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Agroecology

Rhonda Baird

LAST YEAR, I ran across a reference to the term “agroecology.” Noting a focus on production techniques, I assumed that it was merely a form of sustainable agriculture. I was curious, so I set a Google alert on both words, “permaculture” and “agroecology,” and waited. Several months later, I find that there is consistent sharing and discussion about agroecology all around the world which contributes to important conversations around food production, fair treatment of people, and care of the landscapes—and permaculture isn’t talked about as much. Why? Permaculture practitioners can’t be just bad at search engine optimization. What is driving this?

I learned a great deal about agroecology, which I now understand to be an approach to sustainable agriculture with roots in the same research and thinking of the 20s and 40s that informed permaculture (see Dale Hendricks’ article on J. R. Smith’s friend, John Hershey in this issue). Apparently, we are cousins.

What becomes clear is that agroecology stayed close to its academic roots, fostering a lot of discussion, research, and documentation about what it is and its potential to influence policy and practice. That focus creates opportunity for advocacy—and that is just what it has done. Questions of food systems and food justice come forward. Via Campesina is among the leaders in this and in supporting farmers around the

world to claim their power and voice. Thank you to Ayla Fenton and Bryan Dale of Via Campesina for contributing to this issue. The social justice advocacy seems to spark everyone that I talked with about the relationship between permaculture and agroecology.

Connor Stedman shared this assessment which extends his article (see page 5, shared here with permission):

Overall, I think the two definitely can learn from each other, but that permaculture at this point has a lot more to learn from agroecology, especially on the level of its explicit political analysis, its engagement with social movements, and its centering of poor and working-class people, than the other way around.

I know that might read as a harsh conclusion and I don't mean at all to be unwarrantedly hard on permaculture—it's done a lot of very good things and gotten millions of people involved in sustainability and transforming their local landscapes. That's huge! But I think we're at the point in permaculture where realistic assessments of what we have and have not accomplished and where we might really be able to grow and evolve are very helpful and needed.

In reading and talking with the authors, I agree that—despite our good intentions—permaculture people have some work to do. We have not accomplished all that we set out to do—and hearing that message can trigger us into defensiveness or determination. I choose determination. Part of addressing this issue is in telling our stories so that we can see and understand what is being accomplished. So, I invite you to share your thoughts and work to address these needs. △

The Ascension of Charles Darwin

John Wages

ASCENSION ISLAND in the South Atlantic was once a fairly barren, remote, rocky outcrop of the Mid-Atlantic Ridge, until it was visited by Charles Darwin in 1836. Although the full story has yet to told (and is worthy of a book or film), the bleakness of Ascension inspired him to an experiment in regeneration. Over 200 species of plants were collected from around the world. Kew Gardens in London and Cape Botanic Gardens in South Africa, as well as sources in Argentina, contributed diverse species to the effort. Planted on the slopes of Green Mountain, the highest point on the island, vegetation gradually grew into a self-sustaining cloud forest. At the summit, a dewpond (also known as a cloud pond or mist pond) was constructed, and bamboo seedlings were planted around it. Collecting rainfall and probably some condensate from surrounding vegetation, the dewpond still exists and is a popular tourist destination for intrepid souls who venture to Ascension. Photos show a smallish pond ringed by ferns with a bamboo forest beyond. Ascension Island is still green, 175 years after Darwin’s first visit. Ascension is sometimes heralded as an example of terraforming and of what we might do someday on other worlds (Mars, anyone?). Unfortunately, humanity’s track record on Terra itself is mostly “terra-deforming.”

Driving into the campground in Minnesota for the North American Permaculture Convergence in 2014, I was ironically surrounded by monocultured corn. Never one to ignore ironic confluences of events, I stopped the car and took a few pictures of the undulating rows. The corn was tasseling, and the near-uniformity of the rows produced some interesting patterns. The plants also seemed short, compared with some of the older varieties that can easily reach 8-10' or even higher. It was interesting from a distance—a little like the rings of Saturn—but, having spent some time in industrial soybean and cotton fields in my youth, I know where the real excitement lies. Around the cotton field behind our house was a hedgerow, not planted on purpose, but

allowed to exist and to develop untended. Trees had sprouted along the original fence line and had been joined over time by other plants. It was probably no more than 10' wide in most places. Nevertheless, wandering through there as a child, I never failed to find something new. There were prolific wild Chickasaw plums and blackberries in the spring, feral apples, and lots more kinds of insects than were out in the cotton. Once, I ran across a guinea nest with 20 eggs of unknown provenance. What I didn’t realize at the time was that the hedgerow was nature’s attempt to restore diversity to the field. Were human intervention to stop, the hedgerow would have gradually grown into the field, seeding its way to the middle and uniting with other pioneer species wafting in on the wind or on the fur of wild animals.

What if we deliberately moved the hedgerow into our field? Obviously, that would be a mess! But what if we instead carefully considered what beneficial aspects of that hedge we might like to have? Perhaps nectary plants to augment pollinator and beneficial insect populations? What if we looked closely at the soil in the hedgerow, which hadn’t been plowed in many years? We would see that the soil indeed “uppens,” as Gene Logsdon put it. We could transfer that benefit to our fields through deep mulch and no-till practices. Or, we might even establish hedgerows with productive species (berries always come to mind) in the soybean or corn fields. Much like Patrice Gros’ no-till system we presented in issue #104, we could use such in-field plantings to generate organic matter to gradually rebuild the surrounding soils. We could integrate the semi-wild hedge with our domestic fields and produce a more ecologically sound form of agriculture, perhaps as a transition state on the way to an even more stable ecological agriculture, where the field becomes the hedgerow, aka the food forest.

An important distinction: agroecology and permaculture aim not to domesticate the hedge but to unshackle the constraints of annual monocultures to enable the higher potential yields of a more diverse system. In this issue, we’ve collected some notes on agroecology and some exciting reports from the field. We appreciate our writers, our subscribers, and our many other readers. May you enjoy these offerings. May you be well. Thank you. △

Agroecology: An Holistic Perspective

Ayla Fenton and Bryan Dale

IT SHOULD BE NO SURPRISE TO READERS of this magazine that our society is facing myriad crises, and that most of these crises are inextricably linked to our food system. Globalized capitalism, which of course has its historical roots in the trade of food, has led to massive economic inequalities, the concentration of wealth amongst the corporate elite class, and the exploitation of workers around the world. Proponents of the capitalist food system claim that it is the most efficient in history, yet it fails to deliver food security for the majority of the world's population.

We face a crisis in human health, as preventable diet-related disease has become the leading cause of death and disability in North America. This, of course, is a direct result of the capitalist industrialized food system providing cheap access to processed foods that are high in sugar, sodium, and trans fats, rather than healthy whole foods.

We are also facing the crisis of climate change and environmental destruction, which threatens our very ability to thrive on this planet. Approximately 30% of global greenhouse gas emis-

...any proposal for fixing our broken food system must take into account social and economic power dynamics...

sions are attributed to the food system, three-quarters of which results from the production and use of nitrogen fertilizers and the industrial methods of raising livestock. In the North American food system, it is estimated that for every calorie of food energy that reaches our mouths, we consume 13.3 calories of energy (mostly in the form of fossil fuels), which in fact means that this modern food system is the least efficient in history.

All of these problems can be solved by shifting to an agroecological food system that promotes more direct marketing of whole foods between farmers and eaters, and that incentivizes farmers to adopt more ecologically sustainable production methods.

That said, it is important to understand why North American farmers have adopted industrialized systems of production in the first place. It is easy to point the finger and assign blame to “conventional farmers” for the problems described above. It is more difficult, but crucially important, to begin to understand the economic and power dynamics behind the decisions that



Bygone from the beginning of the industrial farming era. The systems which saw the rise of “get big or get out” creates a legacy of challenges for all farmers and people. Photo CC0 via Pixabay.

farmers make. It is only through this understanding that we can begin to enact change. Over the past 60 years, North American governments have pursued aggressive export-oriented agricultural policies, which have promoted the monocultural production of export commodities, rather than food for local communities. And policies supporting urbanization have decimated rural communities and economies, forcing generations of young people to migrate to cities for what are purportedly “better” opportunities.

These policies have encouraged the consolidation of land and resources—the number of farms and farmers has been declining steadily for several decades, and the average farm size continues to increase. As governments have allowed corporations to concentrate power in the food system, farmers were sold a ‘high input, low diversity’ model of production, otherwise known as the “get big or get out” game. It has always been difficult to earn a living as a farmer, but this new model of production has allowed powerful transnational corporations to extract almost all the value in the value chain. In Canada, between 1986-2016, corporate input manufacturers (fertilizer, pesticide, and seed companies—often all under the same corporate ownership), and service providers (banks, etc.), have captured 98% of farmers’ gross revenues. Average farm net income has hovered around zero for several decades, and farm debt is at a record high. Many North American farmers realize that they are in a trap, but their precarious economic situation makes it very difficult for them to change the way they are doing things.

For these reasons, any proposal for fixing our broken food system must take into account social and economic power dynamics, and not just production practices. Agroecology provides a holistic framework for this kind of change. Agroecology is not



How do we ensure that everyone can sustain themselves? Photo CC0 via Pixabay.

just a set of production practices, it is a proposal for a social and political system that requires us to shift the structures of power in our society. Agroecology uses—and creates—social, cultural, economic, and environmental knowledge to promote food sovereignty, social justice, economic sustainability, and healthy agricultural systems. Ecology is the branch of biology that deals with the relations of organisms to one another and to their physical surroundings. Agroecology requires us to change the way that we relate to each other as humans in a shared society, and the way that we relate to non-human life and the land that sustains us.

In North America, agroecology is taking baby steps. The term is just starting to permeate popular consciousness in farming circles, as people are gradually beginning to use it to describe their approach to agricultural production. However, agroecology has a long history. A Russian agronomist, Basil Bensin, actually used the term as far back as 1928 in a book on commercial crop experiments. Over the next few decades, agroecology was generally understood as the application of ecology in agriculture but, as resistance to industrial agriculture emerged in the 60s, the concept took on new meanings. Over time it became increasingly connected to social movement struggles, and academics began to look at agroecology as the study of the entire food system, including its social, economic, and ecological dimensions.

Today agroecology is considered to be not only a science, a set of on-farm practices, or a social movement. It is all of these things. In fact, the University of Vermont's Ernesto Méndez and his colleagues suggest that the "sweet spot" for agroecology is when there is an overlapping of these three aspects. The challenge, however, is to figure out how to make these things converge. This is especially difficult in North America, where educational institutions that take up agroecology as a science can be quite "siloed"—disconnected from the social movements pushing for political changes in the food system. Similarly, most ecologically oriented farmers are too busy growing (or raising) food that they barely have time to read an article this length, let alone get involved in food politics, or try to connect with agroecological scientists to better understand their on-farm practices. Despite these challenges, agroecology holds a lot of promise. One of its biggest proponents in recent years has been La Vía

Campesina (LVC), the international movement of peasants and small-scale farmers. LVC was formed in 1993 and has since grown to have a global presence that spans nearly 80 countries and includes over 160 peasant and farm organizations.

When LVC defined the term "food sovereignty in 1996," it was in part a reaction to the co-optation of the term "food security," which was being adopted by corporate interests to promote their model of producing superficially "cheap" food. LVC recognized the need to push further, and defined food sovereignty as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems."

In 2015, LVC organized the 2015 International Forum on Agroecology in Mali, where peasants, farmers, and allies came together to define some of the key pillars of agroecology, recognizing that the organic movement was quickly becoming co-opted by industry as well. In terms of on-farm practices, the pillars emphasize ecological principles, context-specific innovation, and a reduction of externally purchased inputs. Also of importance is horizontal, farmer-to-farmer knowledge sharing as a means to promote agroecological practices within communities and intergenerationally. However, the participants at the forum also articulated agroecology in terms of direct, fair distribution chains, and solidarity between producers and consumers. This kind of approach is meant to challenge the corporate control of the food system, and the broader structures of power in our capi-

Also of importance is horizontal, farmer-to-farmer knowledge sharing as a means to promote agroecological practices

talist, patriarchal society. LVC views agroecology as a practical roadmap to achieving food sovereignty. It is often said within the movement that, "Without agroecology, food sovereignty is just a slogan."

If we are to step back then, and think about agroecology in relation to permaculture, it should be clear that the two terms are not synonymous. They are also not mutually exclusive, as permaculture should be seen as an approach that can support a transition towards agroecology. In order to bring to life the vast aspirations inherent in La Vía Campesina's understanding of agroecology, we need to ensure that our field of vision does not stop at our farm gates or urban garden beds, but rather that it is cast further to the level of the community food system, the regional and national food policies that can constrain or enable us, and the global flows of food commodities that currently make little ecological sense.

In saying this, we do not mean to suggest that permaculture is necessarily limited to the scale of a particular agricultural operation. Indeed, the design principles associated with permaculture are quite holistic, and in many ways overlap with agro-ecological methodologies. Proponents of agroecology however, as with at least some permacultural practitioners, emphasize the political and social changes that need to be realized in order for our food systems to be integrated into a just and sustainable society. This broader perspective is sometimes not taken up by permaculture practitioners, just as many ecological farmers more generally tend to focus on the physical and intellectual work required to make their farm ecosystems thrive and their operations successful.

In practice, it can be very challenging to arrive at socially

On-farm practices must be connected with food politics.

and ecologically responsible decisions that position a farm within a regional, national, and global context. For instance, does it make more sense from an agroecological perspective for a farmer to purchase organic fertilizers that have travelled great distances, or to buy non-organic manure from a neighbor who is part of the ecosystem of her local community? Can veggie and grain farmers integrate livestock into their operations and/or focus more on green manures, so that they don't need to bring in as much external fertilizer? Is it possible to scale up the distribution of local, ecologically grown food while also enabling direct trade with peasants' cooperatives in the global south so that we can still enjoy bananas, avocados, and coffee? The answers to these questions are not necessarily clear-cut.

Fortunately, the conversations around such issues have already begun. In Canada, La Vía Campesina member organizations, the National Farmers Union (NFU), and Union Paysanne have started promoting agroecology as a part of food sovereignty struggles. In the US, a number of farms and farming organizations are beginning to take up agroecology, while New York-based WhyHunger has put out an excellent brochure on the topic. There is also a North American-wide grassroots effort that has begun that is being referred to as the "People's Agroecology Process." Farmer organizers are providing political education in tandem with practical production training to advance agroecology.

If these diverse efforts go well, and if academics can break free of their institutional constraints and put agroecological science at the service of a social movement, then we may begin to see a real shift in the food system. As implied above, permaculture has much to offer the science, practice, and movement for agroecology, particularly with its focus on the long-term health of agricultural ecosystems. However, it is tremendously important that permaculture be made accessible—just as the food produced by permaculture operations needs to be available

to more than just a lucky few—while it is also essential that on-farm practices are connected with food politics. The same can be said about organic, biodynamic, or other types of farming.

Only when we effectively link the scientific, technical and political aspects of ecological agriculture will we start to see real change. Only then will agroecology go from taking baby steps to making leaps and bounds toward the transformation of our food system. △

Ayla Fenton is a first-generation farmer and community organizer based in eastern Ontario. She is the former youth president of the National Farmers Union (Canada) and a member of the international youth articulation of La Vía Campesina.

Bryan Dale is an associate member of the National Farmers Union and a PhD candidate in Human Geography at the University of Toronto. His research interests include political ecology, climate justice, food sovereignty, and social movements.

Further reading

- National Farmers Union, *Agroecology in Canada*: www.nfu.ca/issues/agroecology-canada
La Vía Campesina: www.viacampesina.org
WhyHunger, Agroecology: www.whyhunger.org/our-work/resources/agroecology/
Ernesto Méndez and colleagues, *Agroecology: A Transdisciplinary, Participatory and Action-oriented Approach*: see www.crcpress.com



A farm tour in Ontario, Canada, which took place as part of a three-day agroecology workshop. This farmer has worked collaboratively with other local ecological farmers to offer a greater diversity of vegetables, meat, and other goods as part of a cooperative CSA program. She is also engaged in a seed-saving program and an organization that focuses on farmer-to-farmer knowledge sharing. Photo by Bryan Dale

What Agroecology and Permaculture can Offer Each Other

Connor Stedman

AGROFORESTRY IS A SET OF TECHNIQUES that combine trees and forests with other forms of agricultural production, but it also is a field of research and practice based in traditional agriculture around the world. The modern field of agroforestry has its particular roots in traditional tree-based farming in the global tropics and emerged alongside and partially out of the field of agroecology. Permaculture has drawn extensively on agroforestry techniques from its inception, and the two fields have developed in parallel yet with relatively little collaboration or crossover over the past 40 years.

After attending and presenting at the North American Agroforestry Conference (NAAC) in Blacksburg, Virginia in June 2017 with a wide group of permaculture colleagues from the northeast and midwestern US, I would like to offer several proposals on what permaculturists, particularly those in the US and wider global North, might be able to learn and gain from engaging with agroforestry:

...permaculture can learn from aligned movements and fields who are addressing similar needs...

Agroforestry as a field is rooted powerfully in the experiences, skills, and practices of smallholder farmers in the global South. This body of knowledge and practice can offer a powerful antidote to the US-centrism and global North-centrism that can at times exist among white US- and Northern/Western Europe-based permaculturists. Many practices employed widely by global North permaculturists, such as multistrata homegardenning, water management through earthworks, and livestock/tree crop integration, are widely practiced agroforestry and land management techniques among poor and working-class farmers of color in Latin America, Africa, south/southeast Asia, and Oceania. In many cases, the living traditional knowledge of these systems in the global South greatly exceeds what has been re-discovered or re-innovated by white global North permaculturists. Remembering this can help us as permaculturists to



How could permaculturists learn from other fields? Apple orchard in production. CC0 via Pixabay.

ground our practices in their actual lineages of development and use, and to remember accurately that we did not innovate or invent them (1).

Agroforestry is a research field rooted in agroecology that employs both empirical research methods and participatory farmer-led evolution of knowledge and practices. These strengths can be helpful antidotes to the patterns of guruism, silver bullet thinking, and mis- or non-attribution of information that can at times exist in the permaculture field. Useful questions to ask about widely held permaculture beliefs and assumptions could include:

- “How do we know this?”
- “Who produced, developed, and contributed to this knowledge?”
- “How can this knowledge be further expanded, developed, and made accessible and useable by a wider diversity of people?”

The empirical and participatory research methods often employed by agroecology and agroforestry can provide excellent inspiration and modeling for how to engage these questions (2).

Agroforestry is being used to address significant challenges to smallholder farmer livelihoods such as drought, diet and nutrition diversification, on-farm livestock feed/fodder production, carbon sequestration for climate mitigation, and more. Some of the greatest social and environmental potential of permaculture design lies in addressing these same critical

needs for peoples' livelihoods and survival worldwide. Given this, permaculture can learn from aligned movements and fields that are addressing similar needs with similar techniques. This can be especially helpful given that permaculture can tend at times towards inaccessible jargon and in-group language. Seeing how other groups using entirely different language are achieving similar goals can help us as permaculturists broaden our ideas of how to implement permaculture design in practice (3).

Agroforestry offers a powerful framework for applying permaculture principles and practices to broad-scale agriculture and land management in the US. Many systems associated with permaculture design principles and processes have

Permaculture design can help develop unique solutions for unique situations....

been widely applied at home-garden scales in cold climates, but their broad-acre application in North America has been more limited. Several North American organizations have emerged in recent years that are working to deliberately bridge the gap between permaculture and agroforestry, and between small-scale and broad-acre applications of the two, including the Savanna Institute in Illinois (4) and Propagate Ventures in New York (5). Temperate-climate agroforestry's focus on relatively simple tree-based systems that increase farm viability and environmental services provides an excellent basis for applying permaculture design thinking on larger landscape scales, through techniques such as silvopasture, alley cropping, and multifunctional windbreaks and riparian buffers. It also allows avenues for bridging permaculture systems with more widely-adopted farming practices that have existing sources of funding and technical assistance from US federal and state government agencies (6).

Lastly, I would like to offer two proposals for how permaculture



What can other fields gain from learning more about permaculture design? Shiitake mushrooms, image CC0 via Pixabay.

may be able to further support agroforestry and agroecology researchers and practitioners:

Permaculture can offer powerful tools for developing unique land-based solutions that arise from the specific needs and goals of land users/managers, and that integrate with the unique characteristics of the site or land-base in question. The agroecology and agroforestry fields have been very strong at examining the technical and social practice of ecological and tree-based farming systems. In my view, they have perhaps been less strong at developing consistent processes for customizing and applying those practices to the unique needs and potentials of specific farms, communities, and places. Permaculture design processes grounded in observation of local and site-specific environmental conditions, and in a deep understanding of the goals and needs of specific people, can help develop unique solutions for unique situations and in turn help apply agroecology and agroforestry practices more widely and effectively (7).

Permaculture can help bring agroforestry knowledge and practice to a wider non-academic audience in North America. The substantial majority of attendees and presenters

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at NAAC 2017 were researchers, and the scholarly agroforestry community in North America has identified building relationship and collaboration with farmers and non-academic practitioners as a priority, including permaculturists specifically. In contrast to its widespread use and integration with other agricultural fields in many parts of the global South, agroforestry is barely known as a field and discipline in the US and Canada outside of its own researcher base. In addition, permaculture is a much more widely recognized concept and approach to land management outside of the academy in North America.

An alliance between these two fields has the potential to be mutually beneficial to each and—more importantly—support the essential work that the two fields share. Both seek to transition land use and agriculture into diverse, resilient, biologically intensive systems in the face of the accelerating global crises

Both seek to transition land use and agriculture into diverse, resilient, biologically intensive systems....

around us. I propose that we in these two fields can achieve these goals much more broadly and effectively through knowing and learning from each other. △

Connor Stedman is an agroforester, permaculture designer, and ecological educator based in the Northeast US. He specializes in applying carbon farming and agroecology practices to create resilient, biodiverse, climate-mitigating farms and businesses.

Connor is principal and head designer at AppleSeed Permaculture (8) and lead faculty for the Omega Institute's Ecological Literacy Immersion Program (9). He also serves as a Professional Affiliate instructor for the University of Vermont's Leadership for Sustainability M.S. program (10).

1. See, for example, Altieri & Toledo, "The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants," *Journal of Peasant Studies*, Volume 38, 2011.

2. See, for example, Franzel et al, "Assessing the adoption potential of agroforestry practices in sub-Saharan Africa," *Agricultural Systems*, Vol 69, 2001; and Medez, "Agroecology as a transdisciplinary, participatory, and action-oriented approach," *Agroecology and Sustainable Food Systems*, Volume 37, 2013.

3. See, for example, Akinnifesi et al, "Contributions of Agroforestry Research to Livelihood of Smallholder Farmers in Southern Africa," *Agricultural Journal* 3 (1): 58-88, 2008; and, Kumar & Nair, eds., "Carbon Sequestration Potential of Agro-



Gathering sap for syrapping. Can permaculture break away from its image as a homestead-based activity? Image CC0 via Pixabay.

forestry Systems: Opportunities and Challenges," *Advances in Agroforestry*, Volume 8, 2011.

4. <http://www.savannainstitute.org/>

5. <http://www.propagateventures.com/>

6. See, for example, USDA's Strategic Agroforestry Framework, now out of date but reflective of recent agency thinking on the value and broad applicability of agroforestry in the US: "USDA Agroforestry Strategic Framework, Fiscal Year 2011-2016" - https://www.usda.gov/sites/default/files/documents/AFStratFrame_FINAL-lr_6-3-11.pdf

7. See, for example, Ferguson & Lovell, "Grassroots engagement with transition to sustainability: diversity and modes of participation in the international permaculture movement," *Ecology and Society* 20(4): 39, 2015.

8. <http://www.appleseedpermaculture.com/>

9. <https://www.eomega.org/workshops/ecological-literacy-immersion-program-2>

10. <https://www.uvm.edu/rsenr/leadership-sustainability/>

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Our Journey Regenerating the Land

Paula Westmoreland and Lindsay Rebhan

THE SUN IS SHINING BRIGHTLY on this early spring morning as 9,000 hazelnuts and a tree transplanter arrive.

The contours are staked. The rye cover crop we seeded last fall is mowed where the hazels are being planted. The root dip is ready, along with manure and mulch. This 100-acre farm is marginal land with gently rolling hills and lots of water. Historically, it's been in wetlands and ponds. For 15 years, it was farmed in corn even where it was too wet to produce a consistent crop. This is Midwest corn and soybean country. It is a place with abundant soil and water resources, but a vast portion of the landscape has been contaminated with chemicals and GMO crops. It is largely devoid of life. This morning, excitement and hope is in the air. We all feel it as the planting begins, a regenerative paradigm is taking hold in the Midwest.

We are awakening the biology and bringing this land back to life. The land is hungry as it gobbles up the cover crop that's just been mowed. The perennial crop and mycorrhizal inoculant will start rebuilding the fungal network and the carbon cycle. We are early in the establishment phase of a project we designed last fall. The "we" includes Ecological Design a women-owned business led by Paula Westmoreland and Lindsay Rebhan.

The place we call home—the American Midwest—is in the

Both of us feel an urgency in healing the land—more, better, faster.

midst of a major transition. Property changes hands on a scale not seen since the Louisiana Purchase. As the average age of a farmer nears 60, massive land transition is occurring. As farmer/author Joel Salatin says, "new farmers can't get in, if old farmers can't get out." Who gets control of the land and its management will have a major impact on future generations. If we want to grow healthy food here, we need to get people and animals back on the land. At the same time, we need to rapidly build skills in regenerative agriculture—an ecological agriculture that is self-regulating and self-renewing.

This is our work and our passion: transforming land with degraded soil and water systems into healthy agroecosystems, reconnecting people to their roots, and enriching both in ways that ensure an abundant future. We are part of a larger regenerative agriculture movement that has been gaining knowledge and growing for many years.

Both of us feel an urgency in healing the land—more, better,



Lindsay and Sarah plant asparagus using a tree transplanter.

faster. Because of this, we design to implement. To help ensure success, we provide support throughout the entire Regeneration Lifecycle—from evaluating the land's current condition, translating the vision of the owner into an optimal property design, then managing or supporting the installation and recovery to a healthy productive state.

Our work is grounded in permaculture ethics—Care of Earth, Care for People, and Care for the Future—and permaculture principles. The three-legged stool of indigenous wisdom, scientific knowledge, and observation guides us. We have learned from many teachers and designers and incorporate Holistic Management, Carbon Farming, Scale of Permanence, and permaculture practices in our work.

The roots of our story

The business started in 2000 with a goal of getting permaculture on the ground in Minnesota and Wisconsin. We began working with homeowners and homesteaders to harvest water, grow fruits and vegetables, and provide habitat in Minneapolis and the greater Twin Cities area. Our team did the first rooftop farms in Minnesota (Cornerstone, Bachelor Farmer) and designed and helped implement some of the largest urban farms in the region (Frogtown Farm, Minnesota Food Association). Along the way, we've had the opportunity to work with innovative businesses (Tiny Diner Restaurant and Farm) and community spaces (Urban Flower Field) to showcase regenerative systems at different scales. We learned some early lessons from this work.

Over the last five years, our focus has shifted to broad-acre

permaculture—that is farms growing large-scale crops and livestock. With the social, environmental, and ecological crisis accelerating and the climate changing before our eyes—we feel the solutions need to be larger and more quickly adapted. Regenerating the land on a larger scale needs to be demonstrated and pathways created for new and existing farmers to quickly heal the land. For our region, this includes a shift to agroforestry and animal-based systems.

This transition from small-scale intensive to broad-acre agro-ecosystems led to shifts in our work:

1. Intensive designs were plant-centric, while broad-acre designs integrate animals as partners in management and regeneration.
 2. Intensive designs were highly diverse, patchy, and organized for hand harvest. Broad-acre designs are field-scale. Diversity is still a priority, but it is more concentrated in the understory, groundcovers, and alleys to allow for machine harvest.
 3. Urban designs minimized disturbance because of buried infrastructure and contaminants. Broad-acre designs use regenerative disturbance to repair the water cycle and jumpstart the system.

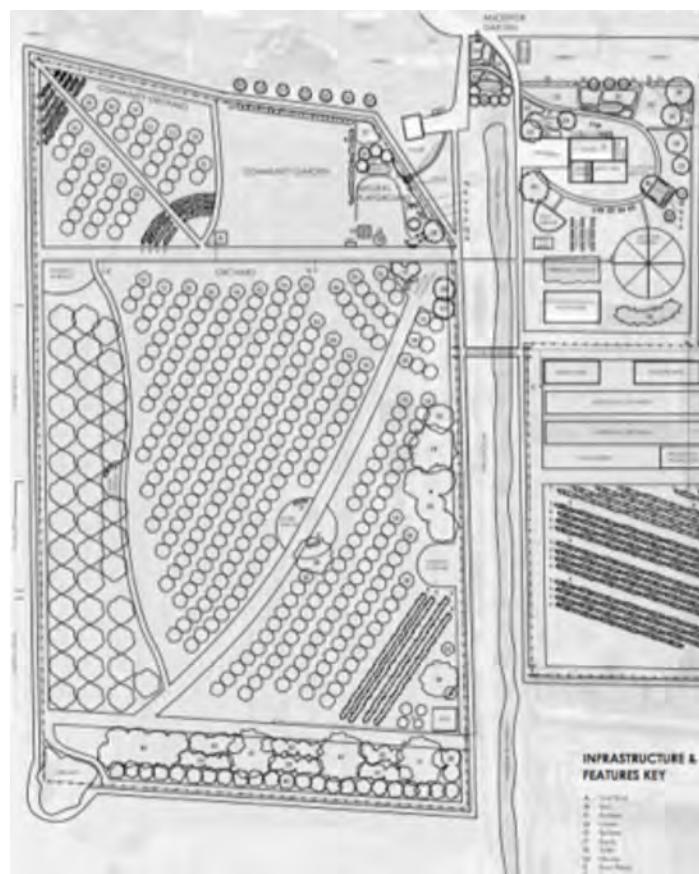
Regenerative design

Regeneration is a process predicated on mutually beneficial relationships between people, the land, plants, and animals. It is about growing and adapting, generating abundance, never taking without giving back. It relies on engagement and for many people, new patterns of being on the land, observing, responding, collecting feedback, and acting appropriately.

