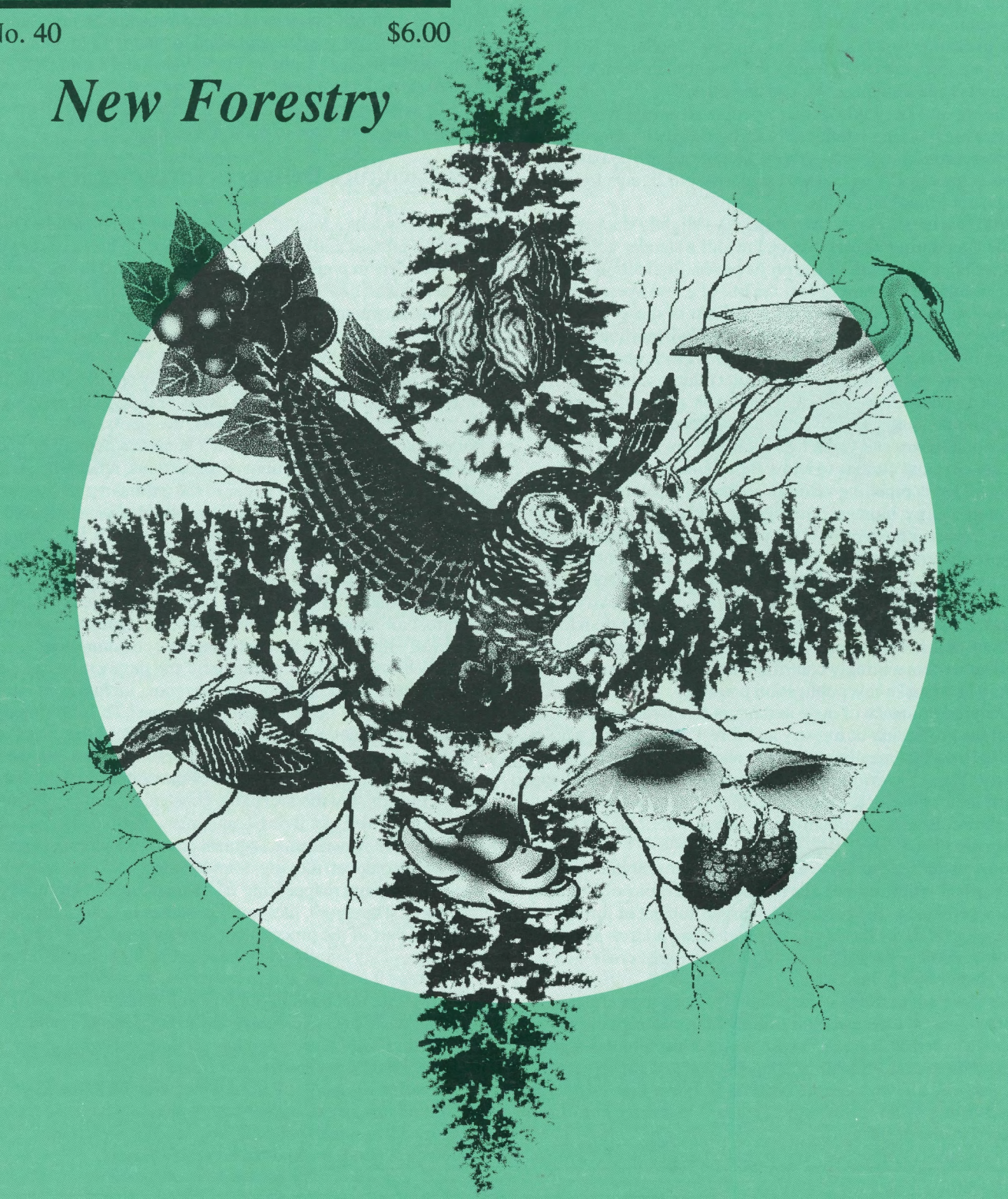
THE

PERMACULTURE ACTIVIST

No. 40 $6.00

New Forestry



CALENDAR

November 29-December 12. Dexter, OR. Permaculture Design Course. Lost Valley Educational Center, 541-937-3351.

November 30-December 13. Harbin Hot Springs, CA. Larry Santoyo & Assoc., 309 Cedar St. #85, Santa Cruz, CA 95060. dotcalm@got.net; 800-469-5857. www.permearth.org

January 20-23, 1999. Pacific Grove, CA. Ecological Farming Conference. CSA, 406 Main St., Suite 313, Watsonville, CA 95076. 408-763-2111, fx/-2112. www.csa-efc.org

February 27-March 12, 1999. Occidental, CA. Permaculture Design Course. Occidental Arts and Ecology Center, 15290 Coleman Valley Rd., Occidental, CA 95465. 707-874-1557, fax/-1558. www.oaec.org

March 13-14. Freeland, MD. Eastern Permaculture Teachers Assn. Meeting. Linda Felch, EPTA, 21300 Heathcote Rd. Freeland MD 21053. 410-343-DIRT. lfelch@jhu.edu

March 15. Freeland, MD. EPTA Teacher Training. EPTA. 410-343-DIRT. lfelch@jhu.edu

April 23-May 1. Summertown, TN. Fundamentals of Permaculture. Ecovillage Training Center, PO Box 90, Summertown, TN 38483. 931-964-4324. ecovillage@thefarm.org Web: www.gaia.org

May 14-16. Black Mountain, NC. Introduction to Alternative Building. Culture's Edge. 1025 Camp Elliott Rd., Black Mtn. NC 28711. 828-298-2399. culturesedge@mindspring.com

May 28-June 2. Summertown, TN. Advanced Permaculture/Village Design. Ecovillage Training Center, 931-964-4324. ecovillage@thefarm.org

June 6-12. Taos County, NM. A Natural Building and Permaculture Convergence. Permaculture Drylands Institute, PO Box 156, Santa Fe, NM 87504-0156. 505-983-0663. PDrylands@aol.com

June 10-18. Orangeville, Ontario, CANADA. Fundamentals of Permaculture. Ecology Retreat Center, RR 1, Orangeville, ON, L9W 2Y8 Canada. 519-941-4560, fax/-942-3951

June 12. Black Mountain, NC. Forest Gardening Workshop. Culture's Edge. 828-298-2399. <culturesedge@mindspring.com>

June 14-25. Williams, OR. Permaculture Design Course. Scott Wilson, 963 Panther Gulch Rd., Williams, OR 97544. 541-846-6407.

July 7-August 18. Black Mountain, NC. Permaculture Work/Study Program. Culture's Edge. 828-298-2399. culturesedge@mindspring.com

July 9-17. Black Mountain, NC. Fundamentals of Permaculture. Culture's Edge, at Earthaven Village. 828-298-2399. <culturesedge@mindspring.com>.

July 31-August 2. Celo, NC. Sixth Annual Southeastern Permaculture Gathering. The Summer Gathering, Celo Community, 272 Seven Mile Ridge Rd. Burnsville, NC 28741. SASE Please.

August 6-14. Black Mountain, NC. Permaculture Village Design Practicum. Culture's Edge at Earthaven Village. 828-298-2399. culturesedge@mindspring.com.

August 8-22. Northwestern PA. Permaculture Design Course. Darrell Frey, Three Sisters Farm, 134 Obitz Rd., Sandy Lake, PA 16145. 412-376-2797.

August 24-September 5. Basalt, CO. CRMPI, Box 631, Basalt, CO 81621. Ph/fx: 970-927-4158. Email: permacul@rof.net; website: www.rof.net/permacul/

September 27-October 2. Black Mountain, NC. Building with Earth and Straw. Culture's Edge, at Earthaven Village. 828-298-2399. <culturesedge@mindspring.com>.

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Attitude Matters

Peter Bane

Despite cautions from colleagues that the term "New Forestry" had acquired a tainted reputation from its use by still-too-short-sighted academic and institutional foresters in recent years, we thought it said more simply than anything else what we wanted to portray in this issue. The need for New Forestry is everywhere evident; "old" forestry has been a disaster. What needs to change first is attitude, as Andrew Goodheart Brown points out: trees are living beings yet forestry has been too much a form of crude slaughter. We can do better.

The hopeful story is how many people all across North America are working intelligently and seriously to reform forest practices, protect and restore forests, and revalue our existing forests economically so that we can derive our livings from their livings, not from their deaths.

With this issue, *The Activist* turns 40—slightly thicker in the middle than during its early years, but still a slender volume with what we hope is a spark of life on its pages. Production of our small circulation paper will cost the life of a few trees: A half-ton of wood pulp and some hundreds of gallons of diesel fuel and gasoline will be required to circulate these half-million words to readers in 50 U.S. states, 10 Canadian provinces, and 40 other countries. As we sit in the soft (compact) fluorescent glow of the office, computers humming and Beethoven's Choral symphony playing on the radio, all still reflecting the decay of nuclear fuel in Carolina Power and Light's reactors, we are grateful to have this capacity, and curious to know if this small counter-entropic effort still has compelling value, or meets our ethical test of producing more energy, biomass, intelligence, and diversity than it consumes. You dear readers, hold the verdict in your hands and hearts.

