam; Holmgren on Pc
- #40† Dec. '98 New Forestry: Regl. Devlpmt., Horselogging; Menominee Res'v'n; Forest Investing; Restoration; Old Growth; Homestead Tenure; Forest Soils; Forest Farming; Woody Agric.; Rainforests; Windbreaks; Coppice
- #41* May. '99 Natural Building: Oregon Cob; Cordwood; Bamboo; Thatch; Ethics; High Winds; Origins of Conflict; Greenhouses; Ponds; Adobe; Road-Building; MicroHydro; Bldgs. That Live; Under \$20K Houses; Dreams
- #42† Dec. '99 Self-Reliance & Community Cooperation: Co-Intelligence & Self-Orgn.; Archetype Design; Sovereignty; Samoa; Mondragon; Natural Housing; Comm. Gdns.; Zone Zero; Solar Electric Tractor; Beekeeping
- #43† June '00 Food & Fiber: Food for Hunger, Ferments, Seasons Salads, Heirlooms, Self-Fertile Gardens, Revolution in Rice, Cold Climate Food Strategies, Edible Insects, Chillies, Food Origins, Garlic, Ethnobotany, Wild Food, Bamboo, Fencing, Fibers, Hemp, Silk, Mulch Beds, Chicken Forage.
- #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/AIDS; Agents of Decay; Comm. Health Centres; Grafting; Women & Trad. Medc.; 4th World Apothecary; Healing Weeds; Hawaiian Botanicals; Garden as Healer; Medicinal Crops; Ginseng.
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Trees have been planted alongside a series of swales. An orchard and intensive growing area are closer to the house. The house is built of thermal stone, and offers a beautiful view across the valley. The property is located 180 miles northeast of Mexico City, and 20 minutes drive from San Miguel de Allende, a beautiful colonial town, offering many cultural activities for artistically and holistically-minded people. \$50,000. frevaschikorr@hotmail.com -47

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Land to lease for Permaculture home sites, CSA, organic growers at Fayetteville, Arkansas. Five miles to 3x/week farmers market, three miles to University of Arkansas (home of ATTRA). New Pear Farm Land Trust newpearfarm@aristotle.net. -47

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CALENDAR

May 15-19. Summertown, TN. Ecovillage Design. Ecovillage Training Center, PO Box 90, Summertown, TN 38483. 931-964-4475, fx/-2200. ecovillage@thefarm.org.

May 17-22. Mendocino County, CA. Applied Permaculture Techniques. Emerald Earth. 707-895-3302. lorax@ap.net.

May 19-24. Summertown, TN. Japanese Bamboo Basketmaking Short Course. Earth Advocates, 30 Myers Rd. Summertown, TN 38483.

May 23-27. Otis, OR. Permaculture Design Workshop. Sitka Ctr. for Arts & Ecology, PO Box 65, Otis, OR 97368. 541-994-5485. sitkacenter.org info@sitkacenter.org

May 24-June 1. Summertown, TN. Permaculture Fundamentals. Ecovillage Training Center, 931-964-4475, fx/-2200. ecovillage@thefarm.org.

May 26-June 9. Mora, NM. Hummingbird Ranch. PO Box 732, Mora, NM 87732. 800-336-3493. valiant@yahoo.com cocreativeculture.com/pc.htm

June 1-15. Trinity County, CA. Permaculture Design Course. Permaculture Institute of Northern California, PO Box 341, Pt. Reyes Stn., CA 94956. 415-663-9090. pinc@svn.net

June 3-9. Summertown, TN. Permaculture Practicum. Ecovillage Training Center, 931-964-4475, fx/-2200. ecovillage@thefarm.org.

June 8-9. Hocking Hills, OH. 4th Annual Landowners Conference. Cynthia Brunty, Rural Action Sustainable Forestry, PO Box 21, Glouster, OH 45732. 740-767-2090. forestry@ruralaction.org.

June 9-14. Summertown, TN. Bamboo Design & Construction Short Course. Earth Advocates.

June 9-16. Taos, NM. Build-Here-Now Design Convergence. strawhomes.com/build/here/now.html

June 10-22. Winlaw, BC. Permaculture Design Course. 250-226-7302 spiralfarm@yahoo.com www3.telus.net/permaculture

June 15-21. Summertown, TN. Natural Building Immersion. Ecovillage Training Center. 931-964-4475, fx/-2200. ecovillage@thefarm.org.

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Black Mountain NC 28711 USA

ADDRESS SERVICE REQUESTED

June 19-25. nr. Santa Cruz, CA. Permaculture Teacher Training. Rain - TT, 316 Main St. Santa Cruz, CA 95060. 831-457-9469. rainscascadia@yahoo.com.

