

Permaculture



Design

Regenerating Life Together

Agroecology

Regenerating Landscapes

Cooperation Emerging in Puerto Rico

Annual Agriculture Patterns



The Other Hershey's:

A Pennsylvania Adventure

DIY Seedling Table! The Niwot Raspberry

Pollinator Tips in a Permaculture Garden

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Upcoming Issues, Themes, & Deadlines

#108	In Your City	March 1
#109	Building Living Soil	June 1

Our Journey

Regenerating the Land

Paula Westmoreland and Lindsay Rebhan

THE SUN IS SHINING BRIGHTLY on this early spring morning as 9,000 hazelnuts and a tree transplanter arrive. The contours are staked. The rye cover crop we seeded last fall is mowed where the hazels are being planted. The root dip is ready, along with manure and mulch. This 100-acre farm is marginal land with gently rolling hills and lots of water. Historically, it's been in wetlands and ponds. For 15 years, it was farmed in corn even where it was too wet to produce a consistent crop. This is Midwest corn and soybean country. It is a place with abundant soil and water resources, but a vast portion of the landscape has been contaminated with chemicals and GMO crops. It is largely devoid of life. This morning, excitement and hope is in the air. We all feel it as the planting begins, a regenerative paradigm is taking hold in the Midwest.

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

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

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

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

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

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



Lindsay and Sarah plant asparagus using a tree transplanter.

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

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

The roots of our story

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

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

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

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

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

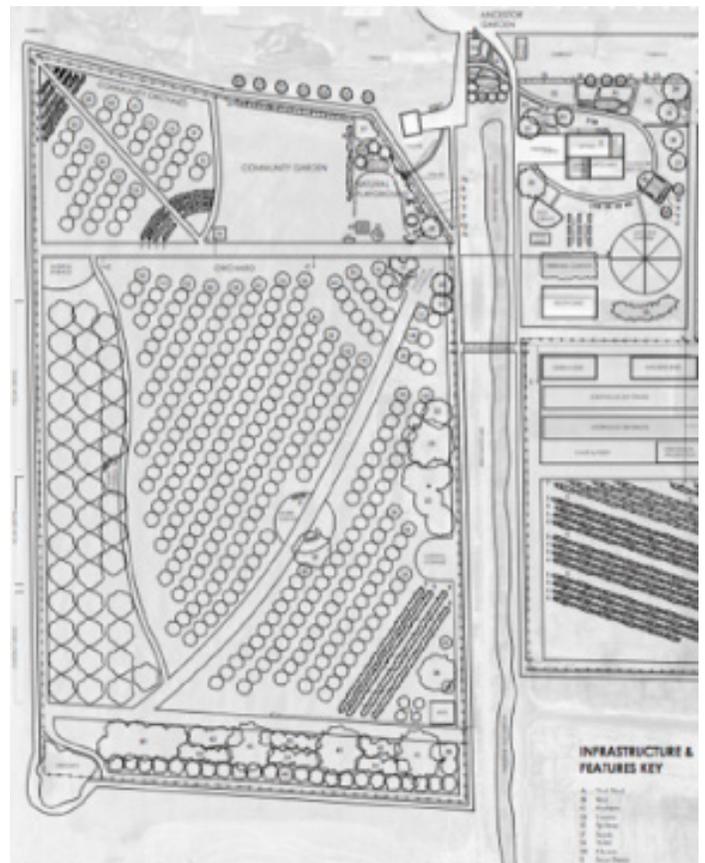
Regenerative design

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

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

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

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



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

Lessons from Our Urban Work

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

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

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

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

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

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

Regenerative implementation

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

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

Site Assessment—Do Your Homework

The Land

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

The People

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

The Economy

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

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

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



Lindsay after planting fruit trees in a alley crop.

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

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

Summarized below are specific strategies we routinely use:

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



Prescribed grazing goats.

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

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

progress.

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

Lily Springs Farm: Regeneration – Education – Celebration

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

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

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

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

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

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

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

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

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

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

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



Paula surveying a recent planting.

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

Main Street Farm: regenerative poultry system

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

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