Regenerative design requires the designer to think and work in whole systems. From our experience, this means a couple of things:

1. Biology heals, and a solid design should lay the foundation for biology to flourish. The land responds quickly when chemicals and excessive tillage are eliminated. The healing accelerates if we proactively build healthy carbon, water, and nutrient cycles and facilitate partnerships between plants, fungi, soil organisms, pollinators, animals, and people. When done well, the system can become a fully robust agroecological system in 3-4 years in our water-wealthy climate.
 2. Every design starts with the land, but for the land to flourish, a good social and economic design is needed. Who is managing the land? How is it being managed? What is the relationship of the farm to the community? What investment is required during establishment? What are the cash flow projections over time?

In our part of the Midwest, the oak savanna is our ecosystem model. With its 20-40% canopy cover, it is one of the most productive systems on earth for harvesting sunlight and managing water. It is also the pre-settlement landscape for this area. Agro-



This 40-acre organic farm has many common design elements and is designed for land, community, and economy to flourish.

Lessons from Our Urban Work

- Designing and establishing urban farms taught us how to jumpstart production and translate permaculture principles and practices to watershed groups, government agencies, and the park system—an important skill.
 - Rooftop farming taught us about building ecosystems in sterile environments. This was a skill that became quite important when we transitioned to working with denuded and dead soil in rural agricultural landscapes.
 - Designing community spaces taught us how to create engaging intergenerational, multicultural landscapes that introduce the public to growing and harvesting food.
 - Installation taught us how to remediate and regenerate contaminated and compacted soil through small scale earthworks and waterworks.

forestry systems of alley crop or silvopasture with contour rows of trees or shrubs and alleys of annual vegetables, medicines, grains, or grazing are a good production mimic of the savanna. In our northern temperate climate, options for fruits and nuts can

be limited. In zone 4, most nuts, fruits, and berries are productive. As you move to zone 3, you lose many nut trees, and as you move to zone 2, you lose most fruit trees.

We design with a whole systems framework and the triple bottom line—land, people, and economy—to build the relationships and flows that lead to resilience and abundance. Early on, we saw many good land designs falter or not be implemented because of weak or nonexistent social or economic designs. The new perennial economy we are trying to grow rests on a foundation of strong relationships and community. Community is critical for sharing labor, equipment, and knowledge, and for selling products. It also rests on careful financial and succession planning. Alley cropping and silvopasture systems are a good fit for staging cash flow where we place the long-term crops in the rows and the short-term crops in the alleys.

Although each design reflects the land, people, and economy, there are common regenerative design components in our region:

- Diverse buffers and hedges mitigate chemical and GMO drift
- Ponds, wetlands, grass waterways, and swales capture, store, and disperse water
- Agroforestry systems (Creativity is the limit.)
- Pollinator and wildlife habitat
- Woodlots and/or coppice areas
- Pastures, orchards, and hoop houses
- Homestead production/recreation (kitchen gardens, social space, nature play, small animals, infrastructure...)

Regenerative implementation

Regenerating land starts with water. Indigenous peoples remind us water is sacred, the Lakota remind us *Mni Wiconi*—“Water is Life.” We understand that water is paramount, and water is a design driver. Biology follows a sequence. Australian keyline designer, Darren Doherty’s insight, “You have to be blue, before you’re green, then black.” This means you have to have water before you have crops before you make money or build soil. The reasoning guides our process.

For water to be alive, it needs to flow and be in relationship with soil, plants, and animals. As regenerative designers, our job is to facilitate this process. This means shaping the earth. The goal is to slow water down, spread it out, and infiltrate it.

Site Assessment—Do Your Homework

The Land

Collecting and creating maps, digging into history, looking at the land in the larger landscape context, and gathering soil and water samples provide useful information. But the most important step is to walk the land and observe. Simply relying on soil or water tests can be misleading because they are only measurements and don’t reflect relationships. The color of the soil, its smell and texture, and what is growing or not growing can be critical in designing effective regeneration strategies.

The People

Interviews, stories, and drawing community maps are ways to understand people’s goals, interests, capacities, assets, and relationships. This can be challenging when a farm is in transition with multiple generations of stakeholders, each with different relationships to the land and interests. Facilitating this process well can be key to successfully regenerating the land.

The Economy

Investment goals, financial plans, and budgets provide useful insight into people’s capacities to invest and the level of acceptable risk. This helps inform staging and regeneration strategies. Crop sheets, yield projections, and pricing information help show what’s likely to happen over time and what future cash flows might look like.

We move at 1% grade where it is possible and create catchments where necessary. Contour farming, keylines, swales, grass waterways, farm ponds, wetlands, and riparian buffers are methods to facilitate this flow in our area. They can be done on a mini scale in an urban yard or a larger scale in a broad-acre landscape.

Working with water is both art and science. It takes an engineer, a sculptor, and “eyes on the ground” to create a resilient system. Translating the design to the land requires adaptation



Lindsay after planting fruit trees in a alley crop.

in real time. This also makes us a better designer every time. A common example: one morning a few years ago, we began laying out a water system at a five-acre urban farm starting with bioswales or “mini ditches” running between the field edges and the road. First, we set the level. Then the bobcat excavated at a 1% grade. When the lay of the land shifted and the drop became too great, we created a check dam and infiltration basin. The level was reset, and we moved on. When an equipment crossing was needed, we installed a mini culvert, reset the level and moved on again. Once finished, it was time to test the system. Heavy rains were forecast the next day so we could immediately see the system perform and adjust as needed. Feedback is critical. (We have a coincidental record of rains coming as soon as we finish an installation!) We breathed a sigh of relief, but also knew we had done our homework and our experience adjusting on the land paid off. After the rain, we seeded a diverse grass and pollinator mix to jumpstart the carbon and fertility cycle.

After water comes carbon and the “liquid carbon pathway” described by Australian soil scientist Dr. Christine Jones as “the conduit for moving life from the sun through plants to deep in the soil.” This pathway flourishes when there is diversity and strong relationships between perennial plants, fungi, soil organisms, pollinators, and animals. Regenerating this pathway repairs the carbon cycle and reverses climate change by pulling carbon out of the atmosphere and putting it back in the soil. The outcome is a regenerative system that increases in value over time. Our role is to monitor, augment, and facilitate this process.

Summarized below are specific strategies we routinely use:

- Keep the soil covered. Ideally take a year to prepare the land with diverse cover crops and/or intensive grazing before planting permanent crops and perennial groundcovers.
- Select cover crops based on the functions you want performed, for example, weed suppression, nitrogen scavenging, and breaking up compaction. Use at least three species in each cover crop.
- Use cover crops as indicators to tell you what’s really going on with the land. Use them to help you identify where the productive and less-productive areas are. They are as valuable as soil tests!!!



Prescribed grazing goats.

- Plan for ongoing fertility management upfront. Manure is magic, but if you can’t graze, be sure to leave alleys wide enough for growing and turning under fertility crops.
- Apply root dip and/or inoculate soil and mulch with mycorrhizae and effective microbes before planting woody plants.
- Remember to plant for pollinators and pest confusers.
- Most important of all: observe. Walk the land. Take notes. Use your eyes and tools like the penetrometer (measure compaction) and refractometer (measure Brix) to monitor

The transformation of the red pine plantation started with bringing in a herd of eight Kiko Boer goats and a livestock guardian dog.

progress.

Over the last 17 years, we have helped hundreds of customers regenerate their land, and we’d like to share two recent projects.

Lily Springs Farm: Regeneration – Education – Celebration

Lily Springs Farm, nestled in the rolling hills of western Wisconsin, is a 90-acre farm with woodlands, wetlands, open fields, and a spring-fed lake. It is a family-owned property that was primarily used as a weekend retreat for the last 30 years and now a regenerative agriculture farm.

We began working with the family in 2014, developing a vision for an education and demonstration farm for regenerative agriculture. They started with many assets. There was a solid infrastructure, local area organic farms, a property free of chemicals, and urban and rural community ties. The land had 40 acres of red pine plantation with an understory of aggressive colonizing woody plants including prickly ash, buckthorn, brambles, and large patches of poison ivy. There were 20 acres of fallow grassland, and the remaining acreage lay in oak woodland, wetlands, and buildings. The soil was very sandy, beach-like in some areas, and generally acidic. Some agricultural runoff enters the property and makes its way to the lake.

Given the features of the land and the family’s goals of regeneration, education, and celebration, we decided to plant a diversity of high-value perennial crops that could be made into niche products, as well as provide educational programming, agrarian training, retreat, and agrotourism opportunities.

The design includes 12 acres in alley-cropped nuts and berries, a three-acre orchard, one acre of asparagus, a silvopasture pine plantation, and forest farming with timber and mushrooms. In addition, there are riparian buffers, lakeshore restoration, multi-use recreation areas, outdoor classrooms, retreat space, and two homesteads.

We spent the first year observing, testing, and building infra-

structure. We built farm roads, set up water systems, installed fences, and prepared the land. We had a full year to rebuild the carbon, water, and fertility cycles before planting crops. Appropriate disturbance and establishment strategies varied for each farm biome. Ten acres of fallow pasture had an early spring prescribed burn, followed by three diverse cover crop rotations. Cattle intensively grazed the other ten fallow acres during the summer months.

The transformation of the red pine plantation started with bringing in a herd of eight Kiko Boer goats and a livestock guardian dog. We cleared paths through the pines to make room for rotational electric fencing paddocks. The goats are amazing for this task! Goats really do eat trees. We have a saying: "weed and seed... remember nature abhors a vacuum." Immediately after the goats rotate through an area, we seed it in a diverse groundcover of 16 grasses and forbs. Once the prescribed grazing weakens most of the buckhorn, prickly ash, and poison ivy in one area, the goats move to the next paddock. The herder takes care of woody plants that may have been too large for the goats to remove. Humans and goats partner in regeneration. The changes are dramatic and fast.

The second year, cover crop rotations continued. The nut and berry crops were planted in a contour alley crop pattern. The orchard was planted, and bee hives added. We began to see

The farm is an invitation to deeper connection. There is a concerted effort not to be driven by an extractive paradigm.

changes in the fields almost immediately. Pollinators appeared and wildlife began to change their patterns. Frogs, toads, turtles, and even a crayfish showed up in the orchard that year. These were signs the land was becoming more hospitable. We just finished the third year. The biology is thriving, and the harvest is a year ahead of schedule in many crops. The results are a validation of the process and of biology's power to heal the land.

The social design is robust, including multi-age education opportunities, diverse agritourism and microadventure platforms, community sharing, a summer and winter festival, and working with local restaurants, the chamber of commerce and residents. The early aronia harvest led to a fun product testing party this year. Chefs, mixologists, caterers, and creative makers were invited, each made a different food or drink with aronia berry. A local lamb was offered, and ideas for the farm's future aronia product discussed. A perennial culture is being cultivated. The farm is an invitation to deeper connection. There is a concerted effort not to be driven by an extractive paradigm. Co-operation while healing ourselves and the land is very important



Paula surveying a recent planting.

to everyone at the farm. The context for diverse regeneration to thrive has been set, and you can feel this when you come to visit. To learn more, visit www.lilyspringsfarm.com

Main Street Farm: regenerative poultry system

Main Street Farm is a 100-acre farm located an hour south of Minneapolis in Northfield, Minnesota. It is the research and demonstration farm for a regenerative poultry agriculture system developed by Reginaldo Haslett-Marroquin and managed by Julie Ristau. Meat chickens are raised free-range in a rotational paddock-based agroforestry system of hazelnuts and elderberry and a groundcover of nutritious sprouts. They live in chicken heaven eating the sprouts, seeds, and bugs. The agroforestry crops provide protection from predators, and the chicken's fertility produces thriving nuts and berries. Inspiration for the design came from Regi's experience growing up in the Guatemalan rainforest.

We started working with the team in 2017 as the farm was being purchased. The property is considered marginal land with a high water table at the base of an agricultural watershed. It has been conventionally farmed corn-on-corn for 15 years and farmed and drain-tiled for 100 years. The soil is a rich silty loam, but it is lifeless from chemical use, tillage, and erosion. The hills have lost their topsoil, and the valleys and wetlands are



Building swales to move water in a soon-to-be homestead orchard.

filled with the eroded material. These conditions are typical of many farms in the region.

Main Street Farm's goals are rooted in the triple bottom line.

- Grow a regional network of farms to build profitable markets for chickens, hazelnuts, and elderberries.
 - Heal the water cycle by restoring wetlands, creating ponds, connecting catchments, and remediating contaminants.
 - Research and demonstrate regenerative agriculture strategies for transitioning conventional row crops and other degraded lands.
 - Provide agroforestry education and training on perennial crops.
 - Engage and welcome diverse communities to learn, work, and celebrate together.
 - Create economic opportunities for Latino immigrants through the poultry system. The farm will be as a training center for farmers adopting the system.
 - Create financial pathways to help farmers access land and transition to perennial crops.

The design includes nine acres of poultry paddocks; 30 acres alley crop fields of hazelnut, elderberry, asparagus, and small grains; 15 acres kernza and prairie hay; six acres annual vegetables and beans in addition to wetlands, two farm ponds, conservation areas, agroforestry education plantings, outdoor classrooms, R&D ministations, a cabin, solstice structure, and community gathering spaces.

2018 will be the first full year of implementation. Stay tuned as we document our progress. To learn more, visit www.main-streetproject.org.

This is the work we get to do each day. Awaken biology. Heal the land. Work with amazing people who are paving the way to a regenerative future. Heal ourselves, and transform our thinking in the process. Nature is resilient. Biology heals, and—if we can put ourselves into right relationship with the

world around us—the future is very bright.

△

Paula Westmoreland is a permaculture designer and agroecologist who grew up on a family farm in northwestern Iowa. She received her Permaculture Design Certificate in 2000 and started Ecological Design that year. In 2003, she co-founded the Permaculture Research Institute Cold Climate and developed the Natural Capital Plant Database for designing polycultures and cropping systems. In 2010 Paula co-authored a book of illustrated essays, This Perennial Land: Third Crops, Blue Earth, and the Road to a Restorative Agriculture.

Lindsay Rebhan is a permaculture designer, specialist in land management, regenerative agriculture teacher, and experienced grower. Since 2005, she has been designing and implementing edible working lands with Ecological Design. For over 12 years, she has worked with farmers, homesteaders, chefs, and local food nonprofits to organize and strengthen ecological networks. Lindsay studied food systems and culture in Bangladesh, Cuba, and Guatemala – including the l'jatz Cooperative and Instituto Mesoamericano de Permacultura (IMAP). She is a former Program Director at the Permaculture Research Institute Cold Climate, a Program Coordinator at Renewing the Countryside and speaks on land regeneration issues.

Find us at:

<https://ecologicaldesign.land>

Owners Paula Westmoreland and Lindsay Rebhan

Agroforestry News

The August 2017 issue features fire-resistant landscapes, recent research on the effects of reforestation on regional climate in China, plant profile: narrow-leaved lupin (*Lupinus angustifolius*), wasabi, sycamore maple syrup, & more. \$31/yr., \$59/2 yr. (US) // \$38/yr., \$73/2 yr. (Canada). All back issues available.

Agroforestry News



Fire-resistant landscapes

Volume 25 Number 4 August 2017

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Crop Rotation Keys

Learning from Annual Agriculture

Eric Toensmeier

SOME PEOPLE WILL TELL YOU that there is no place in permaculture for annual crops. I'm known as something of a perennials enthusiast myself. But permaculture is in part a design system that can be applied to many areas of our lives, and this certainly includes annual crop production. In 2002, I was privileged to spend the weekend interviewing a panel of highly experienced organic farmers through my work with the North East Organic Network (NEON).

At the time Dave Jacke and I were writing *Edible Forest Gardens*, I was absolutely amazed to see the parallels between the annual crop planning and rotation system and the permaculture design process. Even today, that experience is one of the strongest influences on my own design practice. Though it took a few years, a book was finally published based on NEON's work. It's called *Crop Rotation on Organic Farms: A Planning Manual*, and you can download it here for free: <https://www.sare.org/Learning-Center/Books/Crop-Rotation-on-Organic-Farms>. I co-wrote one of the chapters which is largely a tran-



Permaculture practitioners, whether farmers or designers, can learn a great deal from allied groups. Image CC0 via Pixabay.

The process is much more dynamic and deeply integrated into the overall farm planning process.

script of the panel.

The introduction of the book states:

Crop rotation is a critical feature of all organic cropping systems because it provides the principal mechanism for building healthy soils, a major way to control pests, and a variety of other benefits. Crop rotation means changing the type of crop grown on a particular piece of land from year to year. As used in this manual, the term includes both cyclical rotations, in which the same sequence of crops is repeated indefinitely on a field, and non-cyclical rotations, in which the sequence of crops varies irregularly to meet the evolving business and management goals of the farmer. Each field has its own rotation, and, consequently, each farmer manages a set of rotations.

I had previously always thought that farmers had relatively simple rotations that they put on "automatic pilot" for each field. For example, a field might switch from tomato family crops to

brassicas to squashes and back over the course of three years. What I learned is that the process is much more dynamic and deeply integrated into the overall farm planning process. I also learned that many organic farmers on our panel believe in the power of perennials to restore soils, and incorporate multiple years in perennial crops like hay and even dwarf apples for this reason.

During the panel, we used a workplace training curriculum called DACUM (*Design A Curriculum*), which breaks the job (in this case "managing a crop rotation system") down into various duties, each of which is comprised of smaller tasks. Through my employer, the New England Small Farm Institute, we had previously had great success using DACUM to create an "occupational profile" for the Northeast (US) small-scale sustainable farmer, which you can download here for free: <http://www.smallfarm.org/uploads/uploads/Files/outline.pdf>.

I'd like to share just a few of the topics that popped out for me from the chart that we created. Here are the duties (letters) and just a few tasks for each one (letter-number). These are just a few of the 93 total tasks in the chart. For much more, please review the table on pages 12-13 of the crop planning manual. (See Table 1 on the next page.)

To me that sounds a lot like what Jonathan and I do when we manage our forest garden, though we may use a longer time scale. This is particularly true after the initial design and establishment. These farmers have to deal with a constantly evolving situation. Their plans go awry when fields are too wet to plow in spring, or a new market opportunity opens up. In our forest garden, things die or taste bad and must be replaced. Gaps open, and we need to be ready to fill them quickly or give a chance for weeds to establish (or lose the chance to do something produc-



Strawberry plants in production. Using the DACUM to guide rotation could be helpful to farmers and gardeners that integrate annual production into their systems. Photo CC0 via Pixabay.

Table 1. Crop planning process.

A) Identify Rotation Goals	A6) Balance acreage, at whole farm level, between cash crops, cover crops, livestock, and “fallow” (e.g., bare soil, stale seed-bed, sod/hay, permanent pasture, or woodlot; consider role of livestock in fertility and weed control)
B) Identify Resources and Constraints	B9) Identify cultural constraints based on equipment (e.g., row width, irrigation)
C) Gather Data	C9) Categorize crops C10) Categorize fields
D) Analyze Data	D3) Compare crop cultural needs to field characteristics (e.g., soil test results, crop residues)
E) Plan Crop Rotation	E4) Consider harvest logistics (e.g., access to crops; field and row length, minimum walking and box-carry distance, use of harvest equipment, plan for ease of loading onto trucks) E8) Determine the field locations of most profitable, beneficial, and “at-risk” crops E9) Determine field locations of lower-priority crops E16) Develop guidelines for contingencies in case rotation does not go as planned (e.g., written or mental guidelines for improvisation; principles, priorities to use to make on-the-spot decisions) E17) Use senses and imagination to review plan (e.g., field plans and logistics; walk fields and visualize rotation, “farm it in your head”)
F) Execute Rotation	F10) Plant crops (follow plan and planting calendar as conditions permit; capture planting windows, “seize themoment”; adjust plan as needed based on contingency guidelines [see E16]) F13) Adjust actions according to field and crop conditions (e.g., weather, soils, weed pressure; assign crops to different fields or beds to adjust for wetness or other problems; replant if necessary, abandon crop or replace with a cover crop to cut losses)
G) Evaluate Rotation Execution	G10) Measure performance against rotation goals (positive or negative outcomes)
H) Adjust Rotation Plan	H1) Identify successful combinations and repeat (set successful rotations on “automatic pilot”) H4) Tweak crop mix (e.g., based on market data and field performance; consider adding or abandoning crops or elements of rotation as necessary) H5) Tweak field management (e.g., change planting or plowdown dates, crop locations; shift crop families to different fields; put poorly performing fields into hay ahead of schedule) H7) Start process over

tive in that patch this season). These farmers all had guidelines and contingency plans ready so they could roll with the punches and improvise a successful season no matter what got thrown at them.

One of the most important things that happens in these farmers’ rotation plans is that they match crops to fields. A key component of this process is categorizing the crops and fields (see tasks C9 & C10 in Table 1). Here are some of the ways that these farmers categorize their crops and fields.

I don’t know about you, but to me that sounds like a lot of the factors I think about when designing or maintaining a perennial permaculture system. Interviewing these farmers and then spending a few months writing up the chart and chapter has really influenced the way I think about design and had an impact on the design chapters in *Edible Forest Gardens* volume two as well. Whether you are growing annuals, perennials, or both (as I do), I think you’ll find this chapter has something to offer you. We all have so much to learn from farmers and researchers. Perhaps they even have a few things they could learn from us.

The rest of the book is truly fantastic and features an overview of crop rotation science, sample actual cropping sequences

Crop Characteristics	Field Characteristics
<p>The table below lists crop characteristics from most to least important, as ranked by expert farmers.</p> <ul style="list-style-type: none"> • Botanical family • Market demand • Season of planting, harvest, labor, and land use • Susceptibility to pests and diseases • Cash versus cover crop • Ability to compete with weeds • Annual, biennial, perennial, or overwintering annual • Direct-seeded versus transplanted • “Givers” versus “takers” • Heavy versus light feeders • Cultural practices (for example, spraying, cultivation, irrigation) • Preferred seedbed conditions • Space requirements • Income per acre • Effect on cash flow • Harvest timing • Costs per acre • Tolerance of mechanical cultivation • Ability to trap nutrients • Root versus leaf and fruit • Drought tolerance • Row versus block planted • Large versus small seeded • Deep versus shallow rooted • Tolerance of poor drainage • Shade tolerance versus intolerant • Pollination requirements 	<p>These relatively permanent characteristics of a field are difficult to change; many affect the type of equipment that can be used in the timing of operations.</p> <ul style="list-style-type: none"> • Recent planting history (1 to 5 years) • Within-field variability • Proximity to water source • Erosion potential • Drainage • Sunny or shady • Known problems with weeds, insects, diseases • Poor tilth or hardpan, wildlife • Slope • Moisture-holding capacity • pH • Soil type • Aspect (north, south, east, west) • Air drainage — frost pockets • Size • Cation-exchange capacity • Proximity to barn or access roads • Stoniness • Shape (corners, road lengths) • Proximity to similar fields

from our expert farmers' fields, a planning procedure, ideas about crop rotation, transitioning to organic agriculture from conventional, and some very interesting guidelines for intercropping. It also has excellent tables in the back looking at opportunities and challenges in following one crop after another, and how to use rotation to minimize diseases, weeds, and pests. △

This article first appeared as a blog on the pages for Permaculture Research Institute, and was submitted by the author.

Eric Toensmeier is a well-known researcher, writer, and speaker on permaculture systems. His contributions to forest gardening and carbon farming through Edible Forest Gardens, volumes 1 and 2 (which he co-authored with Dave Jacke) and his own Carbon Farming Solution inspire and inform practitioners and allies around the globe.

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Hershey's Legacy

A Pennsylvania Permaculture Adventure

Dale Hendricks

DURING THE LAST FEW YEARS, more people and groups have been planning, tending, and establishing new food forests. It seems that perhaps some of the ideas that permaculturists have long promoted may be catching on. Folks around the country are excited by the idea of productive public and private landscapes with tree, shrub, and bramble crops, with humans happily immersed—learning, propagating, educating, and eating. Nearby, the Philadelphia Orchard Project (<https://www.phillyorchards.org/orchards/>), very much a permaculturally aligned group, partners with dozens of organizations and supports the efforts of more than 50 community orchard projects.

Several in the neighborhood were excited when the Feb '16 issue (*Permaculture Design* # 99) featured an article by Ben Richmond “Standing Tall Amidst the Sprawl” about John Hershey and his nursery in Downingtown, Pennsylvania. Hershey was a friend of J. Russell Smith and was referred to often in his iconic book *Tree Crops, A Permanent Agriculture*. He lived from 1898 to 1967 and until that article was largely forgotten outside of a few history and nut tree buffs.

Early fall '16 at a local Back Yard Fruit Growers meeting, buddy Max Paschall said, “Hey, I know where those Hershey Nursery remnants are in Downingtown. Let’s go.” The next weekend, six of us assembled at the Quaker Meetinghouse, and Max, who had been there



A row of 50-70 year old grafted persimmon bearing abundant crops in a friendly backyard at the old Hershey Nut Farm

before, led us. We headed north and in the side yard of the Methodist Church (built over much of the original nursery) we found honeylocusts. The ground was scattered with huge, up to 20” long, and 2”+ wide pods filled with sweet pith. Many of these turned out to be grafted, and we could see thorny branches at the bases and further up all thornless after some subtle—largely healed over—graft union lines. In the same small grove, we picked up shagbark hickory nuts in profusion as well as several hicans (hickory x pecan). There are several 4' DBH (diameter at breast height, a common tree metric) of these lovely trees with shiny leaves and huge nuts.

Then we came to persimmons... good-sized for natives (*Diospyros virginiana*), sweet with few seeds, and these had crops from late August until mid-November. Later we observed that most native populations are smaller fruited, have many more seeds, and bear much later.... Nearby women were coming to work at the neighboring senior living home and noticed us picking them off the ground and eating them. They asked what we were doing, and we brought them some. They loved the fruit and remarked that they'd seen the large ones (Asian) in the grocery store. Now they know about the free, largely unappreciated organic natives falling to the ground in front of their workplace.

In early summer, during mulberry season, we again plunged into the edges and scruffy woods looking for remnants from the breeding program. We had friendly talks with folks at the apartment complex. Most had no idea mulberries were edible. We made sure to be open, friendly, and informative. After all, we were prowling around in the edges/back lots of their homes, and we want allies not frightened people. These chance encounters gave us many opportunities to contrast Hershey's vision and works, planting a diversity of selected trees designed to shower farm animals, farmers, family, birds, and friends with a diversity of tree-based food with the current agricultural practices of monocultures, delivering industrial food to animals in crowded and unhealthy prisons.

In mid-September, Buzz Ferver of Perfect Circle Farm in Vermont made a trip to see the trees—and collect seeds of course. He is friendly and outgoing and knocked on several doors asking permission to visit the trees, which were widely scattered in all directions from the Meetinghouse. This led to us starting new friendships,

and with them building great interest in protecting and extending this bountiful and lovely legacy which before this time had been largely invisible while all around them. It was fun to describe the burgeoning movement for food forests, agroforestry, and permaculture worldwide and in places like Philadelphia and Seattle. It is exciting to see people recognize how important and energizing it is to design for people as well as native wildlife. They get really excited when we mention that their town has perhaps the oldest example around—a 90-year head start!

Meanwhile, Buzz and Max had been discussing this on the NAFEX (North American Fruit Explorers) and NNGA (Northern Nut Grower's Association) forums and had gotten in touch with Peter Chrisbacher. He's a nut tree enthusiast who has been studying, and more importantly, assembling documents of John Hershey for several years. He was kind enough to share many of these with us. His biography ** touchingly written by his wife and published in '68 in the journal of the Northern Nut Grower's Association had this: "In 1945 the Nut Tree Nursery was moved four miles north of Downingtown."

The ideas for tree crops came in large part out of the dust bowl.

Aha! Now we knew why the map from issue # 99 and the *Tree Crops* book didn't fit. It turned out that it was describing a second, 72-acre farm! With great excitement and Peter's information in hand Zach Elfers (Nomad Seeds) and I headed up country. Sadly, as mentioned in the bio, the farm had been sold shortly after his death (1967) and sure enough was now a wooded and leafy bit of suburbia... As we walked around though, many more wonders revealed themselves. Rows of honeylocusts—all thornless—and loaded with supersweet pods persist next to the townhouses. Part of a large public green—where folks walk their dogs—has mature pecans, hicans, hickories, chestnuts, and more persimmons. Turning into the development and glancing right, parallel to the road was a row of grafted English walnuts. Thirty feet further in stands a long straight row of white oaks and next a row of honeylocusts, and between a few remaining clumps of hazels. It's astonishing when you think of it. Here's quite a bit of remaining, regionally adapted, multi-layered food forest, much of which is 50-70 years old!

Our challenge now is to raise awareness and deep appreciation for these trees, as well as to protect them in place as well as to propagate and nurture their progeny.



Persimmon fruit in need of cattle, sheep, chickens, hogs or humans. Hershey Nursery 50-70 years after planting.

We've begun building bridges with local interested citizens, churches, local and regional horticultural organizations, permaculture groups, and more. We are lining up presentations with community groups, the library, and likely more writing for the Philadelphia Orchard project. Of course, we've also begun growing a few seedlings from these treasures.

