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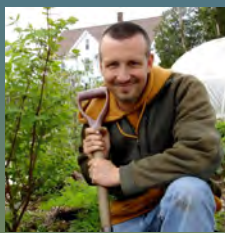
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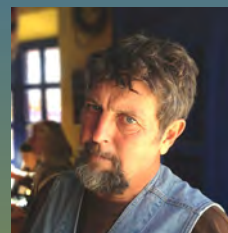
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Permaculture Activist welcomes your articles, news items, photos, and other materials of interest. Please contact the Editor in advance of your submission to request writers guidelines and present your ideas. (editor@permacultureactivist.net)

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Upcoming Issues, Themes & Deadlines

#92	Stacking Functions	March 1
#93	Experimentation: Science in Pc	June 1
#94	Seasonal Cycles of Work	September 1

Permaculture is a holistic system of DESIGN, based on direct observation of nature, learning from traditional knowledge, and the findings of modern science. Embodying a philosophy of positive action and grassroots education, Permaculture aims to restructure society by returning control of resources for living: food, water, shelter, and the means of livelihood, to ordinary people in their communities, as the only antidote to centralized power. For 30 years Pc has combined top-down thinking with bottom-up action to make a world of difference in over 100 countries. We are everywhere.

Seed-Bearers of Democracy

John Wages

Whenever I look around me, I wonder what old things are about to bear fruit, what seemingly solid institutions might soon rupture, and what seeds we might now be planting whose harvest will come at some unpredictable moment in the future.

—Rebecca Solnit, *The Faraway Nearby*

While permaculture isn't synonymous with "gardening by design," it makes sense that filling one of the most basic human needs would appeal to the most people.

The best gardeners are those who've seen the fires burning in living things: the energy flows that sustain life on this planet. The response to this issue's theme was overwhelming: articles arrived from the four corners, setting out the philosophy and practices of seed-saving. As editor, I had little to do but ponder whether to use a hyphen in "seed-saving" or not ("seedsaving").

Climate change will require breeding new crop varieties in the short term. Where commercial types fail without dependable irrigation plus fertilizers and biocides, locally adapted heirlooms may continue to perform. As Zone 7a becomes 7b, then 8, we will need to change the varieties we grow. For example,

...a question of democracy and local control.

in considering what apples to plant this winter on our nascent farm back home in northeast Mississippi, Gwen and I skipped the recommendations of the Extension Service and chose even lower-chill varieties now best suited to the Gulf Coast. They should bear in our current zone, but will do better, not worse, with moderate warming. Under similar climate pressures, we should not discount the robustness of hybrids, but should urgently collaborate to develop locally adapted and controlled, open-pollinated, and also hybrid, vegetables and staples.

The overall direction of this issue may make it appear that hybrids are worthless, and heirloom varieties the answer to all our problems. A more accurate assessment would acknowledge the benefits and shortcomings of each. Hybrids represent a rich genetic resource from which to develop new open-pollinated varieties. Though hybrid seeds will not breed true their choice traits can be stabilized over time by patient gardeners who know basic plant genetics and can maintain good records. Hybrid vigor is not a myth. And though most hybrids were developed to bear well under conventional cropping, others could be developed for high yields under organic growing conditions, under permanent mulch, or as part of a particular intercropping system.

Anyone can save open-pollinated seed, but some vegetables require gene pools large enough to make long-term backyard seed-saving difficult or impractical. Thus, we are likely to continue to rely on ethical seedsmen to maintain highly productive

strains of these varieties. Also, some strains quickly go off-type without strong selection pressure. The legendary Stewart's Zeebest okra quickly loses the highly branching habit that contributes to its high yields. Each season, in addition to maintaining the required separation distance, the seed-saver must apply selection pressure by choosing only the most branched plants. Saving tomato seeds is, by comparison, a cakewalk.

To me, the question of heirlooms and hybrids is largely a question of democracy and local control. Who makes the decisions that affect our lives: multinational companies, the government in Washington, the City Council, neighborhood associations, or we ourselves? For whom do land-grant researchers and Extension agents work—the people or agribusiness? Without the ability to make our own decisions, including economic ones, democracy is a sham. When we take back the right to save our own seeds, establish open-access seed banks, and buy from small seed companies with high-yielding, regionally adapted varieties, we loosen the octopus' grip just a little bit more, and make more space for the seeds of democracy to grow.

Upcoming issues

Issue #92 will address "Stacking Functions." Such a broad theme invites thoughtful consideration of how we apply design principles to the built environment, as well as to the landscape. I suspect we're in for some interesting stories. Tell us about your experiences. Share a recent design. Tell us something new. Provoke us to think beyond the chicken tractor. Submissions are due by March 1.

Looking ahead to #93, the *Activist* will focus on the role of science in permaculture. While there are other modes of discerning facts and dispelling myths, including analytical observation and case studies from the present and the past, we would like to hear how scientific method (hypothesis-experiment-results-refine hypothesis) has been applied to permaculture and related systems. Are caloric yields higher in a prairie ecosystem like a woodland savanna, or in a food forest? Which system captures the most solar energy and which yields the most food? How does interplanting (with trap crops, insectary plants, and companions of various types) affect yields? How do open-pollinated and hybrid varieties perform under permanent mulch? What do objective measurements of straw-bale, light clay-straw, rammed earth, and underground buildings tell us about their energy efficiency, health factors, and comfort? Maybe an economic analysis or two would be good—where do cellulosic ethanol and biogas fit in the alternative energy pantheon, when all costs are counted? Perhaps most importantly: how can experimentation complement observation to help us refine designs?

Please review our Writers Guidelines at www.permaculture-activist.net and contact us in advance to indicate your interest, along with a brief description of the proposed article. Thank you for sharing your knowledge and experience with our readers. Δ

Stewards of Arizona Seedsheds

Chris Franco

ON THE FIRST DAY at Seed Library School at the Conservation Center in Tucson, (1) I was already designing what would become the Rio Salado Seedshed Library (RSSL). I knew that I was doing this for the indigenous peoples of my place, the Sonoran Desert, and to preserve not seed diversity in general, but the Desert's diverse crops. By extension, this means preserving the cultures of the people who steward the seeds. I am dedicated to the seeds, and also to their stories. These are inherent to the language, farming, foods, history, and interaction of oppressor and oppressed—the whole culture—which is embedded in the seed and which awakens in the indigenous peoples as they behold it.

**This is how
a sense of place
is developed. It is subtle.
It is knowing the plants...**

Cultivating the diet of the future now

People often ask about greens, particularly lettuce. I introduce them to desert, or arid-adapted greens. We are used to buying leafy greens at the store. It takes a shift of habit to walk outside and pull young weeds for dinner. So part of the mission for RSSL is to steer people gently away from spinach and broccoli and towards such desert delicacies as *verdolagas* (purslane, 2), *quelites* (wild amaranth), and *nopales* (prickly pear; *Opuntia spp.*). One of the ways I do this is by selecting seeds and cuttings offered by RSSL. Another way is by pulling those weeds before class and bringing them with me to give people a quick identification lesson. Nearly everyone recognizes them from the yard, the sides of the road, the sidewalk cracks, and every neglected lot in the city. The desert, full of food, will never look the same again, will it? This is how a sense of place is developed. It is subtle. It is knowing the plants (and perhaps later them knowing you). It is seeing the mesquite (*Prosopis spp.*, 3) and palo verde (*Parkinsonia spp.*) trees, the creosote (*Larrea tridentata*) and wolfberry (*Lycium spp.*) bushes, the globemallow (*Sphaeralcea spp.*) and sunflower weeds, and knowing their tastes, smells, and medicines, their dormancy, flowering, and fruiting—knowing their life cycles and having them entwine with your own.

Summer monsoon means the unmistakable smell of creosote in the air, the collecting and seemingly endless drying, sorting,

and storing of mesquite pods before the rain. The tiny bruchid beetles fly around the house, gathering on the back door by day and on the indoor houselights at night—they leave nips on my body now and then. This peak gardening season—yes, in the desert summer—brings, at the very least, the corn, beans, and squash that have been staples for thousands of years. Then comes the eerie brightness of the magenta prickly pear, the juiciness of its fruit so incongruous in the plant's desert home, along with the fresh orange hackberries. The cooling fall arrives, and the peak season of introduced crops begins. RSSL stewards a selection of desert-adapted, non-bioregional seeds to provide off-season fall crops.

The winter rains come, returning the pungency of creosote to the air. The wildflowers bloom—different every year. In spring, yellow flowers explode everywhere: the puff balls of the acacia add an exciting variant to the more rare pinks and purples of the riparian desert willow (*Chilopsis linearis*), jacaranda, (4) and the now sadly unpopular spined ironwood (*Olneya tesota*). For a short time, the pods of green teardrop palo verde (*Parkinsonia microphylla*) pop out to offer their edamame-like experience. These, as well as jojoba (*Simmondsia chinensis*) and wolfberry, may be stored for the year. Finally, again, the heavy bundles of mesquite pods can be spotted on the trees as the humidity rises with the returning summer monsoon, repeating the cycle.

As you might guess, RSSL offers tree seed and seedlings, cuttings, and wild plants, as well as the more familiar agricultural seeds.

Use it or lose it

The slogan for RSSL, “Use it or lose it,” carries multiple



The author's children surrounded by mesquite pods. Children can be taught early on about wild harvesting and processing.

meanings. It addresses the loss of seed-saving skills, of traditional (indigenous) agri-cultural knowledge, and of bioregional cultural diversity, as well as the obvious loss of seed diversity. Thus we teach traditional desert gardening and farming practices but especially seed-saving, featuring seeds important to the indigenous peoples of our region, and share what knowledge remains of how those plants were used.

The edges hold the most diversity: where peoples and cultures merge, swap, and fight. Such loved characters in the local food movement as the I'toi onion and White Sonora wheat carry a heavy history. I hear the name of Father Kino associated with this seed over and over, but I ask who was doing the work? Who were the first farmers and stewards? I repeatedly shoved down my reaction to White Sonora wheat as it returned to prominence. Finally, I stopped and took in my feelings. The story of my great-grandfather escaping a missionary school at 12 years old because of beatings and not being allowed to speak Hiaki, ran in my head. I hadn't realized the mention of Father Kino was angering me. Who actually did the planting, harvesting, and winnowing of that famed wheat? Who kept those seeds when they fell out of agricultural favor? How often is that mentioned? (5) Why are cultural histories glossed over? Those prized foods exist because people were colonized. White Sonora wheat provided an important winter harvest to the indigenous peoples (remember summer is the high season) and, with our increasingly drying Earth, promises a legacy of tough staple wheat. Both the seed and the stories of why it exists need a place in seed libraries. Oh, the irony of the indigenous peoples stewarding the seeds and trees of a missionary—it's not Father Kino I think of when I hold a stalk of White Sonora wheat, but the blood, sweat, and tears of those who stewarded it—and I am so grateful. I'toi onion and White Sonora wheat are found in RSSL.

I know I picked on foreign greens and lettuce earlier and introduced crops above, but a lettuce is actually one of the prized crops in RSSL. It is a Cimarron Romaine. I obtained it through a community seed grant from Native Seeds/SEARCH. These lettuce seeds were from their farm at Patagonia, meaning



Jing at seven years, processing clumping I'toi onion for RSSL. The original bulbs were a gift from Tohono O'odham farmers.

the parent plants had indeed survived well enough to reproduce in the desert. Success! And some of those seeds were given to me. Among the Tom Thumb bibb and Oakleaf looseleaf lettuce seed also sent, the Cimarron Romaine stood out. Not only was it a good tasting plant, but it survived to reproduce, unlike all the Oakleaf and all but one of the Tom Thumb. Every Cimarron Romaine survived the season and went to seed. Even with losing many of those seeds to wind and to a spilled envelope accident (sigh), I have enough seeds to feed the entire city for a decade! Cimarron Romaine, you hold a special place in my heart and now in RSSL. Let us see (no pun intended) if your legacy grows on, and if you continue to thrive in our cool-season desert gardens where others wilt and never seed.

I see the desert choked by the introduction of salt cedar, but I don't think the primary issue is the salt cedar itself, but the loss of traditional stewardship.

Growing seed is in itself a slow food paradigm. No magical, clean, and tidy packet is going to appear at the end of that stalk of lettuce, but something real—hundreds of seedheads, which may be lost to the wind in a day or be completely void of viable seed. On the other hand, you may succeed and experience the abundance of nature—thousands of tiny black lettuce seeds. More lettuce than you could grow in a lifetime on an urban plot—all from one plant. Staring at your glass jar of thousands of seeds from that one season can leave you wondering why anyone is going hungry in the world. Enough Farm-to-Fork—we need seed-to-seed thinking!

What defines a native?

My own family history is as muddy as that of most Americans. The stories on my father's side are more intact than those on my mother's. I know my father's people are the Yoeme, but mainly my mother's family define themselves as Mexican from Sonora. Mexican is as much a culture as White or American. Quoting an acquaintance, "The thing is, a long time ago there were no such beings as 'Mexicans'." Mexicans are basically "Lost" or Assimilated Natives who forgot who they were, so they called themselves Mexicans. Mexican is not a race—it's a form of nationality." Most people forget we were all indigenous at one time, whether Red, White, Black, or Yellow. Some of our ancestors forgot this long before others, and some still remem-

ber. For this reason, for many Americans, the idea of a homeland or a culture may no longer exist.

In nature, no one thing lays claim to a bioregion. Species move in and out, sometimes rather violently, or evolve; the same is true of people. As the current population, we are the new stewards. Whether we are a long-time resident or a recent transplant, the responsibility of bioregional stewardship rests on our shoulders. But we don't have to reinvent the wheel. The cultural history of the local indigenous peoples offers us direction; we have the history of the colonizers before us and what they contributed (whether we deem it positive or negative), and we have the present-day culture of the indigenous and settled peoples.

I find it ironic when the invasive species debate arises. It's always humorous to be the token Native in a room of white people discussing the definition of invasive species: originates outside the local area, has the potential to spread long distances on its own, once established has the potential to out-compete native species in the wild. (6) Somehow I think any joke about what to do with the invasive Europeans would not go down so well. Can we uproot European peoples? Cancel their visas? Build a great wall along the East Coast?

The edges between indigenous and settled peoples, and of ancestral and adopted foods, provide insight into the use of native and non-native plants and offer a place to begin research on plants to use in a permaculture design. I'll share a few of the questions I ask. What are the Native stories of that plant? What interaction has it had with the local indigenous peoples? How about the settled people's cultural history of it? Does the

Let's slow down and learn the history and culture of the indigenous peoples in the area where we work and live.

interaction span 50, 100, 200, 1,000, or more years? I'm wary of using many plants without any relationship stories. I also don't regard the marker of European contact as the be-all and end-all. I understand that many people want to remove the human factor when deciding whether a plant is native or not, but this does not entirely make sense to me as an indigenous person. America was largely stewarded by the time of European contact. This land was not a bubble of untamed wilderness. Humans have and will interact with their environment. Do we imagine that Native Americans were not introducing weedy plants to new bioregions? We certainly know they were introducing crops such as corn. I see the desert choked by the introduction of salt cedar, but I don't think the primary issue is the salt cedar itself, but the loss of traditional stewardship.

We are still here

I have noticed a recurring pattern in permaculture gardens of growing token native plants or designating as the "native plant garden" an area filled primarily with ornamentals or signs indicating such and such as a dye plant used by such and such tribe. Well, what's the point of having a native garden if you aren't using the plants—whether for food, drink, medicine, fiber, ceremony, music, shelter, livestock, etc.? It's as if the poor

plants are on display in the same way as the people. A token remnant of what was, but no longer will be—dragged out for an elementary field trip to the garden or for an exploratory Thanksgiving curriculum. My challenge to you is to bring these traditional native plants into modern times, to steward the dying traditions, recipes, and craftsmanship that supplied an indigenous nation, for we may need these the most when they're gone. We're at the point of, "Use it or lose it."

A local example is the sweet mesquite tree (3) here in



My eldest daughter Jing, at age five, showing her wolfberry catch. The wolfberry bushes along with a flowering desert willow can be seen behind her.

the Sonoran Desert. As desert natives, they are a semi-popular landscaping tree, but hardly anyone knows they're a staple food of the indigenous peoples. The pods are everywhere in

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the summer, a bane of many HOA homeowners. I say they are semi-popular, as non-native mesquites from South America are unfortunately favored. They offer the same arid-adaptedness, but not the same sweetness or bioregional history. At the Desert Botanical Garden, there is an old mesquite pod mortar-and-pestle on their Plants and People of the Sonoran Desert Trail, but there is no hammermill and no modern-day recipe board, or any information on how mesquite is used today. A hammermill is our modern blessing for quickly pulverizing whole mesquite pods into flour. The Tohono O'odham reservation has a hammermill which we are able to use under their guidance. Desert Harvesters, a Tucson organization, puts its spotlight on native, food-bearing shade trees: it runs its hammermill for the public. Native mesquite beans are included in RSSL. You may also recognize mesquite flour from Slow Food's Ark of Taste.

Another unfortunate pattern of oppression is the co-opting of indigenous ideas. I recall an Elder's response on hearing that Richmond Grows Seed Lending Library was claimed to be the first public seed library. He said, "We had a seed library 30 years ago when I was a young farmer. We placed a clay pot on a table in the community room. People placed their seeds in baggies and put them in the pot and others took as they needed." His plucky response was an acute reminder that our permaculture idea is probably a new spin on an indigenous theme. Seeds are sacred, and it's rare that I come across an indigenous person selling their seeds. Actually, the only time I've encountered it has been in the guise of a non-profit or co-op to keep the Native farming tradition alive. I relay this personal experience, as it is the most pertinent to this article, but time and time again, I cringe at permaculture events or online groups when people title anything as "the first," especially concerning their work in (so-called) developing countries. (7) Be mindful of your language.

Let's slow down and learn the history and culture of the indigenous peoples in the area where we work and live. It may take much time and effort to encounter what continues among indigenous peoples, and to earn a friendship, or dare I even

say—learn the local language instead of relying on their knowledge of English. Go on guided plant tours, search the library and bookstores, visit local museums, visit the resources on the reservations, and introduce yourself. Volunteer and attend public events, and search the Internet and social media for decolonization groups and events. We are blind to the presence of indigenous peoples and cultures, and it will take a lot of work to stop and then to redress the damage of colonialism.

Bringing it home

When I was growing up, our family garden was full of sunflowers and chiles. There were no lettuce, beets, onions, chard, or even tomatoes. There was, however, nearly a year's supply of sunflower seeds for me and my brother and a never ending supply of various chiles. People knew where to come for their chiles, and we gave those away by the handful. It wasn't until having my own children that I acknowledged how strange I felt planting greens and root vegetables. It's not the legacy I want to leave my children. Yes, I want gardeners, but I want desert gardeners, indigenous gardeners, and this will happen only through growing the food of our bioregional culture. Our story is sunflowers and chiles. What's yours? Δ

Cris Franco remains a devoted Southwest desert dweller despite her travels. Her permaculture interests lie in the social realms of family, culture, and traditional health (Zone 00). In August 2012, she created Rio Salado Seedshed Library (rsssl.org), a network for the greater Phoenix area. Her website is sewapermaculture.com and with her partner she facilitates a PDC twice a year in Phoenix through Four Directions PermaCulture.

Notes

1. Native Seeds/SEARCH's Conservation Center, www.native-seeds.org
2. Purslane may have been a pre-invasion settler. "Verdolaga (*Portulaca oleracea*)," <http://extension.umass.edu/vegetable/ethnic-crops/verdolaga-portulaca-oleracea>
3. I am referring to three mesquites in particular: velvet (*P. velutina*), honey (*P. glandulosa*), and screwbean (*P. pubescens*).
4. Jacaranda is not native to the area, but is a drought-tolerant landscaping tree. Its large, beautiful panicle flowers are difficult to miss and are now part of my Sonoran Desert memory.
5. For an insightful article, photo slideshow, and short film "Tasting History: Seeds of an Era Long Gone," http://www.nytimes.com/2012/11/22/garden/in-tucson-a-search-for-fruit-the-missionaries-knew.html?pagewanted=1&_r=0
6. "Defining "Native" and "Invasive"," <http://nativeplantwildlifegarden.com/defining-native-and-invasive-2/>
7. I use "developing countries" for ease of communicating, but the reference to "development," as well as the terms "3rd world" and "1st world," are foreign-imposed labels disdained by many people worldwide. State and national boundaries are modern constructs. When outlining their homelands, indigenous peoples tend to use natural boundaries such as mountains, rivers, and where a certain species does or does not grow.



The author (with Rhiannon) leading a group through prickly pear processing methods and mesquite muffin solar baking.

A Seed-Saving Primer

Randel A. Agrella

IT'S EASY FOR GARDENING to become just another consumer activity, as home gardeners often start the season buying seeds or plants, soil amendments, and continue to buy through the seasons. That's fine, as far as it goes, but the desire for simple living suggests another approach. Why buy what Mother Nature willingly provides at no cost, with little human intervention?

Organic gardeners and permaculturists already know that composting is Nature's way of returning nutrients to the soil; closing a natural cycle, it allows endless new beginnings. It's a logical next step to consider saving seed, which allows savvy gardeners to close another natural cycle: the life-cycle of garden plants.

Even when a gardener is willing to buy seed, it may not be available. Non-stop consolidation in the seed trade means an ever-shrinking number of seed companies. If it's in their interest, they'll drop a variety of fruit or veggie just like that. Remember when you found that perfect green bean, one that grew so well and out-produced everything else—but then wasn't available the next season? Saving seed allows gardeners to keep a reliable supply.

Seed-saving is all about the flowers: nurturing them, encouraging them...

Getting started

Gardeners will often shy away from the idea of saving seeds. It sounds too difficult to some; others may not see the value. But most who try it find that seed-saving is not that hard, and it's very satisfying.

All common garden plants incline naturally toward flowering and forming seed—it's what plants do! Saving seeds involves little more than stepping aside and allowing nature to take its course. There's no need for a lot of fancy equipment—well-stocked kitchens contain the main tools needed for harvesting and storing seed. Colanders, sieves, maybe a blender or grater, and jars or baggies will suffice for the collection and storage of a wide range of seeds.

Whatever value a flower may have to a bee or a person, to the plant it has but one purpose: to create seed to ensure that the species survives another year. Everyone has seen flowers



John Glavis holds freshly collected amaranth seed with lots of chaff from the dried seed head. Careful sieving and winnowing is needed to clean the fine seed. Photo by Brian Dunne.

of beans, peas, or squash. But how many gardeners have seen the flowers of carrots, beets, or leeks? Seeds come from flowers. Seed-saving is all about the flowers: nurturing them, encouraging them, and, when the time is right, taking in the harvest.

Hybrids don't work!

Seed saved from hybrids won't run true to the parents. Instead of robust, disease-resistant, productive plants, seed-saving from hybrids usually results in sickly, worthless ones. The reasons lie in how hybrid lines are developed and maintained. A much better choice is to save seed from open-pollinated varieties. These will breed true generation after generation. Trueness-to-type allows gardeners the confidence of knowing what to expect from their seeds, which is vital to creating a productive garden. The ability to save the seeds of heirlooms (open-pollinated varieties) is a major reason they are all the rage today. Heirloom varieties have been grown and preserved for decades, sometimes for centuries, by generations of gardeners. Today's seed-savers find it practical and satisfying to be a link in the chain of gardening hands that extends back into the past, and forward into the future as well.

When it comes to saving viable, true-to-type seed, plants have different requirements. For example, flowers differ in their mode of pollination—bee-pollinated vegetables may need to be isolated half a mile from similar crops. Some seeds benefit from special pre-treatment, including fermentation of the fruit pulp in contact with the seed. Effective seed-saving must take into account these specific requirements.



The Hidatsa people grew these dry beans along the upper reaches of the Missouri River in North Dakota. Maintained over the generations, they are now available as Hidatsa Shield pole beans. Photo by Brian Dunne.

Genetic considerations

Seed saving begins by determining how a crop is pollinated. All garden plants fall into one of two categories: outcrossers or inbreeders.

Outcrossing plants need to cross with other members of the species to give viable, vigorous seeds. If bred with only a few closely related plants, subsequent generations are apt to be weak, slow-growing, and unproductive—all characteristics of an inbred population. Outcrossers need a large population to maintain vigor. Authorities recommend 200 plants as a minimum for corn, and at least 25 for squash, melons, and other cucurbits. Therefore, when saving seeds of outcrossers, gardeners should expect to devote adequate space, save lots of seeds, and plan to store them effectively to use over several seasons, eliminating the need to save fresh seeds every year.

Inbreeding plants have flowers that self-pollinate. They may already be pollinated before the flower opens. Such plants require a much smaller population for good seed production. In many cases, seed could be saved year after year from even a single plant with no apparent loss in vigor. It is still recommended to take seed from at least a few plants, however, for the sake of maintaining some diversity.

Pollination vectors and isolation

Maintaining true-to-type strains requires isolating one variety from another. Crossing can otherwise occur, and subsequent generations won't "match" the parents. How the flowers are pollinated determines the isolation distance.

Self-pollinating flowers require little isolation. Often 10-20' in the garden is sufficient to avoid the very occasional chance cross of self-pollinated flowers. Self-pollinators include beans and tomatoes.

Insect pollination mandates greater isolation from one variety to the next. The usual insect pollinators are bees, although

moths, butterflies, and flies are at work as well. Insect-pollinated varieties need up to one-half mile from their neighbors to be safe from crossing. Some typical insect-pollinated types are squash, cucumbers, and melons.

Wind-pollinated vegetables can cross-pollinate up to a mile away. Typical wind-pollinated vegetables include corn, beets, chard, and amaranth.

Seed extraction

It's vital to extract only mature seeds. Extraction techniques vary according to the type of plant. With some, simply splitting a dry pod and collecting the seed is all that's needed. Others may require a wet-extraction or fermentation process. None of these techniques are difficult, but knowledge and planning pay dividends in the form of viable, healthy seeds.

Seed storage

Once seeds have been properly extracted and dried, they must be stored properly. Such seeds can remain viable for many years. Heat and humidity injure stored seeds. Therefore a cool, dry location for the seed bank is necessary. Seeds shouldn't be stored in a bathroom, kitchen, or damp basement. And they shouldn't be stored near a sunny window, stove, or heater vent. Most garden seeds will store safely for 3-5 years just by observing these simple rules. For room-temperature storage, envelopes, plastic bags, or recycled jars are suitable. In humid climates, a packet of silica gel to absorb moisture is a wise precaution.

Very long term storage is possible in the freezer at about -18°C (0°F). Garden seeds last literally decades in such conditions. For freezer storage, jars with screw tops are preferred, because they have the best seal against moisture. Silica gel desiccant may be helpful under these conditions. Allow the container to warm to room temperature before opening a jar of frozen seeds. This procedure takes a few minutes longer, but will prevent the condensation of moisture from the air onto the cold seeds.

Tomatoes, peppers, and eggplants

Tomatoes, peppers, and eggplants belong to the same family, along with ground cherries and tomatillos. Their pollination and seed-saving requirements are fairly similar: all are inbreeding and self-pollinating. The flowers are self-fertile, requiring only the tiniest nudge to "trip" them and ensure pollination. Simply jostling a tomato plant in bloom is generally enough to pollinate its flowers.

They don't need large populations to maintain viable, vigorous stock. In theory, seed could be saved from a single plant year after year with little loss in vigor. However, growing at least three individuals of a variety allows some selection and a check on the strain's uniformity.

To varying degrees, members of this family are quite capable of outcrossing, despite being self-fertile. The flowers can be insect-pollinated, but aren't terribly attractive to bees, who will

gladly forage elsewhere if they can find better fare. The pollen is also relatively heavy, and bees seldom carry it far. Most tomatoes need only 10-20' between varieties to maintain purity, eggplants 50', but peppers need much more: about 500'.

Once pollinated, the fruits must mature fully on the plants for best quality seed. With tomatoes, the seed is ready when the fruit is fully ripe whether on the vine or off. With peppers and eggplants, a color change usually signals full ripeness. Peppers turn red, sometimes orange or yellow; eggplants vary, with purple types turning brown, white turning yellow, and so on.

With peppers, extraction is simple. The fully ripe fruits are simply cut open, and the seeds scraped out and collected. If desired, entire cores may be removed intact, with the seed still attached, and allowed to dry before removing the seeds.

Eggplants are generous producers. Use a knife or a toothpick to tease a few dozen seeds from a mature fruit. For larger amounts, grind the fruit in a meat grinder or food processor, and wash the seeds in buckets of water until all the pulp has floated away. The light brown seeds will all sink to the bottom. Any floating seeds are probably undeveloped and should be discarded.