Fewer letters than usual this issue may reflect an increase in other means of communication. More and more contacts come to us through the Internet, though mail, phone, and fax carry most of the traffic still. Readership is growing slightly faster than forests. Goodwill is difficult to measure but seems to be increasing as excellent writers willingly contribute their works and cooperators at every hand make this publication possible.

The predominance of male authors in this issue seems to reflect the profession of forestry and forest workers as a whole, an imbalance that may be part of the reason for the crisis in forestry. Men as warriors and guardians are especially challenged to shift their attitudes to embrace a defense not merely of loved ones, home, hearth, community and nation, but of all life on this blue-green planet.

More underlies this issue than we can represent in 68 pages. An excellent article by Lea Harrison on the Origins of Conflict, so very germane to the politically charged subject of forestry, will have to wait for the spring issue when we address Natural Building, another part of the solution to the forest crisis—as Toby Hemenway points out.

For if we are to reforest the planet, we must temper our appetites—or, in a permaculture vernacular, redesign our systems—to reduce demands on the forest. And permaculture design begins with ethics. An ethic of conservation and conservative use must underlie all we do, or we become no better than engineers, perhaps using softer technologies, but still in service to a human-centered vision of the world.

The picture of New Forestry we have painted here draws heavily from the palette of permaculture solutions: forest farming (Deborah Hill, Mark Shepard), restoration and regeneration (Matt Kovacs, Tom Ward and Randy Carey), patterning (Christopher Meuli), the renewal of traditional practices (horselogging, coppice-with-standards), indigenous knowledge (the Menominee forest), and innovative science (Phil Rutter's breeding work). All of it rests on a base of clear-eyed observation of the natural world (read Alex Shigo on forest soils and Lee Barnes on old-growth inventory), a willingness to rethink old conventions (David Wilson on Homestead Land Tenure) and new prejudices (David Simpson on forest investment, David Wheeler on private timberlands), and the determination to "put it all together" in a community setting (Anthony Flaccavento and Colin Donohue on Appalachian development).

Just as the forest is more than the trees, we need all these pieces at the same time to make a whole. Δ

Permaculture Designers Directory Re-Issued

John Irwin has done it! *The American Permaculture Directory* is off the presses and ready to be snapped up by an eager public.

Five years in preparation, the Directory will be welcomed by all veteran and new permaculturists for the light it sheds on our far-flung community. When a review copy arrived in the mail, I pored over it like it was my high-school yearbook, "Am I in it? What does it say? Who's that? Oh look…"

This handsome spiral-bound volume is crammed with lists of courses and graduates, fat with pages of individual profiles of permaculture practitioners, teachers, designers, and homesteaders, and peppered with a generous helping of juicy bits for the newcomer: definitions, explanations, aphorisms, and stories. It devotes several pages to the publishing history of this magazine (someone's actually been paying attention!), and lists internships available (a hazardous endeavor in a fast-changing field) along with non-profits you can contribute to. It lays out permaculture principles and design methods, explains such basics as the foundation of organic and community-supported agriculture, bioregionalism, environmental economics, and compost, and even offers ten tips on reducing fuel consumption!

Reflecting the editor's pragmatic and democratic cast of mind, the Directory has something for everyone, including at least one mistake for every person listed in its pages! To John's credit, he announces this at the beginning and throughout the directory—and he warned us for at least three years that this would be the case. It is, of course, not the fault of the editor or of publisher Greg Peterson, but the inevitable consequence of producing a data-rich portrait of a living community. Permaculturists (no -al, please, we're American…) squirm about like worms in a box of…well, compost, moving, transforming, re-forming, disappearing and reappearing faster than mushrooms after a rainstorm. The errors, like small mistakes in permaculture, are an expected part of the process, nor do they render the Directory unusable—they simply whet the appetite for better information.

We owe it to John, and to ourselves, to sit down over the holidays with this book in our laps and make note of what's missing, what's changed and what's out of place. He's promised us a revised edition soon and has set up a web address for input of revised data from readers and friends.

We offer the book by mail order. For $16 and $2 postage, we'll send one anywhere in North America. Overseas readers add $2 more. Give one to yourself, buy another for a friend. The early reviews are good. It stands to become a classic. Δ

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December, 1998 **Issue #40**

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Cover art courtesy of Keith Johnson

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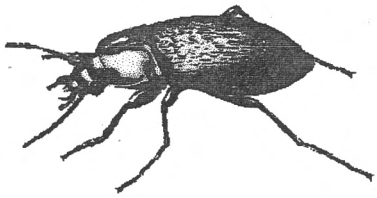

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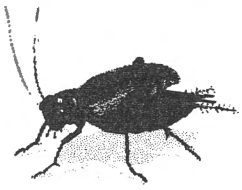
Forest Health... Is More than Forestry



Toby Hemenway

I live where your wood comes from. The signs of this—vistas lacerated by clearcuts, endless chains of log trucks on the freeway—are abundant around my Oregon home. But I hadn't realized how far-flung was the demand for my bioregion's trees until a recent visit to Connecticut, where I wandered into a building supply store. There, piled up in the warehouse were towering stacks of western red cedar from Oregon. The east coast is home to several fine species of cedar, so I was amazed that the machinations of our economic system make it more profitable to ship heavy, bulky red cedar timbers 3000 miles to a lumber yard in New England than to harvest local wood. How warped is the accounting of costs, how weak the viable local supply, how strong the pull of demand to send log trucks roaring the entire length and breadth of the interstate highway system. Although I'm a staunch supporter of ecological logging methods, I fear that sheer demand for trees will render insignificant much of the New Forestry.

But though the picture now is bleak, there are encouraging signs on the horizon.

My home state of Oregon leads the nation in timber production, with adjacent states Washington and California close behind. In 1994, 4.2 billion board feet were harvested from 805,000 acres of Oregon's forests. (1) This means that a piece of Oregon larger than Rhode Island is used for selective and clearcut logging every year (In the 1980s, before reductions mandated by the Northwest Forest Plan, harvests were roughly twice as large).

Because of logging, the view of the Northwest from a plane window looks like a three-toned checkerboard. Giant squares of scraped-bare clearcut and rectangles that glow with the bright green of young, monocultured tree farms far outnumber the patches of darker mature trees. And in a satellite photo, the Northwest has smallpox. Thousands of white speckles—clearcuts—mar the expanse of red that on a satellite's infra-red film signifies vegetation.

But those are views from a distance. Closer to my home, our insatiable demand for wood has a powerful effect on me.

I live at the end of a two-mile gravel road. In the last year, three parcels on my road have been logged. Too many mornings my wife and I have sadly turned to each other, awakened by the scream of chainsaws and the staccato snap and crash of toppling trees.

Here's an example of land use that is typical of the local pattern: Down our road, a naive local landowner sold his 20 acres of mixed conifers, oaks, and madrones to a realtor for $36,000. The realtor immediately resold the property to a big logging firm for $100,000. The loggers moved in with expensive feller-bunchers, huge machines that crunch through the forest, grabbing each tree with giant pincers and snipping it off in seconds. Feller-bunchers do the work of four or five sawyers, leaving the unemployed loggers to gripe about environmentalists.

Next, cat-treaded log-pickers smashed through the remaining vegetation and dragged the trees onto a computerized de-limber.

This "labor-saving" machine, in one split-second snarl, battered off the branches from each tree and stacked the log for transport to the mill. In two weeks, as I watched from our tree-shrouded home, the loggers clearcut the steep parcel and hauled 55 loads of logs down our road. The loggers' gross: about $200,000.

Since this was a big logging firm, they replanted the parcel with Douglas fir. Small logging outfits, called gyppos, often don't replant, as zoning loopholes allow them to declare they are creating pasture or building sites (about seven other parcels on our road have been logged by gyppos, and remain treeless).

After the big-time logger replanted the churned mineral soil of the clearcut, he sold the parcel to a local Baptist pastor for $25,000. The pastor bulldozed out a wide driveway and roads to his two wells, and leveled a sprawling site for a mobile home and yard. The roving 'dozer ripped out about a third of the replanted trees. The pastor then moved in, divided his parcel in two and put the unoccupied half on the market for $35,000. I was relieved to see that at last, this ever-rising trajectory of greed finally exceeded the market's realities: the piece didn't sell. A few months later the pastor moved to the midwest, selling the property to a family who bulldozed another section to build a large wood-framed addition to the mobile home.

This story repeats, with variations, every time land on our road changes hands. Each new owner squeezes more money from the land, and each time the land is degraded further. Demand for wood products ensures that the best use for trees, from the landowner's point of view, is to send them to the mill for a tidy profit. Environmentalists have striven to make logging on public lands less destructive, but on private land, we insist upon the right to treat our property any way we want. Especially in the American west, so-called property rights advocates, backed by extractive industries, fight any private land-use regulations.

I admire anyone willing to go toe-to-toe with property owners who view regulations as a socialist plot. And I empathize with environmental activists who struggle to implement rational logging practices in our national forests. But from what I saw while doing fieldwork with the Forest Service this summer, most of the replacements for clearcutting on public lands, industrial experiments in "New Forestry," merely spread the logging and road-building over a wider area in an attempt to leave some trees standing, while still cutting the same number of trees and still destroying topsoil and understory with heavy equipment. And no matter how much we legislate and educate, our demand for wood grows each year.