The ideas for tree crops came in large part out of the Dust Bowl. Hershey and others were greatly concerned with erosion, declining water quality and supply, and soil and nutrient losses. His approach, at least for the eastern, central and upper south of the US, was to use his farm and nursery catalog, public speaking, and writings, to demonstrate and advocate for farmers to add productive trees. These trees and the vision and foresight behind them seem to have hung on long enough to be recognized and appreciated by folks ready for their wisdom, generosity, grace, and utility.

A year after he died, his wife Elizabeth Hershey wrote "*The tree of the field is man's life*, Deuteronomy 20: 19. This verse was the motto that made John Hershey. He knew the importance of trees in the scheme of the universe—"fruit for food, the power to hold water in the soil, stopping erosion, for shade, and of course, beauty. John loved God, was companion of the trees, and husbandman of the soil." △

Dale Hendricks is a veteran horticulturalist, networker, biochar enthusiast, and food forest and agroforestry student who grows plants at Green Light Plants in southeast Pennsylvania (www.greenlightplants.com).

** Check the *Permaculture Design* website for a link to Hershey's bio, made available by the courtesy of the Northern Nut Growers Assn. (www.nutgrowing.org) **

No Till Organic Relay Cropping

Kentucky Strategies Move North?

Dr. Brian Caldwell and Ryan Maher

SUSANA LEIN IS AHEAD OF THE CURVE. In this article, we can only scratch the surface of the many regenerative practices she has implemented at Salamander Springs Farm near Berea, Kentucky, with off-grid energy, contour swales, and no-till production of staple beans and grains, eggs, vegetables, fruits, nuts, and herbs. Please see the photo site, www.flickr.com/photos/salamanderspringsfarm/sets for informative slides of her farm practices.

Susana has adapted the “relay cropping” methods of Japanese farmer Masanobu Fukuoka to her Kentucky climate: sowing a crop into a field while another is still growing there. This is one way she avoids tillage, while growing an impressive array of crops. (She uses variations of this method for many vegetable crops.) Pinto and black turtle beans are important staple protein sources that she sells online, at markets, and in stores. Here is her basic method for growing dry beans, utilizing relay cropping in exemplary fashion:

From late fall until spring, a winter cover crop mixture covers the field. The mix is mostly wheat or rye (to provide straw mulch in the spring) with 20-30% being crimson clover, Austrian winter peas, daikon (providing tillage) radish, turnip, mustards, and other brassicas. In mid-May, when the wheat or rye has headed out (close to maturity but still green), Susana broadcasts bean seed into the standing winter crop. On the same day, she scythes down the winter mix, mulching the seed. The beans grow through the winter residue, which suppresses weeds while the beans grow to cover the field (without rows) through the summer. In August, when the bean pods are mostly yellow



January 1, Winter wheat cover mix with previous season's residue. Photo by Susana Lein.

and drying on the plants, Susana broadcasts buckwheat and cowpeas into the maturing crop. Within a few days, the bean plants are cut and removed from the field (to continue drying in the granary for later processing).

The buckwheat germinates quickly, creating a “smother crop” preventing establishment of weeds. In warm weather, the cowpeas begin to dominate after a few weeks, creating extra biomass and cover. This late summer smother crop grows to partial maturity until killed by a hard frost (usually late October) when the winter cover crop mixture (described above) is broadcast into it and soon grows through the dying summer crop. Thus, the cycle starts again.

Not disturbing the soil keeps most weed seeds in a dormant state. They're just not stimulated to germinate.

Sections of the field in dry bean production are rotated from year to year with sections sown with buckwheat, about 20% Iron & Clay cowpeas, and 10% milo (grain sorghum) for poultry forage and cover crop seed production. Over the years, pinto and black beans or summer cover crops have marched back and forth across the field. The triple whammy of the buckwheat, cowpea, and milo cover, plus chickens, has strongly suppressed weeds while providing high quality chicken forage and seed. Chickens help cycle fertility in the system, spreading manure and feeding on weeds, cover crops, and soil biota.

For seed production, a section of buckwheat/cowpeas/milo mix is sown in May into the standing winter cover crop which is scythed—the same as for the dry bean crops. Chickens move through remaining sections of the field during the spring and early summer, tearing down the winter cover crop to eat the grains and seeds. After 7-10 days, they’re ready to move on, and after each move, Susana sows the buckwheat/cowpeas/milo mix in their wake. She shakes the straw that the poultry left on the ground with a fork to help the seed fall underneath, sometimes spreading it around more evenly than they left it. Buckwheat and cowpeas germinate easily without much cover or rain.

As the summer cover/forage crops mature, the chickens go back through these sections of the field. Poultry love buckwheat and cowpeas at the green pod stage, and milo is also a staple in their winter feed mix which Susana grows in her cornfields. Cowpeas planted by mid-June produce viable seed, which she harvests before the chickens are moved through each section of the field. Buckwheat planted in June sows itself a second crop, while dry beans and cowpeas are maturing in the field.

How does this approach work with its glaring lack of tillage? The system takes advantage of some powerful basic biology. Not disturbing the soil keeps most weed seeds in a dormant state. They're just not stimulated to germinate. In fall, she sows "winter annuals" (wheat, rye, crimson clover, winter pea, radish). These species adapted to grow in cool weather and are highly competitive in the cooler months. Surviving through the winter in her region, they grow strongly in spring. By mid-May, they are programmed to make seed and die.

In contrast, buckwheat, cowpeas, milo, and dry beans are warm-season plants that thrive in summer and die at the first frost in October. Beans are not particularly competitive; but in Kentucky, buckwheat, cowpeas, and milo are champions. Susana experimented and diversified her cover crop mixes with changing conditions over the years. Cool-loving species dominate and suppress weeds from fall through late spring, creating a substantial amount of top growth (biomass), soil biology, and tilth. They are cut down when this biomass is at maximum, when it is too late for them to regrow. They have come to the end of their season without reproducing. Beans are sown just before the winter cover is cut down—the residue covers the seed with a mulch, suppressing germinating weeds and keeping the beans moist at the soil surface. Now it is the beans' turn to thrive, with long days and hot weather. When they mature, there is still enough summer left for buckwheat and cowpeas to com-



April 2, 2013. Winter wheat cover mix in April. Chickens in background. Photo by Susana Lein.

spacing being developed and used by large scale farmers like David Brandt in Ohio and Gabe Brown in North Dakota—to plant and roll/crimp diverse crops at the same time.

The presence of weeds in Susana's fields today has greatly diminished with the increase in soil biology and organic matter. Annuals like ragweed and foxtail which predominated in early years are hardly seen. Perennials like ironweed and dock have a much weaker presence, with a depleted root energy storage and no root pieces cut by tillage to start new plants. If they make it through the cover crop, Susana sometimes still snaps off tops before they set seed, but considers them "pioneer species," like the daikon radish in her winter crop mix. They helped bring in organic matter and soil biology by penetrating the hard silty clay soil which was devoid of topsoil when she started in 2001.

Can this system be adapted to cooler regions like New York State? Perhaps with mechanized mowing? It is certainly worth a try! Here are some suggestions:

- 1) Start with a relatively weed-free field.
- 2) Experiment with varieties for the winter mix, like winter peas and vetch. Susana uses less Austrian winter pea in her mix and stopped using hairy vetch because they can get tangled when scything, but this would not be a problem if using a flail mower. (Vetch self-sows like a weed in Kentucky, so she still has it in her fields).
- 3) Crimson clover is not reliable in colder areas, and daikon (tillage radish) is not recommended for fall sowing in upstate New York; it will die before making much biomass. Try including these and other brassicas in a late summer mix with buck-

Can this system be adapted to cooler regions like New York State?

pete against recalcitrant weeds. Then the season cools down, and the process repeats—but next year the beans will be sown in neighboring sections of the field where weeds were hit harder by the summer cover mix and chickens.

Broadcast sowing, considered old-fashioned and inefficient by some, has advantages. Seed is not confined to rows with wide spaces in between where weeds become established. Spread uniformly, it covers the soil more completely. The biggest advantage is that no soil disturbance happens in planting and the gains in soil biology, fertility, and tilth are not reduced by tillage. Uniform sowing and scything are arts that Susana has honed and enjoys teaching apprentices and workshop participants. Tall stakes in the field serve as guides. For a scale larger than two acres, Susana is excited about no-till seeders with closer row

wheat.

4) For a warm-season mix, cowpeas are not as well adapted in the north (but may still make useful biomass in parts of New York). Forage field peas grow well in both the warm and cool parts of the season here. Soybeans work well in warm months. Japanese millet, sunflowers, and sorghum sudangrass are good options. Susana loved the biomass production of sorghum sudangrass, but found milo works better using chickens and a scythe. She also plants oilseed sunflowers around the field (for chicken feed) and would increase both with mechanical mowing. She recommends starting small and experimenting before investing in no-till equipment.

5) Strong weed-suppressive measures are planned for immediate implementation in Susana's system. Rotating in strong competitive cover crops plus chicken impact keeps weeds at low levels. Cutting out those practices may result in problems.

6) Susana recommends starting with a few cycles of diverse, biomass-producing cover crops with zero tillage before starting a cash crop. After years of tillage, compaction and organic matter depletion on most farms, soil biology, and tilth need to get to a better level first. Soil fertility, carbon sequestration, and weed suppression will increase with soil biology—once tillage stops.

This article was written for the Cornell Small Farms Program and was published this winter in its Small Farms Quarterly in an effort to bring this type of farming strategy north. Re-printed here with permission. <http://smallfarms.cornell.edu/quarterly/archive-2/winter-2018/>

Reduced tillage practices take many forms. This story is part of a series featuring organic vegetable growers who have adopted reduced tillage practices on the way to greater farm sustainability. Experienced growers at diverse scales are tackling weeds, managing rotations, and integrating cover crops, while minimizing soil disturbance. Look for past and future SFQ issues to learn the practices that are helping these growers build better soils.

Visit <http://smallfarms.cornell.edu/projects/reduced-tillage/> or contact Ryan Maher of the Cornell SFP for more information on this project.

Brian Caldwell (bac11@cornell.edu) and Ryan Maher (rmm325@cornell.edu) study reduced tillage for organic vegetable systems at Cornell University. Caldwell is co-owner of Hemlock Grove Farm in West Danby, NY, growing certified organic apples, chestnuts, and hazelnuts.



May 3. Salamander Springs Farm apprentice Dori Stone scythes winter rye mix to mulch bean crop. Photo by Susana Lein.



July 6. View of bean field separated by summer cover crop (with buckwheat in flower). Photo by Susana Lein.

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Cane Fruit Development

The Story of Niwot Black Raspberry

Peter Tallman

LET'S DISCUSS THE STORY of the origins and development process for the 'Niwot' primocane-fruited black raspberry that I developed over a number of years and that has now been commercialized.

My horticultural background in the 80s was growing fruits and vegetables for my own use in Poughkeepsie, New York, using commercial sources for plants and seeds. One fruit that I was not growing myself was black raspberries, which were easily available in the summer from wild plants growing along roadsides and parks in the area. Black raspberries are essentially vigorous weeds, and, thanks to birds spreading the seeds, were growing wherever some unused space existed. My habit at the time was to pick wild black raspberries in early July to stock the freezer for the winter. The reality of the untamed black raspberry thickets made it necessary to wear jeans and long-sleeved shirt for these picking visits, even though these were some of the hottest days of the summer. As I drove around town, I got pretty good at recognizing thickets of black raspberry plants by the characteristic light-violet-colored canes in the autumn. These I would mentally catalog for a potential picking visit the following summer.

... I was not previously aware that black raspberries were able to do the same trick.

An exceptional find

In October 1986, I was clearing some weeds from my apple orchard area when I noticed a black raspberry plant near the orchard. The odd thing was that this plant was ripening some black raspberries at that time of year. I was familiar with primocane-fruited (fall-bearing) red raspberries from growing the 'Heritage' raspberry which gave welcome crops in the autumn, but I was not previously aware that black raspberries were able to do the same trick. I marked the plant for observation and returned in the autumn a year later and observed that it was repeating the autumn crop. In the spring of 1988, I moved the plant to a garden area to study it further. I gave the selection



Progress as of 1991.

a tracking number of 'W1.' The plant was small. Its berries were small and not plentiful. However, the correct black raspberry flavor was present, and the autumn fruiting was an intriguing talent. There were not enough black raspberries for eating by themselves, so red raspberries were needed to supplement. But I really, REALLY wanted to have more black raspberries in the autumn. The prospect of picking black raspberries in the autumn seemed preferable to going out in the heat of the summer.

My search of existing nursery catalogs did not turn up any primocane-fruited (pf) black raspberries, which was very disappointing to me. A search of old literature turned up a primocane-fruited black raspberry named 'Ohio Everbearing' that was well known in the second half of the 19th century, but I could find no modern source of 'Ohio Everbearing.'

I submitted an article describing my unusual black raspberry plant for *Pomona*, the magazine of the North American Fruit Explorers (NAFEX) organization, which is a group of mostly amateur fruit growers. *Pomona* is a quarterly containing member-written articles about various fruit topics. In the article, I idly wondered if perhaps W1 might be useful for someone to use in breeding to make the trait available again in the modern era. I also wondered whether I should learn breeding so I could cross with existing modern black raspberry cultivars to improve the crop.

Responses to my article were positive and helpful. There was encouragement from readers that the contemplated breeding project would be useful. It was suggested that seeds of my new black raspberry be sent to the USDA National Clonal Germplasm Repository to ensure that the black raspberry primocane-fruited trait wasn't lost. The biggest source of instructional material was from an amateur grower in Arkansas who was working with blackberries and who also had experience with

black raspberries. He mailed me some very detailed instructions that he had written about the actual method and mechanics of doing crosses, germinating seeds, growing the new plants, and propagating new plants from cuttings using a misting bench. This respondent also sent me a clone of a black raspberry selection from Arkansas that he said exhibited unusually large berries for a wild black raspberry. Using the detailed instructions, I constructed a misting bench for propagating additional copies of interesting black raspberry plants, and I practiced using the misting bench for creating more copies of W1. I shared the resulting plants with interested NAFEX members and a couple of organizations that were doing black raspberry breeding.

I ordered a series of commercial black raspberry cultivars to grow for doing crosses. Meanwhile, to practice germination, I took seeds from W1 and germinated them according to the detailed instructions. When the resulting seedlings were grown, all of the 50 plants exhibited the pf trait. This was very encouraging because it showed that the pf trait could be transferred to new plants via seeds. A few of these seedlings were marked as improvements over W1 for use in future crosses.

For breeding, crosses are selected based on what characteristics are desired. For my work, I kept notes on each selection in a bound composition book from which I could select the parents. Others, I'm sure, would computerize this in some fashion, but, in my case, the breeding work and associated gardening were the antidote to the daily computer work in my job.

Controlled crosses with black raspberries consist of (1) emasculation of the blossoms, (2) pollen collection and preparation, and (3) pollen application to the emasculated blossoms. The emasculation is done with a razor shortly before the flower opens and before the bees get their chance. Once the cross is made, the selected bloom is marked and wrapped in mesh fabric. I used bridal veil tulle as being inexpensive and available. The tulle fabric is tied with a string to keep bees or birds from disturbing the carefully planned cross.

Seed extraction from the ripe berries is done with a food blender and a bit of water, removing the non-seed flesh material from the berry by running the blender, then letting the seeds



Explorer in 2004.

settle, and carefully pouring off the water and flesh. The blender work is repeated until there is no more water coloring from the berry.

This is followed by seed germination which involves scarification, stratification, and growing out the seedlings. This is a very detailed procedure that is best left to another article. I will say that I do scarification with household laundry bleach, which is much less dangerous to work with than the generally recommended full-strength acid for commercial use.

I usually give newly germinated plants at least two years growing in the garden to show what they are capable of. I remove any plants that are not at least "wow" or "gee whiz" after a few years. The exception is for plants of the first generation from controlled crossing which were crossed with a non-pf parent. It was apparent in my work that the primocane-fruited trait is recessive, which means that a cross between pf parents and non-pf parents is expected to be non-pf in the first generation. In these cases, an extra generation is needed to re-express pf trait. New plants are grown from seeds of this first generation. This new generation is expected to have some percentage of pf plants.

The trouble came when Explorer was planted in an area where there was not outside pollen available.

My first attempt at commercializing a pf black raspberry selection was named 'Explorer,' named after North American Fruit Explorers. To prepare for outside evaluation, I named the variety and initiated a US Plant Patent application to protect the genetics. The patent application was developed in cooperation with a patent attorney who specializes in plant patents. Additionally, I had the outside testers sign a testing and non-distribution agreement to prevent propagation or sale of any test plants in order to retain control of the genetics. I managed to get Tim Nourse of Nourse Farms interested in the project, because it was a product not readily available commercially. Nourse Farms was able to virus index the selection and provide tissue-culture propagation of new plants to distribute for evaluation.

Unfortunately, Explorer was found to be not self-fruitful; that is, pollen from other plants would be needed to properly form Explorer berries. In my own garden area, my other black raspberry plants grown from seedlings could provide the needed pollen to make Explorer look good. The trouble came when Explorer was planted in an area where there was no outside pollen available, in which case the berries did not form at all or were malformed. Unfortunately, the defect was identified long after plants were distributed. This defect was readily apparent in the samples I sent to a good friend of mine for testing in his yard in Poughkeepsie, New York. Once his plants were grown, it

was apparent that there was something very wrong with berries on those plants. Not a single druplet formed. There was no other raspberry in the area to provide pollen. I had nearly the same experience when I planted a new row of Explorer plants in part of my yard that didn't have other raspberry plants nearby. It was something of a beginner mistake of mine not to check on self-fruitfulness before moving on with the commercialization of Explorer. I had not considered that a raspberry could be not self-fruitful. When the defect was finally identified, some experiments with bagging blossoms and hand-pollinating the flowers with their own pollen showed clearly that there could be no berries from that combination. A raspberry with that defect was not a viable variety for commercialization, so 'Explorer' was withdrawn from consideration, and no further effort was made in that direction.

While doing the work for commercializing Explorer, I had made another selection, 2A4, which was actually superior to Explorer in many respects, including berry size, plant vigor, and productivity. However, I didn't want to disturb the progress of Explorer while that process was ongoing. When the pollen defect was proven in Explorer, I tested the selection 2A4 similarly with bagging and hand pollination. I was very lucky that the selection 2A4 proved to be self-fruitful, so my commercialization efforts were immediately shifted to 2A4. I propagated some 2A4 plants and sent the plants out to some of my Explorer testers to see if it was an acceptable replacement, and there were some enthusiastic responses. After a number of new names were considered and discarded for one reason or another, the name 'Niwot' was chosen, which was the name of a village in

As of now, the patented “Niwot” primocane-fruited black raspberry is available in the US.

the vicinity of my garden. (The name rhymes with “My pot.”) During the Nourse Farms preparation of 2A4 for propagation, virus testing identified a latent virus in the sample that I supplied to Nourse Farms for propagation. It took a couple of years for Nourse to clear the virus from the variety using heat treatment before additional propagation could be considered for distributing to evaluators. Once evaluation plants were sent out, Niwot was well received. A new patent application for 'Niwot' was submitted. When 'Niwot' was recognized as useful by the evaluators, Nourse Farms agreed to offer the variety in their catalog. Plant Patent #27131 for 'Niwot' was granted on September 6, 2016.

As of the current time, the patented 'Niwot' primocane-fruited black raspberry is available in the US from Nourse Farms, and also from other nurseries who buy tissue-cultured starts from Nourse. △



A cluster of Niwot raspberries.

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Thai Integrated Systems

Experience with Chickens

Michael B. Commons

MY WIFE, YOKE, AND I have resisted taking on raising animals for many years. This is for a few reasons, mostly being that neither Yoke nor I can be consistently at home every day of the year to care for them while Yoke's parents (who share a home with us) have not really wanted to take on any such responsibility. We have fish in our ponds, but they can fend for themselves on whatever is in these ecosystems.

A couple months ago, I had the chance to do a two day training at the Khao Hinsorn Royal Agricultural Development Center that is only about 12 km (7.5 mi.) from our home. While I chose to study New Model Farming (sort of a composite of integrated methods in line with His Majesty's Self-Sufficiency Agriculture model), I was also interested to learn about their method of raising chickens.

For a number of years I had been visiting the site and observed they were breeding a new chicken with genetics from modern layers and the very strong Thai village chickens mostly selected to be good fighting cocks. This work was finally done, and now this new breed is available for sale. However, luck was such that when I sat down for the training, a Bangkokian joined me who had signed up to study chicken raising even though he did not yet have any place to raise chickens. As each student in this group was to receive 12 chicks with some feed and medicine, he offered to share them with me. So at the end of the course, aside from receiving quite a number of interesting seeds, some fruit tree seedlings, and biofertilizers from the New Model Farming group I joined, I also received six young chickens and a bag of feed. As we had built a hen house over the pond close to our new home, we were more or less ready to go for this.

Our developing integrated orchard



The chicken coop over the pond.

Two months later, the chickens are far bigger (although not yet laying), used to our home and orchard/garden space, and looking very healthy. Dalia, our 7-year-old daughter, enjoys taking care of them, but what is so wonderful is that they need so little care. I am very happy with this new breed. The second day at our home, one escaped outside and did a very good job of hiding in the lemongrass bushes, but also fell (or jumped) into the pond when I was trying to capture it. It swam quite fine—and I didn't think chickens (or chicks) could swim much. Since then, we have seen that these chickens are not at all bad at flying and that the bridge between the hen house and the pond edge was not really necessary as they can quite easily traverse the gap.

**It swam quite fine, and
I didn't think chickens (or
chicks) could swim much.**

The hen house over our fish pond

While I was worried about dogs and wildlife (like snakes), and there are a number of neighborhood dogs, so far these chickens seem to be handling their local ecology very well, and now we don't have any need to close or open the door to their house. They have feed and water inside and some places to perch and rest, but every day they go out on their own and migrate in their small group around the roughly two acres of our garden and orchard, scratching and searching for seeds and worms and resting under trees and bushes when it is hot. While six chickens are not many (and we intend to increase our flock soon enough to something more like 20 or 30), these fully free-ranging swimming and flying chickens (like the normal village chickens) are about as easy to manage as I could have imagined. While I am certain they could manage without water in their house (as the ponds have ample), I think they could also probably manage for quite some time without extra feed as they are quite skilled at being chickens.

Learning limits

The only bother we have had so far is that they were pooping on our back porch. While this may seem like a compromise that we must accept for having truly free-ranging chickens, I was gladly wrong. Yoke's cousin who lives across the street has a dog who has been coming by more often to hang around the house. This dog, named Ma Ruay, has a distaste for chickens in his space and clears the chickens from our back porch whenever they enter. What is beautiful is now the chickens seem to have learned and are respecting that the back porch is his territory. They can and do range on all of the soil-covered areas just around the porch but are keeping off the porch (not to mention not entering our home itself). I should also say that while we have happy chickens, the fish living in the pond under the hen house seem even happier in this relationship, and learned right off to wait under for droppings. So this seems a proof in practice of one of the classical permaculture relationship concepts of Hen House—OVER—Fish Pond. This integrated system is promoted at Khao Hinsorn.

It would seem that having such a clever breed of chickens might be the easiest way to raise chickens, however we have something else in our forest garden that is even easier. This is wild jungle fowl. These are not only chickens, but the ancestors of all our modern chickens, and they are wild and most beautiful.



Two fowl foraging along the forest edge.

Did we put the jungle fowl there? No. Jungle fowl are one of the beautiful wild bird species of Thailand, and Southeast Asia is usually cited as where the chicken originally comes from, even as it has adapted to so many climates around the world. There is an expression “If you build it, they will come.” This expression gives far too much credit to human ingenuity and effort. As I see it, we are just collaborators with much greater forces. Mother Nature is working to care for this planet and bring it back to its fully abundant state. We (humans) have and can play a very important role to help facilitate and steward this process



Our forest garden in development provides great habitat for an increasing number of species.

and guide it towards abundance that also meets our own needs. This is what my wife and I have been trying to do following the principles and tenets of “Wanakaset.” With a complete avoidance of using any sort of chemicals, and only minimal “strategic” plowing and movement of earth, our forest garden is looking quite like a forest, and for over one year apparently looking very attractive for some wandering jungle fowl. So we have about 25-30 jungle fowl who reside in our forest garden—sleeping on branches at night and laying clutches of eggs hidden in thick grassy areas that sometimes they hatch and other times they abandon. Also since our new orchard-garden has developed, they are coming more and more across the road and to a certain extent co-mingling with their slightly more domesticated

Many Thai villagers see whatever natural bounty wherever it may be as “for the taking.”

cousins—all of which makes me think that the genetic crossover will continue in our backyard.

Birds of a feather

While strictly considering maximum productivity, one could look down strongly upon jungle fowl compared to modern broilers and layers, we can and do find abandoned eggs often enough and harvest and use them at home. The jungle fowl require absolutely no care or management by us. Their only requirement is that we provide them a nice environment. We have worked to develop and continue to steward our forest garden to be such a place.

In fact, this environment has become an environment for many other wild species, such as the beautiful colonies of weaver birds that now occupy a few trees. There must be millions of



Several jungle fowl browsing at the edge of our more mature forest.

ants and termites, and often enough we will find wild bee hives. I have written about our joy in finding (and harvesting) one variety of delicious mycorrhizal mushroom well established with some of our trees.

All of this leads to an interesting sort of contrast or conflict of views. Many (if not most) Thai villagers see whatever natural bounty wherever it may be as “for the taking.” They see ownership of an animal or crop as being dependent upon effort. So a raised chicken or a cultivated mushroom belongs to the farmer, while a wild animal or mushroom—even on someone’s private land—may be taken. At the same time, almost everyone who has this perspective would say that the sort of “farming” that Yoke and I are doing, is not “farming” at all and that it is “stupid” or “crazy” as it looks chaotic and wild. They think “there is nothing

I would question the sort of separation and distancing that is often spoken of with “Zone 5.”

to sell.” As these people, like most “smart” farmers, know better, they (along with other development policies and practices) removed all vestiges of wild areas and forests from our general area. A Google map snapshot reveals that our forest garden is now the deepest forested area in the neighborhood, and there are not many more. This dynamic removes the abundance of the commons, while not the practices. At the same time, like any sensible villager, they appreciate wild foods—normally even more than the cultivated ones. But for almost everyone, there seems to be a total disconnect between the choice (perhaps even responsibility) to create or maintain healthy diverse forest type ecologies, which then will provide space and habitat for many wild species including many that Thais highly value for food, medicine, and other uses.

For Yoke and myself, we see ourselves as stewards of the spaces we are blessed to manage, and we consider that we have rights to sustainably harvest some the wild animals, fungi, and plants, that have come to join our space. It is quickly clear that if you are a jungle fowl, a swarm of bees, or a fungal spore that most of the areas beyond our property boundaries are far less habitable. These lands generally lack perennials. There is very little verticality or structure to provide the sort of havens these species may prefer. Then there is the practice of regular dosing of herbicides, chemical fertilizers, and plowing. Worse yet, land is often covered with sheets of impenetrable concrete. The world around us seems far from being a welcome place. I like to think that if we help take care of our mother, she will help take care of us. And that this may in fact be our primordial role. Helping to steward an environment that provides abundance for the many children of Mother Earth. Going back to Permaculture 101, I would question the sort of separation and distancing that is often spoken of with “Zone 5.” If my Zones 1, 2, and 3 have become a welcome and abundant place and habitat for all sorts of wild beings, am I to leave and abandon my home and garden? I think not. I think we (humans) are also wild beings, siblings to the animals and trees, and when we live under such a premise and provide space and place for all, then Zone 5 (the wild) merges with the home, the garden, and even perhaps the “Zone 0” of our very selves. While we do need to change our ways and methods, I think the heart of “Regeneration” may be found in this change of perspective. △

Michael B. Commons lives with his family in Chachoengsao, Thailand where they practice Wanakaset (forest gardening and self-reliance) and are active in the Wanakaset Network. For over 12 years, he has worked with Earth Net Foundation to support small-scale farmer groups and associated supporting organizations from South and Southeast Asia to develop organic and fair trade supply chains, regenerate ecological and community health, and build their resilience capacity. Two years ago, he joined Terra Genesis International to use his skills to help link and assist concerned and innovative companies, their consumer networks and farmers' groups to collaborate in developing regenerative pathways.



How could you design your system to provide for you and many more beings from a Zone 5 perspective?

Natural Risks Building Ecological Resilience

Gloria Flora

ALL FARMERS, RANCHERS, AND PEOPLE of the land face natural risks. In response, they develop time-tested techniques, passing their wisdom down through generations. But there's trouble brewing in nature, and it's serving up risks and challenges at rates that provide little chance for protracted observation, experience, or intergenerational knowledge development. The major issue is climate change, better described as climate weirding, which is magnifying the scope and scale of known risks like drought, floods, and wildfire. Seasonality of these events likewise pays little heed anymore to "normal" cycles. Even the "worst case scenarios" of our best models undershoot reality.

Those who pay attention to their landscapes are well aware of these heightened risks. A recent report of the major concerns among young farmers in the West¹ found access to/availability of water (82%), drought (76%), and climate change (70%) at the top of the list. We get it, but what do we do to be sure these risks don't get us?

Crafting a cogent design response to climate-amped natural risks requires three vital elements: place-based context (science), biomimetic pattern recognition (nature), and a restoration toolkit (permaculture). Throw in some innovation, resources, and pluck and you too can dance backwards in high heels while blindfolded.

What does that mean in an out-of-balance system?