Tomato seeds may also be extracted individually from the fruits; quite a lot of seed may be amassed using this method. If more is wanted, the fruits may be crushed or run through a mill of some sort—some folks use a food processor, but others feel this damages the seed.

Proper isolation guarantees pure seed; without it, saved seed can be very different from its parent.

Allowing the tomato flesh to ferment briefly helps loosen seed from pulp. Fermentation also discourages some seed-borne diseases; fermented seed often germinates more quickly when planted. At warm summer temperatures, the process takes only two or three days. Cover mashed tomatoes with cloth or another closure that permits air flow but keeps out flies. Place the bowl or bucket out of the way, as a marked odor will develop! In a couple of days, a white mat of mold becomes discernible on the surface of the pulp. At this point, wash the seeds free of pulp and skins. Allow them to sink, and pour off the unwanted material in successive rinses. The good seeds will sink; the pulp will mostly float off. The seeds should be removed promptly however—too long in fermentation, and they could sprout!

Dry the seeds quickly and thoroughly. Spreading thin layers in front of a fan should dry the seeds fully in 3-4 days. Dried seeds may then be stored.

Seed-saving tips—squash family

Squashes, cucumbers, melons, and watermelons are closely related, and have similar requirements when grown for seed. These large-fruited plants yield quantities of large seeds and are great choices for beginning seed savers, provided proper isolation can be maintained. For this reason, it's necessary to know which species you're growing.

Different genera won't cross with each other. Cucumbers (*Cucumis spp*) cross only with cucumbers, never with melons (even though some melons are *Cucumis spp*, crossing is very rare) or watermelons (*Citrullus lanatus*)—and so on. It's easy to recognize these vegetables as distinct types, but squash are more problematic. Squashes (*Cucurbita spp*) actually come in four species, each of which, for all intents and purposes, won't cross with the other three. So it's possible to grow one of each species near each other, with no crossing concerns. To determine which species you have, check the seed packet or the catalog.

Four species of *Cucurbita* are cultivated in the US: *C. pepo*, includes zucchinis and typical summer squash (like yellow crookneck), but also some of the pumpkins and winter squash like acorn and spaghetti squash. Most winter squash and pumpkins are *C. maxima*. *C. moschata* includes winter squash like butternut and the Italian variety known as tromboncino that have solid stems. *C. mixta* (sometimes called *C. argyrosperma*) includes the cushaws, calabaza, and squash that are grown primarily for their edible seeds.

Proper isolation guarantees pure seed; without it, saved seed can be very different from its parent. These crops are bee-pollinated, and so can be crossed by other varieties of the same species, growing within a half-mile radius. That's a pretty good distance, especially to city dwellers. Fortunately, while a half-mile guarantees purity, lesser distances still help. The farther the plants are, the smaller the likelihood of unwanted crossing—even 500' is much better than nothing.

If isolation cannot be assured, hand pollination is possible. Because blossoms open in early morning, they should be bagged the previous day. An envelope or small paper bag works well, especially on large blossoms. Squash plants have separate male and female blossoms. Female blossoms are easy to identify,



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having a miniature fruit right at the flower's base, while male blossoms are smooth at the base. Pick the male blossom, and rub its center on the center of the female blossom. Re-bag the female flower until the next day, when fertilization is no longer possible. If pollination is successful, the incipient fruit begins to grow even as the flower wilts and drops off. Mark the fruit with a colored twist tie like those used on bread packages.

Nothing could be easier than saving seed of beans and peas.

Fruits must ripen fully before seed is extracted. On winter squash and melons, full ripeness coincides with the correct time for eating as well. When preparing the fruit for cooking, scoop out the seeds and save them, rather than feeding them to the chickens. In contrast, summer squash, cucumbers, and watermelons need to stay on the vine past the normal stage for eating. Summer squash needs to show a hardened exterior. Cucumbers become enormous, usually yellow, and very soft. Watermelons may crack or become soft. It's best with any of these to pick the fruit and hold at room temperature two weeks or longer to increase the seeds' viability.

Fermentation simplifies cleaning larger quantities and reduces seed-borne diseases, as with tomato seeds. Scoop out the pulp, and place it in a bowl or bucket. Add water just to cover. After a couple of days, wash the whole mess in a colander. Fermentation softens the fibers surrounding the seeds, which are easily washed clean with the stream from a hose. Viable seed is plump and solid; immature seed is often small or hollow. After washing, air-dry the seeds indoors for a week or two. When a seed can be snapped in two, the batch is sufficiently dry. If the seed merely bends, more time is needed. Dried seeds are packaged and labeled. Stored in airtight jars in a freezer, seeds will keep for decades, amply rewarding the gardener's seed-saving efforts.

Beans, peas, and other legumes

Nothing could be easier than saving seed of beans and peas. In fact, with these vegetables, the crop usually is the seed. Once the pods begin to develop, they are simply allowed to remain on the plant until fully dry. Then the pods are picked, and the seeds extracted.

All the common legumes are self-pollinating, but some are more apt to cross than others. The degree of crossing seems to vary from place to place, and even from season to season. As a rule, their flowers aren't terribly attractive to bees. One possible precaution is to grow something that the bees find more attractive. Members of the mint family, like basil, lemon balm, mint, or oregano, are wildly attractive to bees, and make good decoy crops. If bees are observed working the legume flowers,

then saving that particular crop of seeds isn't advisable.

Another possibility for self-pollinating flowers is "caging." A barrier is created to keep bees from reaching the flowers, so that only self-pollination can occur. Sometimes frames and screen are used; on a small scale, floating row cover works well. Many gardeners already use it to hold in a bit of heat in cool weather to preserve tender crops. For caging, use the lightest grade, which holds in the least heat. Simply spread it over the plants to be protected, and secure it with rocks or boards. Once blooming is finished, remove the row cover.

To harvest small amounts of seed, simply shell the dry pods. For larger quantities, thresh the seeds from the pods. Place the pods into a cloth sack, like a feed sack—even an old pillow case will do. Then briskly stomp the sack to break the pods and release the seeds. The seeds, being heavier than the pods, quickly drop to the bottom of the sack. Pull the unwanted portions—empty pods, broken stems, and dry leaves—out of the bag, leaving the beans and some fine matter. Separate the seeds with a colander or screen, or winnow the whole mass by pouring it back and forth between two bowls or buckets in a light breeze or in front of a fan.



Planting heirloom lima beans (Christmas Pole Lima). Photo by Brian Dunne.

Garden legumes differ from one another in their pollination and isolation requirements. Common beans (*Phaseolus vulgaris*) rarely cross-pollinate. A distance of 25-50' from one variety to the next is considered sufficient. English peas (*Pisum sativum*) have usually been self-fertilized even before the flowers bloom, so no isolation is necessary in the home garden. Bumblebees occasionally pollinate field or cowpeas (*Vigna unguiculata*). If none are working the flowers, the seed should be pure. Where bumblebees are prevalent, caging may be needed if multiple varieties are grown. Lima beans (*Phaseolus lunatus*) are more easily crossed, and bees do like them and may carry pollen up to a mile. If isolation cannot be assured, caging the plants will be necessary. Peanuts (*Arachis hypogaea*) are grown in home gardens more commonly in the South than elsewhere. Bees may carry peanut pollen up to a mile, so complete isolation may be impossible, except by caging the plants. Like English peas, soybeans (*Glycine max*) are usually self-fertilized before the

flowers open. No isolation is necessary.

Other crops

Lettuce (*Lactuca sativa*) is self-pollinated and rarely crosses with other varieties—another good choice for the beginning seed-saver. The flowers look just like dandelions, complete with fluff on the mature seed. Lettuce goes to seed very easily; the trick is simply to allow it to flower and then catch the ripe seeds before they fall to the ground. When the seeds become loose in the seed heads, it's time to gather them. Hand-picking is easy enough, but for larger quantities, whole seed-stalks are gathered, dried indoors, then placed in a bag and threshed out. Some growers take a battery-powered vacuum right into the garden and vacuum the seed heads periodically!

Okra (*Abelmoschus esculentus*) is a Southern staple whose seed is easy to save. A few pods are simply left on the plants where they quickly become woody and inedible, as every okra grower knows. The main problem is that bees can pollinate the flowers, so isolation requires a mile, which is impractical where okra is widely grown. However, the flowers are also self-fertile, so bagging blossoms is possible, and a single pod may yield 50-100 seeds.

Bees carry sunflower (*Helianthus annuus*) pollen up to a half-mile. Fortunately, bagging the seed heads is easy; paper bags are placed on the flowers before they open and kept in place for a couple of weeks until the outer or ray petals have withered. The seeds are then removed by rubbing two dried seed heads together—the seeds fall right out.

Corn (*Zea mays*) is wind-pollinated and requires one mile of isolation. If this cannot be provided, seed should not be saved. [Editor's note: Opinions differ on the minimum isolation distance for corn. Native Seeds/SEARCH recommends isolating varieties by at least 1,000' in arid conditions and more in humid climates. UC Davis (Brittan, 2006) reports that 660' (200 m) was sufficient to limit cross-pollination to 1% or less, while 984' (300 m) reduced it to 0.5%. However, even 1,640' (500 m) could not reduce cross-pollination to 0.1% consistently. One strategy to ensure no crossing of adjacent plots is to plant sacrificial border rows. These border rows intercept most of the pollen from adjacent fields; seed is saved only from plants in the center of the field. Similar techniques may be useful with other wind-pollinated crops.]

Biennials

Cabbage, some kales, collards, broccoli, cauliflower, and kohlrabi are all biennial, so they must be brought through a winter before they will bloom and set seed. Except in really cold winters, they will usually overwinter right in the field. Floating row cover or mulch helps. Lifting plants and storing in moist sand in a very cool spot like a root cellar or unheated garage sometimes gives better results. After replanting in the spring, the plants begin to grow again and soon bloom. Because the flowers are bee-pollinated, only a single variety can be grown for seed at any one time, isolated by a mile. Moreover, all those listed above are a single species, *Brassica oleracea*, and all varieties,

whether morphologically distinct or not, are sufficiently genetically alike to cross easily. Fortunately, the *brassicas* are generous seed producers, and it's possible to choose one type each year and save a lot of seeds, which may then be used for several successive years. The next year, a different variety can be grown for seed, and so on. It's possible to maintain five or six different types in this way.

Individual seed pods may be picked when ripe (brown and dry) or entire seed stalks brought indoors, dried, and threshed as for lettuce.

Turnips (*B. rapa*) and rutabagas (*B. napus*) are *brassicas*, but they are two different species. They won't cross with each other or with those relatives listed above, although some kales, the Siberian types, may cross with rutabagas. Isolation requirements and seed-saving techniques are otherwise identical to cabbage and the other family members as listed above.

Carrots (*Daucus carota*) are another biennial. Their lacy white flower heads are bee-pollinated and need up to a half-mile isolation from other carrots and from Queen Anne's Lace, a wild carrot widely distributed throughout the eastern US. Unless good isolation can be assured, this crop should be avoided for seed-saving purposes.

Beets and chard are biennials. Because these two are really a single species (*Beta vulgaris*), all types cross freely. The wind-borne pollen travels up to five miles, which is why GMO beets are such a concern! It's best to grow only a single variety at a time, but bagging the seedheads prior to bloom does work. Mesh or row-cover bags are ineffective, however, as pollen blows right through the pores. Δ

Horticulturist Randel A. Agrella has supervised rare seed production at Baker Creek Heirloom Seed Company (www.rareseeds.com) in Mansfield, MO, since 2005. He owns and operates Abundant Acres (www.abundantacres.net) which grows strictly heirloom vegetable plants in the spring, shipping them throughout the eastern and central US. His articles have appeared in a number of publications. This article was originally published as a series of six in Natural Awakenings Magazine of Southwest Virginia, beginning in November 2010 and is reprinted here by permission of the author.

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A Multipurpose Tree for the South & Southwest

Experimenting with *Leucaena*

Marjory Wildcraft

GARDENING IN THE SOUTHWEST during the hot, dry summer months of July, August, and September is challenging to say the least. Many gardeners and commercial organic farmers use shade cloth, often tediously covering their plants during the heat of the day, then removing the shade cloth during morning and afternoon hours.

I went on a quest for a sustainable alternative to synthetic shade cloth and discovered a small, fast-growing, deciduous tree called *leucaena* (or lead tree) which I've come to love and appreciate. In addition to finding a perfect solution for living shade cloth, I found an amazing variety of uses for this tree. I hope by sharing my experiences with this plant to inspire others to try working with her. Although this article focuses on *Leucaena leucocephala*, which grows best in latitudes south of Dallas, the genus *Leucaena* contains about 24 species of trees and shrubs, and the concepts I discuss are appropriate for the use of similar species in more northern latitudes. For example, Peter Bane, author of *The Permaculture Handbook*, uses a species of mimosa (*Albizia julibrissin*) in his garden in Indiana.

Leucaena is native to tropical climates and dies back with the first freeze (typically mid-November in Central Texas where my primary research center is located). Seasonal die-back is desirable in my system, as I don't want shading during the winter. Unlike many tropical plants, *leucaena* emerges in early spring and has enough growth to provide shade by early summer: a perfect timetable for the Southwest. *Leucaena* grows a single stalk in the first year; it comes back in successive years as a multi-stalked plant. Its life expectancy is about 15-20 years.

Leucaena is a legume and has the small compound, pinnate leaves typical of that family. She provides a gentle, dappled shade. I planted her down the middle of my garden rows (ori-

ented north/south) which allowed sunlight to reach the smaller plants during morning and afternoon hours, but cast a light shade during midday. I've experimented with several spacings and have found that planting the trees about 6'-8' (1.8-2.4 m) apart provides a good level of shading and sunlight. Plantings spaced at 4' (1.2 m) yielded too dense a shade. And spacings of 10' (3 m) or greater yielded too little. Under the shade and companionship of my *leucaena*, winter greens like chard and

I enjoy the taste of crunchy, mature *leucaena* seeds cooked like popcorn.

collards have lasted significantly longer into the summer.

Leucaena is both heat- and drought-tolerant. Amazingly, she survived the summer of 2011 with 90 days over 38°C (100°F.). With enough water, the foliage was always lush and never showed signs of wilting or heat stress. Under normal conditions, *leucaena* doesn't need much water. I've seen her growing in extremely dry soils and high heat without any supplemental water, but she only *survives* in those conditions. Provide the small amount of extra water she needs to thrive, and she will produce amazingly abundant foliage. With irrigation, I've gotten three and sometimes four cuttings in a season. My plants would grow 8'-10' (2.4-3.0 m) tall, and I would cut them back to about 5' (1.5 m). Then, they would regrow, and I would cut again.

I enjoy the taste of crunchy, mature *leucaena* seeds cooked like popcorn. *Leucaena*'s young pods and leaves are said to be edible, but I didn't find them particularly palatable. While humans probably aren't going to start eating *leucaena* leaves and pods anytime soon, rabbits and other livestock love them, especially during August when there is a scarcity of anything green. Fresh *leucaena* leaves are fairly high in protein, which is also desirable during the heat of summer. I've dried *leucaena* leaves for winter livestock feed—they contain 24-27% protein. The leaves do contain mimosine, which is toxic if overeaten. I've found I cannot feed more than about 10% *leucaena* in the diet of my rabbits. The first sign of mimosine toxicity is hair thinning, then loss. Eventually, death will occur (although I never let it go that far).

Like many but not all plants in the legume family, *Leucaena*



Rabbits enjoy fresh leucaena leaves. Livestock can handle leucaena in moderation, but no more than about 10% of their diet.

fixes nitrogen. [Ed.: *Cutting or coppicing nitrogen-fixing plants releases nitrogen from their root nodules to fertilize nearby plants.*] But its most desirable aspect is the transpiration of water which creates a lush microclimate in the garden and provides habitat for birds, butterflies, and other insects.

The dead trunks left behind in winter have many uses. Sometimes, I leave them in place as support for vining plants. I've also visited sites that use tightly planted rows to surround a garden as a living fence. The trunks are very straight, and the wood is excellent for woodworking, stakes, or scaffolding—I've made bow drill sets with it. The wood is highly flammable and of an excellent size and burn rate for rocket stoves. *Leucaena* bark has potential for cordage, but I've not yet experimented with that.



Leucaena's prolific biomass production yields abundant mulch.

Seeds are often difficult to obtain—suggesting a possible side income.

I start my *leucaena* trees in a greenhouse in early spring. I try to plant the seeds so that the seedlings are ready to transplant after the last frost, but before they are more than 12" (30 cm) tall (about 10 weeks). *Leucaena* seeds have a very low germination rate (~10%) and require scarification. [Ed.: *This involves nicking or abrading the seed coat or subjecting it to a brief immersion in hot water or acid.*] Seeds are often difficult to obtain—suggesting a possible side income.

Two sources for seed are ECHO Seeds (www.echonet.org), and occasionally World Hunger Relief (www.worldhungerrelief.org). Note that many native *Leucaena* spp are slow-growing and not as palatable to livestock as the developed varieties.

Leucaena is a highly researched plant used extensively in tropical countries. Much information regarding propagation and culture is available via the Internet and printed material. Deep appreciation is extended to Matt Hess of World Hunger Relief Inc., ECHO seeds, and to Dr. Steven Lukefahr of Texas A&M for their assistance and collaboration around the many uses of *leucaena*. Δ

"Homegrown Food On Every Table" is the vision of Marjory Wildcraft's organization. She has been called the "Martha Stewart of Self-Reliance" as she is a regular guest on many national radio and television shows. Most recently, Marjory was featured as an expert in sustainable living by National Geographic. The author of several books, she is best known for her video series "Grow Your Own Groceries" which helps you create an organic food producing paradise in your backyard. "Grow Your Own Groceries" is widely used by homesteaders, survivalists, universities, and missionary organizations around the world. Marjory has an online resource center for backyard food production at www.GrowYourOwnGroceries.org where you can find inspiration, humor, and practical steps for getting homegrown food on your dinner table.

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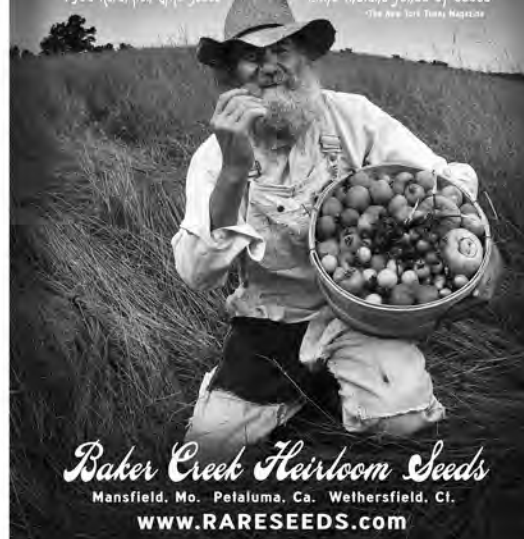
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Volunteer Plants in the Garden

Michael Pilarski

MOST OF US THINK OF SEED as something we have to gather, store, and then plant. Perhaps the most valuable seeds of all are those that ripen, fall, and germinate without our intervention: what we gardeners call “volunteers.” I’ve watched a lot of volunteers come and go over the years, and here are a few of my observations.

Using volunteers is a gardening strategy linked to many permaculture principles such as “Observe and interact,” “Obtain a yield,” “Use and value diversity,” “Make the least change for the greatest effect” (or in older terms, get the most bang for your buck), “Use on-site resources,” and “Work with Nature.”

Seeds are one of the multiple yields of my plantings. I deliberately let many plants go to seed so that I can harvest the seeds for sale, trade, or give-away—mainly medicinal herbs, but also vegetables, culinary herbs, so-called weeds, woody-stemmed plants, and native wildflowers. Generally, I harvest and clean the seed of 60-80 species each year. Many of these seeds hit the ground and move around naturally—I sometimes help them. Another yield comes from potting up some of the volunteers to trade or sell.

Soil seed banks

Every soil has a seed bank. This includes some species with long-lived seeds that will come up for decades. Other species have seed that is short-lived in the soil. If you keep them from going to seed, you can gradually lessen them in the garden. However, it’s hard to eliminate some more weedy species.

A permaculture garden will have a dynamic seed bank that increases in diversity over time. The main functional categories of plants in the seed bank: 1) weeds (including unwanted grasses), 2) vegetables, 3) culinary herbs, 4) medicinal herbs, 5) native wildflowers, and 6) woody-stemmed plants (trees, shrubs, vines, and berries).

These categories are not mutually exclusive, and many species fit into two or more. Dandelion (*Taraxacum officinale*) and sheep sorrel (*Rumex acetosella*) are weeds, vegetables, and medicinal herbs. Cilantro/coriander (*Coriandrum sativum*) is a vegetable, culinary herb, and medicinal herb. Wormwood (*Artemisia absinthium*) is a weed, medicinal plant, and the main herb in absinthe.

Weeds are some of my most common volunteers. Till any parcel of ground, and an assortment of weeds will spring up. Sheet mulch, and you will have a lot fewer weeds. The ones that do come up are generally vigorous, rhizomatous species like quackgrass, other runner grasses, Canada thistle, Russian knapweed, bindweed, and the like. Each part of the country has its own suite of weeds. They are moving all the time, within fields and between locales, regions, and countries. Weeds are a fas-



Calendula and dill seeds ready to hit mineral soil.

inating field of study, and all permaculturists should study the weeds of their region. I have a large shelf of books on weeds.

Volunteers are both an opportunity and a challenge in gardens and properties. We might say that there is never an overabundance of volunteers (or weeds) in a system—there is only a deficit of management. The volunteers and weeds are never fully in charge of my gardens, but neither am I in complete control of this co-creative dance. Using volunteers to advantage is an opportunistic type of gardening. Oftentimes, several or many plants will attempt to grow from the same spot. My weeding and mulching helps determine who lives and who dies. Almost always, volunteers come up too prolifically, and thinning is necessary or helpful. Woody-stemmed plants are an exception, as they often come up isolated and don’t need thinning.

I farmed in three locations in the Okanogan Valley of north-central Washington from 2008 to 2012. Two of the plantings were tidy, picture-perfect gardens, but one deliberately tended toward wildness. The wildest garden gave me my most exciting insights. It was 0.7 acres (about 0.3 ha) and fairly flat. Last year was my fifth growing season since taking over what was a bare-soil, vegetable field. The soil was not that great. I grow vegetables, berries, and herbs, and I use a lot of trees and shrubs in hedgerows, windbreaks, and various agroforestry combinations. The woody component occupies only about 1/3 of the site; the other 2/3 is in annuals and perennial herbs. Over time, the tree/shrub canopy will take up a bigger footprint, but the system is designed to have lots of sunny areas. A hedgerow/windbreak surrounds the garden in the shape of a horseshoe facing south, a typical permaculture suntrap.

I’ve been using biomass in my farming for several decades. Within three years, I turned worn-out, low organic-matter soil

with hardly any earthworms into a soil with high organic matter, huge numbers of worms, and a wide array of soil life, including fungi. This renewed soil is sequestering carbon at a rapid rate. My soil isn't perfect yet and has a long ways to go, but so far, it's improving every year. I have no doubt that this sort of biomass farming and gardening, if practiced worldwide, would sequester much of our excess atmospheric CO₂ in a short period of time. (1)

Herbs

I grow about a hundred species of medicinal plants and 15 species of culinary herbs. I let a lot of them go to seed for seed production as an auxiliary income stream—herbs are a large part of my volunteer flora. They can be divided into prolific and occasional volunteers. The prolific volunteers can be a pain in the butt sometimes. The ones that have been most problematic for me include feverfew, motherwort, mugwort, wormwood, and vervain (*Verbena officinalis*). Think twice before recommending these to a lazy gardener!

- Agrimony (*Agrimonia eupatoria*) self-seeds near the parent plant. Surprisingly, it hasn't moved far in my garden despite its velcro-like method of dispersal.

- Baikal skullcap (*Scutellaria baicalensis*) is a rare and valuable herb. Alas, it takes four years or more before the root is big enough to dig and sell. Usually started in the greenhouse,

Everyone knows that burdock is a noxious weed.

skullcap needs careful attention to weeding in its establishment year. In 2010, a whole forest of volunteers sprang up in and next to my Baikal skullcap patch. I've been digging the volunteers and transplanting them for the past three years and will dig more in 2014—hundreds in all which would cost me \$1.50-2.00 each from my wholesale growers. All they cost me was an hour or two of weeding spread throughout the season.

- Blessed thistle (*Cnicus benedictus*) is an annual that self-seeds to a limited extent. It has surprisingly few seeds for a thistle—I could use more. They tend to emerge in clumps from where the spiny seed heads lie on the ground. Transplant them rather early.

- Borage (*Borago officinalis*) easily self-seeds and moves around. They become robust plants that I weed out except for the few that chance to germinate where there is adequate space.

- Burdock (*Arctium lappa*) has many uses. Thus, I have four markets for burdock: root for food, often called by its Japanese name, *gobo*; root for medicine (great for fighting bacterial infections); seeds for the seed trade (my seed is the Takinogawa variety, one of the best known varieties; and seeds for medicine—similar to the root in its uses, but stronger. Everyone knows that burdock is a noxious weed. It flowers and goes to seed in its

second year. In 2009, I harvested 60 lb. (27 kg) of burdock seed. A prolific crop of volunteers came up in 2010, mostly adjacent to where it grew the previous two years. That fall, I harvested 120 lb. (54 kg) of one-year roots, and there were more to dig in the spring. The areas that I thinned had nice, big roots, but unthinned areas yielded tiny roots. Seedlings that came up widely spaced in adjacent deep, woody mulch grew giant roots. A deep, light soil gives the best results, and thinning is important to this root crop.

- Calendula (*Calendula officinalis*) is one of my favorite volunteers. It loves to volunteer, although it tends not to travel very far. With its bright sunshiny colors, it's easy to sell. I can always use lots of calendula and sell the flowers—fresh, dry, in tincture, or infused into oil; I also sell seed.

- California poppy (*Eschscholzia californica*) patches usually get bigger every year if you let them go to seed and give them a relatively clean seed bed, which means hand weeding and often-times thinning. I've sold a lot of above-ground plants, as well as roots, over the years.

- Catnip (*Nepeta cataria*) is an opportunist. I may never start another catnip seedling in the greenhouse. Every year, numerous healthy seedlings volunteer. If they're in an unoccupied niche, I let a lot of them grow *in situ* and get three or four cuttings a year. I always let some go to seed. For highest yields, it's better to transplant the young seedlings to some nicely tilled ground. I plant them out 18" (46 cm) apart in rows 3' (90 cm) apart.

- Clary sage (*Salvia sclarea*) is a biennial and a prolific self-seeder. Once you let it go to seed, it easily becomes part of your volunteer flora. Clary sage is a very tough plant that can grow (and flourish) in tougher situations than some of your more delicate volunteers. Transplant it early in the season, as the deep taproot doesn't like disturbance.

- Echinacea (*Echinacea spp*) volunteers are common and easy to transplant. *E. angustifolia* is more desired in the marketplace than *E. purpurea*, but I sell lots of both.

- Elecampane (*Inula helenium*) volunteers, typically in mulched, unweeded areas. I transplant seedlings, let some grow *in situ*, and usually harvest at one year (two years for transplanted ones). I seldom use greenhouse starts but dig volunteers and do crown division after selling the branching roots of two- and three-year-old plants.

- Feverfew (*Tanacetum parthenium*) becomes one of the worst, weedy, spreading plants in the garden. Think twice before planting it or plant well away from the main garden.

- Gumweed (*Grindelia squarrosa*) is a weedy, native, biennial medicinal that likes to move out from its original planting.

- Holy basil (*Ocimum sanctum* syn. *O. tenuiflorum*) likes to volunteer in mineral soil, but it germinates so late in the season that I mostly rely on greenhouse seedlings to get large plants by season's end.

- Hyssop (*Hyssopus officinalis*) volunteers usually take a couple of years to appear and need some area that isn't scraped by a hoe. The seedlings need some months to grow big enough to transplant.

- Marshmallow (*Althaea officinalis*) volunteers near the mother plants, usually not until several years after establishing a patch.

• Meadowsweet (*Filipendula ulmaria*) volunteers usually take a couple of years to appear and, like hyssop, need an area that isn't cultivated by hoeing. The seedlings need some months to grow big enough to transplant.

• Mugwort (*Artemisia vulgaris*) is one of the worst medicinals for becoming overly abundant and weedy in the garden. Plant it in zone 3 gardens.