So what is the answer to this heartbreaking destruction of our forests? Certainly, we must work to establish more sustainable logging practices. But the real answer lies in basic economics: the law of supply and demand. If we cannot curb our appetite for wood products, regulations and enlightened practices that reduce timber supply will simply be tossed out when demand dictates. Demand defines the market, and it is demand for timber—the wood-framed houses that nearly all of us live in, the paper that we spew endlessly from our computers and newspaper presses and toilet paper rolls—that denudes our forests.

How can we reduce our demand for timber? Fortunately—and I now abandon this bleak recitation of forest death for a more optimistic tale—the answer lies in two fledgling industries, the natural building movement, and the tree-free paper business.

A Home of Earth

Most of the world's people don't live in wood houses. Their homes are built of the earth under their feet. Earthen housing is an ancient, time-tested technology all but abandoned in the over-developed world, yet it is being re-introduced by a handful of pioneers, and embraced by thousands. Many permaculturists know of cob, a sculptable mixture of clay, sand, and straw used to build European houses for centuries. There is also rammed earth: stabilized soil packed in forms and tamped into thick walls. Other earth-based building materials include adobe and stone. An added delight of these materials, beyond reducing wood use, is that the construction techniques they require are simple enough for nearly anyone to build their own home.

Another alternative to stick-built houses is the straw-bale dwelling. Many straw-bale houses, because of conservative building inspectors skeptical of straw's load-bearing abilities, are timber-framed with straw infill between structural members, but even these use less wood than conventional framing.

A typical wood-framed house uses 16,000 board feet of framing lumber plus another 6,000 board feet of wood for plywood and chipboard. (2) It takes three to five acres of trees to supply this wood. Since 1.1 million new houses are started in America each year, if even a small percentage of these were earth- or straw-built, a lot of sterile tree farms could blossom back into real forest (an interesting aside: although since 1946 the average number of occupants per house has shrunk from 4.3 to 2.5, the average house size has bloated from 1100 square feet to 2100).

Why don't we see more non-wood houses? Inertia. When Americans think "house" we picture a wood-framed building. Also, banks don't like to loan money on "non-standard" construction, since it might make the house harder to sell. Thus banks restrict owners of earth and straw dwellings to either those so poor they must build their own, those rich enough to not need a home loan, or those clever enough to build their own alternative to the 30-year wage-slavery brought on by a mortgage.

In addition, building inspectors don't know what to do with non-wood houses.

In Eugene, Oregon, Rob Bolman is building a permitted straw-bale/cob structure, and he's patiently shepherded his project through several years of back-and-forth with perplexed inspectors. They've forced him to use more wood and concrete than necessary, and vetoed a few innovations, but they've also listened to him and made significant allowances in the code for more ecological techniques. Bless Rob's heart, his perseverence has laid the groundwork for others to build with less wood in Eugene.

Paper Without Trees

After house builders, the other big instigators of forest plundering are all of us who use paper. Wood-based paper, responsible for 29% of all trees cut, is harvested from 12,400 square miles—nearly eight million acres—of American forest each year. (3) Yet dozens of other paper-grade fibers exist. Kenaf, hemp, jute, sisal, bamboo, flax, and the waste from sugar-cane production called bagasse, make fine paper. Ten percent of the world's paper is made from non-wood pulp. In China, 73% of all paper is tree-free.

It does take farmland to produce tree-free paper. But many non-wood fiber plants yield far more biomass per acre than do trees, so a shift to treeless paper will reduce pressure on our forests and save energy at the same time.

Obviously, we can't change all of our wood-consumption habits overnight. But we can gradually alter our focus. That's what I've tried to do. Heaven knows I still use wood. As a writer, I use a fair chunk of paper, though I console myself that I consume a lot less than when I worked in an office. And I re-use paper fanatically, and search for recycled paper with the highest post-consumer content. I've even got a few sheets made from hemp.

I'm not anti-logging; I've cut trees myself, and I believe that it's not immoral to harvest a small number of trees from a limited amount of land. My lifestyle, like that of every reader of this wood-pulp magazine, consumes trees. Our Oregon home is not made from cob—it's wood frame. Again I console myself that the carpenter we bought it from was a master scavenger, and most of the wood in it is either used, from odd lots that a local mill was going to burn, or sawn from salvaged logs. These are small steps, but they help, and they aren't beyond what the average person can do. I'm not going to preach hypocritically that everyone else immediately cease using wood, or that loggers stop cutting trees. But I hope that we can join in taking the first steps toward lessening this relentless demand on our forests.

The alternatives to forest destruction exist. Using harvest and planting techniques that allow forests to function as ecosystems instead of tree factories will help. But just as important—maybe more so—if we build smaller houses, some from earth and straw; if we write on tree-free paper; and if we simply remain aware that each conscious choice can allow, somewhere, a tree to grow instead of die, then maybe my mornings won't be filled with the splintering crack of falling trees. Maybe I can just listen to the birds and smell the sweetness of fir-scented air.

Sources

1. Oregon Department of Forestry
2. National Association of Home Builders
3. Earth Island Institute

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Toby Hemenway is associate editor of The Permaculture Activist. *He writes from Oakland, Oregon.*

Forestry in Central Appalachia:
Developing an Economy of Place

"The economy is vitally dependent on meaninglessness. The whole commercial community is geared up to exploit and play to meaninglessness. When you feel bad, you go out for a nice lunch or buy yourself something nice." Dr. Thomas Naylor, Duke University.

Anthony Flaccavento

Nearly two centuries ago, economist David Ricardo forwarded the theory of "comparative advantage," describing an international system of exchange in which each nation specialized in the production of a limited number of goods, which for various reasons, it could produce relatively more efficiently than other nations. All of these efficiently produced goods, according to the theory, would then be "freely traded" among nations, spurring a global proliferation of goods, rising export income, and steadily expanding consumer choices.

The idea of comparative advantage has proven to be more than just theory. It has been the centerpiece of economic development strategy for the World Bank, the International Monetary Fund, and every other major Western development institution in the 20th century. It also describes the relationship between Central Appalachia and the urban-industrial centers of our nation since railroads first "opened" mountain communities a century ago.

For Central Appalachian communities, and much of the so-called developing world, the problem with comparative advantage lies in its assumptions. These can be stated as follows:

- An ever expanding array of consumer choices is necessarily good;
- The best means to achieve that expansion is through specialization and the substitution of capital for labor;
- Local, regional, even national self-reliance is at best impractical, at worst anti-progressive;
- A free market, consumer-driven economy is the best means to allocate resources, including decisions about what to produce and how to produce it;
- The economic playing field is a level one.

Comparative advantage as an economic development strategy has been ruinous to Central Appalachia, indeed to the culture and economy of countless local communities around the globe. Its major success, the global proliferation of cheap food, fiber, and stuff, has only marginally benefited the poor, and has degraded ecosystems in an almost unfathomable number of ways.

This article will describe the efforts of Appalachian Sustainable Development and other community based organizations to forge an alternative to this specialized, extractive economy in southwest Virginia and northeast Tennessee. This alternative is sustainable, community-based development. Particular attention will be given to our sustainable forestry and wood products initiative, which, though nascent, is providing insights into the opportunities and challenges of sustainability.

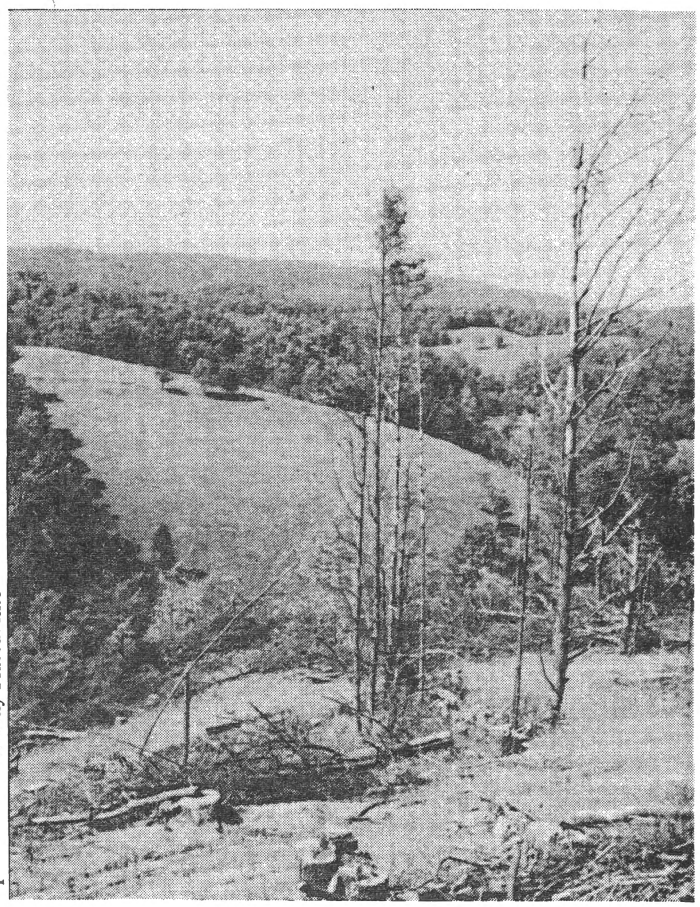


photo credits Anthony Flaccavento

Conventional logging site in Scott County, VA

Principles of Sustainability

"I spent the summer traveling. I got halfway across my backyard." —Louis Agassiz

Principle 1: Sustainable Development is first and foremost, locally rooted. It "fits" within the ecosystem of a particular watershed or bioregion, and it builds upon the opportunities and challenges embedded in the region's human community.