Ecological resilience is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly. Building resilience is a form of landscape restoration. Nature always returns to dynamic equilibrium, but it takes time. Because humans have dramatically impacted terrestrial ecosystems, oceanic systems, and the atmosphere in a brief amount of time; the responsibility to help nature speed up resilience through rehabilitation processes is ours.

Complexities and region-specific information cannot be covered adequately in this overview, but references provide paths to additional information.

Our climate context

The basic concept behind climate change is surprisingly simple. For the past 400,000 years², nature has balanced constantly



moving carbon between the atmosphere (air), the biosphere (plants and animals), and hydrosphere (water), particularly oceans. Life forms have taken up oxygen when they live, move, and breathe, and released carbon when they die and exhale—keeping carbon dioxide in dynamic equilibrium, but never exceeding 300 parts per million (ppm) of CO₂³. This is known as the *active carbon cycle*. But humans dug into the lithosphere (Earth's crust) and extracted fossil fuels previously locked in the *inactive carbon cycle*. We then released that carbon into the atmosphere through burning those fossil fuels. We added too much carbon to the system too fast, overwhelming the active carbon cycle and nature's ability to keep the system in balance. In just 70 years, we shot past 300 ppm, rocketing to over 403 ppm, at last count.⁴

What does that mean in an out-of-balance system? Extremes, unpredictable unseasonal events and perturbations—simply put, things get weird in a big way: 50° of rain in one event, wildfire seasons expanded by 105 days, and record-breaking wet springs followed by record-breaking droughts. From personal experience, it meant a frost-free September at 5,500' in Montana with the 30th hitting a balmy 70° and plants still in full leaf. The next morning, the thermometer stood at 0°. Needless to say, it appeared to be a botanical bloodbath. Fortunately, we had designed for resilience, so most of our more than 300 plantings rallied the next spring.

In addition to recognizing the potential natural risk events in your region, you need to know your local evolving weather patterns. An interactive NOAA website called "Climate at a Glance"⁵ allows you to create historic graphs and predictive temperature, precipitation, and seasonal graphs of your county from now to the end of the century. This information can help

you make choices about where and what to plant or phase out as habitats, growing zones, and rainfall change.

Plant hardiness zones⁶ have shifted dramatically pole-ward and in elevation. Here in northeastern Washington, we've gone from 4b to 6a in 40 years. That's half the life-span of a standard apple tree.

Habitats for native trees and plants are changing with jaw-dropping speed. Phyto-migration, the movement of plant species through different geographies over time in response to less than optimum growing conditions, has been occurring since plants existed. But usually, plants have had centuries or longer to make their way to friendlier landscapes. Now habitats are changing in decades or less, far faster than plants can move. Multiple models will literally scare you out of your chair. A researcher from the US Forest Service's Rocky Mountain Research Station has generated habitat change models⁷ of 76 iconic native western tree and shrub species. Where I live, several of our ubiquitous native species have less than a 50% chance of finding suitable habitat here in 60 years. Think about that.

Causes, effects: drought, floods, & wildfires

To develop solutions to a problem, you need to know the foundational events or causes that created it and the conditions in which it thrives. Natural risks, like floods, droughts, and wildfire, occur under complex sets of circumstances, unique in their effects and impacts based on specific regions and context. But they share common themes.

Floods are an excess of water on land that is normally dry. The water can neither sink into soil nor drain through established channels. The excess water comes from extreme atmospheric moisture, delivered at a speed and volume that overwhelms normal coping mechanisms. Wind, deforestation, lack of ground cover, and hardened surfaces exacerbate the problem. Flooding displaces air in soils with water, causing plants to suffocate or, in moving water, be ripped out of the ground.

Drought comes from the opposite situation, a profound lack of water vapor in the form of precipitation, snowpack, and/or humidity.⁸ Feeder roots and root hairs, many of which reside in upper soil levels, dry out and die. Transport of nutrients and water slows. In prolonged drought, woody plant cells that transport water and nutrients (xylem and phloem) can permanently

collapse. Repeated drought can kill even mature trees. With the substitution of extreme drying for excessive moisture, circumstances that lead to flooding likewise augment drought: wind, deforestation, lack of ground cover, and hardened soils.

Wildfires needs an ignition source and three conditions to spread: heat (high temperature with low relative humidity), oxygen (wind), and fuels. Fuels have many characteristics: type, moisture content, shape, size, quantity, vertical arrangement, and horizontal continuity. Wildfire behavior depends on three factors as well: topography, weather conditions, and again, fuels, particularly the amount and arrangement. In fire-prone conditions, we find overly dense, dry vegetation blanketing the landscape, often with significant ladder fuels (vegetation under a tree canopy) that can carry ground fire into a forest canopy.⁹

Climate change, as discussed above, leads to dramatic weather events and perturbations along with alterations in temperature and moisture patterns, thus changing habitats. Common effects are random extremes in precipitation and temperature, increased wind, and deforestation. These are the same factors that make flooding, drought, and wildfire more problematic.

Plants that are stressed can't effectively combat disease or insect infestations, which can become epidemic in warmer temperatures. For example, mountain pine beetles killed over 46 million acres of trees in the western US from 2000-2012, which leads to deforestation and increased risks,¹⁰ in a vicious feedback loop.

Hone in on the assets and liabilities that you can manipulate...

Simply summarized, wildfire, floods, and drought share causes. Climate change exacerbates those causes while adding some significant ones of its own, most notably for agrarians, shifting wildlife/plant habitats, and hardiness zones.

Identifying the leverage points where we can effect positive change through design and management is key to building resilience to natural risk. And those leverage points are at the nexus of our work as permaculturists: soil and habitat restoration, water and vegetation management, and increasing biodiversity. To build resilience we must:

- Build soil so that it stores water and carbon and promotes healthy, resilient growth of lifeforms.
- Maintain the right diversity, species composition, and density to withstand high-risk natural phenomena and a changing climate.
- Tie those actions together with appropriate water conservation and management.
- Employ biomimetic operation management techniques to increase resilience. **Always ask how nature would solve the challenge you're facing.**

ABOVE GROUND

Windbreaks, shelterbelts, hedgerows
filter strips

Cover crops

Agroforestry

Shade
(structures,
vegetation,
trees)

Guilds/
layering

Swales

Managing natural risks pivots around the concept of modifying your land to **create a network of water pathways and sponges**, using soil and vegetation to **collect and hold as much moisture as possible**—regardless of your landscape or precipitation!

Site assessment

True to permaculture design, the first step in building resilience is an accurate site assessment to identify characteristics and capabilities. Identifying your site's characteristics defines your design parameters and constraints—the boundaries of your sandbox. Honing in on the assets and liabilities that you can manipulate to maximize site capability, defines the tools and

Building soil and managing water are your primary tasks in augmenting resilience.

techniques providing the most effective action—how you can shape the sand.

Although all features play a role in determining your site's existing and future potential, based on the accelerators of risk, these six are the most important elements affecting resilience:

1. **Aspect/Topography:** direction faced and degree of slope strongly influence solar/heat gain potential, soil moisture retention, water run-off, and fire behavior patterns, as well as management options available.
2. **Wind:** remember that wind is a major factor in exacerbating drought, wildfire, and moisture retention in plants and soil.
3. **Soil:** with a goal to create a living sponge of carbon-rich soil, the types of soils on your site dictate your primary actions.
4. **Precipitation:** typical amount, seasonality, and event types guide how you go about directing, capturing, storing, and distributing water.
5. **Vegetation:** actual and potential habitat, regional patterns, species, distribution, and density (above and below ground, horizontal and vertical arrangement). Plants, whether planted by nature or humans, are primary tools in your resilience work.
6. **Adjacent Risks and Assets:** actions by others outside your property can affect your potential risk. Learning where natural threats may come from off-site and who

BELOW GROUND

Biodiverse plantings (root zone management)

Biochar

No-till

Strip till

Vertical till

is doing what “upstream” allows you to leverage your actions for positive impact.

Pay particular attention to assets and liabilities that you can control, change, or manipulate. Liabilities are often found in vegetation (too much, too little) and soils (low carbon content, low moisture retention, hardened surface). Water (quantity, movement through site, storage and distribution potential) and other resources (energy, biomass, equipment, skills...) typically are your key assets.

Soil and water management

Building soil and managing water are your primary tasks in augmenting resilience. Soils rich in carbon and organic matter hold water. Permaculture and carbon farming along with smart management techniques give us a set of soil-building tools below and above ground. Soil moisture can be augmented by no-till, strip till practices, or keylines (vertical till). Adding biochar to soils attracts and holds nutrients, increases moisture retention by up to 30%, provides microbial and mycelial habitat, reduces greenhouse gas off-gassing, and sequesters carbon.

Biodiverse plantings affect both below and above ground conditions. Appropriate root zone management allows maximum

MANAGEMENT

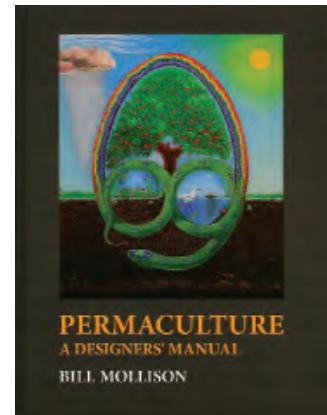
Rotational/Planned Grazing

Crop rotation

Controlled Burns

Irrigation

Forest Thinning



PERMACULTURE: *A Designers' Manual*

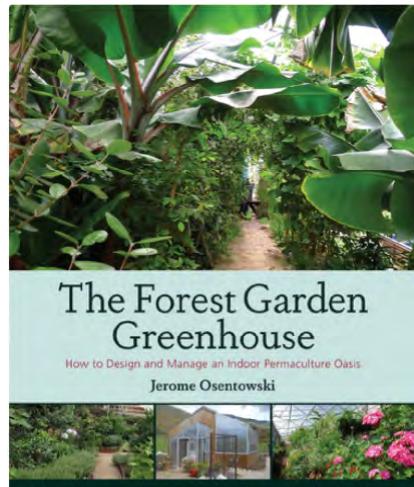
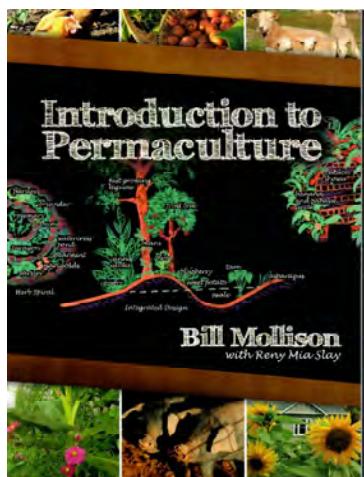
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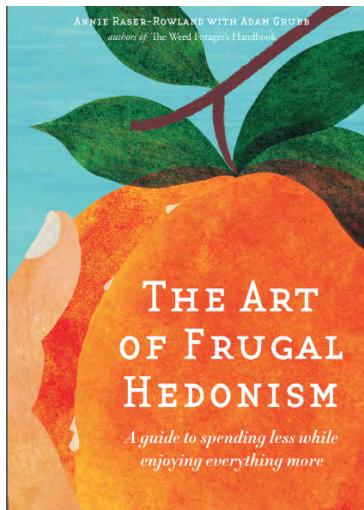


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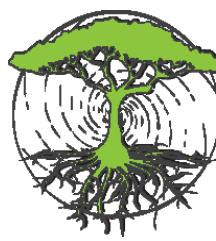


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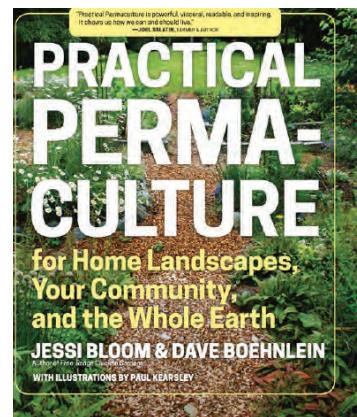


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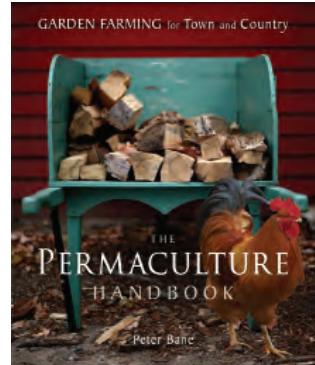


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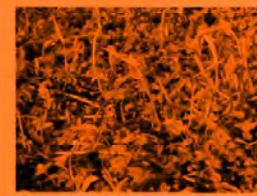
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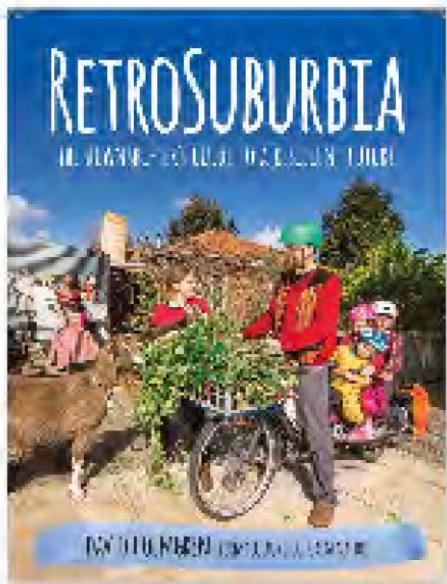
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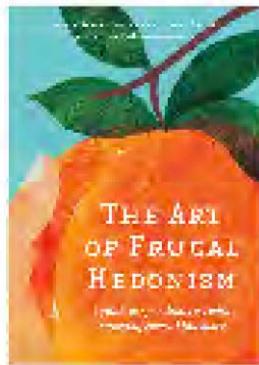
Page 1

SUPPORTING INNOVATORS WITH TOOLS FOR CHANGE

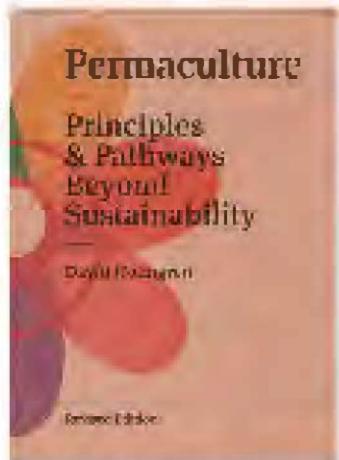


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Forest Thinning to Reduce Wildfire Risk

- Reduce tree densities and promote fire-resistant tree species
- Reduce ladder fuels (limb up 10')
- Favor shade intolerant species



nutrient uptake and retention of soil moisture, while vegetation above ground shades soil and lowers surface temperature.

Above ground is also where we get to play with vegetation—be it guilds, gardens, cover crops and grasses, or agroforestry techniques such as food forests, windbreaks, shelterbelts, riparian buffers, and silvopastures. Of course, plant selection depends on growing zones (current and projected) and water needs. Increase your resilience by selecting varieties that bracket your current zone and then check those climate models and plant for the future conditions—even if that means adding some extra protection for a few years. And mulch, mulch, mulch.

Water management depends on our ability to locate and protect all sources, estimate volumes, keep it on site¹¹, capture it, store it, sink it, distribute it, and love it. Sources can be natural (river, stream, pond, lake, spring, wetlands¹²), human-constructed (pond, catchment, container), subsurface (aquifer, underground flow), precipitation (rain, snow, dew), greywater, or overflow (leakage from offsite).

The permaculture prescription of PATO—patient and thoughtful observation—suggests you go outside in every kind of precipitation event to see how your land responds. Recognize patterns. Where does the precipitation flow or get hung up? How do your buildings and infrastructure help or hinder? How much precipitation is effectively available?

Experts, like Brad Lancaster, have provided some great guidance¹³ for water harvest principles and estimating volumes. Estimating available volumes can seem difficult, but Lancaster and others provide the formulae for calculating specific run-off volumes from any surface from roofs to driveways to swales.

If you want to actually capture water in catchments or channels, first know your purpose(s). Is it flood or erosion control (or both), irrigation, stock use, and/or fire protection? Your purpose and site will then dictate how you deliver or guide that water to storage in containers, ponds, or wetlands. Conversely, how will you guide that water to key areas for storage in the soil by grading, berms, swales, or terraces? You can also place things in the path of the water to diffuse or guide it. Vegetation, rocks, logs, straw bales, erosion socks, or gabions can direct water. Or you can use subsurface channeling like French drains, perforated piping, and keylines to move water.

Design your entire water network beginning at the top of

your site first, then begin to implement slow, small solutions. A tweak upstream can have significant effects downstream. Use techniques that fit your site, capabilities, and purposes while stacking functions.

How you manage and sequence your site operations can influence soil moisture retention as well. Planned grazing, forest thinning, livestock integration, mulch, tillage, irrigation, and crop rotation can enhance or—if done without considering consequences—deplete soil moisture.

Rejuvenating forest landscapes

Native forests are in deep trouble across this country on public and private lands. One would like to think that public forest management practices have been predicated on science with sustainability of forest health being the primary driver. Based on decades of my work with and within land management agencies, it is abundantly clear natural resource decisions are social decisions. Science informs but ultimately, governments make decisions that prioritize short-term benefits to society over long-

When a wildfire does start, the chances of it becoming an inferno are now much higher.

term impacts to people and nature. Climate change is a prime example.

But a second troubling example, coupled with climate change, has put our forests in real peril. Over 100 years of fire suppression has disrupted the natural balance within fire-adapted forests. Periodic fires historically reduced biomass, created charcoal—a vital element for soil building—and created space for regeneration, all the while keeping carrying capacity at optimal levels. Native cultures copied nature, using fire regularly to reinvigorate forest undergrowth and prairies, regenerating culturally important plants and providing high quality forage for wildlife. Old-growth of most tree species easily withstood rapidly moving ground fires and were healthier for them.

Early last century, as people settled in forested regions, politicians faced demands for fire suppression. Politicians were happy to oblige, despite warnings of scientists that comprehensive suppression would actually increase fire severity and disrupt forest dynamics over time. It's now clear that wildfire suppression allowed forests to significantly increase the density of individual trees per acre. These trees compete for water and nutrients. Few actually thrive.

Increased density augments the number of *shade-tolerant* species that need to grow up under *shade-intolerant* species, then outcompete them. Shade-intolerant species, like ponderosa pine, are much more resistant to fire. But now, shade-intolerant trees dominate most forests, and they are notoriously sensitive

to fire. When a wildfire does start, the chances of it becoming an inferno are now much higher. The heat generated by a dense understory is sufficient to send flames into the canopy and many trees that could otherwise withstand a ground fire are killed.

Thinning to reduce tree density, removing thick undergrowth (goats and some sheep breeds are highly skilled at this!), and removing limbs to 10' (3 m) up are key practices. The USDA Natural Resources Conservation Service (NRCS) and state forestry departments often have free expertise and grants to help you pay for 50-100% of the treatments. They, as well as the US Forest Service, conservation districts, university extension offices (found in just about every county), and the National Fire Protection Association, offer education and information across the country. Just visit any of their offices or search the internet for the Firewise USA Toolkit¹⁴ to get started.

Importantly, you'll find that appropriate thinning always improves the aesthetics of your property and the vigor of herbaceous ground covers. Sure, it will take some regular work to maintain the property in a more open pattern, but the property value and functionality—as well as the health of your forest ecosystem—will be vastly improved.

Prescribed burning is highly effective as a post-thinning tool. Because of the inherent risks of escape and residual damage, leave this to professionals. Once some Firewise thinning starts in a neighborhood, more and more property owners follow suit. Hundreds of acres around us are now Firewise, so everyone wins!

Strategies summarized

Once you understand primary natural risks and their causes, the solutions seem quite logical. A plethora of information is available on each of these activities. Taking action not only makes your property more resilient, but you are also helping your community by your positive example. Not every one of these will suit your property or purposes, but each is worthy of consideration.

- Educate yourself on projected climatic changes for your region and county.
- Build your soil through compost, biochar, mulch, cover crops, manure, worms...
- Plant some species at the margin of your hardiness zone, protect over winter.
- Select varieties with a wide range of hardiness suitability, especially to the warm side.
- Begin container-raising cold-sensitive plants in a greenhouse or hoop house for planting out five years from now.
- Propagate your own varieties which seem to stand up well to extremes, especially heat.
- Plant a range of varieties of a particular species with different bloom and ripening periods.
- Increase biodiversity and plant arrangement, vertically, and horizontally.
- Thin your forests according to Firewise guidelines.

- Reduce height and density of understory in non-irrigated forests.
- Limb up trees to 10' (3 m) above ground.
- Convert waste woody biomass to biochar; compost softer organic materials.
- Plant shade-intolerant and thick-barked trees that have higher fire resistance.
- Create windbreaks, a handy agro-friendly tool critical for de-escalating natural risk.
- Create fuel breaks, open patches, or “lanes” through forests, to slow wildfire spread and speed.

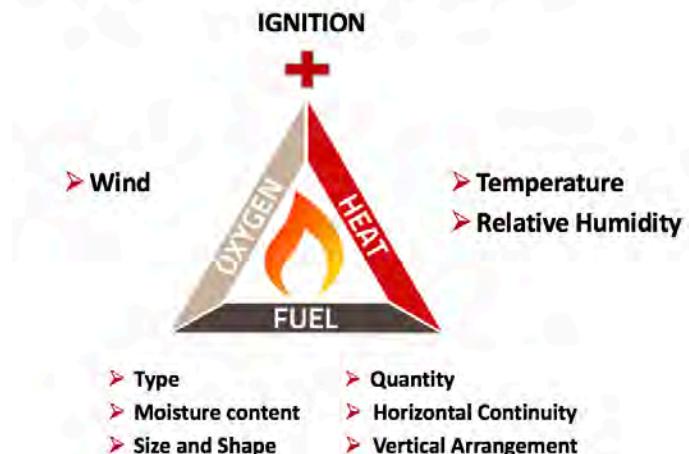
Enjoy the journey! Δ

Gloria Flora is the founder and director of Sustainable Obtainable Solutions, a nonprofit dedicated to the sustainability of public lands; founder of the US Biochar Initiative; board member of The Permaculture Land Trust; former national forest supervisor; landscape architect and certified permaculture designer. She and her husband are growing TerraFlora Permaculture, a learning center in NE Washington, where they demonstrate agroforestry and polyculture solutions within 65 acres of native forest. And yes, Flora is their real last name.

Notes

1. *Conservation Generation: How Young Farmers and Ranchers Are Essential to Tackling Water Scarcity in the Arid West* young-farmers.org/westernwater
2. National Atmospheric Science Administration, 2016 <http://climate.nasa.gov/evidence/>
3. CO₂e: A unit of measurement of the global warming potential of greenhouse gases using the functionally equivalent (e) amount or concentration of carbon dioxide (CO₂).
4. October 2017. Mauna Loa Observatory, Earth Systems Research Laboratory, National Oceanic and Atmospheric Adminis-

What Causes Wildfire?



Rocky Mountain Region:

Recent Historic Suitability vs. Projected –
Net Loss in Suitable Acres by 2060

SPECIES	NET LOSS
Lodgepole Pine	- 90%
Ponderosa Pine	- 80%
Engelmann Spruce	- 66%
Douglas Fir	- 58%

Rocky Mountain Forests at Risk: Implications of Climate Change for Mountain Pine Beetles, Wildfires, Frost, and Drought. Rocky Mountain Climate Group, Union of Concerned Scientists, Frank Sesൺder, et al., 2015. The report is available online at www.ucsusa.org/forests/risk and [www.rockymountainclimate.org/report_k.html](http://rockymountainclimate.org/report_k.html).

stration, U.S. Department of Commerce. <https://www.esrl.noaa.gov/gmd/ccgg/trends/>

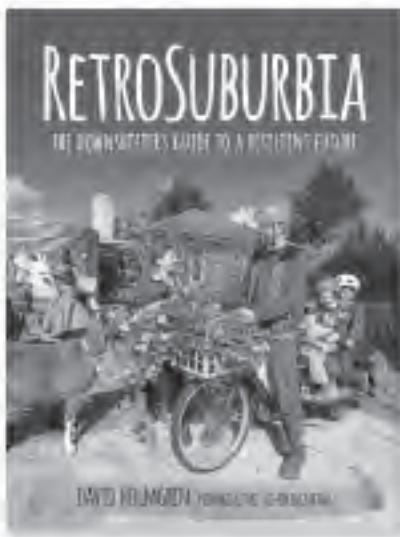
5. Many US government agencies are being forced to eliminate references to and information about climate change by the current administration. At last check, Climate at a Glance was still reachable at <https://www.ncdc.noaa.gov/cag/time-series/us/45/9/tavg/ytd/12/1895-2016>

6. Current USDA Agricultural Research Service Plant Hardiness

Maps are found at <http://planthardiness.ars.usda.gov/PHZM-Web/>. A map showing changes since 1976 can be found at http://www.washingtonpost.com/wp-srv/local/planthardinesszones/index.html?tid=a_inl

7. <http://forest.moscowfsl.wsu.edu/climate/species/index.php>
8. For a good overview of drought impacts on woody plants see: Douglas, Sharon. *Drought, Its After Effect and Management Strategies for Woody Ornamentals*. Connecticut Agricultural Experiment Station.
9. Basic wildfire information can be found at <https://ir.library.oregonstate.edu/downloads/qr46r108p>
10. Interestingly, on a broad landscape scale, insect-killed trees do not necessarily increase wildfire risk. Other factors are far more dominant, including the overall poor health of forests. See Meigs, Garret, et.al.. *Does wildfire likelihood increase following insect outbreaks in conifer forests?* Ecosphere. Volume 6, Issue 7. July 2015. Pages 1–24 <http://dx.doi.org/10.1890/ES15-00037.1>
11. Know water-rights law for your state and region before you start designing.
12. Integrate complementary uses around wetlands—don’t drain!
13. Thank you Brad Lancaster, author *Rainwater Harvesting for Drylands and Beyond*.
- 14 <http://firewise.org/wildfire-preparedness/firewise-toolkit.aspx>

SUPPORTING INNOVATORS WITH TOOLS FOR CHANGE



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To Avert Armageddon?

Chris Smith

I AM GUILTY OF ONCE HAVING a myopic approach to growing food: if I couldn't eat it, I wouldn't grow it. With limited resources (mainly time and space), everything I grew had to feed me and my family. I knew that plants needed to be pollinated in order to produce the fruits that I would consume, but those pollinators simply existed. Bees, butterflies, moths—they provided a function. Hooray! Now back to my vegetable garden and the needs of me and my own.

But with learning, maturity, and permaculture, I discovered we don't live in bubbles. We just think we do. Permaculture teaches integration, while our current society teaches segregation. Here is my house. Here is my garden. Here is my vegetable bed. Here is my flower bed, where (if they wish) butterflies may hang out. There is my neighbor—observe the fence. That's not the way it works in nature. Everything is integrated; ecosystems are complex webs.

We need to be applying sensible, regenerative design to encourage habitat restoration and reverse catastrophic insect loss.

"We need pollinators for global functioning and a livable planet," says Rachael Winfree, an assistant professor of entomology at Rutgers University in New Brunswick, NJ. "80-90% of plant species rely on animal pollinators."¹ When we couple that statistic with a recent study conducted in Germany, which showed a decline of around 75% of insects over three decades², then our bubbles should start bursting pretty quickly.

Some people anticipate this 75% insect loss as an apocalyptic event—the beginning of the sixth great extinction.³ While micro-examples of species loss have been documented around the world, this report is the first to document widespread insect loss on such a scale. In the US high profile cases, include the monarch butterfly as a result of lost milkweed habitat, and the decline of the honey bee with mounting evidence linking increased insecticide usage (especially neonicotinoids).⁴ Elsewhere, European butterfly populations have dropped by half since 1990⁵, and British moth populations have declined 30% a

year over the last three decades.⁶

Sadly, few people respond to global needs unless there is also a personal gain (and survival of the human race seems too big to be considered personal). The good news is that increasing the quantity and quality of insect habitat can also increase productivity of the food crops.⁷

- First, insects are critical for pollinating many crops (as well as many wild species). More habitat leads to more insects, which leads to better pollination.
- Second, creating habitat for beneficial insects creates a predator-prey relationship to control any number of insect pests.

While big ag treats soil degradation with higher amounts of NPK, most sustainable gardeners are on board with the idea of looking after the soil with compost, no-till methods, and cover-cropping techniques. The soil is a living system of mycelium, microbes, bacteria, and "bugs." If we look after it—it will look after our plants. We need to steward the aboveground flora and fauna in much the same way. While big ag purchases and transports hordes of honey bees and invests in robotic mechanical pollination techniques, we need to be applying sensible, regenerative design to our landscapes to encourage habitat restoration and reverse catastrophic insect loss.

What follows are some techniques and ideas for achieving this:



Good permaculture design leads to more insect life, including this very helpful ladybug.



Comfrey has long been a permaculture favorite and for good reason.

Don't spray

I wasn't sure if I needed to write this one down, but let's be clear: **don't spray**. If our aim is to create a balanced ecosystem full of diversity then we have to be honest about the effects of spraying. If it kills the "bad guys," then it's highly likely that it'll kill some "good guys." Let's stop assessing only whether or not spraying is toxic to humans and start also considering if it is toxic to the ecosystem we are trying to cultivate.

Edible flowers

This is a good transition strategy to convince the foodies to plant flowers. It's also a great way to incorporate flowers into the vegetable garden without feeling as if you're sacrificing space. Nasturtiums are prolific, tasty, and beautiful (you can eat the leaves, flowers, and seeds). Borage is a favorite among bees because it replenishes its nectar so quickly and adds color on the plate. Marigolds produce huge amounts of flowers, more than enough to satisfy your salads and the pollinators. The list of edible flowers is really long, so you can go a long way by just planting flowers that you intend to eat (trust me, you'll never eat them all).

Annual crop flowers (seed saving!)