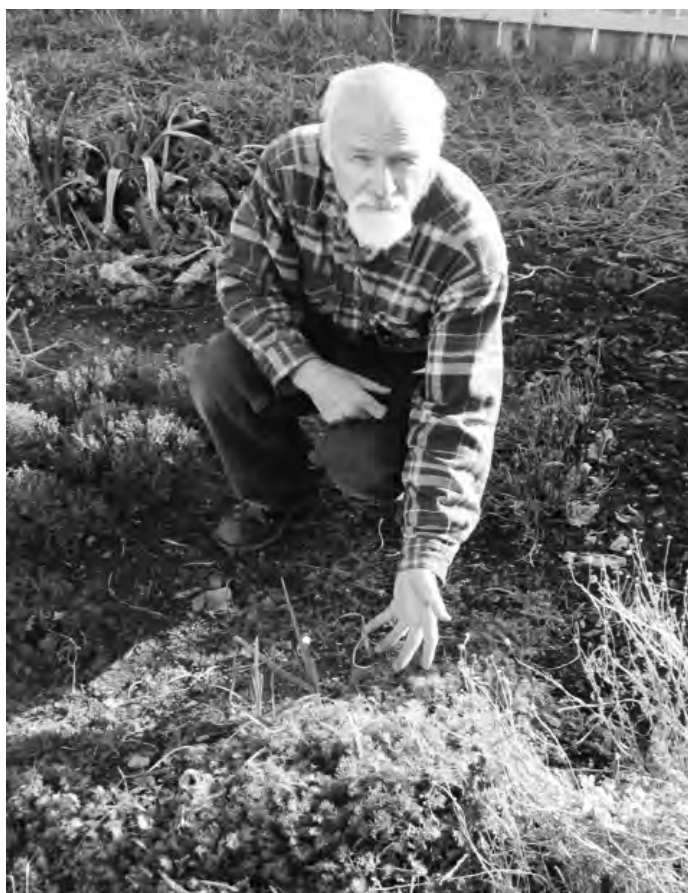
• Red clover (*Trifolium pratense*)—I love red clover in the garden! The plants do not spread by rhizomes. They fix nitrogen and attract bees, and there is an endless market for red clover blossoms at a good price. Occasionally, it's part of the natural weed flora—if not, spread some seed around so it can become part of the seed bank.

• Spilanthes (*Spilanthes acmella* or *S. oleracea*) likes to volunteer in pathways, but it germinates so late in the season that I mostly rely on greenhouse seedlings to get large plants by season's end.

• St John's Wort (*Hypericum perforatum*) is a very successful weed—it will move around the garden if you introduce it.

• Sweet Annie (*Artemisia annua*) is a somewhat capricious self-seeder. Some years it gives me quite a few seedlings, and some years, not enough.

• Valerian (*Valeriana officinalis*) can become quite weedy, particularly downwind, as it uses parachute dispersal. It takes a few years to get there though. I look forward to the day when that happens in my garden—valerian root is one of the top selling herbs. Valerian is very easy to transplant, and older plants yield huge amounts of divisions. I let some volunteers grow *in situ*, but mostly I transplant them into newly tilled ground, where they make large rootballs in one year. I harvest after one-



Michael Pilarski showing a jungle of chamomile volunteers to be transplanted in 2014.

In some areas, the management is benign neglect...

year's growth because two-year clumps are much more difficult to clean and will have two-year old, dead matter to sort out.

• Wormwood (*Artemisia absinthium*) is one of the worst medicinals for becoming weedy in the garden, and it can naturalize into some local ecosystems.

• Yarrow (*Achillea millefolium*) attracts bees and is a part of many beneficial insect mixes. So far, I have kept a lid on yarrow in the garden—its spreading runners would make it a nuisance in my stoloniferous, perennial herb beds with skullcap and meadow arnica.

• Yellow dock (*Rumex crispus*), like most of the docks, is a successful weed and many properties and gardens already have one dock or another. *R. crispus* is the preferred medicinal dock, but garden-grown specimens are generally inferior to wild plants that have grown in dryer, tougher circumstances. The more orange the root, the more active constituents it has. Most garden-

grown yellow dock (even volunteers) yields pale yellow roots.

• Zi Cao (*Lithospermum erythrorhizon*) root is a Chinese medicinal that also yields a purple dye. It volunteers near the mother plant in undisturbed ground.

Weeds

Weeds are volunteers too. I have lots of weeds and manage them in a number of ways. In some areas, the management is benign neglect, and I let them do their thing where they won't lower yields, such as between the rows of perennial herbs, around shrubs and trees, and in hedgerows. I manage weeds as an asset, but seldom let them lower yields of my crop species.

• Alfalfa is a robust, long-lived perennial with a very, very long taproot—up to 150' (46 m). As a volunteer, it isn't compatible with small plants, but I let it grow on edges, in hedgerows, and even in pathways between rows of perennial herbs. There is an endless market for alfalfa herb. If I had time, I would harvest the plants every time they started flowering, but the later harvests tend to get away from me and go to seed. Alfalfa is a great nitrogen-fixer. I slash a lot of it and use it as a mulch.

• Buttonweed mallow (*Malva neglecta*)—I don't sell this weed, but I'm fond of it nonetheless because of its habits. I like it because it has a deep, penetrating taproot and can grow on compacted ground and pathways. The taproot is busy taking deep minerals and chelating them into a biological form for use

by my crop plants. It sends out a carpet of aerial stems from the taproot. It's an easy matter to pull up the carpet and, with one slice of my Japanese sickle, sever a sizable chunk of nutritious biomass to use for mulch. Sometimes, I let the root grow a new top for another cutting; sometimes I pull it if it isn't where I want it.

- Dandelion is one of my favorite weeds. It stays low to the ground, can take endless beheadings, is a great nectar plant, and has a deep taproot for soil loosening and nutrient cycling. I confine it mostly to pathways and remove it from herb beds or vegetable rows. My market for dandelion root is much bigger than for dandelion leaf. Dandelion flowers are also used for biodynamic preparations and make a gourmet wine. I dig roots in the spring and the fall, with the fall bringing a bigger harvest. When I harvest, I take only the big roots and leave the small roots to continue to grow for future harvest. My best harvest areas are in my main pathways. I run over the crop all season long with wheelbarrows and feet and still get a nice crop. The first year of my garden, the dandelions were just getting going, but I've sold about \$1,200 worth of dandelion root and leaf over the past two years. A side benefit of the dandelion harvest is that because I do it with a long-bladed, nursery spade, I deeply aerate and loosen the paths and soil where I extract the dandelion, thus promoting continued good dandelion production.

- Lambsquarters is one of my favorite weeds! It's also one of the tastiest and most nutritious greens to eat. They germinate with warm weather and are usually prolific. I harvest young tops for the table. Sometimes I hoe afterwards to get rid of the small plants. Sometimes I let them grow and get two or three cuttings before finally hoeing them in.

- Plantain (*Plantago major* and *P. minor*)—I made money selling some broadleaf plantain seed one year, so I've let a lot go to seed since then. I may regret this. I need to induce some narrow-leaf plantain to move in as a weed because there is a much larger market for narrow-leaf plantain than for broadleaf.

- Redroot (*Amaranthus retroflexus*)—same rap as for lambsquarters, but I slightly prefer redroot as a potherb. Harvest before the seed head forms as it can be bristly to the mouth.

- Sheep sorrel (*Rumex acetosella*) makes a great nibble and salad green, as well as a marketable herb. I once planted a huge patch for market in my agroforestry system at Twisp, but when the market wasn't forthcoming, I tilled it under, with grave apprehension as to its comeback. Surprisingly, tilling almost eliminated it in one year, although it has persisted here and there under shrubs and in odd corners. Now that I do have a market—mainly for dry root, I encourage it as a weed in my current garden.

- Shepherd's purse (*Capsella bursa-pastoris*) is another medicinal that is prone to volunteer. If it isn't in my garden already, it usually shows up after a few years. I let it go to seed, because I have a modest demand for aerial plant or aerial plant with root for its medicinal qualities.

- Wild lettuce (*Lactuca serriola*) is one of those soft weeds that are easy to curtail, with a single taproot that pulls easily (wear gloves if the plants are old). A fast growing biomass plant, it's also a mild sedative. Every year, I harvest the volunteers as a crop. Usually, I simply cut off the top (when, large, soft, and

succulent and before flowering), then grab the stump and pull it out. I just drop them on the spot as mulch and sometimes gather them to use in deeper mulch systems. The tops are sold either fresh or dried.

Vegetables

- Broccoli likes to volunteer near the seed plant. Quality is variable.

- Red mustard is a prolific annual self-seeder. Once you let it go to seed, you can usually count on having a big patch the next year. Fortunately, it generally doesn't spread far too fast.

- Lettuce—I don't like transplanting lettuce from the greenhouse, so I rely mostly on volunteers. They spread a bit because of the winged seeds. I let different lettuce varieties cross as they like, and the volunteers have always been agreeable to me.

- Celery—an annual celery strain has developed in my garden and comes up every year. It's good for celery greens but not for good stalks.

- Chard likes to volunteer near the seed plant—usually way too thick.

- Ground cherry (a.k.a., Inca berry, Golden berry, Cape gooseberry, and *Physalis peruviana*) is truly a super food! The tasty fruits are great out of hand or processed. They are very high in protein—up to 16%—and are a great adaptogen. Like most *Solanaceae*, they wait for warm weather to germinate. They become huge, sprawling plants that need room to grow and yield well—thin and weed them as necessary.

- Radish loves to self-seed. I spread the seed around by using plant remnants for mulch. Radish comes up in mulch areas, as well as in mineral soils. I like lots of volunteer radish around the garden. I seldom eat the roots, but eat a lot of the seed pods. Volunteer radish is great for hugelkultur and guerilla seeding and great for pollinators too.

- Mache or corn salad often comes up near the seed plants.

- Red and purple orach often comes up near the seed plants, although it moves around a bit. It's easy to spot seedlings because of their color.



The author's backyard garden in Hot Springs, Montana. A stand of orach is going to seed in the middle, with volunteer squash crowding the fence.

- Parsnips are great at self-seeding, and I have lots of volunteers in my garden. Although they're great to have for the pollinators and predator insects, they don't produce a root worth digging if they're crowded. Volunteers usually need thinning or weeding if you want a root crop.

- Spinach volunteers easily. I encourage spinach to self seed. The fall volunteers often make it through the winter for early spring greens.

- Tomato volunteers appear every year, especially near the compost. Generally, they start too late to be worth much, and the quality is variable.

- Squash can be a prolific volunteer in the garden. I harvested 500 lb. (225 kg) of winter squash from just two small patches of volunteer squash plants in my house garden this year, with about one square yard (almost a square meter) of soil surface per patch. Amazing how much squash that small planting area produced! They came up on the edge of the garden (nice placement) and took over a section of the lawn; I let them co-exist with some of the garden.

I like volunteers of all kinds in my gardens...

Culinary herbs

- Arugula reliably generates volunteers; it's one of the earliest spring greens and one of the last to freeze in the late fall.

- Dill is one of the easiest things in the universe to self-seed and great for pollinators.

- Epazote is a very, tiny fiddly seed to start in the greenhouse, and so I'm enamored of its volunteers. It tends to grow in thickets around seed plants with occasional, larger, individual plants found scattered here and there. It doesn't germinate until the season warms, so keep your expected thicket area hand-pulled of weeds until the epazote presents itself. Some thinning is helpful, but they tend to make a big harvest anyway.

- Lovage—I move seedlings around and sell them bare-root in the spring. You don't need many.

- Marjoram is one of the most cursed weeds in my garden. It sets seed prolifically. Piles of tiny seeds look like reddish gold dust. I don't mind the seed, but the marjoram plants send out runners and can quickly become a problem in beds. They do make a nice groundcover under tall shrubs or in forest gardens where you want a spreader. Marjoram is a common culinary herb, and there is a market. It always figures in my culinary herb mix—a pity that the related plant we call Greek oregano is a sterile hybrid and doesn't make seedlings.

- Parsley will volunteer strongly around seed plants, but doesn't travel too far in my experience. It's worth spreading some seed around.

- Summer savory is an annual that one usually starts in a

greenhouse. It will self-seed around the mother plant. It needs mineral soil and an area that isn't scraped by a hoe.

- Thyme volunteers usually take a couple of years to appear and need some area that isn't scraped by a hoe. The seedlings do not establish quickly. They're handy to use, but I also like to put in a tray of greenhouse-raised seedlings as well.

Woody-stemmed plants

Volunteers of woody plants come in two phases: 1) many properties will have seedlings come up from local trees, especially wind- and bird-dispersed species—I've had cottonwood, aspen, Chinese elm, ash, and hawthorn, and 2) as the permaculture system matures, more and more woody species will start seeding and providing opportunity for volunteers. Over the years, I've noticed that gold currant, autumn olive (*Elaeagnus umbellata*), mulberry, apricot, apple, cherry, rose, hardy kiwi, walnut, and others coming up in my plantings. I keep an eye open for them and transplant them or let them grow in situ. These can be grafted over to desired varieties. The longer the time frame, the more kinds of trees and shrubs will present themselves. Of course, many of them are sun-demanding and will not grow in shade.

Wildflowers

A few native wildflowers have starting growing on my site from seed that has blown in or has come along with some forest litter mulch. I let them reseed freely. I collect native plant seed commercially as one of my income sources. I'll sow some of these in the field to get more native plants in the seed bank. Over the next several years, I expect to add more and more wildflower seeds to my site. My long-term goal is for an increasing part of the soil seed bank to be native wildflowers. I can selectively allow some of them to grow for ecological roles, beauty, or sale.

Take advantage of volunteers in your gardens. Encourage them. Watch for them. The key is observation, observation, observation—along with some timely thinning and weeding. One of my goals in life is to be able to identify every seedling as soon as it pops out of the ground. If I see a seedling I don't recognize, I let it grow to see what it becomes. If a new weed shows up in my garden that I don't want, I can often nip it in the bud. I like volunteers of all kinds in my garden—both plants and humans. Bon appétit! Δ

Michael Pilarski is a small-scale herb farmer and permaculture teacher. He moved to Hot Springs, MT, in 2012 and started gardens in five locations. He sells seed of many of the plants mentioned above and more. Contact him for a seed list or correspondence at friendsofthetrees@yahoo.com.

Notes

1. Read my article, "A Carbon Sequestration Proposal for the World," if you want an in-depth analysis with numbers. Published at www.friendsofthetrees.net—scroll down to just after January 3, 2010.

Successful Seed-Saving

Hillie Salo

SEED-SAVING IS THE LOST ART of modern agriculture. The food we eat today is brought to us by the careful selection of many hands; year after year, thousands of times, over and over. Planting and saving a seed links you to all humanity: those we follow and the generations ahead. By saving seeds, we ensure those possibilities.

What is seed-saving all about? It's a glance into the whole lifecycle of a plant and how it might reproduce on its own; an inexpensive way to get and share seeds; the chance to get food with traits that you like and select for; increasing the genetic diversity needed for the environmental challenges ahead; and over time, developing unique seeds that can become adapted to our neighborhoods.

Pollination is the transfer of pollen between the male and female reproductive parts of the flower. Plants that are open-pollinated are pollinated by natural processes, including insects, wind, and self-pollination. Pollination is the first step in fertilization and seed formation. Heirlooms are open-pollinated varieties that have been grown out every year for at least 50 years, and perhaps have a story to tell.



While laborious on a large scale, caging to isolate the whole plant, or just a few flowers, allows varieties to be genetically isolated while being grown close together. Here, a mesh covering isolates this flower from would-be pollinators.

Why save seed?

When saving seed, a gardener must ascertain what goal is intended.

You may be saving seeds mainly for use in your own garden. By selecting, year after year, for traits such as the healthiest

plants or the most flavorful vegetables or fruits, you are creating a new variety that is specific to your garden and tastes. In your own garden, you may be more relaxed about isolation distances or population numbers as you are aiming for adaptation and not purity. A little cross-pollination may be tolerated, and is usually edible.

There are best practices, and then there is real life.

It is important to recognize that the garden is one big science experiment. There are best practices, and then there is real life. Seed-saving recommendations typically come from more rural environs. You may follow all the expert recommendations, and still find that your crop has some outliers; those with unwanted characteristics. In urban environments, seed-saving is new information and new science. There may be factors specific to where you garden, including microclimates, built-up areas, and barriers such as shrubs, fences, trees, and houses that may impact the pollination environment where you garden and save seeds.

The neighborhoods we live in today make it difficult to save some plants that need large populations in order to maintain genetic diversity. To have the necessary population groups, there may be some seeds that can only be saved by growing them together in community, such as through a seed library.

To know which plants may have pollen that could potentially cross-pollinate the plants whose seeds you would like to save, start by learning their scientific names. Every creature on the planet belongs to a family—thanks to Carl Linnaeus (1707-1778). Considered the father of modern taxonomy, his goal in life was to name every living being. The family is further differentiated by the genus (more general) and then by the species (more specific). A scientific name is made up of genus and species names, in the case of crop plants, sometimes subdivided further into cultivar or cultivated varieties.

For example, broccoli belongs to the family Brassicaceae. The genus and species of broccoli is *Brassica oleracea*. This name is also shared with the cultivated varieties of cauliflower, cabbage and Brussels sprouts. Without consideration of isolation, any of these varieties flowering at the same time have the potential to cross-pollinate. If you save seeds from those plants that have been crossed and plant them the next season, you may have something interesting that is not broccoli, cauliflower, or Brussels sprout. However, it may be a new exciting hybrid and



Lettuce plants gone to seed. Each plant can yield thousands of seeds.

possibly edible, or even worth selecting from.

To maintain the genetic purity of a specific variety of Brassica or another out-crossing species, it must be isolated in some fashion from its kin. One of the easiest ways to do this is by time. Grow just one variety in that season and save seed from as many plants as you can. Or grow an early variety, and then a later one, making sure they are not flowering at the same time.

Physical isolation blocks the entrance of unwanted pollen. A mesh or paper bag placed over an unopened flower the night before will protect the flower from contaminating pollen when it opens in the morning. Caging is a similar idea, that uses a mesh covering to protect the whole plant. This method is often used with peppers, because even though they are self-pollinating, they can be subject to tenacious insects that tear or eat through the flower exposing it to foreign pollen. Plants can, also, be isolated by distances that separate them enough to reduce the chance of foreign pollen contamination.

Selection criteria

A central element of seed-saving is the need to maintain a wide range of a variety's genetic diversity. In order to allow the plant variety a full expression of its genetic makeup, it is necessary to save seed from as many plants of that variety as possible. Too small a population can lose vigor over time. For self-pollinating plants, try saving from 10 to 20 plants with isolation distances of 10-20' (3-6 m) between varieties, depending on whether the seed is being saved for home use or for sharing. Many cross-pollinating varieties need 80 or more plants; recommendations for corn are in the hundreds of plants. The recommendations for isolation distances for cross-pollinating plants can be miles. Saving seed from crossers is a much greater enterprise than from self-pollinating plants.

Always harvest seeds from healthy plants. Make sure your plants are receiving the necessary water and nutrients all the way through flowering and seed set. As the seeds dry, start to restrict moisture to allow them to prepare for dormancy. Select for traits you like, such as flavor, color, texture, and earliness. Include those plants that resisted disease and insect attacks. Remember

to evaluate not only the fruit, but the whole plant throughout its entire life cycle, consider those that germinated well with vigor. Select large, smooth, and mature seeds. The larger the seed, the more reserves available to the plant after germination. The more mature the seed, the greater the germination and survival rates.

Harvest and storage

Most seeds fall into two categories: dry seeds, like beans, peas or lettuce, and wet seeds in a fleshy fruit, such as tomatoes. Dry seeds are left to dry on the vine for as long as possible, weather permitting. When the pods are dry and rattle in the pod, they're ready for harvest. Mature seeds change color, usually from light to dark, and are easily released from the pod. They can be picked individually as they dry; or, when 60-80% of the pods are dry on the vine, the whole plant can be removed. Do the same with lettuce, when the heads are greater than 50% white fluff. The plants can continue to dry laid out on a tarp,

Everyone can save seeds, ensuring a future world of possibilities.

hung up, or placed in a paper bag. Allow for plenty of air circulation so that the seeds dry evenly and without any mold. Open up the pods individually or gather them in an old pillow case and beat it until the seeds separate from the pod material.

Dry the extracted and cleaned seeds of wet fruits [Ed.: see *Agrella on wet seed fermentation*, pg. xx] on a nonstick surface such as a plate, screen, or cloth. Paper is not a good drying surface because seeds tend to stick to it. Stir occasionally to maintain even drying. Fans can assist with drying. Avoid drying in direct sunlight. Temperatures above 95°F (35°C) can damage seed.

Seeds need to be as dry as possible before they are stored. Moisture will reduce the shelf-life of seeds. There are a couple of tricks to use to determine if your seeds are dry enough to be stored. To test the brittleness of the seed, bend seeds that are thin. Seeds that bend are not dry enough. Thin seeds should snap if they're dry enough to store. Similarly, bean and similar seeds should shatter when hit with a hammer on a hard surface. If they mash, they need more time to dry. Another test is to place an envelope in the container with the seeds. Place another envelope outside the container with seeds overnight. Compare the envelopes the next day. If the envelope with the seeds is dry or dryer than the envelope outside the seed container, these seeds would be considered dry enough to store. When the seeds are dry enough, store them in air-tight containers, such as glass jars. For storage, cool and dry are the most critical factors—the opposite of what we want when we're germinating seeds.

Seed management

Outside of a few short-lived crops such as onions and leeks, most seeds with proper storage precautions will give their best germination for three to five years. Optimally, the seed is most excellent when grown out the next year. Seeds can be stored in the refrigerator for medium-term storage or in the freezer for long-term storage. When retrieving the container from the refrigerator or freezer, allow the container to come to room temperature before opening to prevent condensation. Even if the freezer is not being considered for long-term storage, several days in the freezer will eliminate any potential pests that might later show up in your seeds.

When labeling, consider putting labels inside and outside of the seed container. The following information can be helpful to add to the label: type of plant; the variety, common name, and scientific name; original source and year grown; height and habit; fruit size, shape, color; productivity; disease resistances or susceptibilities; and flavor and storage qualities.

If you're concerned about seed quality, you can perform a germination test. A germination test assesses the seed's germination rate. With this knowledge, the gardener can determine how much seed to sow and the seed's general health. Generally, as the germination rate decreases, so does the health of the seed.

For a germination test, place a minimum of ten seeds—the more the better—on a moistened paper towel. Cover with another moist towel and roll up tightly. Place in a partially opened plastic bag. Count the germinated seeds after the maximum predicted germination time for that variety or for ten days. If all the seeds have not yet germinated, continue to 21 days. Count all the seeds that germinated, and divide by the original number; this ratio will be the germination rate (usually expressed as a percent).

As we practice seed-saving and sharing, we can start to build an adapted community seed stock that will be available to us as we negotiate the environmental challenges ahead. We will find new tools like seed libraries, where seeds, accessible to all, can be borrowed, grown, and returned greater than before. Everyone can save seeds, ensuring a future world of possibilities. Δ

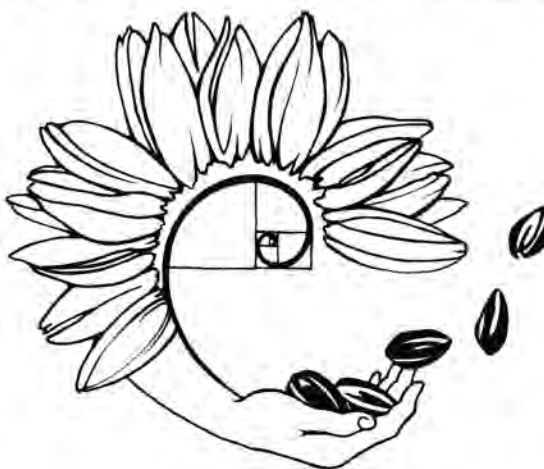
Hillie is a longtime San Francisco Bay Area gardener. As a Home Educator and 4H Leader, she taught organic gardening.

Five years ago, she became a Master Gardener with the University of California Cooperative Extension Program and teaches about Sustainable Vegetable Gardening and Seed Saving.

Resources

1. Seed Saving Guide from Organic Seed Alliance. OSA has free downloads of crop-specific seed production manuals, other seed-related publications, organic seed advocacy information and news. www.seedalliance.org.
2. Seed Savers Exchange, 3076 North Winn Road, Decorah, IA 52101. Phone 563.382.5990 fax 563.382.5872 www.seedsavers.org.

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Natural Selection for Climate Realities

Bioregional Seed-sheds

Don Tipping

FOR THE PAST 18 YEARS, I've grown certified organic seeds at Seven Seeds Farm in the Applegate Valley of southwestern Oregon. We sell these through our small bioregional seed company, Siskiyou Seeds, and to other organic seed companies for national distribution. We were fortunate to inherit a local seed collection of about 200 varieties that had been organically grown since the early 70s by Alan Vanet, Alan Kapuler, Gabriel Howearth, and Alan Adesse through Stone Broke Hippie Seeds, then Peace Seeds, and then, SOW Organic.

Our bioregion has an ideal mix of qualities for seed cultivation: ample water, heat and summer sunshine, and a relative absence of chemical intensive agriculture. Most of the farming in the region has been cattle ranching, hay, pears, and increasingly small intensive organic farms and wine grapes. Growing seeds requires genetic isolation from similar species during the flowering phase to ensure genetic purity. For instance, some pumpkins can cross-pollinate with zucchini, and broccoli can cross-pollinate with collards. More and more small organic farms here have included seed production as part of a healthy, diversified farm system. No less than a dozen farms in the Applegate and Rogue Valleys grow organic vegetable, flower, and herb seed, in large part due to our relative genetic isolation

from other vegetable producers and especially GMO crops such as corn, canola, soybeans, and sugar beets. From a whole systems perspective, the inclusion of high value, organic vegetable seed enables growers to dedicate more land to diversified perennial and rotational grazing systems. Organic seed as a cash crop is a largely unfulfilled niche with plenty of opportunity for new skilled growers.

...we need to come together to determine the best way forward to ensure healthy food systems...

Syngenta comes to town

Until recently, corporate agriculture hasn't had much of a vegetable-growing presence in southern Oregon. Lately, however, Swiss biotech giant Syngenta began producing genetically engineered (GMO) sugar beet seeds in Jackson and Josephine counties on about three dozen scattered small plots. Sugar beets (*Beta vulgaris*) are will cross-pollinate with both table beets and Swiss chard, and their small and light pollen travels easily on the wind up to 12 miles (19 km). It has been found as high as 30,000' (9,000 m). A number of organic farms in southern Oregon produce both Swiss chard and table beet seed, which are now at risk of cross-pollination from GMO sugar beets. Another new crop in the region, genetically engineered alfalfa, threatens the viability of both organic alfalfa hay production and the organic status of animals that may be eating contaminated alfalfa.

Intrusion of these new GMO crops has motivated concerned citizens to initiate a ban on the production of GMO crops in both Jackson and Josephine counties. Ultimately, we need to come together to determine the best way forward to ensure healthy, sustainable, bioregional food systems that can provide us with vital, organic food now and for future generations. In May 2014, voters will decide if GMOs will be legal to grow in Jackson County. Thus far, we have met stiff opposition from Syngenta, the Oregon Farm Bureau, the Oregon Cattlemen's Association, and our local county commissioners.

During the process of organizing small organic farmers who are affected by the production of transgenic sugar beets, it became increasingly clear that having a well-developed culture of seed production greatly assists our ability to act and advocate



Prop or brace roots develop above ground to anchor and support corn plants. Varieties with stronger roots, including well developed prop roots, better resist lodging (toppling by wind) and may be better adapted to a future climate of strong storms.

legally and politically for pure pollen-sheds. The Rogue Valley is a long, fairly narrow river valley, only about 10 miles (19 km) at its widest point—very few farms lie outside the reach of pollen drift from Syngenta's 36 production plots. Fences cannot contain pollen, so we are now having conversations about what constitutes genetic trespass. Organic seed crops for table beets and chard are high value crops, fetching prices of up to \$40/lb. (0.5 kg) for a plant that can yield tons per acre (0.4 ha).

We actually plowed under a quarter-acre of Rainbow Swiss Chard that we discovered was within a mile of a GMO sugar beet test crop on Oregon State University land leased to Syngenta. I was doing a collaborative seed-growing project with a prominent organic vegetable farm in the area with over 100 acres (40 ha) in high value organic vegetables. Given the likelihood of contamination, we had to weigh the cost-effectiveness of harvesting, cleaning, and testing the seed only to discover it

...it may become necessary to turn to other food crops... We should develop new food sources and tendencies...

to be contaminated and worthless for sale on the organic market—a frustrating lesson.