This does not imply parochialism or a clinging to the past, as some would characterize it. Rather, it means that economic and technological choices are made locally, in consideration of ecological limits and the more basic needs of people.

This is no easy task, especially within a broader culture so enamored with mobility, globalization, and change. But it is essential if our development is to be both sensible and innovative. As the theologian Dallas Willard has said, "The first act of love is always the giving of attention." And it is only in this attention to the particular that we can begin to understand complex biological relationships or see unique cultural strengths.

"Before any course of action, we should first ask:
What is already here?
What does nature allow us to do here?
What does nature help us to do here?"
Wendell Berry

Principle 2: Sustainable Development takes place within the context of both the local ecosystem and the larger biosphere. It is guided—and limited—by three essential ecosystem facts: Diversity, Community and Regeneration.

Ecosystems vary dramatically in their levels of biological diversity. In all but the coldest extremes, however, ecosystems evolve towards a level of increasing species differentiation. This provides the foundation for ecological resilience, adaptability, even productivity. (5) Diversity creates symbiotic opportunities, as when mycorrhizal bacteria colonize legume roots, making nitrogen available to the plants. It also limits disease or pest epidemics, and increases productivity: the total amount of solar energy that can be harnessed.

The human community and economy derive comparable benefits from diversity, **to the extent that we do not shrink from it.** A wider range of human cultures and traditions broadens our potential for insight and creativity; economic diversification makes communities less vulnerable to disaster and can create symbiotic and synergistic relationships.

Communities of economic interrelationships create both opportunities and challenges. Some firms, such as Full Cycle Woodworks in Rogersville, TN are undertaking full cost accounting to minimize "side effects" and "externalities." These measures integrate all impacts of the enterprise into its bottom line, creating incentives to reduce waste and prevent pollution.

The third ecological reality is regeneration: In the natural world, everything takes place within cycles of decay (or erosion), death, and rebirth. Simply put, in nature there is no trash, for everything—and all of us—eventually yields to decomposition, the source of fertility and new life.

"Any physical subsystem of a finite and non-growing earth must itself also eventually become non-growing."
John Cobb & Herman Daly

American culture was founded on a pioneering spirit. The increasingly pervasive "global culture" rests in large part on a similar notion of no limits, no constraints. In this context, serious conservation is difficult, and radical reductions in consumption, primarily in the Western world, are urgently needed. In ecological terms, excessive consumption depletes our "sources" and overloads our "sinks," compromising the cycles of regeneration.

Principle 3: Another means to better fit our human subsystems within the biosphere is by maximizing the value added to resources within or close to the place where they're found.

An oak log brings 60 cents per board foot in our area; when sawn into a board it brings $1.00; kiln dried it is worth about $3.00 when directly sold to a neighbor building book shelves. This fivefold increase in value, in addition to generating more revenue within the local community, creates opportunities for more and higher skilled jobs, reduces energy used in transportation, builds relationships between "producers" and "consumers," and increases the likelihood that the resource—trees, soil, fisheries—will be managed for the long-term (since it is more economically valuable).

Principle 4: The fourth element of sustainability which we have discerned is empowerment: building skills, creating assets, and opening the doors (or creating new ones!) to decision-making power within and beyond the local community.

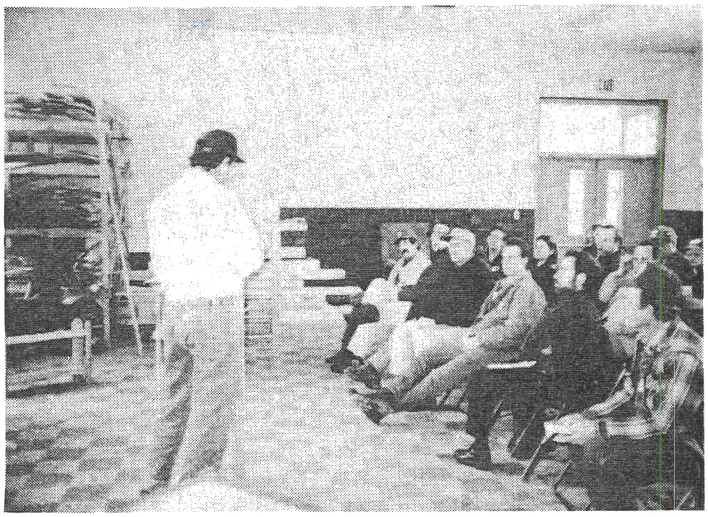
Often these different components of empowerment have been fragmented, with community organizers and political scientists focused on power relationships, while development professionals addressed skill building almost exclusively. In our experience, the two are closely linked if not inseparable: increased skills build self-confidence, creating both personal assets and community alternatives; these in turn tend to level the playing field and open avenues to decision making. On the other hand, more democratic decision-making processes are often required before institutions and public policies ensure fair access to education, capital, and other assets. While an engaged and empowered citizenry, generally, is much needed in our nation, it is especially urgent in rural communities, among young people, and for the economically marginalized.

An empowered citizenry and a value-adding infrastructure together provide the foundation for a more regionally self-reliant economy and community. Regional self-reliance is neither self-sufficiency nor isolationism. It does mean a healthy degree of regional independence based upon innovative, diverse enterprises, skilled and creative households, and a fundamental integration with the ecosystem.

A passerby: "That horse logging does a good job alright, but it's too slow. At the rate you're goin', you'll be here forever."
The horse logger: "Yeah. I know."

Principle 5: The final and most obvious principle of sustainable development is, simply that it lasts. Indefinitely.

Because there can be no logical debate with this goal, the question is only how to get there. This next section will discuss the strategy being used by Appalachian Sustainable Development based upon the principles outlined above.



Ron Highsmith, of Full Cycle Woodworks teaches a class on lumber wood manufacturing, and drying

Sustainable Forestry and Wood Products

Much of the Appalachian Sustainable Development region is forest land, in excess of 60% in many counties. (3) Employment in forest-related industries, however, has declined even as rates of timber harvesting have increased. Regional manufacturers of furniture, cabinetry, and other wood products complain that local wood is very difficult to obtain in usable condition.

The high rates of timber harvest, the steady decline in jobs, and the lack of locally available lumber for manufacturing are due primarily to two factors: the increasing scale of most new wood-processing industries in the region (i.e., pulp mills, chip board plants) and the lack of value-adding businesses and facilities at the local level.

We have a lot of timber, "mountains of hardwoods," as one publication described it. (3) Although these include red oak, white oak, walnut, and other desirable woods, mature poplar and other low-value species predominate, due largely to the high grading and indiscriminate logging that occurred over the past 40 years. The new pulp and chip mills use huge quantities of lower-grade and smaller logs, thereby encouraging clear cutting, the use of mechanical skidders, and expansive road building through the forests. Driven by this fast-growing demand for cheap timber, our better species—oak and walnut—have become, in effect, by-products of our forestry rather than its anchor.

Our strategy has four central components, all designed to increase employment while reducing stress on the forests:

1. Training loggers in environmentally sensitive harvesting practices, especially the use of horses to skid logs out of the forest.

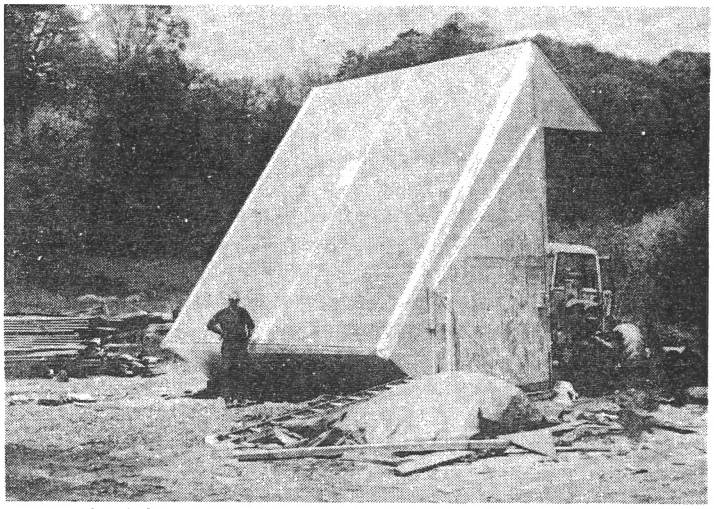
Chad Miano demonstrates horse-logging near Gate City, VA

This old-fashioned technique has been updated to reduce damage to the forest and risk to the logger and the animals. The training also includes elements of forest ecology, along with directional felling, chain saw safety, and tree selection that balances profitability with long-term forest stewardship.