There are lots of things we grow that we never let flower. When I teach seed-saving, I often show pictures of beet, lettuce, arugula, and carrot flowers, and many people cannot identify them. The act of seed-saving has the byproduct of allowing the plants to go through their natural flowering cycle. As a permaculturist, you get to feel very good about the process because you've grown some lettuce to eat (leaves), you've created some pollinator habitat (flowers), and you've saved your own seeds for planting next year (seeds). Because you're also a canny

gardener, you planted some slow-to-germinate carrot seeds under your lettuce as they started to bolt, so when you remove the lettuce, the carrots are ready to go. Allowing some common self-seeding annuals to go through their seed cycle, such as dill and cilantro, will provide some excellent beneficial habitat and give you self-seeding herbs. I haven't bought or planted dill and cilantro for years, but it grows abundantly in my garden.

Beneficial attractants

Farmscaping is a technique where you aim to plant 5-10% of your farm or garden with plants that are specifically known to attract beneficial insects. These are insects that will prey upon pests in the garden: parasitic wasps, ladybugs, lacewings, damsel bugs, hoverflies, tachinid flies, etc. This was traditionally done by leaving wildflower edges and can be easily reproduced in a garden or farm setting. I incorporate wildflower borders in most of my gardens—a 4'-wide border provides the best habitat, but whatever you can achieve is better than nothing. My seed company, Sow True Seed, has a beneficial attractant flower mix that makes the process as easy as sowing some seeds!

Interplanting specific beneficial attractants is also a good technique. Many of the *Apiaceae* family (fennel, angelica, dill, cilantro, carrot—Queen Anne's lace, etc.) provide great habitat for ladybugs and lacewings, and the tiny flowers support many of the parasitic wasps. Yarrow, buckwheat, and members of the mint family will attract hoverflies and parasitic wasps. A lot of the flowering perennial herbs such as thyme, rosemary, and lavender also provide pollinator and beneficial habitat. Diversity (and integrated diversity) is a good thing.

Incorporate insectaries

Permaculture plant guilds allow us to mimic nature's ecosystems with intentional design. In this way, we can create agro-ecosystems. These plant guilds will almost always include insectaries, recognizing the importance of incorporating pollinator and beneficial attractants. For example, an apple tree will never be planted in isolation, but will include plants such as comfrey, yarrow, daffodils, and strawberries. I've added saffron and asparagus to my apple guild. I find myself using comfrey more and more for its multi-use offerings—it is a pollinator, a dynamic accumulator, a medicine, a fertilizer, and a mulch. It's also quite beautiful.

Preserve habitat

Learning that many insects will overwinter underground or in garden debris is an important step in supporting insect diversity in your landscape. Bees will overwinter in the hollow stems of dead flowers; ladybugs in piles of decaying leaves; and praying mantis egg cases can be found in drying vines and stalks all over. If you're going to the trouble of restoring habitat for the insects, don't destroy it in winter! You can go one step further and build or buy wild-insect homes. UNC-Asheville has a bee hotel created in collaboration with Bee City, USA. It is a covered collection of different sized tubes to support overwintering bees and wasps.

Embrace the wild

The permaculture design strategy of leaving some landscape as a wild zone (Zone five) certainly supports our mission to protect insect populations. If you simply leave a place alone, nature does a very good job. However, the German study collected all its samples in nature reserves and still recorded a dramatic decline in insect populations. Hence the apocalyptic warnings. Zone five is inarguably important, but in this case, not enough. As permaculture designers, we need to be pushing out into Zone six: the social zone. I can plant as many wildflowers as I like, but bees will forage many miles each day, well beyond my no-spray zone. I can plant as much milkweed as I want, but monarchs are migratory and need a concerted public effort to save them (something that is actually happening). Our voices need to be heard, and our design focus needs to value more than food production.

It strikes me that creating an environment for insects requires incorporating beauty and diversity into the landscape, with the advantages of increased crop yields and pest control. That seems like a pretty easy pitch to me. Δ

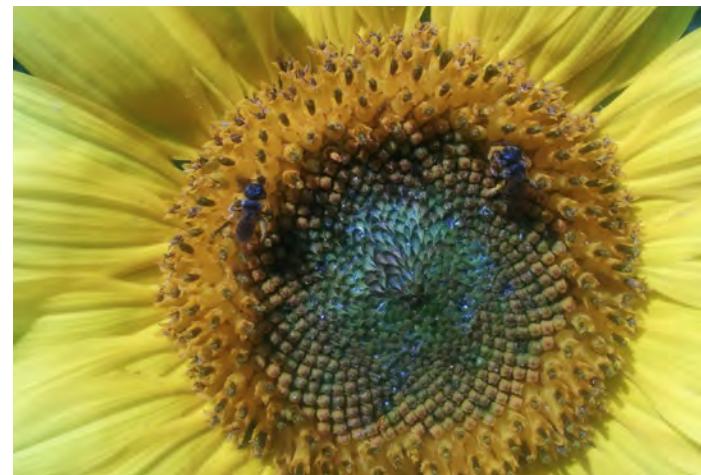
Chris Smith is an enthusiastic grower and permaculturist from a green-thumbed family. He has immersed himself in the world of seed and southern growing. On his urban homestead, Chris is experimenting with landraces, selective seed saving, crop trials, grow outs, and edible seed oils! Chris works for Sow True Seed, an Asheville, NC-based, open-pollinated, seed company committed to a sovereign seed and secure food system.

Endnotes

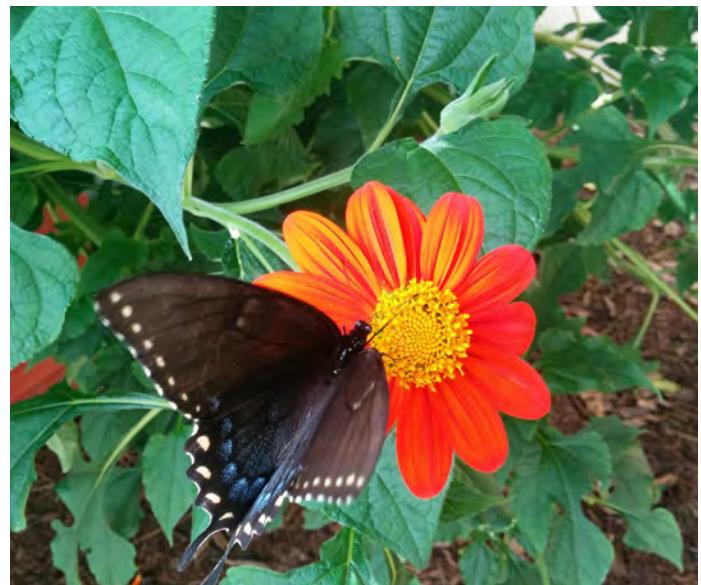
- 1 <https://www.rodalesorganiclife.com/wellbeing/attract-native-bees-boost-pollination-your-garden>
- 2 <http://www.sciencemag.org/news/2017/10/germany-s-insects-are-disappearing>
- 3 <https://www.theguardian.com/environment/2017/oct/18/warning-of-ecological-armageddon-after-dramatic-plunge-in-insect-numbers>
- 4 <http://xerces.org/neonic-report-exec-summary/>
- 5 <https://www.eea.europa.eu/publications/the-european-grass-land-butterfly-indicator-19902011>
- 6 <http://www.sciencedirect.com/science/article/pii/S0006320706001777?via%3Dihub>
- 7 <http://blogs.edf.org/growingreturns/2017/09/07/once-a-pesky-plant-for-farmers-this-weed-presents-a-new-opportunity/>



Parasitic wasps are a real boon in the garden.



Bees pollinating a sunflower



This swallowtail butterfly is another important and beautiful pollinator.

Seedling Table de jour

Gabriel Hahn

NOW THAT THE HOLIDAYS ARE PAST US, lots of people have torn down the Christmas tree lights and taken on the dreaded chore of stuffing them into a tangle and waiting for next year. For those who are sad about taking the lights down, having had the lights up, looking for a better use for them, or turning a consumer product into a producing one, look no further.

You've found yet another article that tells half of someone's life story before getting to the point. Not really, but our aims are provided, as are instructions, which in words are much more complicated than the building process itself. Read on to learn how to put your lights into a box with a clear lid, making a little greenhouse instead of taking up space in the garage.

Last February, my friend Andy Gerber and I were in the process of building a greenhouse and would soon need a way to keep our seedlings warm (and cool). We didn't want to run out and buy a seed mat, propane, or heat the whole greenhouse to keep a few trays of plants warm. Heating air is costly and inefficient. All we needed to keep warm were the plants, the medium they grow in, and the water that hydrates them. So, we devised a seedling table that would:

- Serve as a potting bench, germination chamber, and growing table at home scale (or larger).
- Cost little to no money.
- Keep seedlings above 50°F (10°C) on the coldest of nights in late February and early March, and cool enough in April



The complete but plantless table. Germination and seedling table at back, sowing table at front.

and May.

- Be low maintenance.

We wanted to use mostly materials we had on hand. My farmer friend, Monica Pless, had seen Christmas lights used as a heat source on a tabletop bench. We had some of those. We also had some plywood, 2x6s, 4x4s, old countertops backed with metal, scrap pieces of rigid foam, and a 4'x6' sheet of double-wall polycarbonate, often used as greenhouse covering. (Greenhouse or clear plastic can be substituted here, see below for design suggestions.) These materials largely dictated our design.

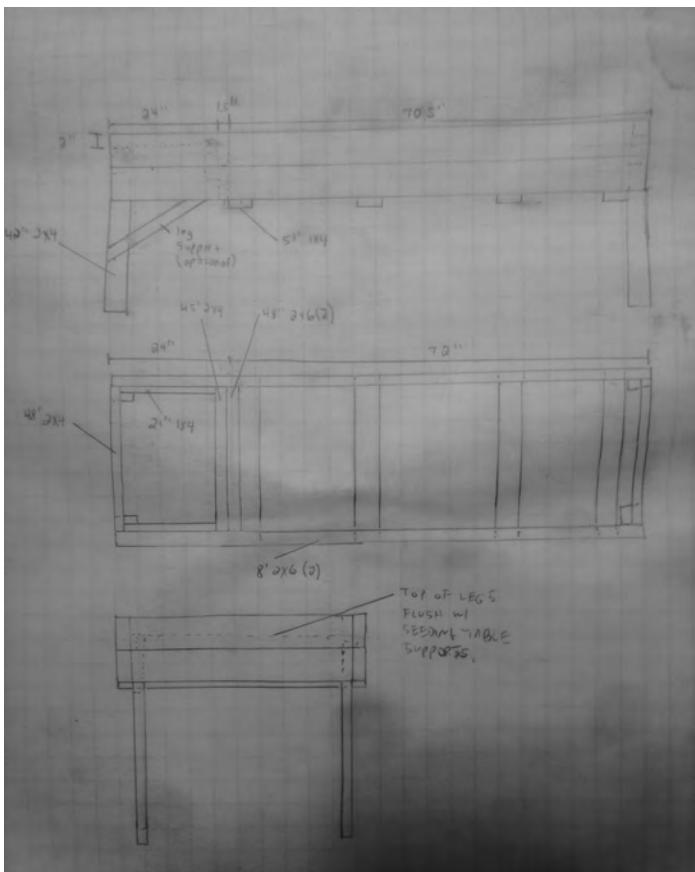
I also purchased an indoor/outdoor thermometer so that I could monitor temperature inside and outside of the seedling/germination section and the greenhouse itself. We vented the chamber manually, but will have automated venting this spring. Manual venting requires close observation and frequent adjustment. Last year, on nights when lows were at 26°F (-3°C), the inside of the box remained at 80°F (27°C) as long as the lights were on. When the sun comes out, closed chambers heat up quickly, and must be vented immediately, and the power to the lights switched off. In general, it is best to error on the cool side and act preventively, while keeping in mind quick changes in temperature are more stressful on plants than gradual ones. The insulated feature of this box, especially if inside a greenhouse, is quite protective, adding a buffer of 15°F or so at night without the heat of the lights.

The aid of a thermostat to act as a switch for the lights is almost essential for top-performing seedlings and germination. It takes the worry out as weather conditions change.

NOTE: The Christmas lights need to be static, preferably rated for indoor and out, and old school—NOT LEDs. LED bulbs do not produce enough heat! If you don't have any lights on hand, they can be found in a sale bin, thrift store, or online. We are talking the tiny lights usually seen on a tree. They come in strands of 100-300, about \$10 for 100 at this time of year.

For the most part, I encourage people to use what they have on hand. Of course, keep the end goals in mind and adjust where needed to avoid excess troubles. It was nearly a year ago that we built this table, so I wasn't thinking of documenting the building process at the time, so the photos aren't glamorous. It was also a large experiment, so we weren't thinking of how this could be a template for other growers at the time.

That said, this is an easily replicable model that can be adapted to most home grower or small farm needs. Ours was intended to be kept inside of a greenhouse, protected from wind and extreme low temperatures. It could be modified to fit a cold frame, or specifically as an outdoor table, although considerations would be needed to protect the lid from wind.



Our sketch plans.

We start most of our seedlings in 10"x20" trays, so we made a large table.

Materials

(this list differs a bit from the items shown in the photos to create a better design with less material)

- 4 8' 2x6s (sides of table)
- 4 48" 2x6s (ends of table)
- 4 42" 2x4s (legs)
- 1 45" 2x4 (supports for seeding table)
- 1 48" 2x4 (support for seeding table)
- 2 21" 1x4s support for seeding table)
- 5 51" 1x4s (supports for seedling/germination chamber. Use 2x4s if adding sand)
- 1 4x8 sheet of plywood (we used 1/2", but that's not vital)
- 1.5 sheets 4'x8"x1" rigid foam insulation (material with at least one reflective side preferred but not necessary)
- 11 1/4" x 3/4" x 42" strips (this needn't be specific, the purpose is for supporting metal above lights and insulation and providing room for sand if used)
- 2 70" strips of wood, about 3/4" on one dimension, with a tapered dimension on the other. 1.5" at one end, 1" at the other to allow for drainage.
- Twin wall polycarbonate (or clear greenhouse plastic; but this requires hoops or a supporting frame. 6" concrete mesh would work well)

Strands of Xmas (tree) lights (length depends on size of table and how tightly the rows are placed)

1/4"x25"x48" sheet of Corian® or other impermeable surface (plywood can also be used here; this is for the seeding table)

Caulk

Duct tape (to hold light strands in place and seal foam and metal to edge)

Optional but preferred for lower maintenance and optimal environment:

Hinges (these allow the glazing to tip for watering and venting)

J channel for polycarbonate (or furring strips)

Thermostat https://www.farmtek.com/farm/supplies/prod1;ft_thermostats_controllers-ft_thermostats_durostat;pger2095.html

Automatic greenhouse vent opener <http://www.littlegreenhouse.com/accessory/vent2.shtml>

2.7 cu. ft. of sand (for 1"x48"x96" seedling area; sand conducts and stores heat)

Weatherstrip seal

Tools

Saw

Drill with bits

Impact driver

2 1/2" deck screws

2" deck screws

J channel for polycarbonate furring strips)

Measuring tape

Square

Level

Hinges

Drywall knife

Pencil

Sharpie

Basically what is needed is:

A table at or above counter height

Enough clearance for plants to grow

A slight slope within the seedling area so that water will drain and not destroy lights

A way to collect and store sunlight

A surface that will allow heat to come through to plants but drain water

Notes on the building process

We started with a simple frame, attached legs, then a partition to divide the table into two sections. The short section serves as a sowing table. The other as a seedling/germination table. I like my sowing table to be high, at my lower ribs is ideal so that I can see small seeds easily and reach the back of a 20" tray without bending my back. I'm 5'9", and for me this is at about 42". Keep in mind that if using trays, the soil level will be 2-3" above the surface of the table, which can affect the comfort zone. The seedling/germination section of the table is



Cross section of plywood and insulation layers. The top layer has a reflective surface. The gray is duct tape sealing in the heat.

lower so that there is space for seedlings to grow and not get burned or hindered by the clear covering. The cross supports for the bottom of this section are set quite deep relative to the top of the table, allowing space for an insulation layer, light strand and sand layer, barrier layer (metal), seedling trays, and growing space for the plants themselves.

Steps

Assemble table frame. Use screws for all attachments, 2" screws for any joint that involves a 1" piece of lumber. 2½" for all others. If using sand, substitute 2x4s for 1x4s on the seedling supports (leg bracing is optional, not listed in materials section). Check for level at attachment point of legs so that all supports are level. This will matter later when installing barrier above lights.

Cut plywood to fit within frame so that it rests on seedling/germination section supports, remembering to notch the corners for the legs. Place in table.

Repeat plywood steps with rigid foam. Hold onto the scrap for insulating the sides and ends later. Caulk around sides, ends, and corners. Then tape so that all above the foam is sealed.

Drill hole for light strands through foam and plywood, preferably near an outlet, and away from where you will drain water from the table. A 1¼" bit will allow a plug to fit through.

Lay in and secure tapered 70" pieces along long edges.

Lay ¾" x ¾" supports about 6" apart, perpendicular to tapered pieces, leaving a couple of inches of space at each end.

Place light strands. Feed a power plug out of the hole, leaving enough wire to connect to an outlet or extension cord. When laying lights, I went side to side on the narrow dimension, about 5" between rows, bending within an inch of the sides with each turn. I laid in enough lights for about half of the 70.5" section of the table, using about 50'. This served as the germination section because of the added bottom heat. The other half of the table received adequate heat because the glazing traps the heat

as it rises.

When laying lights, place a spot of tape here and there as you go if needed. If using sand, add now. 1" depth needs about 2.7 cubic feet of sand.

Lay in metal, (or other heat-conductive, fire-resistant, solid material) following the steps for the foam and plywood except the hole for the lights.

Drill a ½" hole or two, angled downward out the low end of the table frame where it meets the metal so that water can flow out here. Now caulk and tape all edges and drain to ensure water flows out the drain. A bit of standing water is ok.

Cut pieces of remaining foam to cover interior sides of seedling/germination section. I didn't bother insulating around the legs. Place vertically, with the bottom against the metal and the top flush with the top edge of the table. Secure with screws and washers. Caulk and tape optional.

Trim and lay in Corian® (or other hard, smooth material) for the seedling table, making the surface about 1" past the edge of the table. Add plywood beneath the supports if a drawer is desired.

The glazing or sheeting can be as simple as laying polycarbonate on top of this section, venting manually when needed. It could be as complicated as placing hinges, weatherstripping, a thermostat, and automated vents.. If you know how to do these things, you don't need this article. If you don't, stay tuned for future posts, or contact me and I can give you the rundown. The only must is that the glazing is longer on each dimension than the inside edge of the seedling/germination section. In an ideal setting, the glazing is tilted toward the south. This can easily be achieved by cutting the ends of the seedling/germination section at an angle. A 3-6" drop across 48" is sufficient. But know this will come at a loss for head space for plant growth, so adjustments on the other side may be in order.

Keep in mind this is just one design, made entirely from materials on hand. The design could certainly be improved. Things we would change are:

Add the thermostat and hinges.

Make seedling/germination section deeper, with glazing on top half of the south-facing side.

Set the glazing at an angle.

Do a better job of sealing the metal layer.

If you or someone you know are interested in designs like these that enable low resource living, becoming more self-reliant, or ready to learn or become embedded in permaculture, check out Sheltering Hills Design and see if there is an upcoming workshop in beautiful south-central Indiana. The hands-on workshops and classroom experiences create an environment and togetherness that simply can't be had in books or online. △

Gabriel Hahn is adding carpentry and permaculture nursery work to his toolbox which already includes urban farming. Upon taking the PDC in 2016, he moved from St. Louis to Paoli, Indiana, to live in a cooperative project, The Tomato Products Company (an old processing plant), and begin an apprenticeship in teaching permaculture. His participation in Sheltering Hills Design and collaboration with Rhonda Baird has blossomed from there.

Either side of the PDC

A Snapshot of Graduates

Rhonda Baird

ARE YOU CONSIDERING the value of taking a Permaculture Design Course (PDC)? Or perhaps you have already taken a PDC, and you are wondering what your next steps might be. Investing the time and resources to attend a course can be a bit daunting—and it might be helpful to look at what people who have taken the plunge—graduated a design course—are doing. So, I’m going to share some of what I know they’re doing. (I’ve changed the names of some of these students to protect their privacy.)

These are all students who have taken a PDC or advanced course (or both) with me in the past 18 months or so. Their needs, interests, and life situations are all very different, but they’re a fair representation of people who have been motivated to take the course. Their means differed drastically. Of course, some students take a course and then do not stay in touch. This is true of many students over the years who took the course as university students, and then their lives changed so radically upon graduation. Students moved around, worked on farms, lived in cooperatives, started tiny housing companies, started solar installation companies, traveled to nature connection and herbalism schools, founded permaculture-based nurseries and landscaping businesses, married, had children, divorced, worked with nonprofits.... Some stay in touch, but many don’t.

One student was able to consider how permaculture now drew upon the skills and experiences she grew up with...

When I look back at the courses from summer 2016 to now, one particular student has completed a PDC, teacher training, and advanced design course with me. Christine is a leader in her community and has begun to actively educate people about permaculture, while also more deeply immersing herself in soil building, observation, and many other skills. Her advice to new PDC grads is, “Take it slow, be flexible, and be willing to experiment. Permaculture is a way of thinking and designing, and our decisions should be made consciously, deliberately, and with a willingness to adapt.”

Another student, Gabriel, moved from his urban farm-



Students in an activity in the first Great Lakes Permaculture Design Collaborative PDC in Chicago, 2016/2017.

ing life in St. Louis to a small community in Indiana where he moved into a community arts co-housing project with two other students from his PDC. From there, he has been apprenticing with a permaculture-based nursery, traveling to the Versaland farming course, learning carpentry and framing skills, and apprenticing with me as a permaculture teacher—and becoming part of the Sheltering Hills Design team.

Lacey Walz, a mother of three young children (one with severe life-threatening allergies), lives in my own town. She’s a radically warm-hearted, thoughtful woman with a background in sustainable landscaping—before kids. She took the course as one of the first things that she could do for herself after moving to a community and gathering enough support to care for her children so that she could have some time to do something along her own interests. The PDC enlivened her—before the course was even halfway through (it was a weekend course), she had her family in the yard of their new home building a massive hugelkultur, spreading woodchips, working on designs for an attached hoop house, and composting.

The kids started spending their time digging in the soil and planting seeds—even the three-year-old. The last time I talked to her, she had plans to plant a privacy hedge in fruit-bearing shrubs, right below a small pond that the kids could wade in. The transformation of the yard was mirrored in further systems development inside the home—with more sensitivity to meal preparation and also to the internal energy and electromagnetic systems in her home. Perhaps just as importantly as all of these, she was able to consider how permaculture now drew upon the skills and experiences she grew up with in the countryside

and her previous professional experiences in sustainability and landscaping—and then put that in light of her current life choices and direction. She's committing herself to working with her children's Montessori school, designing a perennial pollinator garden for the Hilltop Nature Center—a collaborative project between the City of Bloomington and Indiana University—and helping to implement a permaculture design at the local Unitarian Universalist congregation.

A couple near retirement took the course in preparation for starting a farm operation in Wisconsin with their grown son. In preparation, they propagated more than 200 trees in their crawl-space near Valparaiso and are now growing them out in a sunny hallway in a Chicago industrial building. They are also hosting a design studio workshop the last weekend of June for newer designers who want practice with experienced designer/educators.

Ryan, a last-minute addition to the spring 2017 course in Indianapolis, has jumped in with both feet. He moved onto the developing urban farm at the conclusion of his course and helped care for animals and plants throughout his stay. He writes:

If you want to take up the practice of permaculture, I recommend having a space in mind to practice, however small, to ground the skills you will be learning. It isn't the most important thing, but definitely having a willingness to be vulnerable to the outside is a positive thing, because permaculture is based in caring. When we design and implant something, it is



Students building a hugelkultur for a community garden in an Akron, Ohio-based PDC in early 2017. Two students finished the course and the same day started their teacher training course.

less about our choices and rather about what has been chosen by the land. Our listening has allowed us to perceive it. This takes time, and this was my challenge. My time with permaculture was usually on the outskirts of my energy flow because of my long summer hours away. Permaculture is a practice of being with the land in a relationship. We may have an idea for it, but the land may have another. The teachers, texts, and videos will give patterns and symbolism to refer to when a time of listening comes along. Like any relationship, as the land grows, so will you. If you start a project, ensure that you are willing to see it through to its end; otherwise the land will let you know its frustrations. This can be hard work and frustrating because the answers aren't obvious, and the technology isn't automatic (turnkey).

I've gotten started by moving onto a farm with a PDC alum and practitioner to learn and practice alongside on a new project. This helped because I didn't have time. I have utilized what I learned to create a scrap log terrace for a community garden, and give insight into problems that friends may be having with their own gardens. I have been hired to do a small landscaping project as well. Slowly, I have gotten to know which tools are important, and which may be less important. The most important step is just getting outside to observe and dream with the land and the critters.

Another student with experience in youth programs interned with a local nature connection program, and I run into him while we both volunteer for a community project that aims to plant out more than 1,500 food-bearing trees in our community in the spring of 2018. This project is led by two other recent graduates of the course—who are also involved in cooperative living and food security networks. Many of the more local students have also taken up participation in the Bloomington Permaculture Guild—which began in 2006.

Of the students in the Great Lakes Permaculture Design Collaborative PDC in Chicago in 2017, seven of them later joined GLPDC's Advanced Design course. William Faith and other emerging leaders in the Chicago permaculture scene have done an impressive job of co-creating a great culture for connection. Permaculture primers are offered regularly, and the students from the PDC have begun presenting elements of the primer. They also helped to implement the designs created in the course—staying in touch throughout the intervening months.

Now, at the conclusion of the advanced course, everyone is working together to compile and re-hash design thinking into one comprehensive design for our host site—a small acreage owned by a congregation in Chicagoland that could be developed into an urban farm/permaculture site to support the community. At The Old Schoolhouse, there's a desire to have open, natural space that Boy and Girl Scouts and school children can explore, while at the same time having food production ramp up for increased food security in the area. Already, the garden donated more than 500 pounds of food from 50 raised beds in 2017 to the local food pantry. The site is poised to host workshops and other events that support re-skilling and more.

One student out of a course in Akron, Ohio works with the city in landscaping and has plans to incorporate more perennials. Two students were from the local zoo—looking for bet-



The passive solar heater built by Scott and Eric Prusinski. Their research and information-sharing around nutrition as well as their farm implementation are worth following.

ter resources for habitats and plantings as well as educational resources. City planners and innovative organizers took the course. An architect is now informing her designs with permaculture education. One man is bringing this back to the gardening program he uses to empower other immigrants from his community. One student, from a local university, used it in preparation for her bike and service tour. Most everyone is implementing it in their own systems.

Another set of students from the spring 2017 course—a father and son—are starting a small farm together northeast of Indianapolis. Scott and Eric Prusinski have been very busy with developing soil for nutrient-dense crops and farm infrastructure that makes sense on their small acreage.

Here's an example of one of their projects:

Passive Solar: Eric and I made our first passive solar heater. We thought it at least looked impressive. We were hoping for a 50° increase, but today when I put my hand over the exit vent, I knew it was for real—a 115° increase to 151°F. The Eco-lab and my red wigglers are going to appreciate this.

The Eco-lab is part of a barn. It's a cross between a man cave and a mad scientist lab. Home to bio-ecological books, equipment, soil amendments, vermi (worm) and bokashi (anaerobic) fermented composts. Other “concoctions” I'm making to treat our soil in a quest to grow nutrient-dense food include a melding of ideas from Biological-Organic, Korean Natural, and Biodynamic farming methods. I believe nutrient-poor food is the foundation of our chronic diseases.

When I asked about the fabrication of the passive solar

heater, Scott shared these details: 2x6s x 8ft long at a width to match the corrugated plastic panel; the back is a thin luan panel. There is black exterior paint throughout. It is lined with 1" insulation board. I used 8' sections of flexible dryer vent connected together but have since found a source of 25' sections for less money and fewer connections (translating to less money and maintenance). We sprayed the vents flat black. The vent on the outside bottom has flaps. I rotate it open in the morning to allow air in and close it at night (We probably can get higher tech, but we go there AM/PM to deal with animals, and it takes five seconds.) This was covered in greenhouse/row cover plastic and then covered with the gasket and silicone sealed to the corrugated clear plastic roofing panel. It is liftable by myself but bulky.

Reflections on their stories

What I'm learning from reflecting on who has come to the course and what has happened since then, is that the course marks a point in a person's explorations of what is going on in the world and what they want to do about it. Sometimes, people discover new ideas about techniques or strategies to address problems they're trying to solve.

More often, the permaculture course connects students with other students and practitioners trying to solve similar problems, and it equips them with a better sense of how the particular problems they are trying to solve fit within the larger context of community, society, and landscape. This is the largest part of the transformative, empowering process that can happen for people throughout a course. As a teacher/facilitator of the course, I've seen the empowerment that can happen—catalyzing people into radical changes in their lives for the betterment of themselves, their communities, and the earth. But I fully recognize that it is most activating for those that are already preparing to make those changes. When the right combination of personal reflection, exposure to new understandings, connections to new networks of people, and mobilization of resources happen, the ripples outward can be amazing.

I suppose, for that reason alone, PDCs are one of the most



Gabriel Hahn offering a section in his first course as an apprentice teacher, March 2017.

amazing learning experiences in which to participate—and they are invaluable to those working to stabilize or rehabilitate places and cultures. Layering up courses in an area over time—where new students can meet and learn from networks of previous students, join guilds, participate in personal and public projects, and gather—all this strengthens the whole, diverse movement in which permaculture practitioners participate.