Richo Cech, who oversees the medicinal herb seed company, Horizon Herbs, suggested that it may become necessary to abandon the commonly grown crops for which the biotech companies have developed GMO versions. Crops like corn, beets, alfalfa, canola, and their genetic relatives that are becoming increasingly contaminated may be too difficult to maintain in genetic isolation. Rather than trying to rescue drowning and imperiled species, it may become necessary to turn to other food crops. From a whole systems, permaculture, diversified foodscape perspective, I can see logic in this assessment. Already many gardeners (and eaters) are adopting such crops as quinoa, sweet potatoes, goji, coconuts, and other unusual species. Personally, I think that we should do both. We should develop new food sources and tendencies, such as a more paleo diet with a diversity of greens and animal products from stock raised in diverse woodland ecologies and rotational schemes. At the same time, I believe



Packing seeds by hand—the low-tech way. Starting a seed company doesn't require extensive infrastructure or capital investment.

that it's not too late to organize ourselves and make a stand for GMO-free pollen-sheds where legally, politically, and culturally, we place strong emphasis on the production of non-transgenic species and preservation and advancement of open-pollinated genetics traded open source in the public domain.

Global problems—bioregional solutions

Most of the 300 varieties of seed we sell through Siskiyou Seeds are grown right here in SW Oregon. About 60% of the varieties that we sell are grown on our home farm. We also work with local farmers within a 25-mile (40 km) radius to diversify

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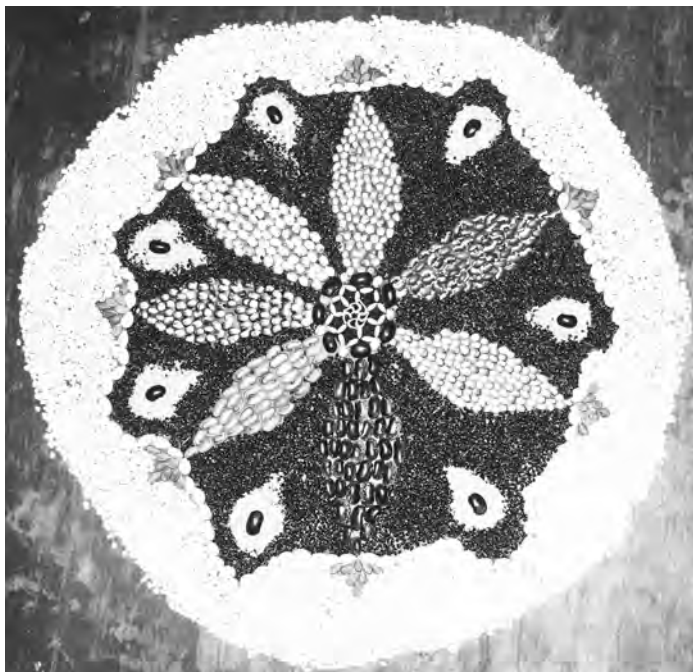
A \$250 deposit is due at the time of registration with balance due on April 7, 2014.

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Traditional seed art. "Through nutrition our bodies become receptive to spirit" —Rudolf Steiner

our offerings. After much experience, we have come to the conclusion that we cannot offer quality seed of certain crops such as carrot, which is always at risk of crossing with our abundant Queen Anne's lace, or wild carrot. Other crops such as varieties within *Brassica oleracea*, including cabbage and broccoli, are susceptible to pollen desiccation when the temperature exceeds 29°C (85°F) during flowering, resulting in small poorly formed seed with low vigor and germination rate. Seed grown in nearby, but cooler summer regions performs and yields much better.

Exceptions aside, growing crops in this area for multiple generations ensures that the plants that perform the best here will also produce the most seed, thereby conferring bioregional adaptation over time. The effects of this natural selection show up as resistance to disease, pests, and climatic extremes, tolerance to diverse soils, and increased nutrition and agronomic traits. We performed a large kale trial of 16 different varieties with multiple strains of each variety. The various strains had been grown in different bioregions, and we noticed distinct adaptation patterns. For instance, we had Red Russian Kale seed that we had grown for over a decade here, a strain from Colorado, one from Washington, and another from Southern California. The Washington strain couldn't handle the summer heat and was covered with aphids, while the others were fine, their seed having been produced in warm summer regions. The strain that had been grown in southern California failed to overwinter, having adapted to mild winters there. We have observed many similar adaptations within varieties of other species.

Does this mean that these seeds will not do well if you don't live in the area where they were produced? Not necessarily. The reality is that the Pacific Northwest is one of the best seed-growing regions in the world. As a result, many varieties are produced only in optimal regions and then distributed globally. For instance, SW Oregon is a great area to produce onion, melon,

lettuce, beet, and chard seed, whereas the Skagit Valley in western Washington produces great spinach, cabbage, and peas for seed. Of course, as the kale example illustrates, obtaining seed grown in a region with a similar climate is a sensible option.

Unfortunately, the predominant trend within the seed industry is a nearly complete lack of transparency about seed sources. Very few of the big mail order companies specify this information. The seed buyer for one of the most popular and prominent mail order seed companies told me that 70% of their seed comes from China. Imagine that! Chances are, most of the seed coming from the big guys is being outsourced to regions where labor and production costs are cheaper.

From seed industry consolidation over the last few decades, we have lost hundreds of regional seed companies that focused on breeding and reproducing locally adapted varieties. Admittedly, it's quite difficult to grow exceptional seed of everything in any given region. Some plants need heat, cold, dry, or other

Plant domestication is not an endpoint...[it] requires us to remain engaged...

specific conditions to thrive. Also, there can be cross-pollination issues with wild relatives like the wild carrot.

Nonetheless, there are gardeners from Alaska to Hawaii and from California to Maine, and seed best serves them that has been reproduced for generations under conditions that the future crops will experience. We have a small 10'x12' (about 3x3.5 m) temperature-controlled, strawbale seed room with about 500 varieties in controlled storage. These are the seeds of vegetables, herbs, grains, and flowers that we regularly grow out on our farm or on other farms in the watershed. Every agricultural region on the planet needs a similar reserve (or a couple of them). Plant domestication is not an endpoint—rather, it is ongoing, and that requires us to remain engaged in continual reproduction and selection, looking for superior traits and adaptation to our microclimates. Thoughtful seed-saving is likely to be humanity's most salient response to global climate change. Δ

Don Tipping and his family have stewarded Seven Seeds Farm (www.sevenseedsfarm.com) for the past 18 years in Williams, OR. They produce fruits, vegetables, seeds, wool, eggs, and lamb, and mentors new farmers through internships and workshops. Don co-founded the Siskiyou Sustainable Cooperative, which manages a 200-share CSA, a commercial seed growing operation, and an equipment co-op and internship curriculum among 12 farms. He also co-founded the Family Farmers Seed Cooperative. Siskiyou Seeds is a bioregional organic seed company operated from the home farm. They will offer a 5-day intensive Seed School on the farm in mid-May.

Saving the Seeds of Cheese

David Asher Rotzstain

CONTEMPORARY CHEESE-MAKING as practiced in North America relies on laboratory-raised, freeze-dried, bacterial and fungal cultures. Paralleling the monopolies of seed companies, the decreasing number of firms that produce these cultures are being bought out and consolidated by some of the better known agribusiness and biotech giants. (1) Cheese-makers who use these cultures are unknowingly supporting corporations hell-bent on developing not only genetically modified seeds, but genetically modified yeasts and bacterial cultures that they hope to use in the production of many fermented foods such as bread, beer, wine, charcuterie, and cheese.

The commercial freeze-dried cultures promote unsustainable cheese-making practices. Cheese-makers must purchase different cultures for making different cheeses. They must keep these in freezers once the packages are opened. And because the freeze-dried materials are unstable monocultures of bacteria (or fungi), cheese-makers adopt unnecessary working practices, pasteurizing their milk to reduce microbial competition, sterilizing all equipment used including hands, and constantly monitoring their cheese vats to be sure their cultures haven't collapsed. These freeze-dried cultures, like hybrid seeds, cannot be re-cultured by cheese-makers.

In my decade of cheese-making, I've distanced myself from the use of these freeze-dried monocultures. Through experimentation and the study of traditional cheese-making, I've compiled simple methods to sustain all the cultures a cheese-maker might need at home. Amongst the "counter-cultures"—those I keep on my counter—that I use for cheese-making activities are: kefir grains, *Geotrichum candidum* fungus, *Penicillium roqueforti* fungus, and *Brevibacterium linens* bacterium. This article will explain how a cheese-maker can keep each of these counter-cultures at home.

Some might think this article would be of value only to cheese-makers, but I propose that it will be of interest to many others: cheese-eaters, for example; or anyone fascinated by microbiology and mycology; additionally, one cannot advocate for the use of livestock such as goats in permaculture systems without envisioning and eventually adopting sustainable methods to transform their milk into cheese; more importantly, the this approach to cheese-making is inspired by permaculture principles. It's fascinating to see how these teachings can be applied to diverse fields.

Traditional vs. modern cultures

The original starter culture for cheese grew in the sloppy milk bucket. Cheese-makers never cleaned out their milking buckets, and the slimes that developed on their sides inoculated all the milk that went into them with healthy populations of

beneficial bacterial cheese cultures.

Early cheese-makers, of course, had no idea that bacteria were implicit in the production of their cheeses. Nevertheless, they stumbled upon methods of keeping mother cultures, which cheese-makers practiced and improved upon for millennia. But no longer is this the case, as traditional cheese-making cultures have slowly disappeared from Western nations.

Cheese-making supply companies have promoted laboratory-raised, freeze-dried cultures for over 60 years. These new cultures, derived from traditional cheese-making cultures, were purported to be simpler to keep, assuring greater consistency in the final product, and were claimed to be equal to traditional cultures for the development of flavor. Beginning in the 40s, "freeze-dried cheese-making" became the norm. Today, few cheese-makers keep their own cultures.

Cheese-making supply companies are selling the cheese-makers the cultures to make cheese. But the real culture is one of dependency. Cheese-makers who attempt to make a spectrum of cheeses such as chevre, blue cheese, Camembert, Parmesan, Gouda, and feta have to buy a package of cheese-making culture for nearly each type of cheese!



Good milk (left), when cultured with beneficial bacterial cultures like those provided by kefir grains (pictured center, both fresh and dried), can be transformed into a vast array of cheeses like this young camembert (right).

The use of freeze-dried strains homogenizes the culture of cheese-making. Cheeses lose much of their distinctiveness when cultured with freeze-dried microbes or spores. Not competitive with wild bacteria and molds, freeze-dried cultures beget pasteurization of the milk, which suppresses their wild competitors. When milk is pasteurized, the cheeses made from it lose much of the flavor for which traditional, raw milk cheeses are known. Cheeses made around the world with the same freeze-dried cultures taste strikingly similar.

Unbeknownst to most, cheese-makers can easily keep all the cultures they need to produce EVERY type of cheese. The following are techniques enable a cheesemaker to keep four starting cultures: kefir grains, which can be used as a bacterial starter culture for any cheese; *Geotrichum candidum* fungus, which can be used to age any white bloomy-rinded cheese; *Penicillium*

roqueforti fungus, which can be used to age any variety of blue cheese; and *Brevibacterium linens*, which can be used to smear washed-rind cheeses. By keeping all of these cultures, I have never had to rely on freeze-dried cultures to make any of my cheeses.

Kefir grains as starter culture

Kefir grains are the embodiment of the culture that makes kefir, a unique type of traditionally fermented, effervescent, and mildly alcoholic yogurt that originated in central Asia. Not a grain like wheat or barley, kefir grains are agglomerations of diverse cultures of bacteria, yeast, and fungi living together in perfect symbiosis. They are also an easy-to-keep, multipurpose cheese-making starter culture. Stay tuned to the *Activist's Stacking Functions* issue (#92 - May 2014) for more information on the many uses of kefir grains.

Kefir grains can be kept at home much like a sourdough starter culture. All that they need to thrive is milk: when placed in milk, kefir grains thicken it into kefir in about one day at room temperature, without any care or attention. Once the kefir is ready, the grains can be strained out, and placed anew into fresh milk, either pasteurized or raw, and the process repeated indefinitely.

Kefir grains will never perish if properly tended. Kefir grains that exist today are descendants of those discovered many thousands of years ago, and have been handed down from generation to generation. They are venerated for their ability to preserve milk and transform it into a celebratory beverage. If one wished to preserve a culture of kefir grains without tending to it, the grains can either be dried down, or stored in milk in the refrigerator for many months.



*A fresh round of cheese (left), when started with kefir grains containing *Geotrichum candidum* (center, growing atop a batch of week-old kefir), can be aged into a surface-ripened cheese, like Crottin (at right).*

Kefir grains can also be used as a stand-in for ALL freeze-dried bacterial cultures when making cheese! (2) Because of the diversity of bacteria in kefir grains, the culture of kefir can adapt to any style of cheese-making. For example, chevre, usually started with freeze-dried mesophilic, or medium temperature-loving, bacteria, can be started with kefir grains, which naturally contain mesophilic bacteria. Parmesan, usually started with freeze-dried thermophilic, or heat-loving, bacteria, can also be started with kefir grains, which play host to thermophilic bacteria as well.

The diversity in kefir grains is their strength! It's also their best attribute for another reason: the diversity of bacterial strains

in kefir grains contributes a diversity of flavors in cheeses that are cultured with kefir. Raw milk cheeses can have even more complexity of taste if kefir grains are used as a starter.

To use kefir grains in cheese-making, simply toss a few active kefir grains into slightly warm milk as the primary starter culture. I use 1 Tbsp (14 mL) of grains per gallon (4L) of milk. One can also use 1/4 cup (50 mL) of whey strained off of ripe kefir. Let the kefir grains culture the milk for an hour before adding rennet. After another hour, once the curd has set to a clean break, the kefir grains will rise to the top of the curd, and can simply be pulled out of the pot and re-used. The cheese-making process can then continue as usual.

Kefir may just be the perfect cheese-making starter culture.

If you're looking for kefir grains, you shouldn't have to look far. Someone in your neighborhood probably keeps them, and they'd likely be very happy to share a grain. Most kefir keepers have received their kefir grains as a gift, and are thus happy to pass along surplus grains to anyone who's interested in keeping them. Beware of packages of kefir being sold in supermarket dairy cases, though. These contain several strains of freeze-dried, laboratory-raised cultures that represent only a small slice of the diversity of kefir, and that cannot be used and sustained the same way as kefir grains.

Kefir may just be the perfect cheese-making starter culture. It's easy to cultivate without risk of contamination, and it contains a vast diversity of bacterial cultures that are useful in the production of every type of cheese. This same diversity of cultures helps to provide an incredible diversity of flavor in cheeses.

Finally, kefir is an excellent source of a beautiful fungus that can be used to ripen Camembert, Brie, and Crottin cheeses: *G. candidum*.

Geotrichum candidum

To create the beautiful, downy coats of Camembert and other bloomy-rinded cheeses, contemporary cheese-makers add freeze-dried spores of the *Penicillium candidum* fungus to their cheeses. The Latin name *P. candidum* reflects the whiteness of the fungus that ripens Camembert. While I haven't yet found a way to keep *P. candidum* at home, there is another fungus that can be used by cheese-makers to ripen a Camembert in a similar way, one that is used in traditional French cheeses like Crottin, *Geotrichum candidum*. You'll never guess where it's found—in kefir grains! (2)

All one needs to do to keep a culture of Camembert fungus

is to keep kefir grains. If you use the kefir as a cheese-making starter culture, you can be certain that the cheeses you make, if aged in the right conditions, will grow a healthy, *Geotrichum*-influenced, soft, white rind.

Penicillium roqueforti

Just as in the culturing of white, bloomy-rinded cheeses, cheese-makers use freeze-dried fungal spores to create their blue cheeses. The fungal culture used to make blue cheeses is *Penicillium roqueforti*, named after the town of Roquefort, France, where blue cheese was born.

Traditional cheese-makers in the Pyrenees region of France didn't have access to freeze-dried fungal spores when they made their Roquefort cheeses. They had a trick up their white sleeves—a secret they used to make their trademark blue cheese: moldy blue bread!

Of course, not just any piece of moldy bread can be used as a source of *P. roqueforti*, only one of many fungal cultures that flourish on bread. A piece of commercial yeasted bread, left in a plastic bag in your cupboard, will play host to dozens of species of wild fungus looking for a substrate to feed on, many of which might contaminate a blue cheese. Sourdough bread, though, naturally resistant to fungal growth because of its acidic nature, prevents the growth of almost all fungal species. And one of the few species that grows well upon sourdough bread is—*P. roqueforti*.

Cheese-makers have devised many methods to keep wild fungus at bay, such as brining, brushing, and waxing.

Whether you are making Stilton, Roquefort, or Cambozola, you can use a healthy, pure culture of *P. roqueforti* fungus grown on a slice of sourdough bread for all of your blue cheese making. Here's a method you can use to keep a culture of *P. roqueforti* at home.

First, get some good sourdough bread. Many varieties of sourdough are made with commercial yeast, so be wary of what you buy. The best way to be sure that the sourdough bread is good is to make it yourself! Be sure to add extra salt, and let the bread get extra sour to check unwanted wild fungal growth.

Second, take a thin slice of bread and spread on it a small amount of ripe blue cheese, preferably a piece marked with blue, the color of the microscopic spore-producing-bodies of *P. roque-*

forti. One doesn't really even have to spread cheese on the bread to introduce the right fungus: it's almost assured that when you slice your sourdough bread, some wild spores of *P. roqueforti*, a very common household fungus, will find their way into the bread!



A fresh round of cheese (left), when inoculated with Penicillium roqueforti (center, cultured on sourdough bread), can become a beautiful blue cheese (right).

Third, place the *P. roqueforti*-infected bread into a plastic container—the perfect vessel for growing fungus. Seal the container, and let the piece of bread sit at room temperature for one to two weeks. Check on the culture every few days to observe the spread of the fungus—it will start to grow as slightly raised bumps of white. As the fungus advances over the bread, it forms a ring of fresh, white hyphal growth surrounding a zone of mature, greenish-blue fungal spore production. (3)

Finally, when the greenish-blue fungal growth completely envelopes the sourdough, the “blue bread” is ready. The container can then be opened up, and the blue bread left to dry for a few days. Flip it to be sure that the bread is fully desiccated. Once dried, the blue bread can be kept in a jar, where it will keep for months or even years—fungal spores are remarkably stable.

To use the blue bread to make blue cheese, break off a small piece of the moldy bread about the size of a fingernail, stir it into a quarter cup or so of water to release the fungal spores, then pour the liquid through a strainer over the milk at the beginning of the cheese-making process to introduce the culture. As the cheese ages under the right conditions, your *roqueforti* fungus will slowly consume it, and in the process will turn it blue.

Brevibacterium linens

Brevibacterium linens is a bacterium that makes the stinkiest cheeses. Limburger, Muenster, and Epoisses are created in a way that encourages the growth of putrescent *linens* bacteria.

These stinky cheeses are made by washing their rinds. As cheeses age, wild fungus will grow on them, regardless of whether fungal cultures are intentionally introduced or not. Cheese-makers have devised many methods to keep wild fungus at bay, each of which influences the development of unique cheeses, such as brining, brushing, and waxing. One method of keeping fungal growth in check has a particularly interesting effect on ripening cheeses: washing their rinds.

To wash a cheese, cheese-makers scrub down their ripening cheeses twice a week with slightly salty whey. This regular washing knocks back wild fungal growth on the surface of the cheese and creates conditions that are too wet for the growth of wild fungus. However, these wet, salty conditions create

the perfect environment for the growth of *B. linens*. When this bacterium establishes itself on the surface of a ripening cheese, it gives that cheese an orangey-pink glow. The culture slowly digests the interior of the cheese, giving it a thick, oozing texture, and it gives the cheese a strikingly foot-like aroma.

Contemporary cheese-makers introduce freeze-dried cultures of *B. linens* into their washing whey to inoculate their cheeses with the appropriate ripening cultures. But there's no need ever to purchase *B. linens*, because you're already culturing it between your toes!

Fortunately, there is another source of *linens* bacteria that cheese-makers can turn to: already ripened, washed-rind cheeses are an excellent source. Cheese-makers need only their ripe washed-rind cheeses as inoculants to initiate their freshly made cheeses into the club.

These home-kept cultures can help a cheese-maker create a unique cheese, one that truly represents the flavors of their land.

To achieve this, cheese-makers first wash down the rinds of cheeses that already have established *linens* cultures and wipe them with a clean rag. They then use that same rag to wipe down their freshly made cheeses, thus introducing the appropriate cultures onto the surfaces of the next generation of washed-rind cheeses. With regular washing, fungal growth will be kept in check, and the cheeses will develop beautifully colored rinds and a delicious stink.

Why the bother?

Why would a cheese-maker bother keeping their own cultures when they are so readily available from cheese-making supply houses? They do so for all of the same reasons that an increasing number of growers are choosing to keep their own seeds.

Keeping cheese-making cultures allows cheese-makers to develop bacterial and fungal cultures adapted to the milk they use, and that grow well in the conditions found at home. These home-kept cultures can help a cheese-maker create a unique cheese, one that truly represents the flavors of their land.

Home-kept counter-cultures help a cheese-maker to save money. Buying freeze-dried cultures poses a significant cost in most cheese-making operations, while counter-cultures are much less expensive to produce. Keeping kefir grains, for example, can even save you money on your grocery bill: the kefir that they produce is a scrumptious stand-in for your morning yogurt!

Freeze-dried cultures have a limited shelf life, while keeping counter-cultures can assure a long-term, consistent supply of vibrant bacterial and fungal inoculants. The methods of keeping these natural cheese-making cultures can be scaled to any size of operation, whether at home, on the farm, or in the cheese plant.

Counter-cultures lessen cheese-makers' dependency on "corporate-cultures." Some of the same agribusiness companies that are monopolizing the seed trade are controlling the culture of cheese. By keeping our own cultures, we oppose corporate control and help establish food sovereignty.

A movement is afoot in North America to use sustainable home-kept cultures in the fermented foods we eat and drink—a movement steeped in the desire to create healthful, traditional foods that are tastier than their modern counterparts, distinctive to the region in which they are produced, and do not rely on unsustainable packaged cultures. In bakeries, sourdough culture is spreading far and wide. In craft-beer circles, wild fermented ales are topping sales. It's about time we stop the homogenization of cheese-making too. Let's keep our own cultures, and take back our cheese! △

David Asher is an organic farmer and guerrilla cheese-maker based on the wild west coast of British Columbia. He runs the Black Sheep School of Cheese-making, a traveling cheese school that offers cheese outreach to communities across Canada and internationally. His Black Sheep approach to cheese-making is influenced by permaculture principles. David received his permaculture training at Linnaea Farm, on Cortes Island, British Columbia. For more info on the Black Sheep School of Cheese-making, visit guerrillacheese.wordpress.com.



A fresh round of cheese, when rubbed regularly with whey containing Brevibacterium linens (shown in center being borrowed from an already ripened washed-rind cheese), will age into a stinky, washed-rind cheese.

Notes

1. DuPont, owners of Pioneer Hi-Bred, a leading developer of genetically modified seeds, purchased Danisco, a leading producer of cheese-making cultures, in 2011.
2. A list of the diverse bacteria, yeasts, and fungi of kefir grains can be found in an article in *Food Science and Technology (Campinas)* volume 30 issue 4, pages 1022-1026 by Bergmann, et al., 2010.
3. Taxonomic identification verified by the USEPA Toxic Substances Control Act, *Penicillium roqueforti* Final Risk Assessment, February 1997. http://www.epa.gov/biotech_rule/pubs/fra/fra008.htm

Create Your Own Seed Bank

Randel A. Agrella

SEEDS MAY LOOK INERT, but a viable seed is actually a tiny living plant surrounded by a small but essential quantity of nutrients. Seeds are perishable under ordinary conditions, and extremely high temperatures, above 49°C (120°F), can kill them outright. Otherwise, the tiny plant remains dormant, very slowly consuming the stored nutrients for as long as they last. When that reserve is gone, the seed is no longer viable. Handling and storing seeds properly helps the embryonic plants make their reserves last as long as possible, increasing the shelf life of the seeds. Your home already has most of the tools and conditions necessary for near-optimal storage of seeds, provided proper practices are followed.

What is a seed bank?

Every gardener has a seed bank, whether it's recognized by that name or not. Have leftover seeds from previous seasons? Or packets bought at closeout for next to nothing? How about that squash you plan to save for seeds, or those snap beans that matured on the plant? Any seed, reserved for later use is, in fact, a seed bank. Even weed seeds in the soil, lying in wait until who-knows-when, constitute a seed bank, albeit one you'd rather see overdrawn!

So what sets one seed bank apart from another? The answer, in a word, is "intent." From the lofty goals of the Svalbard Seed Bank in Norway, to that shoe box full of seeds under the bed, to nature's seed bank in the soil, every seed bank has its own distinct purpose and is managed accordingly.

Why keep a seed bank?

Why bother keeping a seed bank at all? Why not just buy seeds fresh every spring? I asked Ira Wallace of Southern Exposure Seed Exchange that question. Her answer should come as no surprise to most heirloom enthusiasts: "I think that one of the main reasons is the change in the seed industry. There's a lot of consolidation." As big companies gobble up smaller ones, they tend to discontinue what they regard as unprofitable or superfluous varieties. If you find that you have a favorite variety, she explains, "you can't count on being able to buy it in the future. If they stop growing them, the seed is not available to anyone"—anyone who hasn't squirreled away the discontinued variety, that is. "It's nice to have what you want right there at hand."

Also, with heirloom or open-pollinated varieties, you can save seeds produced in your own garden, carrying them over to future years. That's something you can't do with hybrids, which don't breed true. Hybrids need to be purchased every year, which is great for business, but doesn't suit thrifty gardeners and



Collect bean and pea seeds after the pods have thoroughly dried. The pods of some varieties shatter when dry. Spread a cloth under the plants to catch these seeds. Photo by Brian Dunne.

farmers. Saving seed has additional advantages. By saving only seed from the plants that performed best under your conditions, and according to your standards, over time you could develop locally-adapted varieties, superior to off-the-shelf strains. After all, that's what gardeners always did, until the advent of the organized seed trade a couple of centuries ago.

Whether you choose to save seeds, or prefer to purchase them, store seeds correctly until you're ready to plant. Often a packet contains far more than you'd care to use in a single season. For example, a packet of tomato seeds might contain 25 seeds. That could yield at least 20 tomato plants, all of the same variety. That's a lot of tomato plants for most gardeners, especially if they enjoy trying different varieties! The obvious solution is to plant only a few, and store the remainder for another season.

How to store seeds safely

Seeds store best under conditions that do not encourage germination, and that do not cause the embryonic plant to exhaust its stored nutrients. For the vast majority of seeds, germination is stimulated by a moist and relatively warm environment. Therefore, to delay germination and maintain vigor, store seeds in a cool, dry location. Ira advises would-be seed bankers to "look around and find where in their house is a good place to have them. The first thing is to have them in a cool, dry place."



Plastic bags and glass jars are just two ways to store seeds. Labels are essential to good organization. Photo by Brian Dunne.

How cool is cool, and how dry is dry enough? A rule of thumb is to store seeds where the temperature plus the relative humidity equal 100. For example, if a room is 21°C (70°F.), a relative humidity of up to 30% is good (70+30=100). Happily, it works out that conditions that suit people are pretty good for seeds as well. Most seeds will store for several years under ordinary indoor conditions. Some seeds are short-lived—lettuce, onion, parsley, parsnip, and salsify store for only about a year. Beans and peas keep for three years. Squash and melon seed keep up to five years.

Room-temperature storage

If you plan to store seed for only a few years, then storage at room temperature will be adequate. All that remains is to select containers and a location for the seed bank. Be sure to pick a spot that follows the formula. Don't store your seeds in a bathroom closet (too humid) or near a direct source of heat, such as a sunny window or a heater. Instead, try to identify the coolest and driest place in the home. That shoe box under the bed isn't such a bad idea—it's usually cooler near the floor. A closet in an unheated spare room is great too. And seeds keep best when stored out of bright light.

The choice of containers is easy. The original seed packets work just fine, and are easy to organize. If home-saved seed is being stored, plastic zip bags are good, but jars are better. (Be certain that freshly harvested seed has dried adequately before storage!) The entire seed bank can be kept in a bag, box, or ice chest.

A few packets of silica gel, changed or reactivated annually, will complete the picture. Silica gel is a desiccant or water-absorbing agent that comes in little packets. ("Do not eat!") Many new electronic devices and other products come packed with them inside. The silica gel draws moisture from the air and traps it. The material can absorb up to 20% of its own weight in water. Additionally, silica gel absorbs ethylene gas, a waste product of the seed's respiration. In a very close environment, ethylene gas can build up to toxic levels and cause premature death of the seed.