It costs about $15-$25,000 to capitalize a horse-logging business, as compared with $100,000 or more for a one- or two-person conventional logging operation. Because large amounts of debt often lead to excessive rates of extraction, horse loggers have an inherent advantage, ecologically. Nonetheless, ASD has begun to broaden its training efforts to include smaller-scale, environmentally sound mechanical logging operations. By the turn of the century, we intend to have a pool of 8-12 loggers—including animal- and machine-powered operators—who can meet the certification standards described below.

2. Maximizing the value of each log harvested by sawing, drying, and manufacturing it into finished products such as cabinets, furniture, specialty flooring, and wood crafts.

The single biggest gap in this value-adding infrastructure has been dry kiln capacity. Dried oak boards can bring three times as much as green boards. The solar dry kiln built in partnership with the Lonesome Pine Office on Youth in 1995 has paid for itself with the loads of wood we have dried.



Solar kiln owned by Glen Hillman , Ft. Blackmore, VA

More recently, we have completed plans for a Primary Processing Center, with support committed from local sources, private foundations, and federal agencies including the Appalachian Regional Commission and the Economic Development Administration. This facility, to be built in Russell County, Virginia, will include a 20,000 board-foot dry kiln powered by solar energy and wood waste, along with a yard and shop designed for storage and planing of lumber. This will complete the regional processing loop that begins with sustainable harvest and cutting by local sawyers using portable bandmills—which minimize waste and maximize board quality. The Center will also train local entrepreneurs in sawing and drying techniques, lumber grading, and basic wood manufacturing.

ASD has developed networks of other local entrepreneurs, ranging from crafts people to cabinet and furniture makers to buy this sustainably harvested lumber. One such business is Appalwoods, Inc., a small firm producing very high quality display cases, humidors, and other wood products. From their home in Bristol, Tennesse, owners Dave and Ginger Arnold have been steadily building both a strong local and a steadily expanding national market for several years.

According to Dave and Ginger, the single most important reason for their growing sales is the "eco-friendly" product identification they have developed. Using illusrated brochures and the Internet, and drawing on help from both ASD and The Nature Conservancy, Appalwoods has effectively expanded its market while educating the public about sustainable forestry.

3. Certification standards.

Much like the organic label for farm products, certification

potentially provides both incentives for better forest stewardship and assurance for consumers that their purchases contribute to forest health. These advantages are "potential" in Central Appalachia because we lacked a well-established certification system. Since 1996, Appalachian Sustainable Development has been using environmentally sensitive timber-harvesting standards developed by Jason Rutledge (a modern horse logging pioneer), professional foresters, and landowners. These standards have proven valuable in teaching sustainable forestry and, in the case of entrepreneurs such as Dave Arnold, helpful in securing markets.

In the future, these standards will be integrated into a broader set of standards currently under development by the Forest Stewardship Council. Additionally, the certification standards and system will be completely compatible with those developed as part of The Nature Conservancy's Clinch Valley Forest Bank .

4. Developing landowner support.

Sustainable forestry efforts are relatively new in our region, so most landowners have been unaware of horse logging and other forest management options. Many have sold off their timber to irresponsible operators, often with devastating consequences. "I wish I had known about you before...," is a refrain we often hear.

In an effort to educate the public and to secure a timber base for environmentally responsible loggers, ASD has recruited local landowners committed to long-term stewardship. Through articles in the media, public demonstrations of better logging, and word of mouth, this landowner inventory had grown to include nearly 2,000 acres within a three-county section of our larger region. Many additional landowners are "waiting in line" after having seen the exemplary work done by Chad Miano, one of the most successful horse loggers in the area. As described in the sidebar, this landowner inventory will greatly increase, once The Nature Conservatory's Forest Resource Bank is fully implemented.

In summary, the future for sustainable development in Central Appalachia looks promising. We aim to create an infrastructure for sustainability. This will include, at a minimum, highly skilled and innovative entrepreneurs; physical facilities which add value to farm, forest, and other resources while minimizing waste; local and regional markets that support and reward sustainable entrepreneurs; and broad community and institutional support based in a new understanding of the connection between human welfare and ecological health. This new understanding must be more than an abstract notion. It must become, for all of us, a way of life, an habitually creative way of producing, consuming, and living. Δ

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Anthony Flaccavento directs the Clinch-Powell Sustainable Development Initiative, Box 791, Abingdon, VA 24212.

Completed horselogging site by Chad Miano, Scott Co., Va.

Integrating Conservation and Economy

The Clinch Valley Forest Bank

Excerpted from The Nature Conservancy Virginia Chapter News, Summer, 1998.

Sixty years after the last major wave of timber harvests in the Clinch Valley region of Southwest Virginia, these second-growth forests are again ready to be harvested, and it is expected that economic pressures will soon lead to more logging (annual logging rates have already doubled since 1986). Without a region-wide effort to ensure environmentally sound timber harvesting, poor logging practices threaten to pollute streams and degrade wildlife habitat in many places.

The Nature Conservancy's creation of the Clinch Valley Forest Bank addresses this growing environmental threat. The Forest Bank will accept voluntary "deposits" from forest landowners of the right to grow, manage, and harvest trees on their land. The landowner will retain ownership of the land itself. In return, the Forest Bank will pay the landowner a guaranteed annual dividend based on the value of his or her initial deposit, much as a savings bank does on a certificate of deposit. To fund these dividend payments, the Forest Bank will harvest and sell timber from these lands on a sustainable basis. Lands deposited in the Forest Bank will be protected in perpetuity, and the forest will remain intact.

"We've talked with dozens of landowners in the Clinch Valley about the future of their forests," says Bill Kittrell, director of the Conservancy's Clinch Valley program, "and we've heard similar things from a great majority. First, they care about how their forest looks—they don't want to see hillsides marked by unsightly logging. Second, harvesting their timber is an important, once-in-a-lifetime decision for most, and they worry that they lack the know-how to properly manage contracts with loggers. Third, they see their forests as future sources of income, and they aren't willing to give that up completely."

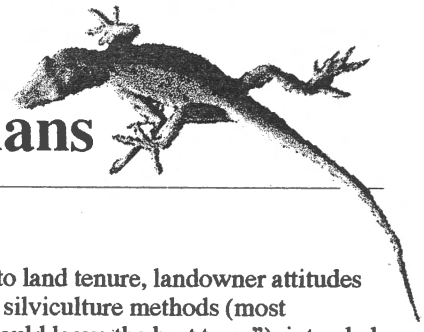
What advantages are there for the private landowner who deposits timberland in the Forest Bank? As Bill Kittrell explains, the owner can:

- turn a non-liquid asset, trees, into a steady stream of income that begins immediately and continues as long as the deposit remains invested in the bank;
- realize the timber's cash value without clearcutting;
- preserve the aesthetic values of the forest and continue to enjoy traditional uses of the land, such as hunting and gathering firewood.
- maintain the option of withdrawing the cash value of the deposit —though not the forest itself—should a financial emergency strike.

The result of nearly three years of study and work, the Clinch Valley Forest Bank received the full faith and backing of The Nature Conservancy's national Board of Governors in June.

This program will be helped by a generous grant from the Tennessee Valley Authority, which has committed $500,000 to help get the Clinch Valley Forest Bank off the ground. Δ

Sustainable Forestry:
A Solution for the Southern Appalachians



David Wheeler

The struggle over the management of the national forests in the Southern Appalachian Mountains is fierce and constant. On the one hand, environmental preservationists say that increasingly rare biological habitats and old growth stands are at risk; on the other hand industry representatives say that timber supplies are shrinking and that new sources need to be found if there are still to be forest products occupations in the mountains.

Both sides are correct in what they say. However, what is often overlooked in the debate is that as of 1993 only ten percent of the timber cut in the Southern Appalachian region comes from the public lands (US Forest Service, Forest Inventory Analysis Survey). Ninety percent of the timber cut in the region comes from private forest lands. Some of this comes from industrial forest lands, but the great majority of it comes from the non-industrial private forest lands (NIPF's). The future of the timber supply in the Southern Appalachians is going to be determined in the private forests.

This was apparent to researcher Dr. Carlyle Franklin of the Small Woodlot Forestry Research and Development Program at North Carolina State University. It was also apparent to him that the private forest lands are undergoing a revolution: people from the eastern cities were flocking to the countryside. As the population rises, land prices also rise, and the size of holdings grows smaller. This makes selling land as real estate more economically attractive; conversely, using land for production of products such as food and timber appears less and less viable.

The demographic make-up of today's landowners is also changing. Once, the largest tracts were owned by farmers. They viewed steep, wooded lands as worthless because these acres would grow no crops. They viewed timber as a kind of insurance —a quick source of income for when need arose. When it came time to log, farmers usually were not picky about how the job was done; they just wanted the maximum amount of cash as quickly as possible.

Today, farmers are losing their land to ex-urbanites who come from different backgrounds and have different objectives for their land. The typical landowner today is a different person than his or her predecessor of 20 or 30 years ago. How would these differences affect the forest products industry, which depends upon these people for so much of their timber base?

Dr. Franklin's interest was in maintaining the timber supply. He decided to study this revolution in land ownership and determine how it would affect the forest products industry. He sent out a statewide survey, asking landowners to describe themselves and the lands they owned. He separated the responses from each of the three regions in the state, so he could tell what was happening in each. His results showed some clear trends and suggested some surprising new directions for forestry.