I would be remiss, too, in not pointing out that while much of the basic science and logic behind the course might seem familiar from high school—or even grade school—science classes, it is the synthesis of information combined with varying worldviews AND the experience and facilitation of the instructors which bring value to the course. You will not find this experience in books or even videos. Each course is different—a new synthesis of information and perspective co-created by the instructors and students and often flavored strongly by the location and setting of the course. Consider carefully the teaching team of a course you are thinking of taking or recommending, and the course culture.

Where to from here?

Perhaps it is time to take a course? Or renew your connections to those who were in a course you took? Or refer someone who is already preparing to take action to a course. Remember, it is only the beginning. Taking up a project—a farm, educating a family, transforming your own environment, working with your current job, deepening your permaculture community through guilds and networks, building a solar hot water heater, composting—really this is the education, and the joy of it is that it never ends and everyone—including the earth—wins.

These stories are interesting—and perhaps it is time for some permaculture researchers to find out more objectively the impact and value of the course in catalyzing individuals and connecting them to projects that are meaningful for themselves. Perhaps that's the next iteration—or maybe it's just a bit too much navel gazing, and we will just keep focusing on the path in front of us.

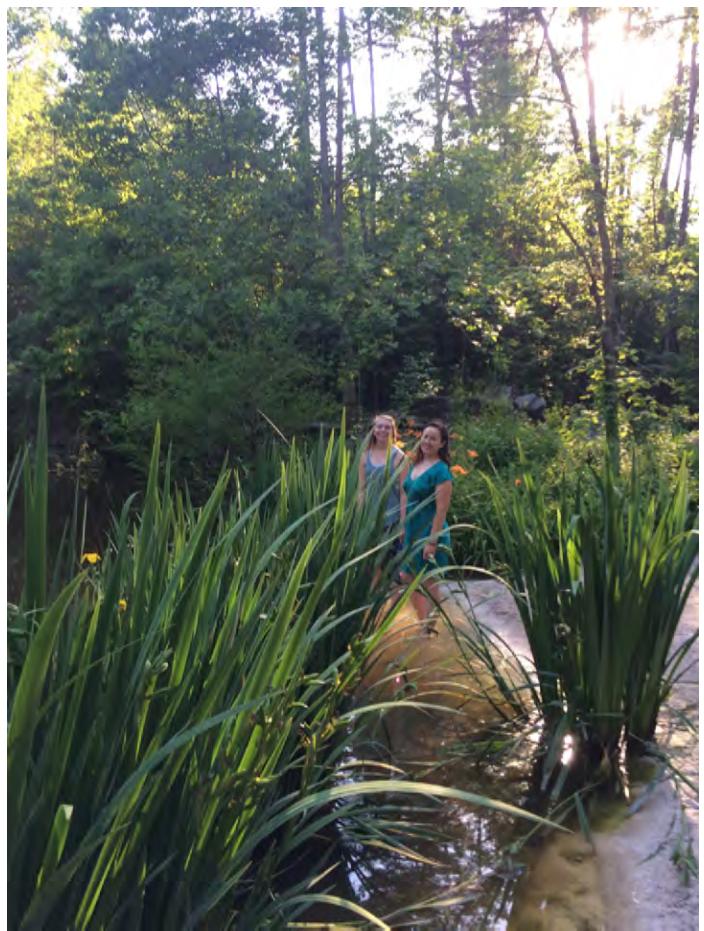
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Rhonda Baird is the senior editor of this publication as well as a permaculture educator and designer. She loves connecting people and places and sharing what she learns along the way—and wants everyone to take a course, no matter their circumstance. She lives in Bloomington, Indiana.

Resources

Great Lakes Permaculture Design Collaborative: glpdc.info

Sheltering Hills Design, LLC: shelteringhills.net



Students enjoying the pond edge during a break at the 2016 Indiana University Permaculture Design Course, held in Paoli, Indiana.



A sign setting intention at the Old Schoolhouse project in Hillside, Illinois.

Expanding the Permaculture Toolset

Integral Permaculture

C. Milton Dixon

AFTER TAKING MY PDC, I found myself unable to fully stretch and exercise my design skills in the urban (and later suburban) environments that I inhabited. Bound by the physical framework of my situation and the landscape around me, I turned to the abundant, flexible, and (not quite) invisible structures that we all inhabit. I have since embraced a practice of permaculture in my thinking and process, and by continuing to live in places that limit my personal projects, I have turned to cultivating the social landscape.

As it turned out, I learned about a charismatic person, Ken Wilber (a bit like Mollison) who was promoting what he called Integral Theory*, which is devised as a method to map the social from the inside out. Thinking through it, I've found that it links to the existing permaculture toolset to provide an expanded toolset, allowing one to assess and talk more accurately about social dimensions, essentially weaving a complex tapestry that represents the situation. Once a tapestry is woven, we have a map that, while not the territory, allows us to better navigate our lives. While every tapestry is unique, each has common themes running throughout, with which we can identify and work.

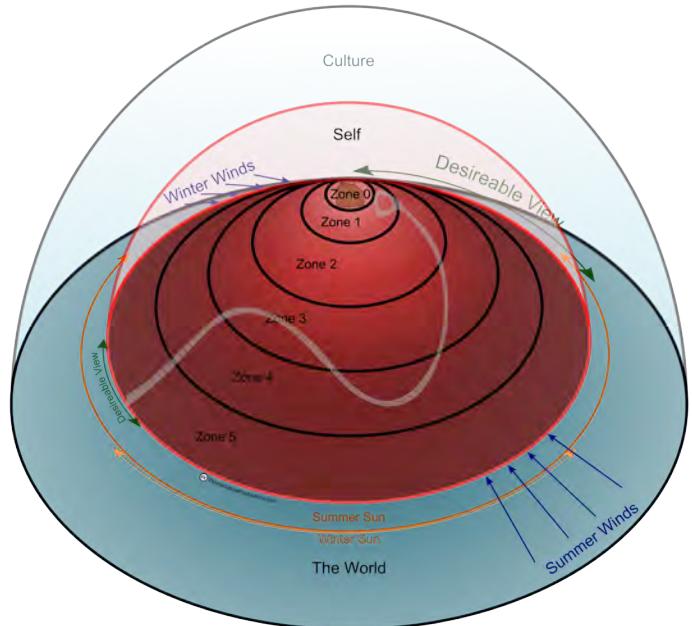
My goal with this article is to connect threads from existing permaculture methodologies to those of Integral Theory so that anyone with an understanding of permaculture can quickly expand their toolset. Integral Theory can be summed up with five tools: the Holon, Quadrants, Lines & Levels, Types, and States. Combined with an understanding of emergence, we can become aware of, and transform, our inner world.

Holon

Holon is defined as a whole made of parts, similar to a tessellation. All of the parts of the system are wholes made of parts. A holon is an individual thread that makes up the tapestry. It's useful to understand the scale at which we're able to manipulate—that we are working with wholes made of parts, the connections they have, and patterns they make. We go from strings to atoms to molecules to cells to organs to the self to family to community to world. As we move away from our own center of activity, we have less effectiveness in our influence of the world around us, but by influencing the world around us we can effect changes in the larger orders.

Quadrants

Permaculturists understand a site, its energy flows, and occupants with a zone and sector analysis. Quadrants expands that into a two-axis matrix of internal and external experiences vs the singular and plural. That gives us internal singular, external



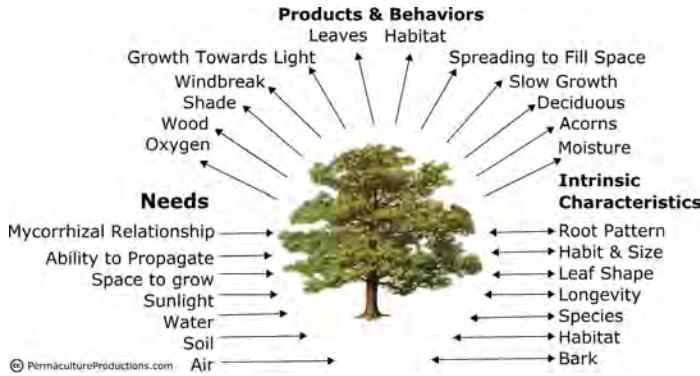
singular, integral plural, and external plural. This is more easily thought of as why I do (Zone 00), what I do (Zone 0-5), why we do, and what we do. A permaculturist's Zone 00 has influence out to their Zone 5. Every person has their own 00 and sphere of influence. Together, our spheres of influence create a culture within the world around us. The tools that we use should have some view of the people and culture that fill the space, as well as the world around them, which is also the source of many of the sectors.

Lines & levels

Lines & levels chart the growth of an individual element or characteristic. Succession is an example of a single line—its level correlates with its stage of growth. Similarly, various skills, hobbies, needs, products & behaviors, or forms of capital are different lines and can operate at different levels. While we might gravitate towards one level, we are capable of operating from any of them, especially when planfully applied through design.

Types

Needs, Products, and Behaviors, a fundamental methodology of permaculture, helps us map possible connections for a single element in a permaculture system. This single element is a type—as are archetypes, Myers-Briggs types, stereotypes, jobs, roles, pattern languages, or even the principles of permaculture.

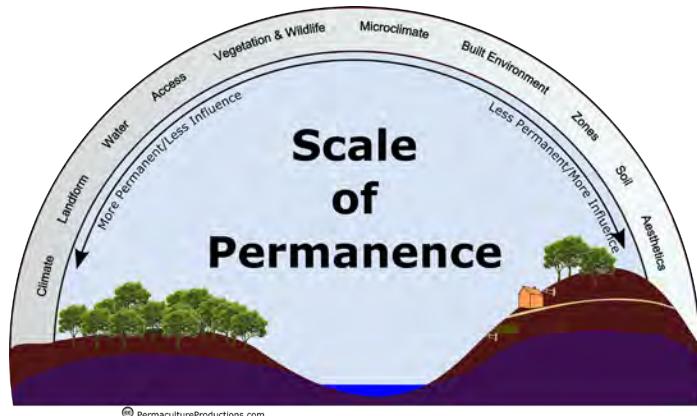


Types gives us a shorthand for quickly understanding patterns and elements. For example, while trees will thrive in a variety of conditions, we can generalize that they need light, water, soil, and air. Or, a family will not thrive if the children are not adequately designed for.

States

State represents the action and mode of being of the system. The scale of permanence as a design tool is equivalent to mapping our current state, essentially a baseline. Altered states can effect the elements of the scale further to the right and may permanently alter the baseline. Examples of altered states exist in both the internal and external realms. Some examples of altered states through the scale of permanence might be:

- Climate: tornado, hurricane, thunderstorm, hail, drought
- Landform: earthquake, landslide
- Water: flood, tidal surges, tidal waves
- Access: changing access routes, road washed out, trees down
- Vegetation & wildlife: plagues, “invasive” species, clearcutting, theft
- Microclimate: change in microclimate i.e., forest succession
- Built Environment: building collapse, major damage, or an addition
- Zones: loss of planned use, crop failure
- Soil: salting, nutrient loss, stagnation, plowing
- Aesthetics: cultural shift, vandalism
- Internal altered states might include:
- Dying
- Future Scenarios



Shock Doctrine (Naomi Klein)

Economic crisis or boom

Psychedelic

Changing governance (Trump election)

Bankruptcy

Job loss

Childbirth

Illness

PDC

Meditation

Rites of passage

Exceeding one's comfort zone

Emergence

Ultimately, through the process of observation, we seek greater understanding. As we learn more and more about the systems around us, that new awareness can lead to solutions to problems we're facing. The emergent aspects of life are not usually planned, but one must give space for them to appear if the conditions are right.

If our understanding of the world is bound within its physical structure, then we're not just transforming this space that we inhabit, we're also transforming ourselves. I hope that this quick primer of integral permaculture, or perhaps just calling it social permaculture, can help spur you on to new awareness of the systems you live in and design. Δ

*For a more in-depth history and explanation, a good place to start is Wikipedia's article on Integral Theory.

C. Milton Dixon is a permaculturist, forager, educator, and an all around computer savvy guy. Having relocated to Ann Arbor from urban Chicago, he is syncing with the rhythms of permaculture in his new location. He is a farm consultant for Polliwog Farm and co-manager at the emergent The Cooperative at Dawn Farm. You can read his writings and more about his latest projects at <https://permacultureproductions.com/>.

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We love to hear from our readers. Tell us what you like and don't like, and what you'd like to see in the pages of upcoming issues.

*editor@
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IPC-India Summary

A Greater Perspective

Jeremy Lynch

This offering is a collection of blogs from Jeremy Lynch during the International Permaculture Convergence which was written on behalf of Permaculture Design. For a full account, please visit our Facebook page.

EVERYTHING IS PROCESS. Fittingly, the 13th International Permaculture Conference began while the systems of its organization continued taking form. All around were the moving pieces of a complex organism four years in the making—and the arrival of hundreds of global citizens—representing 63 countries—drawn by the principle of exchange.

One entered the conference via India, a country with a vast history and depth of contribution to environmental design. Here, at the literal doorstep, a river of smooth stone with banks of potted palm, India invited the world to reflect, discuss, and engage in community.

Climbing the marble steps of the conference auditorium at the Telangana State Agricultural University in Hyderabad, one encountered an intricate arrangement of native seeds in hand-shaped clay bowls set upon the ground to form a mandala of color, shape, and texture. The swinging cloth mops of a latent cleaning crew and the perambulatory feet of new arrivals extended the design outward and into motion, laying tracks across, into, and outside of the building—narrowing and opening in

I have never underestimated smallness.

passage like the datura flowers growing densely along streets and edges beyond the hall, into the urban and peri-urban wild.

Within the center of this activity, the display of seeds resting on the marble carries the tension of permanent and impermanent things. The hard stone shaped by hands in an image of the illusion of unchanging permanence and contrasts with the profound energy residing within the thousands of seeds carefully laid upon it. It is easy to imagine the right convergence of light, water, and time stirring, germinating, cracking, exposing, rooting, and integrating these distinctive elements into a complex whole—the stone and seed both fractured by the activity of life working independently upon itself.

Such is the metaphor for our conference, reflected in the many diverse faces gazing upon the display this morning. Of these faces, now arranged like so many colorful seeds, smiles brightly a familiar visage. Closing a ceremony of seed-sharing replete with live percussion and a march across the grounds, Vandana Shiva led a procession into the auditorium and takes



Opening day of IPC-India 2017.

the stage to speak to seed sovereignty and “the problems of a violent global patriarchy [where] we are born of mothers and forget them—including Mother Earth.”

To great applause, she spoke of the tiny seed that “enfolds the future in permanence”—like the practitioners of permanence who enfold and ensure the future.

Her voice rang in adamance that the machinery of modern life is neither life itself nor its operator—“life is not a machine; life is not invented.” With characteristic passion and argument, Vandana referred to a recent German study indicating recent loss of 75% of insect life. She emphasized the clarified correlations between the ecological havoc wreaked by industrial agriculture and the consequences of civil war and refugee migration in Syria, Africa, and now globally. She said, “[as] the extractive economy leaves five men with the majority of the wealth of the world,” the realization of our passage beyond unsustainability is clear. Our work is in the courts—defending our own laws—and in the fields growing our own food and cultivating the seeds that permit our very future.

“Learning from the seed,” Vandana says, “I have never underestimated smallness.”

She concluded with the call to action that runs through her work—and our present gathering: “love and nonviolence is always more powerful than systems of violence.”

As the morning carried on, Vandana’s words ring in the minds and hearts of those in attendance—as a din of conversation rises over routine.

Observe and interact

India presented an iteration of spatial awareness unfamiliar

to the Western world. Collision and contact increase—physically, socially, emotively—in disrupting and enlivening ways.

Moving around—and travel more generally—opened a range of sensory experience. Packed like sardines in crushed tin cans, we shuffled about as though the will of some greater force demands that we know our neighbor.

But more essential than collision is proximity. We moved like fish before the net, propelled as in a jet stream, not colliding but contouring, affording a closeness encouraging interaction. In India, privacy is often a tertiary matter—a burden better exchanged for the opportunity to witness in full or hazy light the fullness of things.

However, what may first appear as randomness, takes shape in natural patterns. So it is at the day's meals: we formed in clustered circles like grapes on the flat carpet of the makeshift dining hall. The loops opened and closed like molecules exchanging elements to form new compounds in the transfer. What seemed at first the absence of structure is a clean palette upon which our innate ability to organize is expressed.

On our second day, these forms coalesced as we moved through the rhythms of presentation, conversation, meals, and performance. We brushed up against one another in full sweeps. There was an excitement in listening, and the pleasure in exchange is amplified by diversity and differentiation. An openness to this opportunity was a lesson so essential to present-day America. We must be able to express and implement our designs upon the world while remaining receptive to feedback. Phrased otherwise: having one's opinions and ways of being, but remaining open to dialogue, critique, and doubt—having the resilience to be flexible and reject the dogmas of certainty. Accepting that irreconcilable viewpoints need not prohibit our ability to communicate—respectfully. It sounds simple, but we in the States must be vigilant to preserve the approach of love and nonviolence—nonviolence of act, speech, and impact—to ensure that the present uprising of violence around us subsides like a careless, broken wave on a stable jetty. And that when, inevitably, it rises again, we have the presence and patience to calm the waters once more.

Such things we can ensure in dialogue and in action, in how and what we communicate. This is choice. Especially where



Can permaculture and Quantum Theory overcome reductionism?

privilege predominates, we cannot forget our responsibility of choice.

Bearing this in mind, we began Day 2 with Robyn Francis' words emphasizing “the need for men to listen and enable our women.” With the many complex and interrelated systems at the root of this need, we focus today on the women and ideas that reveal resilience, or as Rosemary Rowe says, “permaculture’s unfolding ability to adapt.”

In the morning, Starhawk took the stage in reflection upon the confluence of permaculture and activism. Harkening to our country’s recent just risings—from Standing Rock to Black Lives Matter—she emphasized that “climate change comes down, ultimately, to a tremendous social justice problem. The real problem today,” she spoke, “is that we don’t have an ethic of fair share. We cannot address climate change without addressing the fair distribution of resources on every level.”

Acknowledging that “we have a government in office who has decided that reality is not that important,” she emphasized a focus on civic engagement—be that running for elected office, serving on boards, or otherwise organizing within one’s own community to stabilize the foundation of a progressive movement. Regarding permaculture, it is “an alliance with a lot of other systems. Sometimes it is just a name.” No panacea, it yet expresses the poise and approach we must share if we are to overcome the challenges of our present society.

Our work will become more relevant the deeper the greed becomes.

With this fresh in our minds, we moved into an impromptu roundtable session inspired by the mornings’ speakers and encouraged by the conference emcee, Maria Marasigan, program manager with the Philippine Permaculture Association. This open discussion held amongst a small global community of a dozen individuals seated in a circle on the auditorium stage focused on Deschooling and Decolonization of Permaculture. This opportunity to share represents the opening dialogue on a conversation about how and by what means to transform various aspects of present permaculture strategy to be more inclusive. This conversation will continue through the convergence. A thought was left in the air: what do we not see and what are we not seeing here? And when will we know we have made the needed changes to increase inclusion?

Propelled into the final session, Robina McCurdy facilitated a panel including: Robyn Francis, Vandana Shiva, Rosemary Morrow, Starhawk, Beatrice Ramirez, Padma Koppula, and two local woman farmers from Telangana.

The topic: “Are women leading the change?”

The conversation circled around succession and the notion of bringing up the next generation through the successes and achievements of the old—so to raise the foundation for the work yet to be done. “Who can I bring up,” McCurdy said, “to serve

continually the whole?"

"Women are really leading the way on social permaculture," spoke Francis. "People care involves working [on] empowerment... women have great facility there."

"Qualities are cultivated," Shiva inserted, "they're not intrinsic to any of us." Going on to quote Gandhi ("make me more womanly," he once said, implying compassion), she encouraged, "We can all be more womanly—we all can cultivate compassion."

Speaking then of resilience, she said, "I have not seen women not find a way out... not only are we still here, we are joyful. Next century will be a women's century."

"Women practice the three ethics simultaneously, and often unconsciously," added Morrow. Therefore "they [women] must be leading because that [the three ethics integrated] IS the future."

Starhawk continued her reflections on the way things have been up until now noting, "the understanding that the way we treat women and the way we treat the earth are the same—and neither has been terribly good." She went on: "Understanding that our human relations are often the constraining factor of what we can do to heal the earth... women bring that persistence—we don't have the luxury to give up and quit."

Ramirez, translated from her native Mexican Spanish, recalled a Latin American saying that "women have the power to unify and men have the power to separate—[and] that neither is bad, but we have to balance them."

Padma added: "Emotion sharing is the first important thing." In English, she spoke of the need to draw out this quality and priority of expression in an effort to know the "other"—be that your neighbor or a stranger.

The session then turned to the Telangana farmers who stood to relate to great effect the history of their tangible work in earth care—and the community relationships that have buoyed them.

Shiva would return shortly thereafter (speaking during a collective pledge to resist and reject an Indian government proposal to welcome multinational corporation contract farming) concluding, "Our work will become more relevant the deeper the greed becomes. Our work will become more relevant the deeper the ecological crisis becomes."

As the evening moved through ceremony and toward performance, attendees were "invited to take a moment to acknowledge the diversity in the room."

And, though spoken in a context taken differently here, a few words shared toward the end of the night, during the ceremonial gesture of passing the torch to the next IPC host country, sums up a particular and essential need of men to be active partners in the rehabilitation of gender equality: "part of fair share is sharing the responsibility." The shared burden we have now—and continually—to work through on the road toward an equanimous society requires first the acknowledgement, and then the action which multiple perspectives and a united approach demands. And it requires a willingness in at least half of us to acknowledge we may very well be wrong—or have been wrong—and then to change.

Patterns to details

The conference came to a ceremonious close, with all in



Maria Marasigan presenting on decolonizing permaculture.

attendance gathering on stage to celebrate the hard work of the event's volunteer organizers and supporters. The evening concluded with a series of regional cultural performances, including a presentation of classical Sufi music and storytelling.

Several songs from regions across India were shared. A particularly memorable piece told the tale of a farmer lamenting the loss of his crops to herds of wild deer. The farmer, intent on securing his yield nonviolently, chose to sit in the middle of his field in the early morning in meditation to protect against the browsing deer. His mind served as the thrown stone deterring his animal neighbors from encroaching; his will, the deterrent.

On the quick heels of a colorful bus journey from Hyderabad to rural Pollam—from the city to the Indian countryside—the inaugural round of convergence presentations revisited the story of the meditating farmer. Julie Wright of Coventry University gave the talk "Quantum Thinking for Permaculture: Is It Time To Embrace The Invisible?" As a researcher of indigenous and traditional practices, Wright explores the "invisible or non-material" agricultural practices of various periods and cultures across the globe. One of these happens to be the traditional Rajasthani practice of meditating within one's fields to influence crop growth.

Considering "cognitive justice for indigenous peoples" and the rights for all forms of cultural knowledge to be respected and understood, Wright's research pursues the development of adaptive scientific methods and the evaluation of diverse and—to the Western mind—intangible practices. A major part of her challenge is determining how to conduct research beyond the controls of a laboratory setting.

Guiding considerations include the development of methodologies and tools to measure waves (or patterns) in addition to particles (the component elements of the physical sciences). As quantum theory is the study of energy as small, fast moving particles forming waves, there are opportunities to study the waves of light and sound and their impact upon crops—with regard to yield, nutrient density, function, etc.

Taking this further, the question arises whether human presence and energy, directed intentionally, can similarly influence agricultural conditions—or, more generally, the natural world.

Referring to the metaphor of climate change as a sink-

ing ship from which we as societies are bailing ourselves out, Wright says, “our buckets are full of holes because we are not looking at our inner selves, our spirituality.” Studying non-material cultural practices—the spiritual, prayer, intention, and ritual—Wright maintains a scientist’s objectivism is seeking to quantify the measurable effects of non-conventional methodologies.

In considering how to measure results outside the laboratory, Wright suggests we “think of replication in terms of generations”—in other words, considering the whole and through time, broadening how we perceive the value of impacts over longer duration and through multiple ecological criteria. In other



The Difficulties and Enormous Potential Contribution of Permaculture for Mass Migration and Refugees (panel discussion)

Rosemary Morrow - Facilitator

Amani Dagher (Lebanon)

Sarah Queblatin (Philippines)

Francesca Simonetti (Italy)

Hakim Young (Afghanistan)

Panelists represent a diverse group of permaculture practitioners working in regions affected by the mass migration of refugee communities due to climate crisis, civil wars, and other ecological and social conflicts.

As Sarah says: Our work seeks to “help empower refugees to recover the resilience within—the emotional resilience and the resilience to grow food... if you’ve lost everything, the tendency is to want it back—to search externally... our designs are based on the principle of resilience within [to] restore dignity.”

Permacultureforrefugees.org (coming soon)
Info@permacultureforrefugees.org

words, it requires an integrated approach to evaluating design, incorporating iterative feedback loops.

It is easy for the Western mind to quickly dismiss concepts with which we do not have any experience. But it behooves us to look at our snap judgment and question why we react so strongly, so quickly. Do we feel certain in our correctness, the singularity of our truth? Or is our reaction like unannounced anger: difficult to place and seemingly irrational? Moving beyond this reaction, ask yourself: what have I experienced? What have I heard about from others, through story? Without judgment, is it rational that invisible, nonmaterial influences are shaping the world around us? What do I not know that I do not know?

Opening the mind to the potential for new directions in thought and understanding remained a theme throughout the week, as our global community here in rural India continued to share their research, findings, and vision.

Small and slow solutions

Waking in the early hours of the morning, the music of rural India pocketed the morning soundscape: a chorus of warbling birds from the tall grasses of a nearby lake; the crackle of a wood fire heating metal buckets of water for morning baths; and the splash of that warm water scooped from a bucket, poured over the body, and then crashing down upon the concrete slab floor of a bamboo-sheeted outdoor shower.

The press of cold nights and hot days carried the day’s emergent theme: permaculture’s relationship to societal institutions. The morning began via Skype with David Holmgren. From his home office in Hepburn Springs, Victoria, Australia, David presented perspectives from his forthcoming book *RetroSuburbia: The Downshifter’s Guide To A Resilient Future*.

The premise of his talk was: “Creating the World We Want In An Era of Failing Activism.” David’s argument began with this eponymous statement—a loaded assessment of the past few decades of the “diminishing returns” of social and environmental activism.

Asserting a need to “use the capacity of global networks to assist bottom-up movements and strategies,” David emphasized the limitations of “shouting louder from a position of weakness,” which he presented as the current and longstanding trend in activism.

Comparing this to permaculture solutions that “build a degree of autonomy,” he emphasized that “when we do these things [regenerative designs and behaviors], we are effectively engaging in a systemic strike.” This so-called strike is an effort both to assert a baseline ethic and valuation on the small scale, and to undermine the stronghold of corporate influence over a consumption-driven society.

Systemic striking, or stepping out of consumerism and removing our skills and talents from an undesirable system, offers emulatable strategies for everyday living that emphasize an ethic and culture poised to appeal beyond the strike’s initiators: the global middle class.

“If successful and relevant to other people,” David said, “the capacity to replicate [leads to] a learning cycle” that fosters an adaptive process allowing for continuity and effectiveness through new and differentiated conditions—economic and oth-

erwise.

Intention and Impact

We were asked to take a moment: lower your hand to the ground, run your fingers through the dry grass or press them into the loose clay, pick out small fragments of wood, stone, and chaff, and roll them across your palm. Wherever you are from, and whether you hold an intimate knowledge of your ancestors or not, turn your mind to those who came before you—who are responsible in a literal way for your being here today. On what land did they live? How did they interact, inform, and impact that place? If none of this is accessible to you, then imagine what it might have been. Keep your hand to the ground.

Anytime you feel the need to come down from a situation displacing you from the present, put your hand to the ground and again draw upon this memory and imagination.

In November 2015, *Permaculture Design* magazine released an edition with essays, stories, and other prose covering the topic of Decolonizing Permaculture. This complex subject requires an ongoing conversation as we as a movement strive to remain at the intersection of ecological and social justice.

For permaculture to build its toolbox and remain an effective approach to systems thinking in a true social context, adaptive frameworks for perpetual self-knowledge are essential.

Throughout the International Permaculture Conference, impromptu (or responsively scheduled) sessions were held with the intent and purpose of continuing to engage with the topic of decolonization.

Led by facilitator Maria Marasigan of the Philippine Permaculture Association, these sessions guided participants to confront personal experiences of privilege, trauma, and pluralistic identity. Group activities that reveal how we perceive ourselves—and how others perceive us—aim to be “really honest about what these privileges are... and where our culture does not create a space for us to acknowledge this.”

Emotional responses—discomfort, denial, pride, etc.—clarify these perceptions of identity and draw us toward a posture of receptivity. We accept that, as the past informs the present, historical forces work upon us in the form of memory built into present-day social institutions and patterns of neglect.

We are ourselves alone responsible for maintaining consciousness in practice as to the differentiation between our intentions and our impacts—and an awareness that, whatever our intention, when we enter a cultural context not our own, we carry with us both a history of colonization and the potential to further the deleterious impacts of insensitivity, violence, and oppression. And violence need not be defined singularly, but instead as a spectrum ranging from the most heinous acts of genocide to daily dismissals, neglect, and quietly spoken disparagement of the people around us. Grand or subtle, anything that reinforces or is derived from historical intolerance, falls within this living spectrum of violence.

“You can build compost toilets,” Maria began, “but can you talk about decolonization in permaculture—can you talk about what your privilege is?”

Only when we are able to self-identify privilege, trace its roots, contextualize it presently, and work to disrupt further expressions of violence—from the physical to systematic forget-

ting and neglect—will we be able to say that we have begun to decolonize.