Pests can ruin an otherwise well-maintained seed bank in short order! Guard against mice, especially in the fall, when they seek shelter from the coming winter. They try to set up house-keeping indoors, and your seed bank is an attractive stockpile of food to them. They will be as attracted to your seed bank as they are drawn to the kitchen.

Other pests are more insidious—less apt to be noticed and harder to control. Numerous types of moths and weevils will love your seed bank quite as much as you do, so be watchful. Be careful to avoid bringing them in, especially with home-saved seed—these are vulnerable during the drying process. Remove infested lots promptly. If insects do appear, they can usually be eradicated by freezing at -18°C (0°F) for ten days—you could treat the entire seed bank that way if necessary, with the exception of a few exotic tropical species. Mothballs (usually naphthalene), if you don't object to them, may discourage a range of pests. Organic deterrents include cedar or peppermint oils, various herbs, and diatomaceous earth. Each method has its adherents, and no doubt each method has been known to fail. Check the seed bank periodically, so that you can respond promptly.

Take care of your seeds, so they can take care of you!

Long-term storage

The simple measures outlined above are adequate for short-term storage. But what if a longer shelf life is desired? Some people, especially those with something to sell, advocate canning, freeze-drying, or vacuum-packing the seeds, but that is not really necessary, though all do work quite well. Storage in the refrigerator or freezer is a simpler answer, and again, is readily available in the home. How long will they last? Ira said that "We have some seeds that Jeff [Dr. Jeff McCormack, founder of Southern Exposure Seed Exchange] collected back when SESE had just started [in the 80s]. We pulled them out, and they germinated around 40%!" A British seedsman told me that he was still selling seeds that had been frozen since the 70s! Authorities agree: seed stored in the freezer lasts a very long time—decades in many instances!

For freezer storage, the moisture content must be very low prior to freezing—otherwise the seeds may be damaged. Homegrown seed should be dry enough that it snaps rather than bends (in the case of flat seeds like squash or melons), or is very hard in the case of other types. Commercial seed is dried to the proper moisture content (about 8%). However, if it's been exposed to humidity, it may have taken up some moisture. Be sure to reduce the moisture content before freezing. One way is to place the seeds in a warm location—around 38°C (100°F), and circulate air around the seeds with a small fan for a few hours.

Once the seed is fully dried, place it in closed containers with silica gel. You can even purchase silica gel that changes color when saturated with water, indicating at a glance if the moisture level has been reduced sufficiently. If the color of the granules tells you that the gel has reached saturation, simply remove the granules and replace with fresh ones. Saturated silica gel can be regenerated by baking in a low oven. Be sure to follow manufacturer's directions. Remember to avoid exposing very cold seed to warm room air. Otherwise, moisture condenses from the air and collects around the seed, just as it collects on a cold glass of lemonade on a hot day. Always remove the container from the freezer several hours before opening, which allows the seed to warm to room temperature.

If you don't plan to freeze your seeds, drying them to extremely low moisture levels (1-3%) has been shown to increase shelf life 4-16 times over room-temperature storage. Start by curing seed fully, under moving air at 38°C (100°F). Silica gel or other desiccants are mandatory in this case, using a product with the moisture-indicating color change. Granules are simply cycled through the closed container repeatedly and replaced until no further color change is noted, and periodically thereafter to maintain low levels. Most vegetable seeds tolerate this treatment. It's been shown to be as effective as freeze-drying, and is much simpler. A few of the larger seed types, such as squash, may be damaged by such extreme desiccation. Beans and peas, and no doubt some other types, may develop "hard-seed." This means the seed is more deeply dormant, and may require what Ira calls "heroic means" to induce germination. Otherwise, it takes longer to germinate—sometimes a lot longer, but with ordinary garden types, usually 2-3 weeks exposure to higher humidity prior to sowing will be adequate.

Studies show that the best containers for long-term storage, in the freezer or out, are the so-called Scotch jars—the canning-type jars that have a metal bale or hasp, glass lid, and rubber gasket. These jars exclude all moisture. Jars with screw-type fittings may allow some moisture inside eventually—the lids loosen over time, due to the expansion-contraction cycle that accompanies even slight temperature variation. Still, ordinary jars with screw-on lids can be employed, and will safely store banked seed for many years, particularly in combination with silica gel. Plastic allows moisture infiltration over time, and isn't considered adequate for very long storage periods, although it's fine for ordinary storage requirements.

Organization

Organizing your seed bank need not be complicated, but must be adequate for your purpose. If you're using original packets, alphabetizing is easy. Or you could segregate by type—all tomato seeds grouped together, all the beans together, and so on. What matters is that you can find the seeds you want when you want them.

If you have numerous varieties, a list—kept current—saves a lot of time. It can also strengthen your resolve—if you know those Wando peas are there somewhere, you're more apt to keep looking until you find them!

If you store your seeds in jars or baggies, pay attention to la-

beling. Labels should be legible and contain whatever information is important to you: the variety name and the year grown, at a minimum. It's wise to include a label inside the container as well—especially for long-term storage. Adhesive labels peel away, and felt pen (even "permanent" marker) sometimes rubs off. A label inside the container is a worthwhile precaution.

Seeds come to us ready to store until conditions are favorable for growth. By giving nature a little encouragement, we can store them for a very long time. So develop your personal seed bank. Take care of your seeds, so they can take care of you! Δ

For more informatino about Randel Agrella, see his biography on p. 11.

Sources

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2. The Rust Store, 2830 Progress Rd., Madison, WI 53716. <http://www.theruststore.com>. 877-256-9301. silica gel.
3. Hillas Packaging, Inc., 3301 W. Bolt St., Ft. Worth, TX 76110. <http://www.poly-bags.com>. 877-464-4552. poly bags.
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*Saving the seeds all leads up to the moment of truth: Planting!
Photo by Brian Dunne.*

Sowing seeds of Community

Urban Forest Gardens Emerging

Frank Raymond Cetera

THIS IS THE STORY OF PEOPLE, RESOURCES, and vision coming together to grow a forest garden in Syracuse, New York. Dispersal (Act One) starts in the Fall of 2010 in the office of the Syracuse Peace Council where Frank Cetera of The Alchemical Nursery and Magda Bayoumi of the Rahma Free Health Clinic are introduced by SPC Staffer Ursula Rozum during an Advisory Board meeting. Magda is opening a free health clinic on the south side, in an economically depressed neighborhood. The all-volunteer clinic team is struggling through state paperwork to get the requisite approvals and a license to operate. The last thing they have time for is yard work and landscaping—boy, do they need it!

The clinic sits on a lot fronting a main north-south thoroughfare, South Salina St., and is very much in the public eye. Up-keep is required as per city codes, and it has been lacking. The lanky green expanse of lawn takes up valuable volunteer time and provides little in return from over 7,000 sf (650 sq. m) of land in the urban core. An adjacent gas station/convenience store provides ample litter from junk food and sugar-laden treats.

After Magda hears from Frank about the mission and projects of the Alchemical Nursery, she invites him to lead a food forest implementation at the clinic site. The idea and the direction forward have been planted: let's bring the health care mission of the clinic outside, grow free food for the community, green the urban core, reduce landscape needs over time, and provide an alternative to the convenience store as a source of snacks for local youth.



Lindsay Speer helps supervise as youth from the neighborhood dump mulch over cardboard to sheet-mulch the lawn.

Germination

Winter 2010 sees the idea take shape, as the design comes together for the Rahma Edible Forest Snack Garden. The Alchemical Nursery organizes an open design competition, and seven designs are received from across the country. A select jury of local permaculturists and landscape architecture professionals is recruited to pick the best design. Steve Gabriel's submission, from Ithaca NY, was judged the best design, and becomes the basis for the forest garden's implementation and evolution.

But, lo and behold, the tap of wood chips from the city contractors wasn't shut off!

Fall 2011 brought a series of volunteer work days that were primarily dedicated to sheet mulching with cardboard (collected from various commercial sites around the city) and wood chips (provided by city contractors involved in urban tree removal), and planting some initial species such as apple, raspberry, sunchoke, beach pear, peach, currant, gooseberry, and pawpaw.

At the same time, an IndieGoGo crowdfunding campaign is initiated to raise \$2,000 for the project's estimated budget, with fun and intriguing awards such as a custom designed Polyculture Seed Mix, complimentary registration for a food forest workshop hosted on-site with Jonathan Bates of Food Forest Farm, signed prints of the garden design, and a custom fruit tree guild design. The Alchemical Nursery heavily promotes this campaign over the course of months resulting in \$2,395 raised from over 70 funders. The project is underway!

Disruption

The initial design was for a strip of land approximately 30x145' (9x44 m), which we sheet-mulched in the fall of 2011. But, lo and behold, the tap of wood chips from the city contractors wasn't shut off! We returned to the site after a few months' winter absence and were greeted by another 9-10 cu. yd. (0.75 cu. m) of chips left to the side of our original project area.

So, we rallied as many troops as we could in Spring 2012.

With volunteer help from the IndieGoGo campaign donor roster, graduates of the recently completed first installment of the Community Training in Ecological Design course in Syracuse (a partnership with FLPCI using a truncated PDC curriculum for greater accessibility and general interest), youth and adult leaders from the Syracuse chapter of 100 Black Men of America, and lunch support from both Say Yes! To Education and the Rahma Clinic itself, we mulched another 4,000 sq. ft. (about 1/10 acre) or so, and succeeded in planting a number of additional species for the upcoming growing season including blue bean tree (*Decaisnea fargesii*), beach plum (*Prunus maritima*), sorrel, and northern wild raisin (*Viburnum cassinoides*).

We were also trying to keep our project in the forefront of the local community from a social media perspective. In these early months of 2012, the newly announced Seattle food forest was getting heavy media attention, and local people were often posting it to the interwebs as if it were the greatest thing since sliced bread. We certainly were happy that the Seattle folks were getting such great municipal support and funding, and can't wait until that's the norm. However, "not seeing the forest for the trees" when it comes to what's outside your own door created some extra work for us, as we strove to redirect the news to our local work. Assistance also came from local foodie trailblazer and entrepreneur Marty Butts from Small Potatoes Marketing, whose letter to the editor in the Syracuse Post-Standard drove additional donors and volunteers our way.

We successfully showed that our food forest will... provide food and green the city...

Vandalism was minor, to our delight. One peach tree was completely broken off below the budding branches (but is now re-sprouting and should someday produce fruit), a similar incident occurred to a beach plum, and our interpretive sign, as discussed below, was rocked out of its concrete footings and left slightly cracked and leaning (nothing a little earthworks and a few screws couldn't fix). The site has taken on an identity we believe has reduced the potential for vandalism—thanks to the defined pathways, a variety of signage (including community-painted identification sign-lets created during the last two Earth Day celebrations at Thornden Park), the connection to the Rahma Free Health Clinic, and (we like to think) because we left in place the path used for through-cutting by the community as part of the design—folks walk through regularly.

Vegetative growth

The Alchemical Nursery received a boost in Spring 2012 by being awarded a \$3,990 grant from the Onondaga Lake Partner-



Our permaculture and forest gardening interpretive sign greets and orients visitors to the site.

ship. The award criteria were based on addressing community and watershed environmental issues, innovation, promoting partnerships, and demonstration of a plan that would produce clear and tangible results.

This grant would enable us to move beyond our initial design and project goals, and help support our expansion to the additional square footage that we sheet-mulched with the bonus woodchips. It would also pay an intern for a couple hours per week during the summer to stay on top of watering and general maintenance, and to create an amazing interpretive sign that shares the ideas of forest gardening, permaculture design, and permaculture ethics.

The purpose of this mini-grant program is to support local projects designed to increase the knowledge and involvement of the public in Onondaga Lake and its watershed and strengthen the link between communities and the partnership. We successfully showed that our food forest will not only provide food and green the city, but will also make an important contribution to biodiversity and green infrastructure for the 4.6 sq. mi. (12 sq. km) Onondaga Lake, about 3.75 mi. (6 km) away—one of the most heavily polluted in the nation due to combined sewer overflows.

During our first full growing season, we met, worked with, and gave food to a number of local residents from the community surrounding Rahma and the forest garden site. We had planted two raised beds at the most prominent corner to provide a harvest in the first year, and to provide a familiar site to passersby who might not recognize an urban food forest community garden as being different from an abandoned, vacant, overgrown lot. Herbs such as basil and dill were shared, as well as numer-

MUSHROOMS, MOLDS AND MYCORRHIZAE: A PERMACULTURE OF THE FUNGI

THIS COURSE is a comprehensive introduction to incorporating Kingdom Fungi in ecological design. Lectures and hands-on work will explore: biology and ecology of fungi, inter-kingdom interactions and symbioses, low-tech mushroom cultivation methods including spawn making and substrate preparation, mushrooms and fungi in perennial gardens and small farm designs, collecting and preserving wild mushroom strains, mushrooms as functional food, mushroom medicine, and mycoremediation. We hope to inspire and empower participants to develop regional mycelial mosaics and cultural strategies for expanding the human-fungal symbiosis.

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Mark Jones, Tradd Cotter, David Via, Angel Shockley.

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ous greens such as collards and chard, plus tomatoes, and an abundance of strawberries and garlic.

Reproductive growth

The second full growing season in 2013 provided an expanded array of harvestable items including sorrel, jostaberry, golden raspberry, apples, and pears. Chokeberry (aronia) was also very plentiful from two bushes planted central in the site and next to a couple of pallet-wood benches that volunteers constructed. Community gardeners from a neighboring street harvested the chokeberries, as we found to our delight, when I received a phone call asking how exactly to cook them. Sunchoke were also plentiful and a fun harvest to share and use in teaching about native and alternative food species.

We hope that Year 3 will see even greater use by the surrounding neighborhood. We created a DIY zine that detailed the history of the project, a number of the plant species on site, and some sample recipes (as well as an explanation of permaculture, food forests, and a few other conservation and permaculture-related topics). These were hand-delivered to each doorstep in the surrounding four streets of the block, and are also being sold on a sliding scale throughout the year as an educational and promotional tool.

Dispersal—Act Two

Although we succeeded in “Bringing the Health Care Mission of the Clinic Outside its Doors,” we’ve not yet been able to establish “next-door leadership” at the Rahma Forest Snack Garden. If we are to transplant this idea of community food forests throughout the city, we’ll need more social capital than we currently have, and that’s always been the challenge. This will be a long road, but we feel the strategy of “build it and they will come,” combined with networking, networking, and more networking will find purchase.



The garden after two full growing seasons—white clover as ground cover, comfrey, Asian pear, golden raspberry, black-eyed susan, apple, sunchoke in the far distance, and much more!

For now, we’re moving forward with plans for a few new forest garden plantings in the ‘Cuse that have built-in support from the owners of the locations. Thanks to a Salt City DISHES award, we will be establishing a small installation within a right-of-way strip between roadway and sidewalk, demonstrating productive use of these commonly underused spaces. And, we’ve been working with the Syracuse Real Food Coop to design and plant their backyard as a community and member-owner gathering and demonstration space (See how it grows! Pick some herbs for your deli sandwich!).

The idea of creating landscape-level food forests in an urban environment is taking hold and spreading...

The idea of creating landscape-level food forests in an urban environment is taking hold and spreading. Beyond that, we now have a robust source of plant material—cuttings, scion wood, tubers, and seeds—to propagate in these new locations. We have approximately 70 different species now on site, including dwarf North Star cherry, Nectarest dwarf nectarine, dwarf hybrid Red Anjou pear, Shiro dwarf plum, plumcot, Reliance dwarf peach, beach plum, Regent saskatoon (a juneberry), Wine raspberry, medlar, Cornelian cherry, Manchurian viburnum, northern wild raisin, Fall Gold everbearing raspberries, seaberry (*Hippophae spp*), Chojuro dwarf asian, Hosui dwarf Asian pear, modern “4-on-1” apple, antique “4-on-1” apple, jostaberry, sunchoke, strawberry, blackberry, black raspberry, chokeberry, chives, serviceberry, golden currant, Missouri gooseberry, thimbleberry, pawpaw, and applemint, just to name a few (we can’t wait for our next intern to help us catalog and map the maturing food forest!). But even more importantly, we have a free and open source of these materials for people to take back to their own yards, as the bounty spreads. △

Frank Raymond Cetera is Co-founder and a project manager of The Alchemical Nursery Project, Inc, a 501(c)3 nonprofit dedicated to eco-social regenerative landscapes and lifestyles, and Owner/Operator of Thornpawed Ecological Consulting (member of the Northeast Permaculture Design Business Guild). Frank takes his personal mantra of “lion-hearted and thornpawed” and applies it to community across the board including as Board President of Cooperative Federal Credit Union, Volunteer Coordinator and Treasurer of the Onondaga County Green Party, and development of the Bitternut Housing Collective. He believes that lifestyle politics should exist alongside electoral politics and does not enjoy debating about the juxtaposition.

How to Start a Community Seed Bank

Ellen Rainwalker

COMOX VALLEY GROWERS AND SEED SAVERS (CVGSS) is a volunteer-run, non-profit on British Columbia's Vancouver Island. For the past 14 years, we have promoted the growing and saving of seeds. One of our most popular events is an annual Seedy Saturday that includes a community seed exchange.

In March of 2012, a number of CVGSS members met to discuss starting a community seed bank. Many of our favourite vegetable varieties were no longer available on seed racks or in catalogues, having been replaced by hybrids, which won't come true from saved and replanted seed. We also noticed that some in the community who had been saving and sharing heirloom seeds had moved, died, or were no longer saving seeds. Members raised concerns about the increased power of governments and a few big corporations to regulate our food and seed supply, and about our vulnerability to disruptions in the long-distance industrial food system, especially because we live on an island.

A seed bank for Vancouver Island

We all felt that our community would have greater food security if we could start and maintain a collection of food crop seeds well adapted to our local climate. We decided to start a "living" seed bank, growing out the seeds regularly to keep them viable, rather than putting them into long-term frozen storage as some seed banks do.

We also unexpectedly received seeds from people who...had an heirloom variety that they wanted us to look after.

Each person said they would grow and contribute seeds of at least one of their favourite crops, using fresh non-hybrid seeds from reputable companies or local seed savers. We agreed on the necessity of knowing how different crops are pollinated to avoid crossing with other nearby varieties, and on keeping good records. Each grower was assigned a code.

People took on the tasks of publicizing the seed bank project, communicating with members of the team, designing record forms and labels, and developing a database. Some of the more



Seeds are stored in moisture-proof containers at room temperature. Each container is labelled, and the crop record forms are easily accessible.

experienced gardeners offered to mentor those new to seed-saving. One person offered to compile a list of seed-saving books and other resources, and to put together an instructional slide-show. We knew this would require commitment, but we were enthusiastic and eager to get started.

The following month, we had a potluck lunch at a local organic farm and invited Dan Jason, owner of Salt Spring Seeds and one of the founders of the Seed and Plant Sanctuary for Canada, to come and speak. In addition to some helpful advice, Dan generously gave us a selection of seeds to be the nucleus of our Seed Bank. Dan's article, "Community Seed Saving: How to Organize for a Resilient Future," is in the Resources list at the end of this article.

We continued to publicize the Seed Bank and enlist growers. In the fall of 2012, we met to package and label our first harvest. Each grower provided a Seed Crop Record with detailed information about the performance of the seeds they contributed: seed source, date planted, productivity, number of days seed to seed, resistance to pests and diseases, and tolerance to extremes of weather. These record forms will enable us to see how well the seeds perform year by year, and whether they are likely to adapt to changes in the climate.

After packaging and labelling the seeds, we divided them into two identical sets kept in different places, in case something unfortunate should happen to one set. The seeds are stored in moisture-proof containers in plastic totes at room temperature, and a binder containing the crop record forms for each seed variety is kept with the totes.

The first year, seeds of 51 varieties of food crops were deposited in the Seed Bank along with their crop record forms. We

also unexpectedly received seeds from people who had heard about our Seed Bank and had an heirloom variety that they wanted us to look after.

Ramping up our efforts

In order to involve more growers and add more seeds to our collection, we created a colourful display, a slide show presentation, and a flyer. These were taken to various events such as Transition Town meetings, Seedy Saturday, and our local Fall Fair, and we established a presence on the Comox Valley Growers and Seed Savers website.

It's vital to ensure that our heritage of seeds from past generations is retained...

We began distributing seeds from our collection, in order to increase the quantities and to make sure the seeds stayed fresh and viable. We asked people who took them to sign a Grower's Agreement stating that they would use good seed-growing and seed-saving practices; that they wouldn't use synthetic pesticides and fertilizers; and that they would return to the Seed Bank at least twice as many seeds as they received, along with the accompanying Seed Crop Record.

Because most of the seeds contributed were vegetables and herbs, we created a wish list of calorie crops such as beans, flour corn, grains, lentils, root crops, and squash, and asked people to grow them for the Seed Bank.

We have just met to pack our 2013 seed harvest. Seeds of quite a few of the important calorie crops were contributed, and we now have 34 growers. We feel that we have accomplished quite a lot in less than two years.

Future directions

At our next get-together, we'll be discussing where we're going next with the Seed Bank. Some of the questions will be: Should we keep one set of seeds in long-term frozen storage? Should we try to get people to grow large quantities of seeds of the important calorie crops to be used if a disaster strikes? Should we start a Seed Library and give out seeds to the public? Should we look for curators who will take on one particular variety and provide a fresh supply to the seed bank at regular intervals? How can we get more people involved with the Seed Bank? I'm sure it will be a lively meeting.

It's vital to ensure that our heritage of seeds from past generations is retained, and that locally adapted seeds are available to grow a sustainable and nutritious diet. Starting a Community Seed Bank is one way to be involved in this valuable work, and

you'll get to spend time with some wonderful "seedy characters" as well. △

Ellen Rainwalker is a retired market gardener who has been growing food and sharing seeds for many years. She teaches workshops on seed-saving, growing for market, and permaculture. You can contact her at rainwalker@telus.net if you need help starting a seed bank in your community, or if you would like a more extensive list of resources.

Resources

1. Comox Valley Growers and Seed Savers (lots of information on good seed-saving practices): www.cvgss.org
2. Jason, Dan (2011) "Community Seed Saving: How to Organize for a Resilient Future"—www.seedsanctuary.com/articles/community-seed-saving.cfm
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6. Seeds of Diversity Canada: www.seeds.ca
7. Seed Savers Exchange: www.seedsavers.org



With much experience as a market gardener, the author helped conceive and organize the seed bank.

The Community Seed Bank is a project of Comox Valley Growers and Seed Savers. Its purpose is to preserve and maintain a collection of viable, open-pollinated, non-GMO, organically grown seeds that are well adapted to our local conditions.

Sowing Insecurity for Indigenous Seed, Culture & Livelihood

GMO Seeds: The New Green Revolution in Africa

Trina Moyles

IT'S THE SEASON OF SORGHUM in Nyakiju, Muyumbu, a village of about 100 households nestled in a patchwork of green and brown hills in southwestern Uganda. Today, I'm visiting Olivia Tushabomwe, a Mukiga woman of the Bakiga cultural group, who's been working in the garden since she was four years old and strong enough to hold the long, heavy *efuka* (traditional hand-hoe).

It's no wonder that the Bakiga are traditionally referred to as *Abataka*, which translates from the local language of Rukiga into "people of the soil." They've been rotating and cultivating crops of peas, sweet potato, pumpkin, indigenous greens, and sorghum on the sides of the rising and falling hills for hundreds of years. Olivia has inherited the life of the *omuhingi*, "the woman who digs"—it's how she is able to feed her six children and pay for their school fees.

Olivia isn't alone. In Nyakiju, 100% of the households are engaged in small-scale or subsistence agriculture, growing crops to ensure their daily, seasonal survival. Over 85% of Uganda's people live in rural locales, and practice traditional, low-input (and almost entirely organic) agriculture.

East Africans know Uganda as "The Bread Basket" because of the high number of farming households, the relatively fertile lands and forested landscapes, and adequate rainfall that replenishes most regions of the country, with the exception of the arid landscapes of the north that border with South Sudan.

In Nyakiju, Olivia and her older children recently harvested two garden plots of sorghum, an indigenous grain that grows over 2 m (6.5') high, and sways like an upside-down pendulum with the heavy sorghum seed heads at the top. When ripe, the berries turn the fields into visual poetry with shades of honey, ruby red, rust, and caramel brown coloring the entire village landscape. To the Bakiga people, sorghum is more than an agricultural crop—it's a cultural crop that Olivia and her ancestors have grown for generations—hand-planted, hand-harvested, and hand-preserved for centuries.

Today, Olivia has invited me into her home to share a drink of *obushera*, traditional porridge made from fermented sorghum.

Saving sorghum seed, preserving culture

Olivia's home is a steep climb from the bottom of Nyakiju's valley floor. It's hard to imagine she makes this climb four to five times every day—carrying an *efuka*, a sack of sorghum seed, a plastic jerry-can filled with water, and always, her two-year-old baby wrapped around her back with a piece of cloth the color of the sun.

Olivia's house at the top of the giant hill is a simple structure made of earth and stick walls, with woven stalks of dried sorghum forming a thatched roof. An avocado tree provides refuge



Tushabomwe Olivia (r), a subsistence farmer from Nyakiju, Muyumbu, standing with four of her children outside their home.

from the sun. In front of her home, a myriad of colorful sorghum dries in the sun on top of large blue tarpaulins—seed that Olivia will save for the next season.

Her eldest daughter, around fourteen years old, emerges from their small home, and hands me a plastic mug of porridge. "There's an old saying," Olivia explains with a laugh, "if you don't offer your guest *obushera*, the rats should come and eat everything in your home." Grateful, I take a drink—it's cold and sweet, and quenches my parched mouth.

Indigenous seed-saving culture eroding

Today in southwestern Uganda, sorghum is one of the last remaining indigenous Bakiga seeds.

In conversation with Olivia and many other subsistence farmers in the region, I've learned that the majority of households face major challenges in continuing indigenous seed-saving practices and culture—owing largely to the historic influence of the IMF's Structural Adjustment Program (SAP) in the 90s, the liberalization of agricultural systems, and today's "New Green Revolution" which is being pushed in Uganda and other countries, especially those in Sub-Saharan Africa.

The government and an emerging influx of agribusinesses, including Monsanto, have persuaded Olivia, like her neighbors, to purchase bags of hybrid or GMO seeds. At approximately US\$5, these imported seeds are a large expense to the farmer whose purchasing power is only US\$1-2 per day.

In order to gain a deeper understanding of the shift from indigenous seed-saving to purchasing imported seeds, I spoke with Tunkundane Cuthbert, a Sustainable Agriculture Pro-

gram Coordinator at Caritas Kabale, an NGO operating in SW Uganda. Cuthbert explained how imported seeds are favored by the government, even though the bulk of Uganda's farmers are most familiar with and have the greatest access to and control over local, indigenous seeds. "It's like going to church, where religious leaders tell you that medicinal plants are Satanic—while the [pharmaceutical] drugs are pure!" Cuthbert exclaimed.

This shift is part of a push for the New Green Revolution to take root in Africa, which is being encouraged by wealthy nations of the G-8, multinational corporations like Monsanto, and giant NGOs like the Gates Foundation. These stakeholders hold, with religious reverence, that "improved" GMO seeds will yield higher outputs for the farmer—the old mantra that more food production means less poverty for the small farmer.

The Ugandan government is also preparing to join the New Green Revolution. Since 2008, Parliament has been drafting the Biotechnology and Biosafety Bill, commonly known as the GMO Law. The GMO Law is a regulatory framework for the promotion of biotechnology and GMOs. It's a hot debate in parliament today, with supporters engaging the "more food" rhetoric, and critics claiming that it's aligned to the interests of transnational/multinational companies and not in the interests of

Olivia wouldn't call herself a permaculturist...

Ugandan farmers and the wider public, and will have negative impacts on health and the environment (Muyambi, 2013).

The main problem with the New Green Revolution and promotion of GMO seeds, however, is that regardless of increased food production, farmers like Olivia, the smallest fish in the pond, will remain at the mercy of free market policy. Market vendors earn five times as much as small farmers, yet the cost of production for farmers is also increasing—meaning they're caught in an unjust system and barely breaking even. "When you talk of the price," said Twinamatsiko Alphonse, a youth farmer from Kabale town-centre who grows Irish potatoes, "[farmers] are being over-exploited."

Worst of all, farmers are losing access to the indigenous seeds that have ensured food security and cultural identity for hundreds of years. "It's true that people were more food secure with indigenous [seeds]," Cuthbert told me, "and yet, now they're difficult to find [in southwestern Uganda]."