The survey described landholders in the mountains as mostly white people over 50 years of age, about one-half of whom are retired. Predictably, the owners of larger tracts were wealthier and better educated than the owners of small acreages.

The survey also probed into land tenure, landowner attitudes toward clearcutting and other silviculture methods (most preferred "a partial cut that would leave the best trees"), intended uses and goals for their land, and willingness to use professional and public assistance in forestry. The most important statistic that the survey uncovered was that almost all of the landholders did not expect the income from timber production to be a major part of their total income.

"On private lands, particularly in the mountains, timber is a secondary product. It's not the major reason for land ownership," says Dr. Franklin. "I think that the real motivation for most landowners is to manage for multiple objectives—such as scenery, recreational use, estate building, and wildlife habitat, as well as timber—and to have the option to decide upon one or the other."

Most government programs rely on economic incentives to encourage forestry. The survey results show that this is an ineffective approach, maintains Franklin. When cash for timber is no longer the ultimate reason for owning land, then landowners will not tolerate unsightly and destructive logging.

"They (landowners) know what they like to see, and it's not a clearcut, and it's not roads and hillsides washing away. They just haven't seen an alternative—that there's a way to get something from the forest without having all that to look at."

To Franklin the answer is apparent: give the customers what they want. "The most important thing that the industry can offer is custom harvesting and environmentally sensitive harvesting, even beyond the currently accepted best management practices...

"The key is to manage the timber that we have in a good way. That is how we will have more timber."

To illustrate his point, Franklin cites the example of Lislott Harberts of the Forest Care Company, an ecological forestry company on the North Carolina Piedmont. "Her experience was that she would often be invited to work in a poor area that was not of the best quality, had been high-graded (cut over and the best trees removed), and perhaps needed some timber stand improvement. Several times it happened that if her company did a good job in a poorer area they would be introduced to a stand of magnificent large timber which the owners had been unwilling even to talk about until they were sure that they were talking with someone who was careful with their logging."

The quality timber is out there, says Franklin, but it will be available only to loggers who can work in a way that will preserve other values such as aesthetics, wildlife habitat, and soil and water quality. In other words, Dr. Franklin is telling us, economic and ecological factors have converged to make sustainable forestry a viable solution for the Southern Appalachians.

David Wheeler is the former publisher of Katúah Journal, *a bioregional magazine of the Southern Appalachians. He lives with his family in Whittier, North Carolina.*

A Kinder, Gentler Forestry

Nathaniel H. Axtell

Standing ten feet away, it didn't sound much like a logging operation.

There was no roaring skidder engine, no crackling of brush under tire treads, just the snort of a horse and the slap of his leather harness as he skidded a section of poplar log down the slope. Up the ridge, a titmouse whistled from a locust tree. Down the valley, farm geese honked incessantly.

It didn't look like a typical logging operation, either. The skid trail wasn't the wide, chewed-up swath you see on mechanized logging sites. It was narrow and shallowly furrowed. The forest, although short a few poplar trees, still looked like a forest. There was a continuous canopy, a healthy understory,and a forest floor rich with moist humus.

That's the way Thom Looney and Abby Gage wanted it. The couple needed to cut down about 25 poplar trees on their 40-Acre Canto Farm in the Sandy Mush township of Madison County, N.C. to build a horse barn. But they didn't want to destroy the integrity of their forest, so they decided to hire forestry consultant Paul Carlson of Franklin and horse logger Richard "Snuffy" Hall of Long Creek, S.C.

Carlson helped them flag some of the farm's poplar trees for removal to open up some more light on their pasture and garden. Hall brought his draft horse, Bob, a portable WoodMizer bandsaw, and a crew of expert timber-framers to build the barn. The whole-operation was open to the public, part of a five-day workshop to demonstrate how woodlot owners can sustainably manage their forests to meet the needs of man and Nature.

The workshop began with a lesson in chainsaw safety and directional felling from Tim Ard, an instructor with: Forest Applications Training. Ard showed students how to gauge the "lean" of a tree by drawing an imaginary ellipse around its canopy. The side of the ellipse furthest from the trunk indicates the tree's lean. Fellers can compensate for lean by placing plastic wedges in the cut, and by making their initial face cut more in the direction they want the tree to fall.

Directional felling is dropping a tree precisely where you want it to fall, both to avoid hazards such as power lines and fences, but also to avoid damaging residual trees and shrubs. Chris Farmer, one of Ard's students, demonstrated the technique by dropping a flagged poplar between a dogwood (an important wildlife food source) and a locust snag that was evidently home to cavity-nesting birds. Both residual trees survived.

Once downed and bucked into sections, Snuffy hooked the logs up to Bob's harness and skidded the tree down to the portable sawmill nearby. Afterwards, he talked about the lower environmental impacts of horse logging compared with conventional logging operations, which often use large machines called "feller-bunchers."

"What's happening is we're getting these harvesting machines that come down a line of pines like they're combining corn," Snuffy said. "That's a fine operating procedure for flat ground because you don't mess the ground up. But you get into the mountains with that same piece of machinery, it's going to slide and jig and turn and get stuck. I'm not against them, but the driving up to the tree aspect of them is detrimental to logging in the mountains."

Unlike conventional logging, horse logging allows an operator like Snuffy to harvest trees selectively without ruining those that remain. Heavy logging machines are unwieldy and often damage residual trees and shrubs. They also compact the soil under trees so that their roots can't take up water.

Snuffy avoids damaging residual trees and shrubs by carefully plotting where skid trails go, and using stumps to "bump" logs into position on their way out. Soil compaction isn't an issue, Snuffy said. "With a horse, walking past a tree doesn't damage the soil. It aerates it a bit, makes a little more water go in there. It doesn't do the root or soil damage a heavy skidder does."

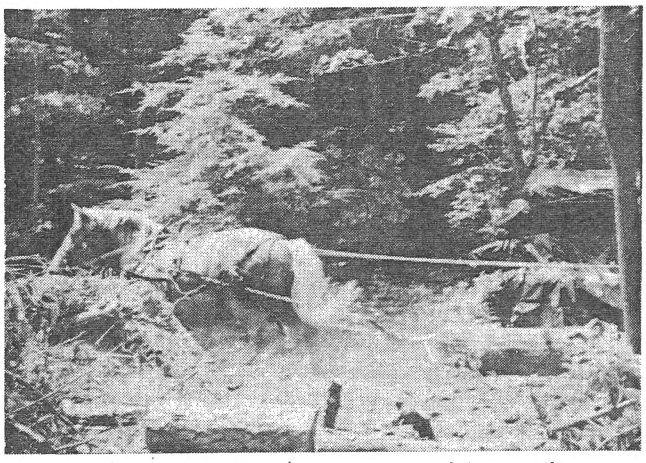


photo by Peter Bane

Bob Marley hauls a log out of the woods.

Mechanized loggers also have to cut big tracts of timber to make it worth their while to be able to pay for their expensive equipment. That usually means they want to clearcut.Snuffy provides woodlot owners with another option: horse-logging select trees and using them to build a timber-frame structure or log home.

"It's an alternative to clearcutting your woods, getting your $500, going down to Lowes, buying your lumber that's got chemicals in it and building something with it," he said. "I look at every tree as a living thing that I take full responsibility for. These other guys, they're driven by a different motivation, I guess."

Snuffy used to be a raft guide, taking clients down the Colorado, the Snake, and the Salmon, as well as eastern whitewater rivers. "I always heard people raising Cain about what's happening to the forests," he said. "A lot of people living down in Atlanta, they're reading newspapers, they're using pencils, everything they've got is made out of wood. I look at them and say 'How you figure you came across that piece of material?'"

"Most people don't realize that you have to log. You have to get trees out," he said. "That's the way it is. Wood is good. I love

wood. If you treat it right, it'll treat you right. But you've got to respect it, and know where it comes from."

Snuffy's love for working with wood and horses led him to buy a pair of Belgian draft horse colts when he was 25. Soon after he started training them, it dawned on him that there was no way he could compete with the efficiency of mechanized loggers. "I realized I had to come up with a system to do value-added logging so I could make a living," he said.

He had helped his friend Steve McWhirt build an "amazing log cabin" using big draft horses and a portable sawmill. "When I saw that cabin, I said, 'Man, I've got to do this again,'" Snuffy said. "If you enjoy what you do, it just comes right to you. Ever since then, we ain't never had a slack day. It's always something."

Snuffy, McWhirt, and their co-workers specialize in building timber-frame structures, mainly barns, but occasionally homes, too. They also build a lot of log cabins out of Virginia pine, which most people consider worthless. "You cut two sides off of them and they're good cabin logs," Snuffy said. "I'll use a V-notch or dovetail. It's a real good use for that kind of wood."

The Gages hired Snuffy and his crew to build them a timber-frame barn, which they later roofed themselves. McWhirt said timber-framing takes about a third longer to build than stick frames, but the resulting structure is stronger and longer lived. "It gives a tree a bit more time in the world, leaves some of its integrity," Snuffy said. "You've got some timber-framed buildings that are 500 years old. That impresses me."