And while white supremacy and patriarchal hegemony are at the center of colonization trauma, colonization can occur between any two people at any time. “I am a woman, and I am a woman of color, and I can be a colonizer. And it is 2017,” said Maria, referring to the relationship between her identity as an immigrant to, and citizen of, the US, and her more recent work fostering permaculture in the country in which she was born, the Philippines.

At the heart of this conversation is... heart. We are not here to shame one another. Decolonization activities and awareness-building create spaces where we can confront our complicated, entangled history as we work our way toward a just future.

This just future is already home to increasingly diverse examples of professional stories providing examples of how we can deconstruct the past while, parallel to this, build a more resilient future.

During a special presentation and ceremony, the Blue Mountains Permaculture Institute presented a group of six individuals from across the globe with permaculture diplomas—Malaysia, Portugal, Japan, the Philippines, Greece, and the US.

Their diverse portfolio of work includes: over 20 years of youth education in urban and rural permaculture practice in Japan; a foundational compiling of research documenting mature permaculture projects from several of the early practitioners; permaculture effected as disaster relief among war-torn communities in the Philippines and Syrian refugees in Greece; a documentary-style literary account of life in a refugee camp; video and social media used as tools for spreading permaculture education in Malaysia; and permaculture art as activism addressing cultural contradiction and human suffering.

The more tools we have and the more media we work in, the greater our resiliency as cultures and as a society to confront the adaptive needs of tomorrow.

For one example of how permaculture is branching into new expression, visit Marguerite Kahrl’s powerful, permaculture-guided, art-based strategies at kahrl.com.

For those interested in supporting permaculture’s next global summit in Argentina, I encourage you to contact the hosts directly:

Beatrix Ramírez Cruz
muralesgcruz@gmail.com

Tierra Martínez
institutonaluum@gmail.com

And I encourage you as well to shape the message of permaculture where you are. Thank you, be well, and stay in touch. △

Jeremy Lynch is small business owner, educator, and activist in Moab, Utah. He operates In Transition Permaculture. His work emphasizes site-scale strategies toward integrative resource management, with a focus on water harvesting systems. He studied with Utah State University’s Permaculture Initiative and presently serves the City of Moab as a member of the Water Conservation and Drought Management Advisory Board.

COP-Bonn

The Climate Bums

Albert Bates

SOME OF THE BETTER SESSIONS of the Bonn climate talks brought out panels of scientists to debate some really tough problems. These are not the kinds of easy debates favored by clickbait media, such as the latest tasty placebo from Elon Musk or Bill Gates. These tackle the more difficult and nuanced issues like how to forge consensus among 7 billion people and to move rapidly to change the way we inhabit a real world—a world going up in smoke.

In these high altitude venues, climate scientists must step out of their specialty and offer policymakers strategies we really can do right now given existing political frictions and lubricants. And then they have to contrast that with what will be required if we are going to survive as a species.

On the 6th day of the COP, we went to a press conference by Climate Equity Reference Project (CERP) about a synthesis approach to equity benchmarking—a fancy way of saying we have to decide how best to ration the burden of rapid economic restructuring.

The press conference was to announce a report, *Equity and the Ambition Ratchet—Towards A Meaningful 2018 Facilitative Dialogue* prepared by the Equity/Effort-sharing Working Group of Climate Action Network International (CAN) with contributions from the scores of non-governmental organizations who attend UN climate conferences.

Fortunately, the Paris Agreement offers ways of securing increased ambition, while taking due account of “means of implementation and support” and being conducted “in the light of equity.”

Ultimately, the challenges here will crystalize around the 2023 Global Stocktake, but the 2018 Facilitative Dialogue will set important precedents. Thus, it must pioneer a process for assessing the adequacy and fairness not only of collective ambition, but of individual country contributions as well.

To that end, Parties should prepare to justify their efforts as fair contributions to a shared 1.5°C global effort. They should do so in transparent ways, measuring their contributions against fundamental equity principles. If their contributions fall short, they must be prepared to quickly strengthen them.

This justice and equity collective voice is there to insist on the Rio Convention’s core social principles, and to then offer indicators most appropriate to measure success on those terms.

The commitments captured in the first round of NDCs [Nationally Determined Contributions—the Obama/Clinton voluntary pledge system—ed.] do not come close to keeping temperatures “well below 2°C,” much less to 1.5°C above pre-industrial levels. Even if all countries were to meet their commitments, the world would still be on track to a devastating 3°C temperature rise or more, with a real chance of tipping the global climate system into catastrophic runaway warming.



Imagine Earth having an atmosphere something like Venus. Despite today's unhappy political circumstances, this reality must be universally recognized and turned to action. We must cease to pretend that we are on track. The Parties must very soon increase ambition far beyond the Paris pledges. This increase must begin before 2020, and at the same time FD2018 must focus on ratcheting up the first round of NDCs.

But here is where the talks in Bonn really hit a wall. It is an all-too-familiar wall—one we also hit in Copenhagen, Paris, and all the other COPs. Most governments (there are a few exceptions) are unwilling to shoulder more of the burden than they have to. Without any sanctions for low ambition or failing to meet targets, the inertia we've witnessed augurs a tragedy of the commons. CAN took a hard look at this and the various ways to bind countries to their fair share.

For now, the sanctions regime relies entirely on shaming. If we must bring emissions down by 30–50 gigatons, what is the best apportionment? There are two ways to divide that: responsibility and capability.

Responsibility

The industrial world, one must acknowledge, got to where it is on the sweat of energy slaves. It got there on the other kind too, but those reparations belong in a separate discussion.

“We live like kings today, on the backs of roughly 100 energy slaves each (human metabolism is 100 Watts, but Americans enjoy 10,000 W of continuous power). Our richness is very much tied to surplus energy availability, and that so far has been a story of finite fossil fuels.”

— Tom Murphy, Do the Math

“Every American thus has a veritable army of invisible servants, which is why even those below the official poverty line live, for the most part, lives far more comfortable and lavish with respect to energy and stuff than kings and queens of old (but obviously not as high in social status). Being long dead and pulled from the ground—and thus a bit zombie-esque—these energy slaves don’t complain, don’t sleep, and don’t need to be fed. However, as we are increasingly learning, they do inhale, exhale, and leave behind waste.

“This all raises the question—or at least should—of whether it might not be a good idea to set the fossil slaves free and let

them rest, since they're going away soon anyhow and when they do we will really need a livable planet. They don't need jobs, and we don't need dollars for happiness."

— Nate Hagens, Bottleneck Foundation

How far back should we go to assign responsibility? To Javad Melikov's 1863 Baku kerosene factory that caught the eye of the Nobel brothers? To 1859, when Edwin Drake drilled for "coal oil" under Seneca Reservation land in Pennsylvania? To James Watt's 1776 coal-powered steam engine that more quickly and efficiently pumped water out of coal mines to sustain its fuel source?

Britain tried to keep secret how its machines were made, but people went there to learn about them and took the techniques back home. Sometimes they smuggled the machines out in rowboats to neighboring countries. The first countries after Britain to develop factories and railroads were Belgium, Switzerland, France, and the states that became Germany. Building a national railroad system proved an essential part of industrialization. Belgium began its railroads in 1834, France in 1842, Switzerland in 1847, and Germany in the 1850s.

— Big History, Project 9: Acceleration

Thanks largely to the railroad boom, by 1900 the US had overtaken Britain in manufacturing, producing 24% of the world's output. Russia was by then supplying half the world's petroleum from its Baku fields in Azerbaijan, where Melikov had made kerosene.

The CAN group proposed the question of responsibility be taken up by the 2018 Facilitative Dialogue with the idea of choosing one of these starting points:

"Responsibility since 1990." This corresponds roughly to the time when negotiations for an international legal agreement to limit GHGs began in earnest and the risks of rising GHGs were acknowledged by the IPCC. The 1990 date is difficult to defend, given that the UN Framework Convention was itself being negotiated at that time, and its authors cannot reasonably be said to have had 1990 in mind when they inscribed the term "historical" into the text. Still, the 1990 case is arguably fair, but only in cases where the benchmark includes capability weighting. This is because historical responsibility before 1990 is highly correlated with national capability.

"Responsibility since 1950." This date marks a useful middle setting. It defines a period in which the climate threat was known, in which responsibility is comprehensible in terms of human lifetimes, reflects roughly the useful lifetimes of much infrastructure, and avoids some of the historical discontinuities that occur when, for example, wars remake national boundaries.

"Responsibility since 1850." This date defines responsibility as cumulative emissions since a date that roughly corresponds to the time at which carbon dioxide emissions from fossil fuel combustion reached significant levels. This is also the earliest date for which plausible emissions data exist.

Another important consideration is whether a country's

responsibility should be calculated on the basis of production-based or consumption-based accounting. CAN offered an online Climate Equity Reference Calculator that could be toggled either way.

More precisely, a Calculator user selects equity-related settings relating to responsibility and capability, and other key parameters. These settings, taken together, define an "equity benchmark." This benchmark is then used to estimate national "fair shares" of the global climate-related effort. Again, this effort includes not only mitigation (though most all of our attention is focused on mitigation) but also adaptation and loss & damage.

Capability

A second way to assign fair share would be to assess the capability of a country to reach a reasonable degree of well-being for its population. Put a pin in the development continuum somewhere between Yemen and Sweden. There needs to be a guaranteed minimum standard of living.

This notion brooks a popular philosophical divide in many cultures. Should we exclude emissions (corresponding to consumption) below a particular income threshold because they arise from the provision of basic needs? In the US, this debate in other forms—framed today as socialist versus free marketer—goes back to Hamilton and Jefferson.

What's the point?

The power of this approach comes from how it allows us to escape the pseudo-debate between, on the one hand, the claim that equity is an entirely subjective matter, a mere battle of opinions, and, on the other hand, the claim that one or another equity approach is the precisely "right one." It does this by providing a quantitative framework within which explicit choices between well specified approaches—e.g., more or less progressive responsibility and capability indices—can be assessed and compared without being over-specified and reified.

The exercise also shows that no matter how you slice it, most people in the world—as represented by India and China—are taking responsibility and reducing production/consumption by their fair share. The rogue nations are the US and the 28 countries of the European Union, taken collectively.

Regardless of whether you base equity on historical responsibility—even as recently as 1990—or capacity to become more efficient, the US is only pledging about 20% of its fair share. The EU is pledging about 50% of its fair share. China and India are both at more than 100%. Report cards for each country are available from the Equity Workgroup website. Δ

For the full article, including a plethora of graphs to help visualize the information, visit: <https://medium.com/@albertbates/> <https://medium.com/albertbates-the-climate-bums-2471874c26b>

Albert Bates is an Emergency Planetary Technician and Climate Science Wonk—using naturopathic remedies to recover the Holocene without geoengineering or ponziconomics.

The name now on so many lips

The “Rich Port”

April Lea

THE ISLA DEL ENCANTO was one of the first stops on the Spanish conquest of the “new” world. Here blended several world cultures over centuries, becoming a microcosm of colonization wrought to modernity. It is fitting, then, that Puerto Rico now generously leads the charge back to crucial sustainability. Hurricane Maria insisted that reckoning time has come.

Before the storm of storms, Puerto Rico’s food system was experiencing a return to its honorable jibaro roots. “Jibaro” in indigenous Taino language means “people of the forest.” The US-directed push toward tourism over agriculture in the late 20th century cast a derisive light on that sacred title. A decade before Maria, sustainable agriculture and reclamation were enjoying an island-wide renaissance. The commonly reported statistic that more than 80% of food is imported to the island does not take into account the culture of backyard growing with which Puerto Rico never lost touch. It is a place where closeness with the earth has been preserved; where interconnectedness with community is a fact of life. Here, permaculture is part of the breath of each day. It is part of why the island feels so darn good.

Farms, gardens, markets, natural health shops, and complementary medicine centers abound. Organic growing is largely the default. Thanks in part to arcane import laws, though, grocery stores are full of produce wrapped in plastic and styro-



New life in Humacao.

Permaculture installations on the island survived: earth buildings, swales, deep roots, and food forestry showed that permaculture indeed works with the changing land better than any system devised by even well meaning engineers. Since Maria, thousands of dedicated folks have committed to taking the reins and manifesting these principles, whether or not they are so named.

Right now permaculture looks like working together to clear land, distribute supplies, ensure clean water access, and replant food, quickly. People “on brigade” from the island or from around the world transport borrowed tools, share vehicles, host volunteers, and nourish one another. Social media organizing looks like mycelial wildfire. We speak to power the heart and logistics, both needed to create a new, “new” world. We get ecstatic about fruit trees.

Cooperative agriculture and economics hold a key to restoring relationships with land and people. As reverence for land and cooperative exchange are intrinsic to life on the island, these tools have natural applications in Puerto Rico. Being one of the last remaining imperial colonies in the world confers an opportunity for Puerto Rico to directly benefit from the open channel to the US, if properly managed and defended from exploitation. The restoration will take significant time and resources. People and institutions in the US can consider this a call to use our collective power and access to the island to make direct reparations. With permaculture, cooperatives, the new economy, and the unprecedented technological interface available for organizing, post-Maria, Puerto Rico can become a model for the world of food, land, energetic, and economic security, based on the principles of Nature herself. It is important that these initiatives take root soon, in time to defend the island and its inhabitants from land-grabs and permanent displacement.

My family and I arrived on the island in 2016-2017 as grateful transplants, healing like many, from the inhuman culture of the Mid-Atlantic megalopolis. Hurricane Maria transformed a

We are a nascent cooperative exchange of educators and volunteers....

foam. Eggs for sale in Yauco are shipped from Lancaster. Entire refrigerator cases are devoted to margarine. The most readily available organic goods are sold by a big-box store which could single-handedly wipe out the island’s debt and rebuild its entire infrastructure. Meanwhile, the Puerto Rican economy is in tatters, and most coconuts consumed by Americans are coming from Asia. Readers know that little of this makes sense... and that undermining food is a sure way to undermine the health, happiness, and strength of any culture.

There is no escaping the waste of modern consumption on an island. There is no redirecting the ocean’s power. There is only a need to build in a way that can withstand the fury, and to address corporate feudalism at a grassroots level.

five-year plan to support ecological tourism and cooperative agricultural enterprise into a three-month launch. Days after Maria, Puerto Rican folks were handling an atomic shift in the landscape, and folks in the States were scrambling to find one another and take action. From Philadelphia with just a few months before I was to return home, the Land + Heart Project was born.

Land + Heart Project is a nascent cooperative exchange of educators and volunteers who foster restoration for Puerto Rico through food forestry farming. We exist to facilitate efforts and long-term support for permaculture of all kinds in Puerto Rico, and maybe someday, beyond. Coordinating permaculture designers, installers, and teachers to support and expand the island's education efforts are obvious goals. Equally important are employing permaculture principles as an organization and seeking resources to create revolutionary business models for farmers, educators, and more.

Our collaborations are an honor that constantly expand. Land + Heart Project interfaces with Restoration Orchard; The Puerto Rico Resilience Fund's La Solidaria 24-month farm tour; Teens Inc Philly; the Association for Regenerative Culture; Weavers Way Cooperative Association; the Disaster Relief Alliance; Raices Cultural Center; Mutual Aid Disaster Relief; the International Tool Library Association; the West Philadelphia Tool Library; the Philadelphia Urban Farm Network; Waves for Water; the CasaBonuco Earthship PR; Plenitud PR; La Loma de la Nina Mariana; Proyecto de Apoyo Mutual de Mariana; several Fincas, and a variety of other agricultural, community, nonprofit, academic, and private institutions and individuals who can create positive and innovative feedback systems based on the needs of those to whom Puerto Rico belongs.

Our focus this winter on the island is on building soil. Relief work creates a new global community, one that must develop based on relationships, solidarity, respect, communication, and clarity. "People care" includes honest work dismantling privilege, racism, capitalism, and assumptions. The tremendous love pouring from contributors, volunteers, and residents opens the way for these crucial conversations.

Traveling the island in solidarity brigades brings immediate food and water relief, and introduces Land + Heart to the farms and gardens eager to implement permaculture design on their landscape. Cooperating with these food forest farm partners, we can help expand and support Puerto Rico's permaculture efforts; inviting locals and travelers to build and educate about water catchment and filtration systems; planting food for permanence and yield, soil regeneration, bioremediation, and more; creating productive, regenerative farms that serve as community centers for all people seeking the connections that make us human.

The future of Land + Heart Project is the creation of cooperative, educational exchange programs for farmers, students, herbalists, new land-justice organizations, academics, research into food access, and more. Like in Central America, permaculture education and demonstration can become a feature of economic restoration for Puerto Rican farmers. Our ultimate goal is a cooperative bridging the island and the states, for all committed to restoration agriculture and a sustainable future. Resources in demand for the many brigades include seeds, tools,

water filtration systems, labor, transportation, solar power installations and oven kits, portable solar chargers, nonperishable food, communications and camping gear, translation tools, and medicinal herbs. Our coalition soon begins outreach to supply these needs on a large scale. Community programs everywhere have been overwhelming in their support. It is a humbling reminder of how much we all care.

Future endeavors in development alongside immediate needs include establishing regional seed banks and tool libraries; documenting the recovery as well as the trash burden and health repercussions; creating earthship communities; hosting elder gatherings and seeing that no elder is uncared for; turning abandoned schools and other buildings into somewhat radical community centers; supporting Fair Trade rooting here; supporting efforts to provide displaced Puerto Rican folks with quality land to farm around the US; and bringing business and cooperative law between countries into the conversation. We are all excited to invite Cuba into the conversation, too. Because of Puerto Rico's size and hearty connections between the island and the diaspora, these projects can quickly become reality. There is a sense of urgency, as the 2018 hurricane season is certainly on its way.

Readers moved to support restoration efforts in Puerto Rico that will ripple out to the rest of our world are encouraged to reach out. Land + Heart Project would love to connect you with the appropriate collaborators, and we welcome new connections every day. Buen Provecho. △

April Lea is a natural foods educator, cooperative administrator, marketer, medicinal herbalist, and western astrologer who is mostly self-taught through a decade in the independent and cooperative natural foods retail business. April developed a love for interconnected health, economics, biochemistry, sociology, and revolutionary business between Kennett Square, Northwest Philadelphia, and Southwest Puerto Rico. She was developing Owl School Philly as community education for the naturally curious when Hurricane Maria birthed the Land + Heart Project.

Reviews

No-work Gardening Meets Permaculture

Review by John Wages

Patrick Whitefield

The Minimalist Gardener

Permanent Publications. East Meon, Hampshire, UK.

138 pp. Color photos. Softcover: \$19.95

Readers of the permaculture literature know Patrick Whitefield from *The Earth Care Manual* and *Permaculture in a Nutshell*, his adaptations of Mollison's Southern Hemisphere

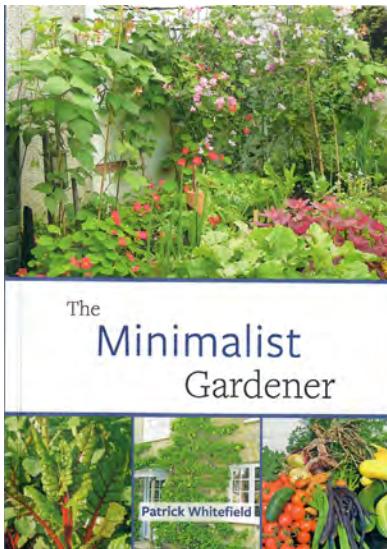
permaculture to the cool, temperate UK. *The Minimalist Gardener* is a collection of articles written originally for *Permaculture* magazine. That a collection of articles written over 20 years could stand on its own as a book is testament to the writer's depth of understanding of natural systems and how they converge in a garden setting.

Be prepared for more stunning color photographs than usual in a book like this. Shots of gardens and landscapes before and after implementing a permaculture design are instructive and inspiring. In explaining permaculture design, Whitefield contrasts literal imitation of nature as might be seen in forest gardens and other types of indigenous permaculture, with "design permaculture." The design approach consciously places components in relation to one another so as to maximize productive relationships between them. Emphasizing no-dig, perennials, polycultures, stacking plants, and succession, this chapter describes how the author actually approached a garden design for a new property with pre-existing trees, hedges, and other elements. A short chapter on sun and shade is interesting and may be applicable to hotter climates to some degree.

As the title describes, Whitefield's gardening approach is best described as minimalist, in the sense of Masanobu Fukuoka's "do-nothing" farming or Ruth Stout's "no-work" deep-mulch system—gardening with a light touch. The gardener observes and learns about the site, then places food-producing plants that require little attention. The author's advice is to emphasize robust plants with high yields on a sq. ft. basis, rather than vegetables or fruits that will always be touch-and-go in your climate. An example might be parsnips in a heavy clay soil in the Mid-South. Possible? Surely. But, at how much cost in time and energy of bed preparation, and lost productivity during the long time parsnips will occupy the space? Parsnips are inexpensive enough in the market. Until Southerners learn how much better than potatoes they are in stews, they will probably remain cheap. In cool Britain, Whitefield recommends growing radishes with parsnips to increase the yield from a single row or bed. There are other choices besides radishes/parsnips—the

concept is stacking in time, to gain a yield while one member of the pair is in a long growth phase. A key aspect of the minimalist garden is that it doesn't try to grow everything in the seed catalog. It focuses on what the household likes to eat, what is high value relative to what can be purchased in the market, and what requires less work in relation to yield. Minimalist gardening is probably the best way for a new gardener to start, to avoid burnout when all those tasty heirlooms fail to yield and dry up in the July sun.

Whitefield devotes an entire chapter



to raised-bed gardening. His reality-based approach to the subject is evident from his noting that raised beds aren't appropriate for every site, and there are multiple approaches to constructing them. There is not much mention of keyhole beds or mandala beds. Appropriate to gardening at high latitudes, sun-angled beds effectively move a garden to lower latitudes. According to Whitefield, every 5° tilt of the bed's surface is the equivalent of moving 50 miles south. In my area, that would move me from Zone 7b to the edge of Zone 8. Making the north side of a 4' bed 3.5-4" higher than the south edge seems a practical price to pay for a leg up in spring planting.

A discussion of stone masonry for rock walls and garden edgings shows us the aesthetics of low stone walls, pavers for paths, steps, and even bridges of stone over small ditches. Here, the photos really help us envision the author's work.

Slugs and snails are always a problem in cool, moist climates, and Whitefield devotes a whole chapter on strategies for

growing vegetables in their presence, including slug-resistant plants, traps, ducks, and the like. In other climates, they tend to wreck havoc in the beginning of deep mulching. Sowbugs and pillbugs occupy a similar niche and do equivalent damage by their constant chewing. Much of what he says about slugs is more broadly applicable. In the minimalist garden, the designer may simply retreat from the mollusk onslaught by giving up on the vegetables they prefer and going for those types the slugs find less palatable. Discretion is the better part of valor.

With discussion of seed-starting and which plants to grow, this book makes a tolerably good beginner's guide to home vegetable gardening, although probably not intended as such. Such a balanced treatment of heirlooms vs. modern varieties is rare in the gardening literature: "Heritage varieties usually taste better..." while "Modern varieties usually have a higher yield."

My favorite chapter is Plants for the Minimalist Garden. The author divides these easy-care plants into three groups. The perennial salad greens include Turkish rocket (*Bunias orientalis*) and French scorzonera (*Reichardia picroides*, not the same as common scorzonera or salsify). Examples of self-seeders include corn salad (which he grows under raspberries with good success), land cress, and rocket (arugula, *Eruca sativa*). All three are good examples of winter/summer stacking: growing cold-loving vegetables underneath deciduous perennials. Lastly, there are "weeds:" chickweed (*Stellaria media*), purslane, and fat hen (*Chenopodium album*), to name a few. Other perennials include herb patience (*Rumex patencia*), mallow (*Malva moschata*), and various perennial onions and leeks. Quite a few more candidates are listed in tables. Granted, most of these vegetables are native to cool temperate zones, there is enough novelty to pique the imagination and open the seed catalogs yet one more time before spring.

This short book (138 pages, with perhaps half taken up by photos) distills a lifetime of knowledge into a few, disarmingly casual chapters. Yet every chapter is inspiring and has useful information. By the end, the reader realizes it's actually been a grand tour. △

EVENTS

Permaculture Design Course Spain

Dates: March 3-17

Location: Andalucia, Spain

Description: Join us for an amazing two weeks of immersion training in permaculture design. Our host, Suryalila Yoga Retreat Center, a world class facility in Villa Martin provides the opportunity to study permaculture in a stunningly beautiful and nurturing setting. Suryalila offers daily yoga classes, bountiful vegetarian meals, and an opportunity to engage in the ongoing development of their property. Suryalila is also a working olive grove, with over 600 ancient olive trees.

Instructors: Darrell Frey, Jacob Evans, and guest presenters

Cost: \$1535, camping and meals provided.

Contact: suryalila.com
threesisterspermaculture.com

Permaculture Teaching Course Spain

Dates: November 20-December 8

Location: La Loma Vida Permaculture Design Center, Granada Coast, Spain

Description: In this dynamic and interactive course, you learn significant teaching techniques to communicate and apply permaculture principles and strategies to a wide variety of audiences and educational settings. Our goal is to encourage and inspire your unique strengths and abilities by demonstrating diverse teaching modalities including effective use of lecture, storytelling, class discussions, interactive experiential activities, visual aids, and hands-on skills.

This is a Certificate Course offered by Instructors of the Permaculture Institute of North America. Prerequisite: Permaculture Design Course Certificate or instructor's approval.

Instructors: Jude Hobbs, Rico Zook, and guests

Contact: www.lalomaviva.com

Permaculture Design Course Costa Rica

Dates: April 24-May 7

Location: Mastatal, Costa Rica

Description: Join our diverse team of permaculture instructors for this annual life-changing 2-week experience. The course covers the core curriculum and emphasizes creating diverse multi-functional human landscapes based on ecological patterns.

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

Instructors: Scott Gallant, Chris Shanks, Rachel Jackson, and Laura Killingbeck

Cost: Central Americans: \$850; Residents and Expats: \$1350; Foreigners: \$1500

Contact: info@ranchomastatal.com; ranchomastatal.com

Permaculture Teacher Training Germany

Dates: May 17-21 **Location:** Circle Wise, Germany

Description: Take the next step in your permaculture design education and become an educator. Join Warren Brush on a transformative journey into what it takes to become a permaculture teacher. The focus of this program will be how to convene a successful course, and will include topics such as: working with international students, recognizing and using leverage points, course integration with a specific site, drawing from one's gifts, student engagement, visual tools, group dynamic, natural patterns of learning, and creating a broad concentric ring of impact through a permaculture course. The course will be taught using a well woven combination of creative presentation methods, practicum, group work, storytelling, awareness exercises, feedback integration, and facilitation as a holistic learning journey.

Instructors: Warren Brush

Cost: TBD

Contact: verbindungskultur.org

Permaculture Design Course Germany

Dates: August 4-16

Location: Hof Herrenberg, Germany

Description: Immerse yourself in permaculture in action with this 14-day learning journey in a beautiful location! Share in the joy of community learning and changing the world. Take home the ability to design and apply natural principles to create stable and resilient systems that provide food, water, shelter, and energy needs while regenerating ecology, community, and economy. This Permaculture Design Course (PDC) includes the 72-hr Permaculture Certification through Permaculture Research Institute of Australia.

Instructor: Warren Brush

Cost: TBD

Contact: <http://www.hof-herrenberg.de/kurse-seminare/kurse-seminare/>

Permaculture Design Course Belize

Dates: March 3-16

Location: Maya Mountain Research Farm, San Pedro Columbia, Belize

Description: With over 26 years of organic management and conversion from an abandoned citrus and cattle farm to a biologically diverse polyculture, MMRF is one of Central America's oldest permaculture farms. Students who attend this course get a chance to learn permaculture in a venue that is the product of decades worth of permaculture design work.

Through lecture, discussion, small groups, and site visits, participants will gain the tools to create sustainable, ecologically based homes, farms, businesses, and communities.

Course graduates will be recognized by the Permaculture Institute of North America.

Instructor: Marisha Auerbach, Rhonda Baird, Christopher Nesbitt, Alex Nikech, and Monica Ibacache

Cost: USD \$1,500/B\$3,000

Contact: Christopher Nesbitt
info@mmrbz.org
mmrbz.org

Send Event and Calendar Listings for Issue #108

(May 2018)

In Your City

by the March 1st deadline

events@permaculturedesignmagazine.com

Permaculture Design Course

France

Dates: August 19-31

Location: Pontgouin, France

Description: Immerse yourself in permaculture in action with this 14-day learning journey in a beautiful location! Share in the joy of community learning and changing the world. Take home the ability to design and apply natural principles to create stable and resilient systems that provide food, water, shelter, and energy needs while regenerating ecology, community, and economy. This Permaculture Design Course (PDC) includes the 72-hr Permaculture Certification through Permaculture Research Institute of Australia.

Instructors: Warren Brush

Contact: greenfriends-europe.org

International Development Focus

Permaculture Design Course

Kenya

Dates: September 30-October 13

Location: Galana Conservancy, Kenya

Description: This course equips people working in international development and grassroots projects with the perspectives and skills needed to engage with communities in partnership to incorporate elements into the design of communities, smallholder farms and land with household agricultural production that are holistic, appropriate, strategic, effective, diverse, as well as ecologically and economically sound. This course includes the 72-hr Permaculture Design Certification through the Permaculture Research Institute.