Uganda's annual GDP may be increasing as a result of the Structural Adjustment and New Green Revolution programs (Watkins, 1999), but life is not getting any easier for Olivia and other farmers. On the contrary—in Nyakiju, a Ugandan healthcare organization estimates that 60% of children under five years are suffering from malnutrition and stunted growth (Kigezi Healthcare Foundation, 2013) almost 20 years after structural adjustment—so much for less poverty.

In reality, stakeholders, like the G-8 and Monsanto, are the

ones who profit from increased control of seed markets, at the expense of small farmers like Olivia, who are more food insecure and malnourished with their GMO seeds.

Securing well-being and cultural identity

Olivia wouldn't call herself a permaculturist, as most subsistence farmers in Uganda have never heard of Bill Mollison's and David Holmgren's system of ecological design; however, traditional Bakiga practices of growing food naturally encapsulate many of the ethics and principles of permaculture. Take one glance around Olivia's yard, and it's easy to see that she's practicing permaculture in the truest sense.

She uses local resources to build and maintain her house and animal pens. She promotes diversity in the yard, growing vegetables and fruit trees, and integrating small livestock. She composts rabbit manure and vegetable waste to feed her garden plots. Olivia depends on the earth for her livelihood; "care for the earth" is deeply engrained in her cultural practice.

With the fate of the GMO Law leaning heavily in favor of the New Green Revolution, the future well-being of subsistence farmers remains uncertain. But at the heart of all the uncertainty, Olivia continues to save her sorghum seed: an act that goes beyond permaculture and traditional agriculture practice. For Olivia, saving her indigenous seeds enables her to secure and preserve, not only the economic means for her family's well-being, but the very essence of Bakiga culture. For now, indigenous seeds are in her hands—ready for next season's planting. Δ

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Movement Musings

IPC-11 in Cuba

Albert Bates

AS OUR CARAVAN of modern tour buses winds its way through the Cuban countryside, our bus guide, a short, handsome man named Jesus with a greying ponytail, picks up the microphone. He points to a closed sugar mill outside the window as we speed along through fields that once grew sugarcane and are now covered with *marabou*, a dense thorny bush up to 10' (3 m) high.

Five years ago, he explains, that mill had been running at full speed. Then, the price of sugar dropped to \$0.05 a kilo on world markets, and the government decided to close 50 of the country's oldest mills. From a business point of view, that made sense. But it completely destroyed the fabric of the rural community that had supported the sugar industry here for 400 years. When you suddenly throw everyone out of work, you don't close only the mill, you also shut down the stores, the taxis, the schools, and the clinic, everything that had supported the mill. With the engines of local commerce suddenly shuttered, most

vests timed to weekly or biweekly schedules to feed the mill, the hauling and processing of the bagasse, the sharpening of machetes and the repair of tractors and combines, along with all the systems that supported the mill in the surrounding villages, no longer existed. In as little as two or three years, it had vanished.

Jesus looks out the window, concealing the pained expression on his face. He thinks a moment while he chooses his words carefully. "You get this with planned economies," he says. "The mills were old, they needed to be shut down anyway."

...the first modern mill to be built in half a century is now under construction.



Gerardo is one of the sugar town men who relocated to Havana, where he now drives a rusty Soviet-era Lada as a taxi.

of the people who had lived in the sugar towns just packed up and left. Some 300,000 unemployed went to Havana and other cities in search of work. A paying job is the constitutional right of every Cuban, after all.

Then, after a few years, the world price of sugar rebounded to \$0.15 a kilo. The government wanted to reopen the mills. They commanded it. But it didn't happen. It couldn't. That 400-year-old fabric, which involved rotational plantings, har-

They were very inefficient and wasteful." I have the sense that he needed that caveat inserted to protect his position as a tour guide. Brazil has been assisting Cuba with new mill technology, he says, and the first modern mill to be built in half a century is now under construction.

Jesus embodies many of the contradictions of Cuba. In his 40s and an experienced tour guide, sporting six days of stubble on his chin after living with 400 of us permies at the state park in Mayabeque, he is well educated and multilingual, and has family in the US. This includes a daughter who sent him the iPad that he used to organize the entire tour. With it, he scanned all of our passports to transmit them ahead to the hotels where we would be staying so that registration could move very rapidly when we arrived, late at night, after a long day of tromping over recently agroforested pastures, descending into crystal caves, sampling the wares of coffee growers in the mountains, or walking through urban projects with some of Cuba's 1,200 native PDC graduates.

We asked Jesus about his education, and he told us that in Cuba, students go to the higher levels if they show aptitude in history, mathematics, or the arts. Cuba trains a lot of engineers and doctors—more doctors graduate each year than existed in the entire country at the time of the revolution in 1959. Jesus' academic strength is in Cuban history, something that became more obvious as we listened to him.

Those of us who wandered into the markets of Havana or perhaps visited one of the high schools or universities, witnessed

the value this nation places on the arts and music. I saw student art that could be displayed in any gallery in the world. But the system favors the early bloomers, advances those, and relegates the slackers and underachievers to menial jobs like cutting cane or waiting tables. This is no different than in the US, but the difference here is that the influence of money to tip the scales to favor wealthy children is still rare. Social class is present in Cuba, but it is officially déclassé.

Every Cuban gets 7 lbs. (3.2 kg) of rice per month, a measure of beans, a chicken, 5 eggs, and a few other things. If you can afford more, you can buy it, and nobody starves. A good urban garden makes \$1,000 per month for a family, after feeding themselves. That compares favorably with an average salary for most

workers, including doctors and engineers, of \$20 per month. It is small wonder there are so many urban gardens.

After the convergence, along with Lila Nuñez, Chair of the International Permaculture Congress, I attended a reception to introduce to the diplomatic community the newly appointed Norwegian Ambassador, who was openly gay, and his Cuban lover. When one considers the persecution of gays in Cuba, portrayed in films like *Before Night Falls*—the biography of Cuban poet and novelist Reinaldo Arenas, who was imprisoned for homosexuality despite fighting beside Castro in the revolution—this appointment and the party to celebrate it made a bold statement. It would be like the US appointing an Arab-American as Ambassador to Israel.

Yet, when I visited the school where the diplomatic corps sent their children, or dined in the homes of some of the more powerful in the Cuban pecking order, I became aware that social class was not exterminated in 1959, only squashed a bit. In these cities of marble and gold, built on the wealth of the Spanish Conquest of a New World and the enslavement of millions of indigenous peoples, the wealthy and powerful today still employ many servants to wait on their every need. Perhaps such a system is required to fulfill constitutional promises of full employment, but those who toil as nannies or drivers are seldom regarded as comrades or equals. For a nation that prides itself on its socialist revolution and the solidarity of shared sacrifice (billboards to that effect are ubiquitous), the loss of dignity among its poor and underprivileged class poses a strange contradiction.



Cuban urban gardener

Perhaps this contradiction gives the Catholic Church here its staying power.

It occurs to me, listening to Jesus, that the Cuban sugar growers are like the Kentucky coal miners. They are dependent on a plantation system that is ecologically (and socially) destructive and must go, but what will become of them? Jesus seems to think that ethanol will rescue the sugar industry and make Cuba less dependent on Venezuelan oil. That same Venezuelan bunker oil, burning 24 hours a day across the river from Old Havana, spews soot so pernicious that it makes your scalp itch after only a few hours of exposure. And despite that insult to the senses, the city still endures almost daily blackouts and brownouts. Surge protectors are de rigueur for anything electronic.

Jesus says the Russians are financing an effort to find deep-water oil in the Gulf of Mexico, and are also looking for tight gas plays with fracking, but so far have not found anything of significance. More promising, he thinks, is the dredging of the deep harbor at Mariel to receive super-mega Chinese container ships. It will become the deepest harbor in the Caribbean, something the US would really like to be able to use.

At present, despite phenomenal success in urban agriculture, 70% of Cuba's food is imported, and 40% of that comes through Houston or Miami. Cuba is the US's fourth largest agricultural trading partner. It is not able to sell anything back to the US because of the embargo, but it is free to buy food because of the US farm lobby. Cuba is betting on long odds like tourism,

At present, despite phenomenal success in urban agriculture, 70% of Cuba's food is imported...

the Mariel harbor, and deepwater oil to rescue its unsustainable import economy. Most of the people on the bus, as we glance into each other's eyes, know full well the folly of what Jesus is preaching, but bite our tongues out of respect.

The Eleventh International Permaculture Congress officially convened in the Havana Libre (formerly a Conrad Hilton hotel) on November 25, 2013, following an opening banquet the night before that was, unfortunately, held outdoors. The choice was unfortunate because the evening brought one of those tropical deluges that can come with little warning at the tail end of the hurricane season, a storm that washed out hastily abandoned plates of Christians and Moors (rice and beans), fried chicken, and veggies, as hundreds of us dashed for the nearest alcove with rescued Cuba Libres and Buccaneer beers.

Roberto Perez, representing the permaculture host, Fundación Antonio Nuñez Jiménez, served as an ebullient and inexhaustible Master of Ceremonies. He rushed around to slice red

tape, shorten queues for credentials, juggle gaps in the schedule, and generally tried to make things work smoothly, no matter what curve was thrown his way. Day One focused on Permaculture in Islands, with reports from Cuba, the UK, New Zealand, Hawaii, and Oceania. Day Two was about Permaculture and Climate Change, with presentations by Carmen Cabrera, Robyn Francis, Jerome Osentowski, Robin Clayfield, Tony Anderson, and myself. Day Three was Livable Cities with reports from Cari Cruz, Marisha Auerbach, Tierra Martínez, Stuart Muir Wilson, and unscheduled talks by Darren Doherty, describing *regrarian* (Regenerative Agrarian) synthesis, and Pandora Thomas describing amazing urban projects like an environmental literacy course at San Quentin prison.

A series of meetings... vetted the possibilities of a North American Permaculture Convergence in 2014.

From the Congress [*Ed. note: In past years, the formal, public events of the IPC have been referred to as Conferences*], we departed Havana to the Convergence in Mayabeque where there were more than 100 concurrent workshops and meetings, some planned in advance, many spontaneous. Despite the lure of all-night samba parties to a relentless Afro-Cuban beat, Robyn Francis reminded us that the original convergences were general assemblies charged by Bill Mollison with the duty of making policy. While the younger designers—the overwhelming majority of 2013 participants—shared slides of projects from six continents, I found myself drawn, with the old silverbacks, into discussions of qualifying PDC curricula (with Robyn Francis, Robin Clayfield, and Scott Pittman), of recognizing diplomas (led by Jude Hobbs, Andy Goldring, and others) of university degrees (an excellent panel presentation from Gaia University), and of future IPCs (London in 2015, India with Nasana Koppela in 2017, possibly Argentina thereafter).

When I could tear myself away from these wiring diagrams, I was drawn to advances in agroforestry described by the likes of Eric Toensmeier, Christopher Nesbitt, John Valenzuela, and Jerome Osentowski; strategies for addressing climate change led by Starhawk; capitalism and permaculture with Scott Pittman; neurobiology and somatic experiencing with Kerry Brady; Google Earth project overviews with

Andrew Millison; and permie myths and pseudoscience with Rafter Sass Ferguson.

A series of meetings led by Ra Sol Gilanpour vetted the possibilities of having a North American Permaculture Convergence before the IPC-12 in London. Sites and logistics were bandied about, and a candidate host emerged. The Center for Deep Ecology, based at Harmony Park, a 44 acre (18 ha) campground and outdoor events venue in southern Minnesota, has been hosting large gatherings since 1992, and routinely manages over 10,000 guests per year, with infrastructure in place to host events up to 4,500 participants.

In contrast with what we endured in Mayabeque, Harmony Park with electricity and hot showers would seem to be plush. Koreen Brennan described the Cuban accommodations this way, “[T]he electricity and water pump were turned off around 2 AM and turned back on at 7 AM or so. There was no hot water. There were no blankets or pillows, only white sheets on bunk beds with thin mattresses.”

I would add that there were no toilet seats, and with water turned off, the toilets would not flush. Depressing a steel button—meaning you had to dedicate one hand for this task if you were trying to wash the soap out of your eyes—turned on the shower. A lack of mosquito netting plus recent rain meant lots of bites. Many more showed up for the convergence than had registered, so single occupancy rooms were duplexed, triplexed, and quadruplexed. Lines for meals took two or more hours.

Look for more on the North American convergence in Minnesota as the support group coalesces and sends out invitations. At present, we are aiming at late August, 2014. Δ

Albert Bates is author of The Biochar Solution: Carbon Farming and Climate Change and a regular contributor to Permaculture Activist.



One horsepower lawn mower in Cardenas

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Clarification

In Joel Glanzberg's article, "Self-Organizing Governance" (*PcA* #89, Aug. 2013), we state "According to legend, the Great Peacemaker... [survived] a leap from Cohoes Falls..." The editors chose this wording to indicate that the historicity of the event could not be independently confirmed. Recognizing the connotation of the word *legend*, we feel that a clarification is needed. We did not intend to imply that the account was mythical, as oral histories have been shown to be remarkably faithful in many instances. The author has also made us aware that spiritual tradition prohibits speaking or printing the name of the Peacemaker. The editors, rather than the author, inserted the proper name. We were not at the time aware of this tradition, and meant no disrespect to the memory of the Peacemaker. In addition, there were several places in the article where a word or phrase was dropped due to software problems in the transfer of documents, leaving a truncated sentence or an incomplete thought. These instances were sporadic, unpredictable, and occurred in a manner that evaded our normal proofreading. We regret that these errors impacted the clarity of the article. We believe we have resolved the software issues involved.

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Movement Musings

Financial Permaculture Convergence to Design Local Foodsheds

Mario Yanez

IN 2008, Jennifer Dauksha English, Gregory Landua, and others came together to launch the Financial Permaculture Institute. From its inception, the group has facilitated large public events or Convergences. The next, from March 10-14, will be held in Miami.

In the beginning, the FPI principals would bring communities and entrepreneurs together to dream up and design regenerative models for local business development. In its latest iteration, the Convergence will redesign four existing local food enterprises. Each is at a different stage, ranging from start-up to major expansion). Each is operating in a different but complimentary business category (farm, retail, value-added, etc.). The aim of the Convergence will be not only to apply regenerative models to each business, but to design a polyculture among them—each has to feed the others.

In preparation for the event, the host organization, Earth Learning, which I direct, solicited applications from local businesses to become design clients. Our criteria were that each be locally owned, and mainly sourced locally as well. We wanted to see that the businesses did not plan to exceed a certain scale and range, that they used appropriate technology, operated or intended to operate in a life-sustaining manner, and most critically, that each would be willing to work collaboratively.

Operating much as a design charette, but focused on the invisible structures behind business communities, the March Convergence will open with plenary talks from four nationally prominent systems thinkers: Eric Toensmeier, bringing permaculture and edible landscaping capabilities, Elizabeth U, a food entrepreneurship financier and social capitalist, Judy Wicks, a leading local business network developer, and Gary

Paul Nabhan, ecological anthropologist and food, plant, and culture conservator. On the second day, participants will form design teams: four teams designing the four businesses and one meta group designing the business ecosystem and its ongoing support structures. This work is intensely dynamic, with much sharing and interacting amongst the design teams. Each team pours all its thoughtful and innovative ideas into its design, while exploring regenerative business models, alternative and optimal markets, resources to leverage, and relationships (ways of working as an ecosystem) that the client may never have considered. On the last day, teams present their designs to the clients, community leaders, potential investors, and the general public.

We expect everyone to come away with something! Each design client will get inoculated with Permaculture, connect with the others, and will thus stand a better chance for success. The local community gains insight about a more holistic approach to economic development and the birthing of a truly local economy. The team leaders (practitioners, teachers, designers, sustainable business people) experience leading collective design processes with real clients. And of course the participants go back home with new tools and regenerative business models applicable to their own local ecosystems.

And what does a regenerative business ecosystem look like? Of course it's diverse, with many niches to be filled by distinctly different but related businesses with many points for potential relationship (think needs and products). For example, you have a diverse small farm, an edible plant nursery, a food hub, a retail market, a food preserve business, and a farm-to-table café. Over time you can begin to close the loops by cycling

resources between the businesses; if the fit is good, there is little waste produced and little need for inputs from the outside. And, the probability of any one or most of these businesses succeeding is much greater because each supports the other. They reduce costs by sharing resources and minimizing inputs. Plus the ecosystem can grow in complexity in a life-sustaining manner without taking on a larger footprint!

Of course this thinking can go deeper.

I met Adam Brock in Cuba. His Convergence session on Pattern Language of Invisible Structures added another layer to my understanding of Financial Permaculture. At the organizational scale, each business must involve a polyculture of different roles that people take on: seeds, champions, network weavers, elders, radicals, and so on. At the business guild or ecosystem level, you need nitrogen-fixers and mineral pullers (components that draw in local financial nutrients), mulch and groundcovers (mechanisms to ensure the flow and regeneration of different forms of living capital, while blocking out unwanted “weeds”), supporters and climbers (ways to guide and temper growth so the businesses remains life-sustaining) and protectors (strategies that ensure overall health, appropriate disturbance regimes, and continued resilience of the whole).

I am sure it is possible to take any metaphor too far, but you begin to see the possibilities concretely when you apply whole ecosystem thinking to the challenge of growing local economies and designing foodsheds. △

Mario Yanez is Director and founder of Earth Learning, serving The Greater Everglades bioregion. He has several decades of non-profit and financial management and systems experience, and is an accomplished grant-writer. Mario is a community connector, a local organic farmer, and food activist. As a Certified Permaculture Designer, he applies design principles at various scales, is implementing food forestry projects, and is leading a comprehensive and participatory design process for the region's food system. More information about the Convergence may be found at www.FinancialPermaculture.com.

Reviews

Tapas en Jardine Review by Peter Bane

MICHAEL JUDD

Edible Landscaping with a Permaculture Twist *How to have your yard and eat it too*

Self-published. 2013.

143 pp. paper. all color plates. 24.95.

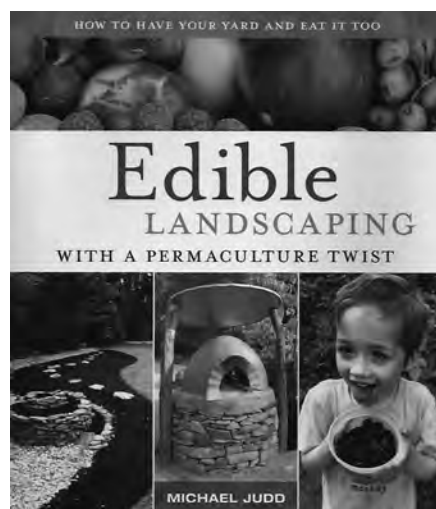
ONE OF A NEW GENERATION of American permaculture authors, Michael Judd has given us a fun, hip, and delectable set of small plates for the sophisticated suburban diner. Long on lush color photos and light on text, this yummy morsel nonetheless delivers well-selected tidbits and thoughtful guidance for key actions. Seven chapters skip across permaculture highlights from the Herb Spiral, Rainwater Harvesting, and Fungi, to the Food Forest, Uncommon Fruits, Hugelkultur, and Earth Ovens. With the exception of herb spirals and hugelkultur (which nonetheless figured large in *Sepp Holzer's Permaculture*), each of these has been the main subject of a major permaculture-related book in the past decade. Judd makes them accessible by displaying his design and landscaping prowess in each of these areas.

Self-publishing can be a mixed bag, but this book is professionally designed and delightfully quirky to boot. In addition to high quality photos by the author, it's replete with charming cartoons and effective technical illustrations by Matthew Von Herbulis that make the concepts crystal clear. The book's signature photo (not on its front cover) launches the chapter on mushrooms and leaves no doubt that author Judd is one FUN -GUY. And then there are the luminous images of strawberry-rhubarb and persimmon wine (complete with instructions) as well as recipes for mulberry pie (no sugar), pawpaw ice cream, and maple-mushroom martinis!

With no index and only a passing reference to the boring S-word at the very beginning, hipster author Judd manages to make sustainability *tres chic* and pretty

sexy. Which is too cool, since it usually claims to be the very model of modern "clean living," something begotten by a crowd of apparently chaste and very un-fun ancestors. *Laissez les bon temps roulez!*

Need to prune gooseberries? (What are those? See *Uncommon Fruits*) Judd will tell you just how long to cut the branches and which ones to remove. Boo-boo in the garden? You'll find a recipe for comfrey poultice and instructions on how to keep one ready-made in the freezer for anytime-of-year use. Snippets and sidebars abound, so the digitally addicted need not be challenged by the slow pace of a book. Jump around and graze the



Jump Froggie, Jump! Review by Peter Bane

GILES SLADE

American Exodus *Climate change and the coming flight for survival*

New Society. Gabriola Isl. BC. 2013.
271 pp. paper. \$19.95.

THIS IS A DIFFICULT BOOK for a number of reasons, foremost being that it addresses taboo subjects, in full seriousness and without the leavening screen of humor that Dmitri Orlov uses to write about collapse. The elephant in everyone's room from the drought of 2012 onward has been, "What happens now that the climate has gone south?" The bigger taboo question is when and how

pages. Need suggestions for companion plants? They're here. So are references to nursery sources, plant info, and juicy websites on all things permaculture. Want a recipe for Sheet Mulch? Try Mike's Deluxe, heavy on the straw. Build an A-Frame level or put in a Starter Swale. Handle your driveway runoff with a Rain Garden or dispose of those tree limb prunings in a Hugelkultur mound. The suite of tools, tree paint, grafting tips, and non-toxic pest control for the orchard makes a cameo appearance. There are seemingly quick, easy, and beautiful solutions for a host of household landscape needs. And when the work's done, kick back by the Earth Oven (complete construction details conveniently provided) and sip some home-brewed ferments while you wait for the pizza to crisp.

Michael's breezy, clowning style is deliberately inclusive, but as the images of his work clearly show and his overseas development work among the poor of Nicaragua attests, he's earned his *bona fides*. Easy on the eye and filled with both botanical bon bons and bibulous *bon mots*, *Edible Landscaping* goes down smoothly, offering its valuable information in canape-sized bits laid out on a tray. This would make a fine gift for anyone curious, skeptical, or even sour about permaculture. You can't come away without feeling good. Δ

do governments and other forms of social capital run out, wear down, fall apart, or collapse under the mounting strain? And what happens then? These unbearable but all too likely eventualities have been backlit over the past half-dozen years by an escalating cavalcade of climate disasters that Slade, a Canadian with long associations in southern California, weaves into a narrative about migration.

The story is both simple and timeless. People exhaust their resource base, or climate shifts to make former homelands uninhabitable. Finances and economies weaken or collapse in the face of incessant environmental calamities. GDP may rise in the wake of Katrinas and Sandys, but debt and real misery rise faster. (So much for neoclassical economics as anything but a cultic derangement.) People vote with their feet. The first to go are the well-positioned with mobile assets; young

men are among this cohort as they have little to tie them to place save bonds of affection. Collapse, or simply the prospect of a more difficult and impoverished future drives them toward greener horizons. Young families leave next, seeking to protect their children, and then a chain of assisted migration begins to form with communities moving together in the steps of those who went ahead. It has ever been thus, and American exceptionalism notwithstanding, will be or is becoming the norm in the US and North America more broadly. In this case, the greener horizon is north and inland, meaning Canada and Alaska.

The political and social implications of climate logic are daunting and beyond the capacity of the author to do more than sketch. This isn't a failing, but points to another of the book's difficult aspects: its authority is borrowed, synthetic; its logic inductive. The subject is immense and terrifying. Sea level rise, heat waves, and monster storms provide the grist for Slade's mill; collected into one book they deliver a wallop that is emotional if not precisely targeted. It is perhaps the only thing that can be done at this stage when action may still make a difference. Perfect knowledge and certainty may come only when it is too late to matter. The tale of Cassandra may be ancient, but there is to date only a thin and tenuous literature of modern environmental migration in rich societies. Thus the author points to the horrors we have collectively seen, while necessarily eliding a much larger body of mostly hidden knowledge. The Gypsies, Turks, and Africans who slip over the Italian hills at night, take tiny dinghies across the Bosphorus, or capsize off the Sicilian coast are mere footnotes to the unpleasant buzz of news from 'Over There.' Syria's hideous civil war is cast by the media in geopolitical terms, but began with crushing drought. Even policy makers in the US know almost nothing of Mexico's generation-long tribulation. Climate scientists, who know the most, equivocate, in the name of objectivity and professional skepticism, though by now their blood must be running cold. We all deny the worst possibilities until the wolf is at the door—Americans more than most in direct proportion to our outsized wealth and privilege.

Slade begins his American narrative with the Okies, or as he terms them in a flash of inspired prose, the "exo-dusters." These impoverished, white, native-born Americans encountered what historians now call "lifeboat ethics" as they flowed in their millions into California. They were feared, scorned, reviled, blocked, and incarcerated by those who felt they had something to lose, until the desperate newcomers eventually tipped the political scales in their own favor. Those tales are woven into our literature now: "...as the po-lice at the border always say, 'You're number 14,000 for the day...'"

By way of a little meteorological background about the dessicating effects of La Niña—which promise to mount—the au-

destabilized the Mexican state, enabled the rise of the narco-cartels, destroyed the Mexican smallholder farm economy, and led to a condition in which nearly one-third of current or recently emigrated Mexican citizens live in the US. As their numbers in 'el Norte' crossed critical thresholds, and as prosperity slipped away under the watchful eye of G. W. Bush, the same racist and xenophobic reactions were hurled at Latinos across the US as had met the Okies in California three generations earlier. And the same ultimate outcome can already be seen. When Latinos turned out by the millions in the spring of 2006 peacefully to protest immigration injustice, even the recalcitrant leaders of the Republican

These behemoth states (CA & TX) plus the rest of the Southwest and the Plains are short of water and won't recover it in our lifetimes.



thor continues examining North American environmental migration by looking at the still current drama of the southern border.

From 1982, and the collapse in oil prices brought about by North Sea and North Slope bonanzas, Mexicans began flooding into the US in search of a lifeboat. Nativists beat them back with oars and are still howling. A rolling economic, political, and environmental disaster known in Mexico simply as, "*la crisis*,"

party, then in control of Congress and the White House, quietly backed away from odious and punitive legislation against, "*los indocumentados*." The demographic wave is still building, and polls in Mexico show that 60% favor *political* union with "*los Estados Unidos*."

Slade's conclusions roll on inexorably, like the tide of needy migrants: What Mexicans have done and are doing, Statesiders will take up in turn. Some, of course, have already sought or accepted displacement from New Orleans or Staten Island or Joplin or Moore. Texas is burning; California's population growth has crested as 270,000 families a year move out. These behemoth states plus the rest of the Southwest and the Plains are short of water and won't recover it in our lifetimes. Quietly but with greater and greater force, thousands and then millions will turn their gaze toward Canada, which with over 5,000 miles of mostly undefended land border and 150,000 miles of coastline (the longest in the world) occupied by a population of 34 million spread across the second-largest national land mass on earth (and mostly in its cities) will inevitably find itself yielding to the demands of the other 92.5% of

North Americans who face inhospitable or unlivable conditions south of the 49th parallel. Better, Slade reminds his countrymen, to accept “the Americans” than the Russians, who already dominate the polar littoral, or the Chinese, whose naval forces are probing into the Canadian Arctic.

Slade draws conclusions the scientists are reluctant to voice. Using models and a growing chain of incidents, an intellectually uncomfortable but vitally necessary foundation for action, the author suggests that a million square miles of the northwest corner of the continent represent the best chance for large-scale resettlement. When we might ask? The curtain on this play has already risen. The dramatic action will be in full swing by 2030, the closing acts will unfold in the generation to follow, but all these dates are notional and the author skips delicately around them. Nature alone holds the schedule and we can barely keep up; all heretofore published predictions of global climate change effects have been inadequate. The book’s flavor is one of urgency, but while Slade is pointing to the exits and noting the smoke, he can’t quite scream, “Fire!” “Flood!” at the top of his lungs. He scarcely needs to though, the conclusions are unavoidable and require no special expertise.

The indeterminacy of Slade’s findings cushions his sometimes brilliant, sometimes baffling and slightly erratic claims. If someone hands you a note telling you to get out of the stadium because it’s going to collapse in a few minutes when the earthquake-shattered columns give way, you’d be chary to criticize the author’s misspelling of ‘kallamutee,’ so forgive me being briefly critical. Statistical errors, ruptured sentences, and dubious details pepper the text without calling into question its fundamental conclusions. This is likely a failing of the editorial process, partly the responsibility of the publisher and partly of the author, who had to sign off on the final manuscript. On pg. 66: “two million live in states under the Ogallala Aquifer.” Wyoming, S. Dakota, and Nebraska have a combined population of 2.8 million. That says nothing of Kansas, Colorado, Oklahoma, or Texas with 30 million more. Maybe 2 million under the Aquifer itself or in the counties under it.