Timber-framing saves wood, he said, "because you don't have all these two-by-fours shut up in your walls." Timber-framed buildings can be walled with straw bales or slip straw, both good natural insulators, or sheetrock and wood siding. The beams are joined with mortise-and-tenon joints and fastened with wooden pegs. "Mortise-and-tenon, it's a 3,000-year-old joint," Snuffy said. "You can't improve on it."

By using wood from their own land, Gage and Looney got more for their money. The 42-by-14-foot barn cost them $10 a square foot, an incredible value. But the couple also spared the environment the heavy costs inherent to commercial lumber production: the damage to wildlife and soils caused by tree plantations, the pollution and wasted energy of trucking lumber to and from market.

"We're trying to close some loops here, or avoid them altogether," Abby Gage said. "Hopefully, that idea will catch on."

Gage and Looney also got better quality wood than they would have at Lowes, lumber which is poorly dried and chemically treated. "All the buildings we build, they smell like sawdust," Snuffy said. "You go into a building that's been built with regular lumber, that the government's taxed and all that, that stuff is poison. I don't like to mess with it. You get a splinter in your hand and the dang thing swells up."

Snuffy treats his draft horses well, making sure not to overwork them, and giving them love and encouragement. For him, care and quality, not quickness and quantity, are the ways to do business. "I was getting my tractor tire changed the other day and this guy said, 'I'm the biggest logger in Oconee County!' I shook his hand and said, 'Nice to meet you. I'm the smallest logger in Oconee County. I cut the fewest trees around.'"

Later in the workshop, forester Paul Carlson took us on a tour of the Gage's woods to discuss small woodlot management. The Canto Farm is typical of lower elevation lands in Southern Appalachia, old farm fields that have grown back into forest in the past 30 to 70 years. Their trees mostly run in the 25- to 40-year-old range. "This forest is very young," Carlson said. "It could grow a couple of decades, easily, without any compelling reason to cut in here at present."

But when and what you cut depends upon an owner's goals and the stand condition Carlson said. "The Gages wanted beams for their barn. Others may want to favor sourwoods for their honeybees by thinning around them. If you want woodpeckers and owls, you might leave your scarlet oaks, which are among the first trees to develop heart rot. If you want to sell your poplar or ash for sawtimber you might not do anything for awhile, allowing the trees to increase in size."

Carlson illustrated this last concept by showing us two poplars of roughly the same age that had been dropped for the barn. "This one is close to 20 inches at the base," he said, measuring the first one. "It's been growing close to an inch in diameter a year. In this case, it was all alone out in the open, so it developed a large crown, allowing it to grow very rapidly. But there's lots of branches all up the trunk, so it'll have lots of knots."

The second poplar was only 14 inches in diameter near the base. "This is a smaller tree, but you can see it doesn't have all that knottiness down below and it has a more cylindrical trunk, because it was growing under more competition. Although it has a smaller diameter, it doesn't have that much less lumber in it because its diameter remains constant as it goes up the tree. Ten years, from now, this tree would've been worth a whole lot more than that (first) tree."

Carlson explained that to get a straight, knot-free hardwood tree that is valuable as sawtimber you want it to have some arboreal neighbors for the first few decades. Otherwise, instead of growing straight up in a race for sunlight, its branches will shoot out to the sides and create a knotty trunk. "The same volume of lumber in a knot-free log, versus a knotty log is worth four times more," he said. "Later on, once the trees are taller and have shed their lower branches, you can thin around the best trees to make them grow faster."

photo by Kevin FitzPatrick

Registered forester Paul Carlson

Carlson led our group up a dry ridge into a stand dominated by Virginia pine, pitch pine, and short-leaf pine, with a mix of hardwoods. "As you go through life, you have to have some rules to work with. My rules in forest stand management are to favor longevity and diversity. A common prescription, in a yellow pine/hardwood stand like this, is to cut the pine. Why? Because you have these black oaks, white oaks, sourwood that could be released if the pine was removed."

"The trouble is, you'd be a fool to cut the short-leaf pine," Carlson said, explaining this long-lived, slow growing tree is a

valuable timber species. "Heart pine flooring is now so rare," he said, Southern yuppies are paying top dollar for short-leaf boards out of old barns. "So all pines are not equal," he said. "If I had a magic wand," he said, I'd reduce Virginia pine in the canopy," thus increasing the dominance of the longer-lived short-leaf, pitch pine, and hardwoods.

The average Appalachian woodlot usually has some parts that are good growing ground, Carlson explained. If growing sawtimber is one of your objectives, you need to identify the most productive areas on your property. "If you're lucky enough that those places have as a current forest canopy interesting crop trees, say poplar or white pine or oak, that's where you can create some cash flow. You've got to figure out how to develop access to it, so you can take logs out without screwing things up."

Which is where horse logging comes back in. "Rather than clearcutting and selling all your timber at once," Carlson said, "it makes much more sense to selectively thin around valuable crop trees (your "crop" could just as easily be wildlife mast, fall foliage, or honey nectar) and to let quality trees grow to financial or ecological maturity. Your rate of return increases dramatically when you allow a mid-sized hardwood of 17 inches diameter to grow into a large tree of 25 inches."

"You can drop a few trees around the best hardwoods and leave them to decompose," Carlson said, "if you don't mind the mess and there's no concern about fire hazard. Or you can pull them out carefully so you don't compact the soil and damage residual trees. Horselogging is a great way to do the latter."

"From a timber management point-of-view, no one wants to clearcut their land, by God. Especially with smallholdings of under 100 acres. Often, you don't have but 10, 20, or 30 promising hardwoods per acre. By thinning around selective trees, you're sculpting the future forest while minimizing disturbance and labor." Δ

Nathaniel Axtell edits Appalachian Voice, *a bimonthly tabloid promoting bioregional awareness of ecological and cultural issues affecting the Southern Appalachians. Write PO Box 880, Rosman, NC 28772-0880. Subscriptions to* AV *come with membership in its eponymous parent organization: $25 per year to AV, 551 Cobbs Creek Road, Boone, NC 28607.*

Menominee— Seven Generations of Forestry

The satellite photos of north central Wisconsin show large patches of young forest interspersed with pastures, hayfields, many small lakes, and streams. About 50 miles west of Green Bay the scanning eye pauses on a large rectangular block of dark green. This is Menominee County, one of the state's smallest, and home to the Menominee tribe. It is also one of the largest sustainably managed tracts of forest in North America.

Since 1856, when the final treaty with the United States Government confirmed the Menominees in their (much reduced) homeland, the reservation has been harvested for timber. Over two billion board feet have been logged from the 220,000 acre forest, yet there is more timber today than 140 years ago.

Visitors to Menominee lands think that they are returning to the forest primeval, yet this is one of the most heavily managed forest landscapes on the continent. How do the Menominee do it? And what do they have to teach the rest of the world?

> *"Start with the rising sun, and work toward the setting sun, but take only the mature trees, the sick trees, and the trees that have fallen. When you reach the end of the Reservation, turn and cut from the setting sun to the rising sun and the trees will last forever." (1)*

So the chiefs directed the Tribe in the middle of the last century when they settled in their present home. Though incomes in Menominee County are below the statewide average, the Tribe supports itself almost entirely from the communally owned forest products enterprise, as it has for well over a century.

A Brief History of the Tribe

The Menominee are the oldest continuous inhabitants of Wisconsin. Their lands used to stretch over 9 million acres from the Escanaba River in the north to the Milwaukee River in the south and west to the Mississippi. Faced with relocation of his people to Minnesota in 1850, Menominee chief Oshkosh refused, insisting that the poorest of his people's land in Wisconsin was better than what the federal government offered elsewhere. The final boundaries of the reservation were established by treaty in 1854, though two years later a small tract was granted to the Stockbridge Munsee Indians of New York for their home.

A small sawmill opened that same year (1856) at Keshena Falls to produce lumber primarily for local use. By 1871 the Menominee were milling wood for sale off the reservation. During the following 15 years 100 million board feet were milled and sold, all of it from dead and downed logs.

Refusing to participate in the Allotment Act of 1887, which parceled reservation lands among individuals of many native tribes, the Menominee maintained their lands in communal ownership, as they do today. This helped them preserve their land base against speculation.

Large Scale Forestry Begins

In 1890, the Menominee were given permission by the U.S. government, which holds their land in trust, to begin cutting green timber to a limit of 20 million board feet per year. By 1907, another 290 million board feet had been cut and sold.

In 1905 a huge windstorm blew down 40 million board feet of timber, and the Menominee petitioned the government for permission to salvage the downed timber, in addition to their annual cut of standing wood. Senator Robert LaFollette introduced legislation which passed the Congress in 1908 to permit the Tribe to salvage this windfall, and a second, more modern sawmill was opened at Neopit that year.

Over the next half century, another billion board feet of lumber were harvested from the Menominee forest. Revenues from this enterprise allowed the tribe to establish a hospital and a clinic by the 1950s, along with a law enforcement agency and a judicial system.

Sovereignty Lost and Regained

These successes were used by the U. S. Government, in a dubious process, to justify terminating the Menominee's sovereign status in 1959. The Termination Act mandated the continued sustained yield management of the forest lands, but transferred title from the trusteeship of the Secretary of the Interior to the tribal corporation, Menominee Enterprises, Inc. (MEI), and all tribal members were issued stock.