Instructors: Warren Brush and dynamic teaching team

Contact: www.pri-kenya.org

Advanced Teacher Training

British Columbia

Dates: March 17-25

Location: OUR Ecovillage, Vancouver Island, BC

Description: Teaching is Sharing Information and is Regenerative, Empowering, and Part of the Permaculture Solution. In this dynamic and interactive course, you learn significant teaching techniques to communicate and apply permaculture principles and strategies to a wide variety of audiences and educational settings. Our goal is to encourage and inspire your unique strengths and abilities by demonstrating diverse teaching modalities including effective use of lecture, storytelling, class discussions, interactive experiential activities, visual aids and hands-on skills. As a class, we create a safe setting of active learning and build confidence through preparing and co-teaching multiple presentations for essential practice. Participants utilize social permaculture and build strong resource networks to support one another via group projects.

This is a Certificate Course offered by an Instructor of the Permaculture Institute of North America. Prerequisite: Permaculture Design Course Certificate or instructor's approval.

Instructors: Jude Hobbs with guest Hannah Roessler

Contact: oureco-village.org

Earthworks for Resiliency

France

Dates: September 10-14

Location: France

Description: The need for people with hands-on skills in landscape restoration and drought-proofing is growing daily around the world. Whether you are working on your own landscape or farm or as a consultant, this course will grow your skills in the appropriate design and construction of structures that will reduce erosion, increase biological productivity, harvest & store water, and create resiliency in the ecologies that sustain us.

Instructors: Warren Brush

Contact: greenfriends-europe.org

Permaculture Design Course

British Columbia

Dates: August 19-September 1

Location: Winlaw, British Columbia

Description: This is the basic (72 hours minimum) permaculture design course. 13 days. This intensive course combines theory with practical hands-on learning.

Topics includes: permaculture design techniques & principles, site analysis, soil fertility, organic gardening techniques, herbs & medicinal plants, fruit & nut trees, water uses, ecological buildings, & more.

Instructors: Gregoire Lamoureux and guests

Cost: early registration: before July 15 is CAN\$890 plus GST;
After July 15: CAN\$990 plus GST

Contact: Gregoire Lamoureux
spiralfarm@yahoo.com
<http://www.kootenaypermaculture.com>

Bullock Brothers' Homestead

Washington

Location: Orcas Island, WA

Contact: Dave Boehlein

360-840-8483

info@permacultureportal.com.

permacultureportal.com

Intro to Permaculture

Dates: May 25-27

Description: Tour, lecture, hands-on projects, presentations, group discussion, and networking. We will cover permaculture design theory & practice, forest gardening, perennial food systems, plant propagation, efficient water & energy systems, fertility management—beneficial plants/healthy soils, and ecological systems as a model for human communities.

Instructors: Douglas & Samuel Bullock,

Dave Boehlein

Cost: \$200, camping, meals.

Advanced Design Course

Dates: August 18-25

Description: Join the team of Terra Phoenix Design and the Bullock's Permaculture Homestead for this excellent follow-up to your Permaculture Design Course. During this course, you can expect to run through the design process several times to build competence and confidence. We will also have "choose-your-own-adventure" sessions where you select an educational pathway that matches your specific interests. Finally, real-world design project walkthroughs from the Terra Phoenix portfolio will allow you to see what finished designs look like and how to assemble a quality package of deliverables for your client.

Instructors: Douglas Bullock, Samuel Bullock, Dave Boehlein, & Paul Kearsley

Cost: \$1200, camping and meals provided.

Permaculture Design Course

Dates: July 14-28

Description: A two-week certificate design course on the Bullock's 35 year-old permaculture homestead. Well over 72 hours of classroom and hands-on education including design methodologies, observation skill-building, whole systems design, annual and perennial foods, water/energy/waste management, appropriate construction, plant propagation and culture, fertility, aquaculture, and more.

Instructors: Douglas & Samuel Bullock, John Valenzuela,

Dave Boehlein, & more

Cost: \$1,535, camping and meals provided.

A Stewardship Intensive Living with the Forest Oregon

Dates: February 8-11

Location: Aprovecho Center for Research and Education in Sustainability
Cottage Grove, OR

Description: The Willamette Valley region offers a unique mix of conifer forest and oak savanna ecosystems. Although many old-growth conifers and oaks have been cleared to make room for industrial forestry and agriculture, opportunities abound to actively participate in rekindling the biodiversity of these ecosystems. This three-day intensive will use lecture and hands-on projects to delve into the principles and practices of developing a culture of regenerative forest and land stewardship in this special place.

Instructors: Tao Orion, Heron Brae

Cost: Early Bird (Registered/Paid by Jan. 8) \$400; \$450 after; After Jan. 25, \$480

Contact: Abby Colehour
abby@aprovecho.net

18th Annual Advanced Teacher Training Oregon

Dates: July 22-28

Location: Cottage Grove, OR

Description: Teaching is Sharing Information and is Regenerative, Empowering and Part of the Permaculture Solution
In this dynamic and interactive course, you learn significant teaching techniques to communicate and apply Permaculture principles and strategies to a wide variety of audiences and educational settings. Our goal is to encourage and inspire your unique strengths and abilities by demonstrating diverse teaching modalities including effective use of lecture, storytelling, class discussions, interactive experiential activities, visual aids, and hands-on skills.

This is a Certificate Course offered by an Instructor of the Permaculture Institute of North America. Prerequisite: Permaculture Design Course Certificate or instructor's approval. Limited to 15 participants.

Instructors: Jude Hobbs, with Guests including Andrew Millison, Tao Orion, & Abel Koester

Cost: Cost: \$950 Includes course materials, camping, & 3 delicious meals a day. Several local work trades available

Contact: infocascadiapc@gmail.com
cascadiapermaculture.com

Permaculture Design Course: Oregon

Dates: February 10-April 22

Location: Southern Oregon

Description: This is the permaculture certificate course offered around the world with lots of local flavor included. Lead instructor Tom Ward aka Hazel, is a senior permaculturist with decades of experience in teaching and design and holds a diploma from the Permaculture Institute of North American amongst many other credentials. He is joined by co-teachers Melanie Mindlin and Karen Taylor, both experienced teachers, designers, and change artists for this weekend course in Southern Oregon where they have been living and working in permaculture for many years.

Instructors: Tom Ward, Karen Taylor, and Melanie Mindlin

Cost: \$725 (reg. by Jan. 10, \$625)

Contact:

siskiyoupermaculture@gmail.com
[https://siskiyoupermaculture.com](http://siskiyoupermaculture.com)

Permaculture Design Course Oregon

Dates: June 17-30

Location: Jackson Wellsprings,
Ashland, OR

Description: We, at SOPI, the Southern Oregon Permaculture Institute, a 503c nonprofit, are planning our intensive residential PDC. This course is for families with teens and adults this year.

Cost: \$1,250/person, Discounts for couples \$50 each. Inquire for other discounts.

Contact: Gene Griffith
541-708-1107
info@sopermaculture.org.

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Permaculture Design Course Oregon

Dates: May 7-19

Location: Cottage Grove, OR

Description: Permaculture is a design system for self-reliant living that is applicable world-wide in any setting from sub/urban to all-scale farms. This course offers a toolbox of principles and strategies to creatively integrate human and natural systems in ways that encourage abundance and sustainability. Participants will gain a clear understanding of the theory and practice of whole-systems ecological design through lecture, discussion, slideshows, design projects, and hands-on experience. Creating a livelihood through permaculture is a strong focus of this course!

Certified by the Permaculture Institute of North American and Cascadia Permaculture Institute

Instructors: Jude Hobbs, Abel Kloster, and Guests

Cost: \$1,500. Includes instruction, materials, housing, 3 meals/day. Early bird discount is \$75 with registration by 4/1

Contact: abby@aprovecho.net
www.aprovecho.net

Permaculture Practicum Oregon

Dates: May 21-June 1

Location: Cottage Grove, OR

Description: Follow up your PDC with hands-on projects that apply the concepts of permaculture and methods of sustainable living. The installation project possibilities include building a composting toilet, installing a water tank, establishing perennial garden beds with earthworks, or developing a hugelkultur system (buried wood mass). Registration for the Installation Project is discounted \$150 if you register for both at the same time!

This course offers a toolbox of principles and strategies to creatively integrate human and natural systems in ways that encourage abundance and sustainability.

Instructor: Abby Colehour

Contact: abby@aprovecho.net

Permaculture Design Course California

Dates: Three offerings: March 17-30

July 14-27

September 22-October 5

Location: Occidental, CA

Contact: OAEC.org

Intro. to Cobb, Natural Building California

Dates: April 8-14

Location: Ventucopa, CA

Description: The course is appropriate for both first-time builders and professionals in the building trade who are interested in natural materials. Our main focus will be cobb, though we will touch on various other building techniques that utilize the same materials, including adobe block, light straw-clay, wattle and daub, and plasters. We will discuss how to find and choose appropriate materials.

Instructors: Sasha Rabin & John Orcutt

Cost: \$800, includes all meals

Early Bird \$100 off by 2/15

Contact: www.quailsprings.org

International Focus

Permaculture Design Course California

Dates: April 29-May 12

Location: Ventucopa, CA

Description: This course equips people working in international development (NGO's, grassroots projects, etc) with the perspectives and skills needed to engage with communities in partnership. Students learn how to incorporate appropriate, ecologically and economically sound elements into the design of communities and smallholder farms. The teaching is directly relevant for international development practitioners, including the technical teams from agency Headquarters and field teams engaged in implementation. This course includes the 72-hr Permaculture Design Certification through the Permaculture Research Institute.

Instructors: Warren Brush, Pandora

Thomas, Thomas Cole,
Lindsay Allen, Brenton Kelly

Cost: \$1,450-2,150 (sliding scale tuition); see site for discounts

Contact: juna@quailsprings.org
www.quailsprings.org

Permaculture Design Course California

Dates: October 28-November 11

Location: Cuyama, CA

Description: Immerse yourself in permaculture in action with this 14-day learning journey! Take home the ability to design and apply natural principles to create stable and resilient systems that provide food, water, shelter, and energy needs while regenerating ecology, community, and economy.

Instructors: Warren Brush, Sasha Rabin,
Brenton Kelly, Alex Vincent

Cost: \$1,450; early bird discounts

Contact: www.quailsprings.org

Permaculture Design Course Colorado

Dates: March 17-October 21

Location: Pikes Peak, CO

Description: Join us for a Through the Seasons Permaculture Design Certification Course! Learn and apply the principles and ethics of permaculture design, earth-centered education, living natural buildings, integrated food systems, and powering down your energy needs. Permaculture offers real solutions for the future, as we seek to heal ourselves and heal the land.

We will cover topics including ecosystems and forestry, rainwater harvesting, small animal husbandry, beekeeping, food forests and growing food, appropriate technology, urban permaculture, greenhouse design, aquaculture, community building, and more! Exceptional instructors teach you how to apply permaculture to everyday living, and you will actively plan and design a project site as well as learn how to take what you've learned into your community. Field trips, educational hands-on projects, and inspiring lectures. This beautiful course will change your life!

Instructors: Becky Elder & guests

Cost: \$1,350. Work-trade, couples discount

Contact: Becky Elder
719-685-0290
rselder@comcast.net

Eco-Tour

Permaculture Design Course Colorado

Dates: May 2018

Location: Boulder, Denver, Basalt

Description: Join Regenerative Adventures for an exciting and educational 72+-hour Permaculture Design Certificate Course, ON TOUR. Enjoy beautiful Boulder, Colorado for the beginning and end of the course, then get ready to explore Colorado and its finest permaculture teachers. We will travel from Boulder through Denver to Woodbine Ecology Center south of Denver and up through the Rocky Mountains to Basalt, Colorado to gather and learn at the stunning Central Rocky Mountain Permaculture Institute. Prepare to elevate your awareness, learn, and share with Colorado's diverse design & information specialists while enjoying epic moments.

Instructors: Mike Wird & Guests

Cost: \$1,500

\$1,400 each for both

Contact: Robin
808-446-2628
futurefruits@gmail.com
RegenerativeAdventures.com

31st Annual Permaculture Design Course Colorado

Dates: July 16-28

Location: Basalt, CO

Description: Come join experienced permaculture teacher, author, and designer, Jerome Osentowski, at his 32-year-old permaculture forest garden homestead in the mountains of Colorado for an immersive and life-changing two-week-long permaculture course. Students will have the opportunity to experience first hand the long term outcomes of design concepts they will learn in the course, gain experience with new innovative greenhouse technologies, and become intimately familiar with the near-closed system of CRMPI. Check out CRMPI.org for more information, and for info on our one and two-day spring courses!

Instructors: Jerome Osentowski, Vanessa

Harmony, Stephanie Syson,
Adam Brock, Avery Ellis

Cost: \$1,875

Contact: Jerome Osentowski
jerome@crmp.org

Permaculture Design Academy Colorado

Dates: August 11-19

Location: Basalt, CO

Description: The Permaculture Academy is a hands-on, immersive, in-depth permaculture education, designed to go further into the concepts of forest gardening (4 days) and greenhouse design and management (4 days). The forest gardening section covers swale building, hugelkultur, greywater, and rainwater catchment, and is taught in CRMPI's 32-year-old forest garden, with established examples of each course topic.

The greenhouse section covers considerations for designing, building, planting, and managing your own greenhouse, including site selection, types of greenhouses, climate battery technology, beneficial plant guilds, integrated pest management, and succession planting. Students may sign up for one or both sections. Visit CRMPI.org for more information on this and other courses.

Instructors: Jerome Osentowski, Vanessa Harmony, Stephanie Syson, Adam Brock, Avery Ellis

Cost: \$1,600

Contact: Jerome Osentowski
jerome@crmp.org

Design Studio Wisconsin

Dates: June 29-July 1

Location: Ashland, WI

Description: Take your design skills to the next level with this weekend intensive on design. We will be working through the entire design process in a working design on a new farm just outside of town. Whether you are fresh out of your PDC and want some practice or need to brush up on your skills after a few years, this workshop will help you to get the fundamentals in order and build your confidence while learning and practicing beside two incredible instructors.

Instructors: Peter Bane, Rhonda Baird

Cost: \$375 before May 25

Contact: Peter Bane

peter@permacultureactivist.net

Permaculture Design Course Chicago

Dates: Apr. 7-8, May 5-6, June 23-24, July 7-8, Aug. 4-5, Sept. 8-9, Oct. 13-14

Location: Chicago, IL

Description: This course includes hands-on demonstrations and field trips that go well beyond the prescribed 72 hours. It serves as an introduction to permaculture design which opens the door to further practice, work, and advanced education. Adding a seventh weekend allows us to include social permaculture throughout.

This PDC is designed for greater impact through active, peer-based learning using liberating structures and other learning approaches. This course dives deeper than traditional lecture-based courses into the design process through case studies, hands-on activities, games, and stories to build a quality foundational experience. The location-based nature of the course aims to build community and collaboration for the future.

Instructors: Rhonda Baird, William Faith, Milton Dixon, guests

Cost: \$950 early; \$1,250 late

Contact: glpdc.info

Permaculture Design Course Online

Dates: Ongoing **Location:** Online

Description: Our course is the classic, official 72-hour Permaculture Design Certificate Course (PDC) as taught by the founders of permaculture—Bill Mollison and David Holmgren.

The full PDC is a 72-hour intensive program. This course involves study modules supported by practical exercises, photos, fieldwork, and videos.

Instructors: Dr. Alan Enzo, Jessica Enzo, Art Freeman, Ben Bishop

Cost: \$550 **Contact:** info@PermacultureEducation.com, PermacultureEducation.com

Permaculture Design Course Michigan

Dates: July 8-21

Location: White Lake, MI

Description: During this magical fortnight, our team of world-renowned and locally grounded teachers will create a stimulating atmosphere for group learning, giving you the tools to practice regenerative land design. Join us for this exceptional opportunity in the friendly White Lake community. West Michigan's wonderland of natural beauty, between lakeshore dunes and wooded ridges, and the emerging garden farm and homestead systems of Blue Sky Farm will provide us a laboratory.

Instructors: Peter Bane, Rhonda

Baird, Keith Johnson, Penny Krebichl, and guests

Contact: Peter Bane

peter@permacultureactivist.net
permacultureactivist.net

Permaculture Design Course Indiana

Dates: Aug. 11-12; 25-26, Sep. 15-16; Oct. 20-21; Nov. 10-11; Dec. 8-9.

Location: Bloomington/Indianapolis, IN

Description: Permaculture design is a fluid, flexible, and very practical system for re-integrating human systems with the natural world. This course lays the foundations for permaculture design and prepares you to apprentice in design, education, or site implementation OR incorporate permaculture into your current career path and home system.

Course materials are shared through discussion, lecture, reading, hands-on activities, design practice and review of case studies: all coming together to give you a solid foundation in Earth Care, People Care, and Future Care.

Self-study at home allows for enhanced practical learning in sessions.

Instructors: Rhonda Baird, Gabriel Hahn and regional guests

Cost: \$950 before 6/1/18; \$1,150 after; payment plans available

Contact: Rhonda Baird
shelteringhills.net

Spiral Ridge Courses Tennessee

Location: Summertown, TN

Contact: 931-231-4099

spiralridgepermaculture@gmail.com

Permaculture Design Course

Dates: June 16-27 OR
September 22-October 3

Description: In this course, you will learn the tools, guiding principles, and strategies that create lush productive landscapes, reduce your energy use, and create more stability and security for you and your loved ones. We will focus on how to ecologically design farms & homesteads, building skills and participating in hands-on projects. Students will complete a design with our guidance—from making holistic goals, mapping and analyzing the landscape, to presenting their designs complete with graphics and getting feedback. This course takes place on a 9-year-old, 50 acre, off-grid, family homestead. Instructors include herbalists, organic farmers, compost tea specialists, regenerative business owners, professional designers, and more.

Instructors: Cliff Davis, Jennifer

Albanese; 10 guest instructors.

Cost: \$1,300 early bird; \$1,500 Regular. Meals & camping

Agro-Ecosystems Series A Permaculture Practicum for Farm and Homestead Resiliency

Dates: October 14-21

Description: This series is a conscious effort to provide on-the-ground training in regenerative land management and cultural repair for permaculture practitioners. An agro-ecosystem is a dynamic association of crops, pastures, livestock, other flora and fauna, soils, water, and the atmosphere. It is agriculture functioning as an ecosystem in and of itself, but also with the surrounding environment. In this training, you will develop your skills and gain hands-on experience as you help further develop a small scale regenerative farming system. This series is three classes in one. Earthworks (3 days), Agroforestry (3 days) and Mushrooms, Molds, and Mycorrhizae (2 days).

Instructors: Cliff Davis, Tradd Cotter; webinar, Eric Toensmeier.

Cost: \$125/day, meals and camping included. Mix and match discounts.

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Permaculture Design Course Pennsylvania

Dates: June 11-23

Location: Pittsburgh, PA

Description: Three Sisters Permaculture Design is offering this 80-hour Permaculture Design Course in Pittsburgh, Pennsylvania. Pittsburgh has a growing reputation as a livable city, with numerous urban farm, gardens, food forests, and many related projects. We will draw on local examples as we focus on urban and suburban issues and challenges. Much of the course will be held at Garfield Community Farm. Garfield Farm is located in the heart of the city, and includes a bioshelter, market gardens, and an evolving perennial landscape. Join us as we continue to develop this community asset.

Instructors: Darrell Frey, Michelle Czolba, John Creasy, guests.

Cost: Vary with lodging options.
Base course fee is \$900.

Contact:
threesisterspermaculture@gmail.com
threesisterspermaculture.com

Earthaven Experience Week North Carolina

Dates: June 8-13

Location: Black Mountain, NC

Description: School of Integrated Living's Earthaven Experience Week is a residential service-learning program that immerses participants in the life of Earthaven Ecovillage. Students join the homes, farms, and businesses of Earthaven for a hands-on, skill-building experience in sustainable community. Topics covered include regenerative culture, off-grid utilities, permaculture food production, and local-scale economics. This course is sponsored by the Fellowship for Intentional Community.

Instructors: Diana Leaf Christian, Chris Farmer, Lee Warren, Dimitri Magiasis, and guests.

Cost: \$650 before 4/1; \$700 after.

Contact: NikiAnne Feinberg
828-669-2707
info@schoolofintegratedliving.org

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Permaculture Design Course Massachusetts

Dates: April 20-23, May 18-20,
June 8-11

Location: Sowing Solutions
Shelburne Falls, MA

Description: Located in the Village of Shelburne Falls, where we will participate in design and installation for local village residents. Practice ecological design alongside leading designers and educators in the Northeast; Gain your Permaculture Design Certificate with Sowing Solutions, celebrating over 11 years of permaculture education. Visit numerous demonstration sites such as Sirius EcoVillage, Wildside Cottages & Gardens, and Hickory Gardens. Sliding scale and fundraising support is available. (An Autumn 2018 Weekend Series is alternatively offered; Check our website.)

Instructors: Kay Cafasso, Keith Zaltzberg, Llani Davidson, Walker Korby, and guests

Contact: www.PermacultureSeries.org

Permaculture Design Course North Carolina

Dates: July 5-26

Location: Black Mountain, NC

Description: The Permaculture Design Certification Course at Earthaven Ecovillage incorporates the internationally recognized two-week PDC curriculum into an extended exploration of community-scale design for climate resilience. Instructors place permaculture practice in the context of the emerging global climate reality, all through the vibrant, 23-year-old living classroom of Earthaven. This 21-day intensive course offers 130 hours of instruction.

Instructors: Patricia Allison, Zev Friedman, Courtney Brooke Allen, and guests.

Cost: \$1,975 before 5/1; \$2,075 after

Contact: NikiAnne Feinberg
828-669-2707
info@schoolofintegratedliving.org

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New York Convergence New York

Dates: August 24-26

Location: Finger Lakes region

Description: A packed permaculture weekend: a permaculture film festival, tours of 20+ permaculture sites, networking with other permaculturists, and converging to share skills and grow the movement.

Cost: Suggested donation \$5-50, camping available for a small fee on some sites

Contact:

info@fingerlakespermaculture.org
fingerlakespermaculture.org

Permaculture Design Course Florida

Dates: April 11-22

Location: Brooksville, FL

Description: This is an intensive two week course held at our permaculture farm north of Tampa about 20 minutes from Weeki Wachee, FL. Students will have the opportunity to participate with and observe permaculture systems installation and operate in an immersive environment, including appropriate tech, innovative greenhouse solutions, perennial food systems, animals, solar, and more. This is a small, diverse farm with many different elements and examples of permaculture that can be translated to a wide variety of settings: urban or rural. The course will address strategies and techniques for both urban and rural areas in different climates and circumstances.

This course exceeds the requirements laid out for the internationally recognized 72-hour Permaculture Design Course. The training provides a deep and wide overview of permaculture design, focusing on skill sets you can apply immediately. It is a thorough introduction to a subject that has many levels and areas of expertise and professional practice. Further study is available through our apprenticeship programs and advanced study.

Instructors: Koreen Brennan

Cost: \$1,395

Contact: Steve
727-495-6145
courseinfo@growpermaculture.com

Calendar

February

Feb. 8-11. Cottage Grove, OR. Living with the Forest. abby@aprovecho.net.
Feb. 10-Apr. 22. Southern OR. Permaculture Design Course. siskiyoupermaculture@gmail.com, <https://siskiyoupermaculture.com>.

March

Mar. 3-16, Maya Mountain Research Farm, BELIZE. Permaculture Design Course. mmrbfz.org.
Mar. 3-17, Andalucia, SPAIN. Permaculture Design Course. suryalila.com, threesisterspermaculture.com.
Mar. 17-25, Vancouver Island, BC. Teacher Training. ourecovillage.org.
Mar. 17-30, Occidental, CA. Permaculture Design Course. oaec.org.
Mar. 17-Oct. 21. Pikes Peak, CO. Permaculture Design Course. Becky Elder , 719-685-0290, rselder@comcast.net.

April

Apr. 7-8-Oct. 13-14. Chicago, IL. Permaculture Design Course. glpdc.info.
Apr. 8-14. Ventucopa, CA. Intro to Cobb, Natural Building, www.quailsprings.org.
Apr. 11-22, Brooksville, FL. Permaculture Design Course. Steve, 727-495-6145, courseinfo@growpermaculture.com.
Apr. 20-23, May 18-20, Jun. 8-11, Shelburne Falls, MA. Permaculture Design Course. permacultureseries.org.
Apr. 24-May 7, Mastatal, COSTA RICA, Permaculture Design Course. info@ranchomastatal.com; ranchomastatal.com.
Apr. 29-May 12, Ventucopa, CA. Permaculture Design Course, International Focus. juna@quailsprings.org, www.quailsprings.org.

May

May, CO. Eco-Tour, Permaculture Design Course. 808-446-2628, futurefruits@gmail.com, regenerativeadventures.com.
May 7-19, Cottage Grove, OR. Permaculture Design Course. abby@aprovecho.net. aprovecho.net.
May 17-21, Circle Wise, GERMANY. Teacher Training. verbindungskultur.org.
May 21-Jun. 1, Cottage Grove, OR. Permaculture Practicum. abby@aprovecho.net.
May 25-27, Orcas Island, WA. Introduction to Permaculture. Dave Boehnlein, 360-840-8483, info@permacultureportal.com, permacultureportal.com.

June

June 6-27, Summertown, TN. Permaculture

Design Course. spiralridgepermaculture@gmail.com.

June 8-13, Black Mountain, NC. Earthaven Experience Week. 828-669-2707, info@schoolofintegratedliving.org.

June 11-23, Pittsburgh, PA. Permaculture Design Course. threesisterspermaculture@gmail.com. threesisterspermaculture.com.

June 17-30, Ashland, OR. Permaculture Design Course. 541-708-1107, info@sopermaculture.org.

June 29-July 1, Ashland, WI. Permaculture Design Studio. Peter@permacultureactivist.net.

July

July 5-26, Black Mountain, NC. Permaculture Design Course. 828-669-2707, info@schoolofintegratedliving.org.

July 8-21, Montague, MI. Permaculture Design Course. permacultureactivist.net.

July 14-27, Occidental, CA. Permaculture Design Course. oaec.org.

July 14-28, Orcas Island, WA. Permaculture Design Course. Dave Boehnlein, 360-840-8483, info@permacultureportal.com, permacultureportal.com.

July 16-28, Basalt, CO. Permaculture Design Course. jerome@crmpo.org.

July 22-28, Cottage Grove, OR. Teacher Training. infocascadiapc@gmail.com, cascadiapermaculture.com.

August

Aug. 4-16. Hof Herrenberg, GERMANY. Permaculture Design Course. hof-herrenberg.de.

Aug. 11-19. Basalt, CO. Permaculture Design Academy. Jerome Osentowski, jerome@crmpo.org.

Aug. 11-12-Dec. 8-9. Bloomington/Indianapolis, IN. Permaculture Design Course. Rhonda Baird, rhonda@shelteringhills.net, www.shelteringhills.net.

Aug. 18-25. Orcas Island, WA. Advanced Design Course. Dave Boehnlein, 360-840-8483, info@permacultureportal.com, permacultureportal.com.

Aug. 19-31, Pontgouin, FRANCE. Permaculture Design Course. greenfriends-europe.org.

Aug. 19-Sept. 1, Winlaw, BC. Permaculture Design Course. spiralfarm@yahoo.com, kootenaypermaculture.com.

Aug. 24-26. Finger Lakes Region. New York Convergence. info@fingerlakespermaculture.org, fingerlakespermaculture.org.

September

Sept. 10-14, FRANCE. Earthworks for Resiliency. greenfriends-europe.org.

Sept. 22-Oct. 3, Summertown, TN. Permaculture Design Course. spiralridgepermaculture@gmail.com.

Sept. 22-Oct. 5, Occidental, CA. Permaculture Design Course. oaec.org.

Sept. 30-Oct. 13, Galana Conservancy, KENYA. Permaculture Design Course. pri-kenya.org.

October

Oct. 14-21, Summertown, TN. Permaculture Practicum for Farm and Homestead Resiliency. spiralridgepermaculture@gmail.com.

Oct. 28-Nov. 11, Cuyama, CA. Permaculture Design Course. www.quailsprings.org.

November

Nov. 20-Dec. 8. Granada Coast, SPAIN. Permaculture Teaching Course. lalomaviva.com.

Ongoing

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

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Upcoming for 2018:

Permaculture Teacher Training/Certification (March) Immersed learning environment for a Pc Teacher Training with PINA Co-founder Jude Hobbs, Cascadia Permaculture and team.

United Nations Sustainable Development Goals Training (April) International Team onsite and Livestreamed info!

International Training of Trainers Certification (April) Global Ecovillage Network and UN Trainers gather to certify diverse range of professionals; government, development workers, community developers.

Permaculture Design Certificate/Earth Activist Training in One (April 27-May 13) This is truly a full bullet course and an outstanding deeper exploration into the Permaculture Design framework. We are offering a full PDC and EAT curriculum led by renowned author and activist STARSHAWK along with Charles Williams and a diverse variety of highly specialized teachers. This course has something for everyone, no matter how far in their Pc journey. This PdC is certainly different from any other!

International "Ecovillage Design Certificate" (April 28-June 3) A course for 'Changemakers' and those who wish to work towards developing sustainable communities. The Ecovillage Design Education curriculum sees an official contribution to the United Nations Decade of Education for Sustainable Development, is given full Certification through GAIA Education International, and is ratified by the Global Ecovillage Network.

Natural Building/Ecological Design Exchange (June-July) Work with some of the longest standing natural builders in Canada! We have a team of builders with elements including cob/ strawbale/EcoNest/TINY House and this year with the teaching team from Just BioFiber! Engineers and building inspectors teach here on over 16 buildings of permited/ engineered building projects.

Ecovillage Explorer Program/Tours (ongoing) For folks who wish to experience Ecovillage immersion, regenerative living, re-skilling and learn more about OUR legal/political/regulatory work.

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