On pg. 59: California’s public investment in infrastructure fell from \$1.50 per capita to \$0.25 (in several decades). Really? Not. believable. \$9 million for public works in California? In what period? Annually? Per month? Per week? At least two or three orders of magnitude low, though the direction and proportion of change is probably the relevant detail. On pg. 90: “In the West, the elevation of the Rocky Mtns. protects much of America’s (Pacific) coastal areas from flooding from sea level rise.” No. Maybe the tectonic uplift of the coastal mountain ranges does so, but the Rockies have little to do with that. I could give a half-dozen other examples of confusion arising from careless editing, slightly or severely garbled thinking, or typographic blunders. None undercut the basic story, though they mar its face.

As I look into the text, I see a manuscript largely written by 2009 and unsaleable, then sold after 2012’s record-shattering heat made its conclusions unarguable. The final chapter was probably grafted on as an update, while the grooming of earlier chapters leaves

something to be desired.

I accept Slade’s sincerity and urgency. His recommendations to his countrymen and to political leaders across North America draw on very bad and very good but also ambitious and hopeful examples of deliberate and assisted migration into Arctic regions. Citing the New Deal-era Resettlement Administration’s relocation of Upper Midwest welfare recipients into Alaska’s Matanuska Valley and the far more thoughtfully planned Cold-War era Finnish creation of 61 new agricultural villages in the north, Slade suggests that while migration, like climate change, will be unstoppable, its worst outcomes and effects could be mitigated by concerted and thoughtful action in advance. Rather like preparation for a wildfire, having tools on hand, equipment staged, and practicing the drills required for successful relocation would lessen the all-too-real toll in human life and misery that lies ahead. We need a new CCC and WPA to build the roads, camps, villages, and way stations north. Permaculture? Canada?

A book not for the faint of heart. Read it if you dare. Δ

Fennel, Chayote & Mache, Oh My! Review by Peter Bane

CHRISTOPHER SHEIN
with Julie Thompson
***The Vegetable Gardener’s
Guide to Permaculture:
Creating an edible ecosystem***
Timber Press. Portland, OR. 2013.
272 pp. pap. all color plates. \$24.95.

A GOOD FRIEND and senior figure in the Permaculture movement wrote me as I prepared my own book for publication several years ago (*The Permaculture Handbook: Garden Farming for Town and Country*, 2012) that he was disappointed to see another title linking permaculture to gardening. I wrote about the holistic nature of the home economy and its emerging importance, about social architecture, disaggregating urban areas, patterning, and a host of wide-ranging topics, and so felt a little misunderstood,

though I get the larger point about public perception. I can imagine my friend taking issue with this title as well and for genuinely similar reasons: It is about permaculture applied to gardening and almost nothing beyond. That said, the charm and visual appeal of this book are ample.

Two processes are at work here and both stem from the same market pressures: limiting risk and expanding appeal. This is the author’s first book and also Timber Press’s first major title on Permaculture. And just as *Gaia’s Garden* was for Chelsea Green in 2000, when it was one of the first American books on the subject—certainly the first aimed at a large market—author and publisher conspired to target the broadest market possible, minimizing the risk of showcasing an odd concept. With 50 million gardeners in the US, it seemed then and must still seem reasonable to expect a fair response to a book bridging the two subjects. The result in both cases—and it is fair to see this book as a descendant of *Gaia’s Garden*—is to push aside the

broader implications of permaculture as a design science for transforming society. As my published friend meant to say with his critique: Permaculture is NOT gardening, and conflating the two helps no one understand the important differences.

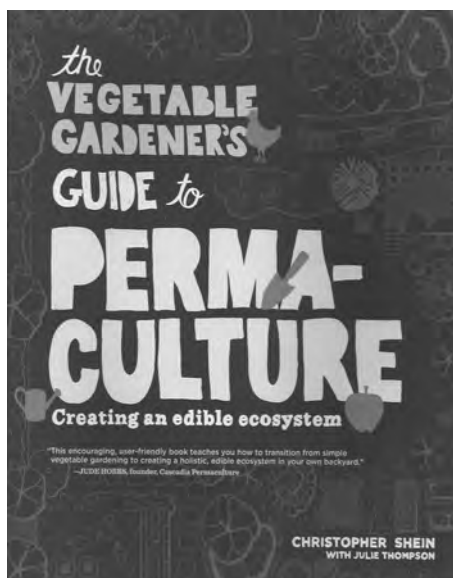
The resolution of these tensions, if there is to be one, comes not, I think, from my friend's curmudgeonly critique—though I agree with its essence, but from understanding that by applying permaculture design to the problem of food production, one generates the integrated systems portrayed so beautifully in Shein's new book. Let readers (and garden visitors) relish the beauty, taste the harvest, then let us use those moments to teach the multidimensionality of the underlying systems.

To that end, the author has laid down the tracks of his garden processes. A section on design displays handsome examples of his work both at home and for clients on several urban scales up to half an acre. To my designer's eye, they don't immediately parse as permaculture systems and their logic is hard to locate in the text. The reader is perhaps expected to take the connection on faith. The book carries a fair rendering of the permaculture patterning that generates zones of inhabited influence and sectors of environmental force. These of course, create the matrix for properly placing ele-

ments in accord with function, leading to synergies and enhanced yield. A section on principles sets out Holmgren's twelve in somewhat simplified form, with what might charitably be called a gardener's perspective. I don't think these concepts have grown more memorable by Shein's pointing to them, but they are at least honestly stated. The concept of Inputs and Outputs from each element of a system is illustrated with a full-page chart, but the chart leaves a bit to be desired as the connections between inputs and outputs are not highlighted. Making such connections

is a central aim of any system design, but here the reader is obliged to push into the thought process a bit to do so, and sadly I suspect, many will not.

The remainder of the book is a generous and lovely gardening manual with a focus on the tolerant climates of northern California. Somewhat more than half the book's page count is devoted to large-scale color images which include shots of the author's winsome and multicultural family and friends among the fruits and vegetables. Word count might run about 80,000, which is in line with the book's modest price; the lavish color spreads



its graphical offerings for ethical and financial reasons; readers may regret those choices. We have to ask, however, of a work at the other end of the spectrum: How much does anyone ultimately benefit from a full-page color close-up of a blueberry stem and fruit, and not the most botanically illustrative either.

The thing with this work is to get beyond the pretty pictures, to penetrate the story—Shein's voice is warm and friendly, it shouldn't be hard—and in the end to enter the story, to create the garden. And dare I say, looking out on a snow-covered prospect—for many of us not living in the subtropical paradise of San Francisco Bay, it is also to accept the limitations of climate that make gardening a part-year or indoor activity; to dream of peaches or figs rather than to drool over Asian persimmons, loquats, or citrus; to see the productivity of land in water flows, stored carbon, and wildlife too.

Offering an attractive if slightly bowdlerized vision of Eden, *The Vegetable Gardener's Guide* might better be understood as a window or a doorway by which a broader public might approach a mysterious and hopeful way of living in the world. If it draws positive attention to permaculture, we can wish that public engagement generated by this book will lead to a deepening of curiosity and thereby to profoundly needed changes in society. Δ

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ments in accord with function, leading to synergies and enhanced yield. A section on principles sets out Holmgren's twelve in somewhat simplified form, with what might charitably be called a gardener's perspective. I don't think these concepts have grown more memorable by Shein's pointing to them, but they are at least honestly stated. The concept of Inputs and Outputs from each element of a system is illustrated with a full-page chart, but the chart leaves a bit to be desired as the connections between inputs and outputs are not highlighted. Making such connections

being a bonus of visual enticement to the would-be reader that are enabled by cheap Asian labor and global sourcing.

A word is in order about cooperator Julie Thompson. Her role has clearly been that of a publishing consultant, market strategist, and editor/facilitator to Shein's technical expertise and lived experience. I don't doubt that she helped make the book possible, improving it in many obvious ways, but the large part of it given over to marketing is another side-effect of the collaboration, and not altogether well-directed. This magazine has limited

HORSE FARM IN EASTERN PA, seeks full-time person for general farm maintenance and duties including: Horse care, hay making, barn/stable/pasture maintenance, landscaping and operating various farm equipment. The right candidate should have experience in the above and the necessary mechanical skills, plus be self-directed and motivated. We are a family-owned farm in operation over 40 years. This is a very family-friendly, smoke-free environment; the owners are actively involved in day-to-day operations. We make hay for sale and are expanding into food and organic cropping. As an employee, you will qualify for health insurance, annual bonus, vacation pay, etc. On-site housing provided. We are an equal opportunity employer. To apply, please send a resume of work history and three references to patty.ponylady@gmail.com; 610-554-1273; PO Box 402, Old Zionsville, PA 18068.

EVENTS

Permaculture Teaching Course Pacific Northwest

Dates: March 30-April 5

Location: Vancouver Island, BC

Description: In this dynamic and interactive course, you will learn significant teaching techniques to communicate Permaculture principles and strategies in a wide variety of settings. This Teacher Training unfolds as a design methodology and advocates the Permaculture Design Course Curriculum.

Our goal is to encourage and inspire your unique strengths and talents by demonstrating diverse teaching modalities such as lecture, facilitating class discussions, storytelling, the use of visual aids, and hands-on projects. In this setting of active learning, you will experience essential practice by preparing and co-teaching multiple presentations.

Instructors: Jude Hobbs, Andrew Millison, and guests.

Cost: \$925. Includes course materials, camping & meals

Contact: caspacadiapc@gmail.com

Permaculture Design Course Peru

Dates: February 10-23

Location: Huaraz, PERU

Description: Immerse yourself in permaculture design perched at 12,000 feet in the Andes Mountains with Ka'Way Monti. Days will be balanced between fun, fast-paced class-room time with experienced teachers, exploration of developing systems, group design process, and hands-on work with local Quechua farms. Special attention will be given to natural building, traditional Andean crops, and community building. With over 100 hours of instruction and support, students will come away with a thorough grounding in principles and experience to begin their practice of permaculture in any setting and a renewed sense of their own work in the world.

Instructors: Rhonda Baird, Whitey Flag, and guests.

Cost: \$800, camping only.

Contact: Chris Dyson
polyminyqua@gmail.com
www.kawaymonti.org

Permaculture Design Course Ecuador

Dates: February 6-16

Location: Vilcabamba, ECUADOR

Description: Vilcabamba, wildly diverse botanically, and culturally, has magnetized a vibrant global community of sustainability buffs. This 100-hour course will provide the internationally accepted curriculum for the initial level Permaculture certification.

Deep ancestral knowledge from the rich Quechua agricultural heritage of the Andes will be delivered by Fernando and Laura Santillan, directors of the Yachay Wasi garden school in Quito and the Pakarinka Center for Indigenous Tradition in Otavalo. Multi-story polycultures are nothing new to these wisdom-holders. Additional focus will be on: ~ natural building ~ strategies for preservation of seed diversity ~ community building

Instructors: Zia Parker

Cost: \$1,200. Worktrade and/or barter available.

Contact: Zia Parker
ziaparker@yahoo.com
www.wilcoway.com
Skype: ziaparker

Permaculture Design Course Hawai'i

Dates: February 22-March 9

Location: Anahola, Kauai

Description: This two-week, residential course offers a unique opportunity to learn the theory, principles, and practice of permaculture in a subtropical rural agricultural community, as well as to learn from local Hawai'i farmers and educators. The course will be held at a developed permaculture site and design teams will be working on other permaculture farms, food forests, and communities. The farm has been designed and planted with permaculture principles in mind. There are gardens and a wide variety of fruit trees.

Instructors: Michael Pilarski, Ray Maki, Paul Massey, and guests.

Cost: \$1,225.

Contact: Ray Maki
Permaculture Kauai
808-634-5412
permaculturekauai@yahoo.com
www.permaculturekauai.com

Permaculture Design Course Belize

Dates: February 10-22

Location: San Pedro Colombia, BELIZE

Description: come to Belize...

Travel far south; to the back of beyond; to a remote valley accessible only by dugout canoe. Study permaculture surrounded by a lush, productive forest of edibles, medicinals and tropical hardwoods. Eat organic food, sleep in dorms powered by renewable energy, bathe in a sparkling pure river....

Instructors: Albert Bates, Nicole Foss, Marisha Auerbach, Christopher Nesbitt

Contact: Christopher Nesbitt
info@mmrfbz.org
www.mmrfbz.org

Permaculture Design Course Montana

Dates: Six weekends, May-June

Location: Hot Springs, MT

Description: This 6-weekends course is focused on the climate of the Inland Northwest bioregion. Learn from one of the US's most senior permaculture course instructors. There are three hot spring soaks nearby and indoor accommodations or camping are available. One of the most affordable PDCs in the US in 2014. Lots of hands-on activities, as we will be in the thick of the planting season.

Instructors: Michael Pilarski and other local teachers.

Cost: \$750

Contact: Michael Pilarski
friendsofthetrees@yahoo.com
406-741-5809
www.inlandnorthwestpermaculture.com

Permaculture Design Course Oregon

Dates: June 15-July 19

Location: Cottage Grove, OR

Description: Aprovecho's Sustainable Living Skills Program is the oldest program of its kind in the Northwest and includes hands on training in appropriate technology, sustainable forestry, natural building, and sustainable agriculture. The 72-hour Permaculture Design curriculum is woven throughout the program, leaving students with a framework for integrating strategies and techniques into cohesive designs for sustainable human settlement.

Instructors: Abel Kloster, Tao Orion, Jude Hobbs, Marisha Auerbach, Rick Valley and guests.

Cost: \$2,200-\$3,000

Contact: Aprovecho Institute
541-942-8198
abelkloster@aprovecho.net
www.aprovecho.net

Send Event and Calendar Listings for Issue #92 (May)

Stacking Functions

by the March 1st deadline to:

Address: pcaeditor@comcast.net

Permaculture Design Course Oregon

Dates: September 28-October 18

Location: Cottage Grove, OR

Description: Join Aprovecho's stellar team of teachers and practitioners for a PDC this fall. Through a combination of lectures, hands-on projects, visits to local farms and wildlands, and a group design project, students will leave with over 100 hours of experience.

Instructors: Abel Kloster, Tao Orion, Jude Hobbs, Marisha Auerbach, Rick Valley and guests.

Cost: \$1,000

Contact: Aprovecho
541-942-8198
abelkloster@aprovecho.net
www.aprovecho.net

Permaculture Design Course Oregon

Dates: March-November

Location: Cottage Grove, OR

Description: Join us for a 9-month exploration of the potential we have to plan our way out of our current crisis into a resilient and exciting future. This series may be taken in parts or as a complete certification course. Certification may be obtained through an additional payment of \$250. This accounts for additional one-on-one instruction, coordination of student design projects, etc.

Instructors: Abel Kloster, Tao Orion.

Contact: Aprovecho
541-942-8198
abelkloster@aprovecho.net
www.aprovecho.net

Food Forest Focus

Permaculture Design Course Pacific Northwest

Dates: February 8-March 16

Location: Ashland, OR

Description: Six-weekend PDC, 72-hour international curriculum plus food forest planting, medicinal herb walk, seed saving, garden-to farm-scale design and even bread making. Hosted at Restoration Seeds farm, you will learn more about plants than anywhere else. You will gain real-world design experience with your group design project. A typical day begins with morning class followed by afternoon hands-on projects and workshops. Includes camping and three vegetarian meals per day. Discount for couples \$50. Course photographer, student \$100 discounts.

Instructors: Chuck Burr and guests

Cost: \$850.

Contact: Chuck Burr
541-201-2688
courses@sopermaculture.org
www.sopermaculture.org

Permaculture Design Course California

Dates: May 30-June 14

Location: Bolinas, CA

Description: Fully immerse yourself in the world of permaculture and experience life on a working permaculture farm. Join pioneer Penny Livingston-Stark for this two-week permaculture certification course based on the internationally recognized curriculum. You will observe and use the same principles that make ecological systems self-sustaining, and learn how to apply them to integrate homes and gardens. In addition, you will learn to apply these principles to energy systems, water supplies, healthy communities, meaningful and fulfilling work, and ecological economies.

Our experienced team of instructors will provide you with knowledge and inspiration for making meaningful changes in the way you view and interact with the world.

Instructors: Penny Livingston-Stark and special guests.

Cost: \$1,650; \$1,550 by 4/18

Contact: Regenerative Design Institute
Commonweal Garden
info@regenerativedesign.org

Cob Building Hands-On

Permaculture Design Course Pacific Northwest

Dates: July 27-August 9

Location: Ashland, OR

Description: Two Week Intensive PDC, 72-hour international curriculum plus cob hands-on, medicinal herb walk, greenhouse propagation, garden-to farm-scale design and even bread making. Hosted at Restoration Seeds farm, you will learn more about plants than anywhere else. You will gain real-world design experience with your group design project. A typical day begins with morning class followed by afternoon half hands-on projects and workshops. Bring your work clothes and get ready to learn by doing. Includes camping and three vegetarian meals per day. Discount for couples \$50 each. Course photographer, Assisted cook, student \$200 discounts.

Instructors: Chuck Burr and guests.

Cost: \$1,450 before 6/27, \$1,650 after.

Contact: Chuck Burr
541-201-2688
courses@sopermaculture.org
www.sopermaculture.org

Permaculture Design Course California

Dates: March 2-14; or July 13-26

Location: Occidental, CA

Description: Whether you currently own property or dream of it, this two-week intensive will immerse you in information, ideas, and inspiration for how to design sustainable, regenerative systems in balance with your home ecosystem. Using a combination of lecture, discussion, hands-on activities at OAEC's 80-acre site, visits to local permaculture examples, and a group design project, you will have the chance to integrate and apply the concepts of permaculture during almost 100 hours of course time.

This course usually fills up six weeks in advance! Please register as soon as possible.

Instructors: Brock Dolman, Kendall Dunningan and guests

Cost: \$1,650; \$1,550 if registered three weeks in advance

Contact: Occidental Arts
& Ecology Ctr.
707-874-1557 x103
oaec@oaec.org
www.oaec.org

Advanced Design Course - ZAP Colorado Range

Dates: Weekends Feb. 22-23;

Mar. 22-23; Apr. 26-27

Location: Boulder, CO

Description: Zombie Apocalypse Permaculture! This 40-hour Advanced Permaculture Design Course will explore solutions for all issues that cascade from global changes to our biosphere and our human communities. Focusing on community-scale design for earth care, people care, and fair share, we'll consider designs for water, food, shelter, energy, health, spirit, community, livelihood, waste, and justice—guiding students towards resilience, interbeing, and support. Students will learn about designing for disaster—for both immediate and long-term failure of large systems—and will explore regenerative solutions for their personal lives and local communities.

Facing the possibilities of Holmgren's Future Scenario #4—Lifeboats, this intensive course will include community discussion, lecture, hands-on design team projects, site tours, and celebration. Readings and design team work outside of class will be required.

Instructors: Barbara Mueser, Sandy Cruz, Marco Lam, and guests

Cost: \$800

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

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to subscribe —
more than 50 already do.
See Library Service, pg. 60.**

Permaculture Design Course

Colorado Front Range

Dates: March 7-23

Location: Lyons, CO

Description: The Lyons Farmette, Yummy-Yards, and Eat are thrilled to offer a two-week PDC at The Lyons Farmette. This intensive 82-hour immersion into permaculture principles and ecological design touches on natural and social systems as well as group process and technical skills including alcohol-as-fuel, beekeeping, etc. Please visit our website.

Engage in the revolutionary act of self-empowerment and discover how to build resilient human communities that care for the earth, provide for people, and create a surplus for all to share.

Instructors: Laura Ruby, Spencer Branson, Erin Schey, Jason Gerhardt, and other guests.

Contact: Spencer Branson

LyonsPDC@gmail.com

720-313-4150 www.lyonspdc.com

Permaculture Design Course

Colorado Front Range

Dates: June 15-28

Location: Woodland Park, CO

Description: The first residential PDC in the Pikes Peak Region, our 5th certificate course showcases top-notch instructors Peter Bane, Marco Chung-Shu Lam, Sandy Cruz, and Becky Elder. Experience engaging site visits, do hands-on projects, and participate in a meaningful design from visioning through final presentation. From ethics and principles to soil and herbs, from forestry to food systems to natural building, the home and the urban zone, we cover a full spectrum, including invisible structures of our human culture. Living on site, with the instructors, allows immersion in the deep end of permaculture. We invite you to join us. Get inspired, get certified!

Instructors: Peter Bane, Sandy Cruz, Marco Lam, Becky Elder.

Cost: \$1,300.00 before 2/15;
\$1,400.00 before 4/1; \$1,500.00 after

Contact: Christina Zahn,

303-517-6167, xtina Zahn@gmail.com

Permaculture Design Course

SE Michigan

Dates: July 13-19 - Fundamentals, July 27-August 2 - Design Practicum

Location: Adrian, MI

Description: A full PDC in two sessions; take both for certification or singly, either to refresh your skills or to fit your schedule and budget. Join us at the Adrian Dominican campus, over 100 park-like acres that is home to a worldwide order of women activists for peace and social justice. Bringing together masterful teachers, comfortable accommodations, all meals, and a dramatic edge to community, farming, urban engagement, and economic transition, this course will turn your world around. Convenient to Detroit, Chicago, Columbus, Cleveland, and Indianapolis.

Instructors: Peter Bane, Keith Johnson, Rhonda Baird, and guests

Cost: Fundamentals \$775; Practicum \$650; Both for \$1,250 by 5/1, then \$1,395

Contact: Peter Bane, pactivist@mindspring.com, 812-335-0383

Permaculture Design Course

Indiana

Dates: May 18-June 3

Location: nr. Lafayette, IN

Description: Sponsored by Indiana University since 2003, and taught by the mid-continent's most knowledgeable teachers, this course invites you to embrace the tools of permaculture amidst hundreds of wild acres of prairie, streams, and woodland. Learn critical systems thinking and practical skills for problem solving in the emerging environment of energy descent and relocalization. University credit is available.

Instructors: Peter Bane, Keith Johnson, Rhonda Baird, and guests

Cost: \$1,250 by 3/15, then \$1,350; includes all meals, and camping.

Contact: Rhonda Baird

812-320-9136

shelteringhills@gmail.com

Permaculture Design Course

Chicagoland

Dates: Mar. 13-16, Apr. 11-13, 25-27

Location: Naperville, IL

Description: Join us for three Spring weekends at McDonald Farm to explore the transformative future of metropolitan and small town landscapes. Just west of Chicago, Naperville is served by cheap, low-carbon, commuter rail and Amtrak fares from IA, WI, MO, IL, IN, MI, OH, and all points east and west. With over 50 years Permaculture experience and more than 100 courses taught, our team will lead you through the core of whole systems patterning and design so you can launch your own PDC projects. All aboard!

Instructors: Peter Bane, Keith Johnson, Rhonda Baird, and guests

Cost: \$1,400; discounts for check payment, couples/pairs, TRI Coop members, limited trades available.

Contact: The Resiliency Institute (TRI)

10S404 Knoch Knolls Rd.

Naperville, IL 60565

630-281-0184

michelle@theresiliencyinstitute.net

Permaculture Courses

Wisconsin

Location: Fountain City, WI

Contact: Kinestone Academy of Applied Permaculture
608-687-3332

inquiry@kinestoneacademy.com

Permaculture Design Course

Dates: April 5-13; or

August 16-24

Instructors: Wayne Weiseman, Dan Halsey, Jarad Barkeim

Cost: \$1,295 or early bird - \$1,170 (before 3/5 for April; before 7/16 for August)

Description: This PDC course exceeds the 72-hour international standard as a foundational course for Permaculture practitioners and teachers. Special attention is given to climatic zones represented by course participants.

The Three Epochs of Humanity PDC

Dates: April 30-May 11

Instructors: Wayne Weiseman, C. Milton Dixon, Jarad Barkeim

Cost: \$1,620 before 3/30; \$1,795 aft

Description: This unique course includes the entire PDC and it consists of the creative and experiential application of living skills passed down by our ancestors into the present. The three areas of concentration are: the Hunter-Gatherer Lifestyle, Agricultural Settlement & Pastoralism, and Appropriate Technology & The Ecological Epoch.

Advanced Course - FARMING

Dates: May 7-11, Oct. 22-26

Instructors: Wayne Weiseman, Dan Halsey

Cost: \$1,495 before 4/7; \$1,345 after

Description: In this program we will focus on small intensive and broadacre farming techniques and learn how these differences in scale reflect what a Permaculture farm looks like and how it is managed and maintained. When signing up for this program, you are signing up to attend and complete both sessions.

Advanced Course - DESIGN

Dates: Feb. 19-23 and Nov. 12-16

Instructors: Wayne Weiseman, Dan Halsey

Cost: \$1,495

Description: This program teaches the use of ecological landscape design language and technique using the Permaculture design process to create an ecologically balanced residence and abundant lifestyle. This course will give you the skills and foresight needed to assess, conceive, and design your property. When you sign up for the course you are committing to both weekends and homework.

Permaculture Teacher Training

SE Michigan

Dates: November 9-13

Location: Ann Arbor, MI

Description: A five-day residential course with permaculture teacher's certification. Develop teaching skills with hands-on exercises that build confidence and ease. Learn to stage educational events. Well-seasoned instructors with half a century of collective teaching experience will offer classroom opportunities and personal support to help stretch your capacities. An optional mentorship program is available after the course. Tuition includes meals and lodging. Permaculture design certificate is a prerequisite. A number of partial scholarships are available; deadline 6/1.

Instructors: Peter Bane, Sandy Cruz, and guests

Cost: \$800 if paid in full by Sept. 7th; \$900 after. Monthly pre-payment plan available.

Contact: Peter Bane for an application.