July 3-August 17. Black Mountain, NC. Village Living Residency. Culture's Edge, 828-669-3937. culturesedge@earthaven.org www.earthaven.org

July 5-11. Mendocino, CA. Introduction to Natural Building. Emerald Earth. 707-895-3302. lorax@ap.net.

July 5-7. Twisp, WA. Fairy & Human Relations Congress. Friends of the Tree Society, PO Box 253, Twisp, WA 98856. 509-997-9200, fx/-4812. friends_of_the_trees@yahoo.com friends_of_the_trees.net.

July 5-13. Black Mountain, NC. Permaculture Fundamentals. Culture's Edge, 1025 Camp Elliott Rd., Black Mtn., NC 28711. 828-669-3937. culturesedge@earthaven.org www.earthaven.org

July 14-21. Orangeville, ON, CANADA. Permaculture Fundamentals Course. Ecology Retreat Centre. RR #1, Orangeville. ON L9W 2Y8 Canada. 519-941-4560, ecore@ionsys.com.

July 19-21. nr. Missoula, MT. 5th Annl. Montana Herb Gathering. Kirk Norby, 406-244-5625. montanaherbathering@yahoo.com

July 19-August 8. Shutesbury, MA. Permaculture Design Course. Daniel Greenberg, Living Routes, 85 Baker Road, Shutesbury, MA 01072. 413-259-0025; fx/-1256. LivingRoutes.org daniel@ic.org or info@LivingRoutes.org

July 23-August 3. Tlaxco, MEXICO. Land Restoration, Ecological Living & Natural Building. Ianto Evans, PO Box 123, Cottage Grove, OR 97424. 541-942-3021, ph/fx/-2005, deatech.com/cobcottage.

July 25-August 3. Oberlin, OH. Permaculture Design Workshop. Eric Stewart, Ecological Design Innovation Center, MPO Box 357, Oberlin, OH 44074. 440-775-4047. eric.stewart@oberlin.edu.

July 26-29. Occidental, CA. Starting a Community Watershed Group. OAEC. 15290 Coleman Valley Rd. Occidental CA 95465. 707-874-1557, fx/-1558. oaec@oaec.org oaec.org

August 1-4. Black Mountain, NC. 9th Annual SE Permaculture Summer Gathering (at Earthaven Ecovillage). Culture's Edge, 828-669-3937. culturesedge@earthaven.org www.earthaven.org

August 9-17. Black Mountain, NC. Village Design Practicum. Culture's Edge. 828-669-3937. culturesedge@earthaven.org www.earthaven.org

August 16-18. Williams, OR. Skill Sharing & Pe Convergence. Seven Seeds Farm. 541-846-0776.

August 19-30. Basalt, CO. 16th Annual Permaculture Design Course. CRMPI, PO Box 631, Basalt CO 81621. 970-927-4158. jerome@crmpi.org www.crmpi.org

August 21-28. Victoria, BC, CANADA. IFOAM Organic World Congress. ifoam2002@cog.ca ph. 250-655-5652. cog.ca/ifoam2002

August 24-25. Hopland, CA. SolFest 2002: The Solar and Good Living Festival. Starr Communications, P.O. Box 39, Cornville AZ 86325. 928-649-8180, fx/-8181. helle@sedona.net

August 29-September 2. Black Mountain, NC. Women's Work: Creating Sustainable Futures. Culture's Edge. 828-669-3937. culturesedge@earthaven.org www.earthaven.org

September 6-12. Mendocino, CA. Introduction to Natural Building. Emerald Earth. 707-895-3302. lorax@ap.net.

September 14-28. Crystal Waters Village, Qld. AUSTRALIA. Permaculture Design Course. Sustainable Futures, 50 Crystal Waters, MS16 Maleny QLD 4552 Australia. +61-7-5494-4833. courses@permaculture.au.com

September 20-22. Black Mountain, NC. Introduction to Natural Building. Culture's Edge, 828-669-3937. culturesedge@earthaven.org www.earthaven.org

September 28-October 11. Occidental, CA. Permaculture Design Course. Occidental Arts & Ecology Ctr., 707-874-1557, fx/-1558. oaec@oaec.org oaec.org

October 7-13. nr. Elmdale, KS. Continental Bioregional Congress VII. Kansas Area Watershed Council, PO Box 1512, Lawrence, KS 66044 USA.

October 20-25. Black Mountain, NC. Permaculture Teacher Training. Culture's Edge, 828-669-3937. culturesedge@earthaven.org www.earthaven.org

November 26-December 7. Tlaxco, MEXICO. Natural & Experimental Building & Vernacular Architecture. Ianto Evans, 541-942-3021, ph/fx/-2005, deatech.com/cobcottage.

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