812-335-0383

peter@permacultureactivist.net, www.permacultureactivist.net

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V,3 Aug. '89 **Rainforest Conservation** in Ecuador, Gaia, Weed Gardens
V,4 Nov. '89 **Earthworks & Water Conservation**: Small Dams, Ponds, Keyline
VI,1 Feb. '90 **Household Greywater Systems**, Soil Imprinting (\$5 each to here)
VI,2 May. '90 **Insectary Plants**, more Greywater, Land Use for people
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#23 May '91 **Politics of Diversity**, Greenhouse Market Gdn, Pc in Nepal
#24 Oct. '91 **Creativity in Design**: Case Studies, **Index to Issues #1-23** \$5
#25 Dec. '91 **Design for Community**: CSAs Restoring Forests, Garden Ecology
#26*May '92 **Soil**: Our Past, Our Future, Fertility, Worms, Cover Crops
#27*Aug '92 **Integrating Pc**: Deconstructing Utopia, Grassroots Organizing, Garden Polyculture, Pattern Learning, Living Fences
#28*Feb. '93 **Structures**: Comm'ty Dsgn, LETS, Industry, Strawbale/Timber-framing
#29/30* Jul. '93 **Networks**: Media Revw, Rural Reconstructn, Leaf Concentrate, Comm'ty Food, Palestine Pc, Do-Nothing Educ, Feng Shui, Pc Academy
#31*May '94 **Forest Gdng**: Energy & Pc, Mushrm Cultvn, Robt.Hart's F.G., Spp for No. Cal., Alders, Agroforestry: Belize & China, Honeylocust, N-fixers
#32*Apr. '95 **Animals & Aquaculture**: Animal Polyculture, Sm-scale Cattle, Goat Dairy, Keyline, Feral chickens, Bee Plants, Constructed Wetlands
#33 Dec. '95 **Cities & Their Regions**: Green Cities, L.A. Ecovillage, MAGIC Gdns, CoHousing, Micro-Enterprise Lending, Suburban Conversion \$5
#34 June '96 **Useful Plants**: Bamboo Polyculture, Medicinals, Pest Control, Root Crops, Oaks, R. Hart's F.G., Russian Plants, Regl. Plants, Sources \$5
#35 Nov. '96 **Village Design**: Pattern Language, Consensus Democracy, Conflict, Historic & New Villages, Planning for Tribe, Village Economics \$5
#36*Mar. '97 **Climate & Microclimate**: Climate Change, Windbreaks, Low-Tech Sun Locator, Drylands, Cool Slopes, Straw-Clay Bldg. Round Beehive, Water Catch.
#37 Sept. '97 **Tools & Appropriate Technology**: Dowsing, Workbikes, Scythes, Japanese Saws, Nursery, Ferrocement, Greywater, A-frame & Bunyip Levels, Ram Pump, Solar Toilet, Log Yoke, Cookstoves
#38*Feb. '98 **Economic Transformation**: Speculation, No Middle Class, Coops WWOOF, Global Warm'g, Hol. Fin. Plan'g. Land Use, Adopt-a-Hive
#39 Jul. '98 **Knowledge, Pattern & Design**: Pc Way of Seeing, Native Consvn Sand Dunes, Language-Worldview-Gender, Patterning Process, Land-Use Planning, Teaching Pc, Vietnam, Holmgren on Pc
#40*Dec. '98 **New Forestry**: Regl. Devl., Horselogging, Menominee Reservatn, Forest Investing, Restoratn, Old Growth, Homestead Tenure, Forest Soils, Forest Farmg, Woody Agric., Rainforests, Windbreaks, Coppice
#41*May '99 **Natural Building**: Oregon Cob, Cordwood, Bamboo, Thatch, Ethics, High Winds, Origins of Conflict, Greenhouses, Ponds, Adobe, Road Bldg, MicroHydro, Living Bldgs., Under \$20K Houses, Dreams
#42 Dec. '99 **Self-Reliance & Community Cooperation**: Co-Intelligence & Self-Orgn., Archetype Dsgn, Sovereignty, Samoa, Mondragon, Natural Hous'g, Comm. Gdns., Zone 0, Solar Electric Tractor, Beekeeping
#43*June '00 **Food & Fiber**: Hunger, Ferments, Seasonl Salad, Heirlooms, Fencing Self-Fertile Gdns, Rice Revolt, Cold-Climate Food, Edible Insects, Chilies, Food Origins, Garlic, Ethnobotany, Wild Food, Bamboo, Hemp
#44 Nov. '00 **Earthworks & Energy**: Spreader Drain, Horse Swales, Earth Dams, Machinery, Carpet-lined Ponds, Constr. Wetlands, Biogas, Windmills
#45 Mar. '01 **Medicine & Health**: World & Self, Healthy Home, Designing Care, Ayurveda, Agents of Decay, Comn. Health Centres, Women Trad. Med. 4th World Apothecary, Healing Weeds, Medical Crops, Hawaiian Bot'ls
#46 July '01 **Good Work & Right Livelihood**: Pc Golf Course, Downsize Cost of Living, New Forest Economy, Energy Currency, Buddhist Mktg, End Wage Slavery, What's Surplus?, Urban Community, Enterprise Facil'n
#47 June '02 **Watersheds**: Water4Sale, Basins o'Relations, Watershed Devl, Gabions, Urban Runoff, Beavers, Skywater Ctr, Consvn. Investmt, Peat Bogs, Rabbits
#48*Sept '02 **Making Changes**: Co-Intelligent Activism, Webs of Power, Urban Food, How to Change, Teaching for Change, Global Transform'n, City Repair, Escaping Job Trap, Argentine Recovery, Costa Rica Pc
#49 Dec. '02 **Where is Permaculture?** Land-Rent Reform, 10 N. Amer. Sites, Cuba Ag, Rainbow Vall. NZ, Cacti/Succulents, Animal Self-Meds, Challenge2Pc
#50 May '03 **Ecosystems**: Holmgren on Pc Mvmt, Hazelip & Syng. Ag, Chestnuts/Pigeons, Oak Savannas, Root Crop Polycultures, Alders, Fungal Ecosys. Humans & Wilderness, Indoor Ecosystems, Humid Tropics
#51 Jan '04 **Trad'l. Knowledge & Regeneration**: Cataclysm & Collective Memory, Genome Wisdom, *Waru Waru*, Biosculpture, Inuit Medicine, Fermented Stimulants
#52 May '04 **Aquaculture**: EcoAquac, Fish4Health, Dowsing, Pond Design, Greywater Biotreatment, N. Amer. Polyculture, Manage for Native Spp, Integrated Village Fisheries, Vietnam
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#54 Nov. '04 **Fire & Catastrophe**: Design Beyond Disaster, New Opportunities, Globalizatn, Invasion Biology, Street Orchards, Community Food Security, Floodwaters Rising, Disrupted Climates
#55 Feb. '05 **Learning from Our Mistakes**: Petrol Dependency, Village Design, Australian Lessons, RTFM!, Trial&Error, Forestry Experiments, Owner-Bldr, 10 Mistaken Ideas in Pc
#56 May '05 **Tree Crops & Guilds**: Pine Nuts, Tree Vege, Acorns, American Chestnut, Honeylocust Silvopasture, Broadscale Agroforestry, Bamboo, Willow, Social Forestry
#57 Aug. '05 **20th Anniv.**: Challenges & Changes, USA Pc, Hawai'i Retrospect, Permaculture, Pc's Soft Edge, Gaia U, PINC, Oil Depl, IPC-7, Retrofit Suburbs
#58 Nov. '05 **Urban Pc**: Urban/Rural Futures, City Zones & Sectors, Growing Food, Detroit Visionaries, Reblgd. New Orleans & Everywhere, Transforming a Military Base, Workers Co-op, Energy Descent.

Teacher Training Course

New England

Dates: August 18-24

Location: Dorchester, NH

Description: Professional, seasoned permaculture educators will guide the effort through multi-day sessions, resulting in a cumulative experience of participants teaching at the August 23rd D'Acres Pc Gathering. The Permaculture Teacher Training blends the broad experience of PDC graduates with permaculture teachers' detailed knowledge of classroom fundamentals, strategies, and precautions, to get you up and out there... bringing more permaculture education to our communities, building the opportunity for a strengthened resilience in the face of disruptive and unknown change.

Instructors: Lauren Chase-Rowell, Josh Trought, Steve Whitman

Cost: \$1000.00 by 5/1, \$1,100 after.

Contact: Steve Whitman

603-381-1798, steve@low-energy-future.com

www.dacres.org

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- #59 Feb. '06 **Peak Oil:** Eco-Collapse & Trauma, Thom Hartmann, Pathways for Energy Descent, How Cuba Survived, Oil & Food, Biofuels, Algae for Fuel, Relocalize
- #60 May '06 **Land Use Past & Present:** Sust.Ag an Oxymoron?, Negev Bedouin, East. Woodlands AgroForestry, Pc Heals in India, Arocanti, Pop. Growth/Land Hunger, Mexican Reforestation
- #61 Aug. '06 **Unseen Kin-doms:** Observation as Design Tool, Soil Food Web, Bees, Mycelial Internet, D-I-Y Mycorrhizal Inoculum, Cover Crops as Bee Forage, Earth Energies, Local Currencies, Dead Zones
- #62 Nov. '06 **Art of Permaculture:** Painting, Writing & Pc, Ecoartists, Art, Activism & Cmty, Street Theatre, Art & Bioremediation, Living Willow, Body as Zone 0, Art of the Found, Water Magic
- #63 Feb. '07 **Building & Technology:** How to Dwell? Natural Bldg & the Law, Bldg Code, Strawbale in China, Cob in Armenia, Integrated Solar Heating, Cooking, Pumping, Nation-Scale Pc in Brazil
- #64 May '07 **Waste = Food:** Throwaway Econ, Strategy of Salvage, Peak Soil, Pigs & Waste Mgmt, Bikes, Soil & Garbage, Farm as Organism, Opportunistic Plants? Simple Biodigester, Vermiculture
- #65 Aug. '07 **Climate Change:** Shrinking Seas, Forests' Role in Climate, Urban Forests, Making Trees Pay, Rainwater Harvesting, Indoor Gardens, Water Filtration, De-Stabilizing Climate
- #66 Nov. '07 **Animals in Design:** Jumbo Shrimp, Pawpaw Patch, Alpaca, Insects as Food, Integrated NH Farm, Pastured Poultry & Rabbits, Urban Livestock, Predator Restorat'n, Bees, Complementary Animals, Agrichar
- #67 Feb. '08 **Kids in Pc:** School as Ecosystem, Pc Education, Gardening Kids, Pc to H.S. Students, Tlaxcalan Kids Make Seedballs, Fostering Research Skills, Bottled Water Boycotts, Feeding 8 Billion.
- #68 May '08 **Plants on the Move:** Rethinking Non-Natives, Forest Migration, Black Walnuts, Saving Seed Savers, Grow a Community Gdn, N'hood Greening, Healthy Honeybees, Biofuels & Food Prices
- #69 Aug. '08 **Permaculture at Home:** Hawai'ian Cmty, London Forest Gdn, Suburban Renaissance, Calif. Campus, Phila. Orchards, Drinking Roofwater, Floating Island Bioremed., Bike Transport, Miss. Pc
- #70 Nov. '08 **Ethics at Work:** BAU is the Enemy, 13 Princ. of People Care, Pc in Business, Ecovillages, White Man in India, Uganda Boarding School, No Waste, Qual. Control, City Farming w/Runoff, Amaranth
- #71 Feb. '09 **Earthworks:** Hopewell Mound Water Mgmt, Belize, Keyline, Road & Dam Bldg., NW AgroFor, Pc&Landscape Arch, Earthbag Bldg, Low-Watt Fridge
- #72 May '09 **The View from Abroad:** War, Oil & Snails in Nigeria, Green Tech Future, Ethiopian Water Mgmt., Shrinking Forests, Food Exploration in Caucasus, Maya Agroforestry/Biochar, Pc to Trinidad,
- #73 Aug. '09 **Bioregionalism:** New Paradigm, Rocky Mtn. Wildlands, Wild Elephants, Organizing Houston, Heirloom Seeds, L.A. Gdns, Reclaim. Commons, Transition Hohenwald, Tenn., BioCongress Saga
- #74 Nov. '09 **Energy Descent:** In the Home, Transition Communities, Pc in Mexico, Biochar, US Consumption Dropping, EcoTechnic Future, No More Throwaway Economy, Making Fuel Alcohol
- #75 Feb. '10 **Local Food:** A City & Regl. Food System, Working Family on 5Ac, CSAs & Wild Foraging, City Backyard Gdng., Food Bank Gdns & Orchards, Salt Collecting, Regional Staples, City Grains.
- #76 May '10 **Soil Fertility:** Permaculture Way of Soil, Biochar, Sheet Mulch, Hawai'ian Soil Farming w/ Worms, Demystifying Humanure, Urine Fertilizer, Crop Rotations, Mushrooms Build Soil
- #77 Aug. '10 **Eco-Nomics:** Measuring Many Forms of Capital & Quality of Life, Bob Swann & Invisible Structures, Bioshelter Market Gdn, Green Collar Economy, Pc & Finance, Pc Inst., Cert. & Diplomas
- #78 Nov. '10 **Water Wise:** Restoration Engineering, Watershed Relations, Colorado Runoff Gdns, Cisterns in Saudi Arabia, Energy Use & H₂O, Trad'l. Mexican Catchment, Rooftop Garden, Home Water
- #79 Feb. '11 **The Urban Frontier:** Indoor Denver Farm, Rooftop Food, Home town Returns, Urban Ecovillage, City Bees, Urban Pc Projects, Start Pc Farming: Mark Shephard, **Index to issues #24-40.**
- #80 May '11 **Designing for Disaster:** Collapse Mitigation, Global Storming, Responding to Major Events, Stabilizing the Climate, Self-Care, Ensuring Food Supplies, Living Through Drought
- #81 Aug. '11 **Hidden Connections in the Garden:** Neighborhood Gdn, Urban Ag on Empty Lots, Food=Land Access, Indigenous Practices, Seeds, Deep Raised Beds, Greenhouses, Urban Wild Edibles
- #82 Nov. '11 **Growing Staple Crops:** Broadscale Farming, Local Grain & Mkts, Non-Tillage Beans/Corn, Pigs and Potatoes, Rice in Vt. Perennial Staples - Pt. 1, Garden Farming, Acorns & Chestnuts.
- #83 Feb. '12 **The Economy of Wood:** Polewood, A Northwoods Economy, Basketmaker's Landscape, Ligurian Alnoculture, Wood as Fuel, Clearing Woodland, Black Locust, Perennial Staples - Pt. 2
- #84 May '12 **Home and Hearth:** Domestic Permaculture, Natural Building, Roundhouses, Hearthfire, Retrofits, Home Economy, Homeschooling, Drylands Pc, Nova Scotia Homestead
- #85 Aug. '12 **There Goes the Neighborhood:** So. American Neighborhood Projects, N'hood Pattern Language, Community Solar, Food Security, SENS House, Moving Groups, Fracking & Common Rights
- #86 Nov. '12 **Health and Nutrition:** Naturopathy Centre, Seasonal Eating, Plant Medicine, Mushrooms & Vit. D, Herbal First Aid, Campus Forest Gdns, Beer, Growing Wise Children, Fenugreek
- #87 Feb. '13 **Weeds to the Rescue:** Managing Weedy Spp, Favorite Weeds, Wisdom of Weeds, Paulownia, Grafting onto Weedy Trees, Polycultures, Burdock, Reputation of Weeds, **Index to PcA #41-58.**
- #88 May '13 **Earth Skills & Nature Connection:** Mentoring, Cultural Repair, Connecting Youth to Nature & Self, Living with Wild Animals, Observation Skills & Design, Oyster-tecture, Personal Forest.
- #89 Aug. '13 **Practicing Democracy:** Slow Democracy, Seed Libraries, Rhode Island Prosperity, Lessons from the Iroquois, Community Gardens, Entrepreneurship, Social Pc, Pastoralism, Sweet Cicely
- #90 Nov. '13 **Appropriate Technology:** Technology & Culture, Zone 4 Tools, Rocket Mass Htrs, Solar Pump, Solar Food Dryers, Social Sharing Software, Oil Presses, Woody Ag Trials, Scythes, PV Dbl. Cropping

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Permaculture Design Course

New England

Dates: March 23-April 3

Location: Warren, VT

Description: This 80+ hour Permaculture Design course imparts a positive and empowering vision for social and ecological transformation.

This course is ideal for motivated individuals—including community leaders and professionals in the fields of architecture, planning, ecology, and education—who wish to use the tools of permaculture in rural and urban environments as well as for designing sustainable businesses and new models for local economic and ecological regeneration.

Instructors: Andrew Faust, Mark Krawczyk, Lisa DePiano, and Elizabeth Moniz

Cost: \$1,750

Contact: Yestermorrow Build School
www.yestermorrow.org/workshops/

Permaculture Design Course

New England

Dates: May-Nov., 1 wk/d/month

Location: Dorchester, NH

Description: This course introduces the ethics, principles, and practices of permaculture, and is maximizes practical learning by following the annual rhythm of the seasons. Participants will gain exposure to cycles and activities at the farm. This course is especially useful for homeowners, planners, design professionals, community organizers, farmers, and gardeners.

Instructors: Steve Whitman, Josh Trought, Dave Wichland, Lauren Chase-Rowell, Bryan Felice

Cost: \$1,200 by 2/1; \$1,300 by 3/1; \$1,400 after 3/1.

Contact: Steve Whitman
steve@low-energy-future.com
603-381-1798
www.dacres.org

Permaculture Design Course

Florida

Dates: Six weekends, Feb. 22-May 4

Location: Clearwater, FL

Description: The upcoming spring 2014 course is the most comprehensive and intensive line-up we've offered with expanded materials, videos, study aides and more. Expert speakers, field trips, focused hands-on activities, Florida-specific information, well-organized written materials, expanded networking and career opportunities, and design tools

Systems that are designed with permaculture principles use resources in a regenerative way, ensuring that we, our children, and our grandchildren will have access to all the resources they need. Be the change you would like to see, by designing that change!

Contact: Cathy
727-495-6145
cathy@growpermaculture.com
www.growpermaculture.com

Permaculture Design Course

New England

Dates: July 21-August 2

Location: Johnson, VT

Description: Immersed in wild ecology, beautiful scenery, and the abundance of Wil-low Crossing—our family farm and Vermont's oldest permaculture research site—we practice the art of re-visioning and remaking healthy human whole systems.

Instructors: Keith Morris, Lisa DePiano, Mark Krawczyk, Alissa White

Cost: \$1,600

Contact: Prospect Rock Permaculture
802-734-1129
www.prospectrock.org

Permaculture Design Course

Southeast

Dates: April 12-October 30

Location: Asheville, NC

Description: The Urban Farm School (UFS) is a comprehensive 716-hour program. The UFS will accept 25 students for the full season who will work with a team of instructors to run farming operations, gain Permaculture certification, work with experienced practitioners, network with community leaders and entrepreneurs, and connect the dots on farming in the urban landscape. Field trips, activities and workshops will be hosted at sites around Asheville.

Instructors: Stacey Murphy, Sunil Patel, Keri Evjy, Zev Friedman, and 50+ instructors

Cost: varies based on registration; payment plans avail.

Contact: YStacey Murphy. stacey@ashevillage.org
www.ashevillage.org/ufs

Permaculture Design Course

New England

Dates: July 4-13 or
August 22-31

Location: Mad River Valley, VT

Description: This course offers an exceptional opportunity to gain hands-on applied permaculture skills immersed within one of North America's most diverse and intensive permaculture research sites.

Participants will engage with high-performance home and community resource systems that will be more resilient in the face of problems posed by peak oil, climate change, environmental toxicity, and the inability of existing economic and social systems to deal with such challenges.

Instructors: Ben Falk, Erica Koch, Cornelius Murphy

Cost: \$1,850 early bird; \$1,950.

Contact: Whole Systems Design
www.wholesystemsdesign.com

Calendar

February 6-16. ECUADOR.

Permaculture Design Course. Zia Parker.
ziaparker@yahoo.com.

February 8-March 16, Ashland, OR. Permaculture Design Course plus Food Forest Planting Chuck Burr, SOPI, 541 201-2688, courses@sopermaculture.org, www.sopermaculture.org.

February 10-20. BELIZE. Permaculture Design Course. Christopher Nesbitt, info@mmrfbz.org, www.mmrfbz.org.

February 10-23. PERU. Permaculture Design Course. Chris Dyson, polyminyqua@gmail.com. www.kawaymonti.org.

February 18. On-line. Orientation for Diploma and Degree Candidates. Gaia University. info@gaiauniversity.org. www.gaiuniversity.org.

Feb. 22-23; Mar. 22-23; Apr. 26-27. Boulder, CO. Advanced Design Course. Becky Elder, 719-685-0290, rselder@comcast.net.

February 22-March 9, Kauai, Hawai'i.

Permaculture Design Course. 808-634-5412, permaculturekauai@yahoo.com, www.permaculturekauai.com.

February 22-May 8. Clearwater, FL. Permaculture Design Course. Cathy, 727-495-6145, cathy@growpermaculture.com, www.growpermaculture.com.

March-November. Cottage Grove, OR. Permaculture Design Course. Aprevecho, 541-942-8198, abelkloster@aprovecho.net, www.aprovecho.net.

March 2-15. Occidental, CA. Permaculture Design Course. Occidental Arts & Ecology Center, 707-874-1557 x103, oaec@oaec.org, www.oaec.org.

March 7-23. Lyons, CO. Permaculture Design Course. Spencer Branson, 720-313-4150, LyonsPDC@gmail.com.

March 8-October 12. 2nd Saturdays. Boulder, CO. Permaculture Design Course. Lynne duGuay, 720-562-4349, altstates123-co@gmail.com.

March 11. On-line orientation for Diploma and Degree Candidates now offered in

Spanish. Gaia University Latina. javiera@gaiaulatina.org. www.gaiaulatina.org.
March 13-16, April 11-13, 25-27. Naperville, IL. Permaculture Design Course. Resiliency Institute, 10S404 Knoch Knolls Rd, Naperville, IL 60565. 630-281-0184. michelle@theresiliencyinstitute.net.
March 23-April 3. Warren, VT. Permaculture Design Course. Yestermorrow Build School. www.yestermorrow.org/workshops/
March 30-April 5. Cottage Grove, OR. Permaculture Teacher Training. caspacadiapc@gmail.com.
April 12-26. Permaculture Design Course, Asheville, NC. Kathryn Blau, kathryn@ashevillage.org, www.ashevillage.org/pdc
April 25-May 3. Stelle, IL. Permaculture Design Course. Midwest Permaculture, Becky Wilson, 815-256-2215, midwestpermaculture.com.
May-June. Hot Springs, MT. Permaculture Design Course. Michael Pilarski, friendsoft-hetrees@yahoo.com, 406-741-5809, www.inlandnorthwestpermaculture.com.
May-November. Dorchester, NH. Permaculture Design Course. Steve Whitman, 603-381-1798, steve@low-energy-future.com, www.dacres.org.
May 18-June 3, Lafayette, IN. Permaculture Design Course. Rhonda Baird, 812-320-9136, shelteringhills@gmail.com.

May 30-June 1, Cismont, VA. Mushrooms Workshop in Pc. Mark Jones, 434-296-3301, info@sharondalefarm.com.
May 30 – June 14. Commonweal Garden, Bolinas, CA. Permaculture Design Course. info@regenerativedesign.org.
June 6-June 21. Lama Foundation, NM. Permaculture Design Course+Sustainable Communities. Arina Pittman, Arina Pittman, 505-455-0514, info@permaculture.org, www.permaculture.org.
June 15-July 19. Cottage Grove, OR. Permaculture Design Course. Aprevecho, 541-942-8198, abelkloster@aprovecho.net, www.aprovecho.net.
June 15-28. Woodland Park, CO. Permaculture Design Course. Christina Zahn, 303-517-6167, xtina Zahn@gmail.com
July 4-13. Mad River Valley, VT. Permaculture Design Course. Whole Systems Design. www.wholesystemsdesign.com.
Jul. 13-19, Jul. 27-Aug. 2. Adrian, MI. Permaculture Design Course. Peter Bane. pcactivist@mindspring.com. 812-335-0383.
July 13-26. Occidental, CA. Permaculture Design Course. Occidental Arts & Ecology Center, 707-874-1557 x103, oaec@oaec.org, www.oaec.org.
July 21-August 2. Johnson, VT. Permaculture Design Course. Prospect Rock Permaculture. 802-734-1129, prospectrock.org.

July 27-August 9. Ashland, OR. Permaculture Design Course plus Cob Building Hands On. Chuck Burr, SOPI, 541 201-2688, courses@sopermaculture.org, www.sopermaculture.org.
August 6-9. Portland, OR. North American Fruit Explorers (NAFEX) Annual Meeting. nafexmember@gmail.com.
August 18-24. Dorchester, NH. Teacher Training. Steve Whitman, 603-381-1798, steve@low-energy-future.com, dacres.org.
August 22-31. Mad River Valley, VT. Permaculture Design Course. Whole Systems Design. www.wholesystemsdesign.com.
August 23. Dorchester, NH. Permaculture Convergence. www.dacres.org.
September 2014-May 2015, one weekend/month. Bloomington, IN. Permaculture & Nature Connection Course through the Seasons. Rhonda Baird. 812-320-9136. shelteringhills@gmail.com, www.shelteringhills.net.
September 28-October 18. Cottage Grove, OR. Permaculture Design Course. Aprevecho, 541-942-8198, abelkloster@aprovecho.net, www.aprovecho.net.
November 9-13. Ann Arbor, MI. Permaculture Teacher Training. Peter Bane, 812-335-0383, peter@permacultureactivist.net. www.permacultureactivist.net.

LETTERBOX



Are Food Forests Sustainable?

Dear *Permaculture Activist*,

I have a quibble with a comment of Peter Bane's in the latest *PCActivist*. He says "no sustainable food system operates without a significant animal component." Is this really true? I'm a devoted follower of Martin Crawford's work, and I'm particularly interested in his ideas around designing nutrient budgets for forest gardens. In fact, I'm doing a workshop on the subject at the upcoming Guelph Organic Conference, so I'm trying to get my theory down pat.

Crawford contends that we can include all of the nutrient requirements of our forest gardens in the gardens themselves. This is not to say that these gardens will provide us with all

of our nutrient requirements. I myself am not vegetarian, and have friends who hunt deer on my land and share the bounty. But I think it's wrong to say that a nutrient-balanced forest garden is not a sustainable form of agriculture. Am I missing something?

I love Peter's work, by the way. *The Handbook* is a wonderful reference.

All the best,
 Ben Caesar
 Kimberley, Ontario

Agendas Clash on Diet and Animals

Dear *Permaculture Activist*,

Thank you for the review of the fourth edition of *Growing Food in the Southwest Mountains* by Lisa Rayner (Winter edition of *PA*, #90). As Lisa Rayner's husband, I was glad to see the many positive things you had to say about the new book. However, I was disappointed to see the "few but sharp criticisms" you made about the book, especially when some of them were factually inaccurate, and others were based on an obvious personal bias.

Your main criticism of the book can be categorized as "sins of omission." You say the book does not include enough information about raising livestock, or about greenhouses,

or about how to design regional systems of trade and exchange. Most home gardeners probably have no interest in raising livestock in their backyards, nor are most likely to build greenhouses, or set up regional trade systems. Despite its omissions, at 280 pages, *Growing Food in the Southwest Mountains* is the most comprehensive book of its kind ever written for home gardeners who live in the mountains of the Southwest. It is not sensible for such a book to attempt to cover every gardening topic in great depth, especially those topics that are not especially relevant to this region, or those topics that are well covered by other books. Let's look more closely at the most glaring factual inaccuracies in your review:

You say the book does not address greenhouses or other structures that support the garden. While the book is not about greenhouses, greenhouses are mentioned or discussed on 16 pages of the book. Meanwhile, cold frames get mentioned or discussed on 11 pages. You say that the book's USDA Plant Hardiness Zone map is out of date. In fact, it is the 2012 updated map.

I was also disappointed by the amount of space you devoted to criticizing the book for its failure to delve deeply into the notion of incorporating animals into permaculture gardens. This was a deliberate decision that Lisa made early in the writing of the book, know-

ing the decision would be controversial in some circles. However, as a practicing vegan for her entire adult life, she also knew that she could not in good conscience write her book any other way. The decision was not a choice based on Lisa's lacking experience related to keeping animals, as you suggest. She does have experience in this area, having once been an intern for Farm Sanctuary.

You criticize her decision to quote Texas State University associate professor James McWilliams on the subject of vegan diets, noting his support of GMOs and his opposition to both organic and local agriculture. Lisa too disagrees with McWilliams on some points, as she explains in her book. But she feels he nonetheless has some important things to say about the importance of vegan diets in an overpopulated world.

Lisa's book is meant for people who want to grow food in their backyards. If people want to raise livestock in their backyards, there are certainly other books about that. As you note, only 1.4% of the book's 280 pages deal with animals. How ironic then that 50% of your review space is devoted to attacking the book for its stance on animals, or lack thereof. You write, "The choice not to keep livestock must, of course, be honored..." You then launch into a lengthy attack on "Growing Food in the Southwest Mountains" for not delving deeply into the topic of keeping livestock. If this is how you honor the choice not to deal with livestock, then it is obvious that *Permaculture Activist* is edited by a very different kind of animal activist.

Dan R. Frazier
Flagstaff, Arizona

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Brad is the author of the *Rainwater Harvesting for Drylands and Beyond* series and a long time practitioner of integrative design, turning water scarcity into water abundance.

Eric is the author of *Paradise Lot, Perennial Vegetables* and co-author of *Edible Forest Gardens* with Dave Jacke. He has written about, taught and practiced carbon sequestration through agroforestry and is developing a book on Indigenous Plant Management techniques for Woodbine.

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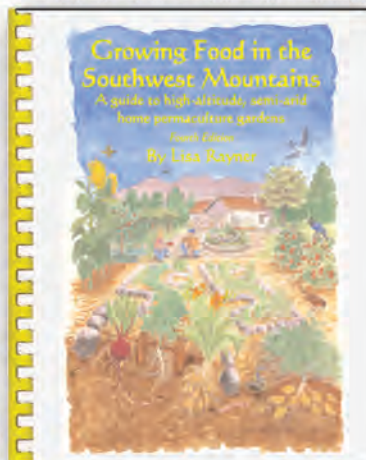
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Permaculture Teacher Training/Certification (March 30–April 5) An innovative and immersed learning environment for a Pc Teacher Training with PINA-founder **Jude Hobbs**, Cascadia Permaculture and team. The perfect chance for new permies and experienced teachers alike to kick off the season.

Permaculture Design Certification and Earth Activist Training in One (May 16–June 1) This is truly a full buffet 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 **STARHAWK** 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.

Regenerative Living and Homestead Community Building Internship 2014 (April–November) After more than a decade we are combining all of our internships into one fully integrated learning journey! With personal exploration, sacred space and community building combined with the homesteading model, this for folks who have a deep commitment to learning how to live and work together cooperatively in ways which nurture, inspire, and serve to create a difference in the world. This internship includes your PDC/EAT and all OUR short workshops offered in 2014.

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