Loss of sovereign status proved devastating to the Tribe, which, becoming subject to state taxes and regulations, began a downward economic spiral. The hospital and Bureau of Indian Affairs (BIA) schools closed, while the forest enterprise struggled to support the tribe, going deeper and deeper into debt.

The Tribe rallied to pressure the federal government to rescind its decision and in 1973 the Menominee Restoration Act restored the Tribe to sovereign status under federal protection. MEI transferred assets back to the Tribe and the rights of members were reinstated. The debts of this period, however, were also transferred back to the tribe's successor business, Menominee Tribal Enterprises (MTE), which has only recently been able to show sufficient profit to begin reducing these obligations.

Under the 1975 Trust Agreement between the Tribe and the Secretary of the Interior, the Tribe must establish a Forest Management Plan, which is then approved by the Secretary. The Dept. of the Interior provides funds and services "for the benefit of the forest." This includes paying salaries for resident BIA foresters, for fire protection, insect and disease control, and providing support for forest and wildlife inventories. These services would be provided whether the Menominee harvested their timber or not. Because of this agreement, the Menominee are able to monitor their forest in a more sensitive manner than most other large landowners. The costs of biological assays, streamflow and water quality assessments, and other natural resource data gathering are met independently of the costs of forestry operations.

Present Management

The Menominee carefully monitor their forest for health and volume of the timber stand. Since 1963, the volume of hardwood sawlogs in the forest has increased 13% to over 1.7 billion board feet. This despite continuous harvest at about 20 million board feet per year. The Tribal foresters directing harvest have traditionally selected low-vigor, high risk individual trees for cutting within each harvest unit or compartment of the forest. This has led not only to increased stand volume, but is accelerating succession toward the northern hardwood cover community of hard maple, beech, and basswood, trees which are able to regenerate from under their own canopy. A 1988 survey of biological habitat identified sites according to their highest potential productivity. In order to maintain high levels of species diversity, silvicultural practices are now being modified to match each site with the community of trees best suited to optimize production in that area.

The Menominee harvest traditional non-timber products from their forest, including game, ginseng and other medicinal herbs, maple syrup, various craft materials, and fuelwood for home use. They have not, however, developed significant markets for these products yet. Harvesting of the non-timber resources of the forest remains under strong, but informal communal governance with an ethic of conservation widely understood and reinforced by close social bonds.

Mill Operations

Menominee Tribal Enterprises (MTE) is the leading employer on the reservation. It pays relatively high wages for the area and retains a skilled work force. Mill workers average 13 years and management 22 years on the job. Until the opening of a tribal casino in recent years, the mill was the primary source of long-term employment in the area. Hiring policy favors tribal members. Most logging is done under contract by small firms made up of tribal members.

The mill, which was modernized in 1975, is technically superior to most other sawmills in the area. It uses all parts of the harvested logs including bark, slabwood, and sawdust. Some material is sold for pulp, while other trimmings are used for fuel to operate the drying kilns. Plans to improve income from the mill by capturing secondary processing markets include adding dry-kiln capacity, implementing cut-stock and finger jointing, and establishing an efficient small-diameter/length log mill.

Markets for Custom Forestry

Because the Menominee have maintained a commitment to harvesting the inferior trees in their forest and their management plan takes only those trees that are ready, they have faced challenges in their marketing. The market in wood products changes from years to year, not only as aggregate wood demand fluctuates, but as innovations and changes in the construction industry call for different types of lumber. Until 15 years ago the Menominee sold most of their lumber through a broker. But in response to this fast-changing market situation, MTE has developed its own in-house sales staff and now secures contracts for its products well in advance of harvest.

With education about their forestry practices, the Menominee have developed a loyal customer base over the years. Their reputation for high quality lumber, and their ability to deliver reliably on contracts has earned them premium prices for their wood. Customers have learned to procure lumber for their projected needs well in advance, based on predicted harvest availability.

MTE is primarily a wholesaler, selling lumber, sawlogs, veneer logs, and pulpwood directly to U.S. and international markets. About 90% of the output goes to domestic buyers, from local small-dimension wood processors to large pulp producers. Specialty woods are sold to local manufacturers for window frames and venetian blinds, while wood shavings go for animal bedding. The Menominee forest yields a steady flow of hard maple, basswood, beech, red oak, soft maple, birch, aspen, white pine, red pine, and hemlock. MTE sells more than a dozen high quality finished wood products.

Improvements in marketing and a commitment to develop value-added wood products have increased the profitability of

MTE in recent years. Plans include expansion of sales of certified timber, joint ventures with other area tribes, and development of specialty markets. The core commitment of the Menominee, however, has always been preservation of the forest resource. It provides them ties to their ancestral culture and a secure economic base that has remained vigorous for over a century.

As Paula Rogers Huff, Director of the Sustained Development Institute at the College of the Menominee Nation, and Marshall Pecore, MTE Chief Forest Manager summarize:

"The culture itself puts constraints on the harvest of the timber, and also the harvest of other forest materials. If a tribal member takes more than what is perceived by others to be necessary, whether it's game, ginseng, or firewood, other tribal members will let him know about it. Overuse is simply not tolerated. The communal attitude toward the forest is that of taking what is necessary, but nothing more than that.

"A society skewed toward economic gain may well decide to overharvest the forest to reap immediate financial gain. A society driven by culture may not be able to harvest at all. A society where the members cannot agree on goals, or change them depending on the current power structure, will not be able to direct effective management of a community enterprise. The Menominee have been able to balance economic, cultural, and ecological values to maintain sustainable forestry." Δ

This article by PCA *staff, is based on "A Case Study of Menominee Tribal Enterprises," by Huff and Rogers, prepared for the Symposium "Forestry in the Americas: Community-Based Management and Sustainability" held February 3-4, 1995 at the University of Wisconsin-Madison. Published by the Institute for Environmental Studies, and the Land Tenure Center, 1995.*

The Patient Investor:

Financing the Sustainable Forest Landscape

David Simpson

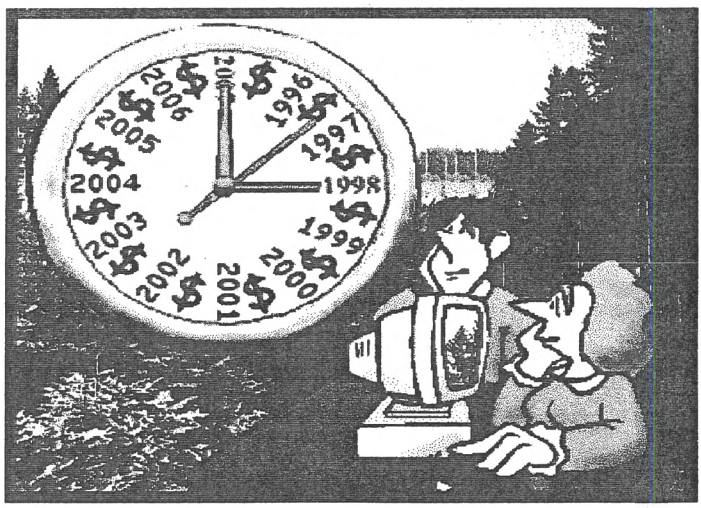
We are on the verge of another change in the way people think about forests.

While the conventional elements in the timber industry and environmentalism seem to be almost statically twined together in the old, irreconcilable antagonisms, the ground beneath their feet has moved. Clearly, another possibility is coming into focus.

Terms used to describe manifestations of this change include sustainable forestry, ecoforestry, community-based forestry, low-impact forestry, conservation-based development, and sustainable development. Some of the tools creating this change are forest certification, conservation easements, value-added industry, nontraditional forest products, wildcrafting, and community sort yards. Long-term forestland investment can be another.

The choice for forestland investors is moral and practical, just as it is for forest managers. We can choose to take out as much as we can in the short run, leaving the source damaged and reduced in productivity, or take a little out at a time and have an income as reliable and sustainable as the long-range productivity of a healthy forest. Improved access to market share through informed consumer choice for certified products expands the likelihood of success for the patient investor. Long-range stability of markets, social institutions, and local and global ecosystems is part of the payback. What a deal!

This is no pie-in-the-sky chatter of a foolish idealist. This is an increasingly common, many-faceted phenomenon. For instance, an article in the winter-spring 1998 issue of *Distant Thunder,* the Journal of the Forest Steward's Guild, points out that The Forestland Group (TFG) has established funds with patient investors for the acquisition and management of timberlands under guidelines that "mimic…the forest's ecological processes…producing sustainable yields of high-quality, high-value timber while also maintaining habitat for wildlife, promoting biological diversity, stabilizing watersheds and soils, and enhancing recreational opportunities." This is accomplished through management regimes and timetables aimed at producing higher quality logs over long time periods. High quality sawlogs bring up to 30 times greater returns than pulp logs. TFG's first fund allowed acquisition of 70,000



acres of Appalachian hardwoods; they are developing a second fund capitalized at twice the level of the first.

An article in the March 19 issue of that old ecoforester's rag, *The Wall Street Journal,* talks about "green timber investing." It points out that more and more of the nation's 4.5 million individual forest landowners have "bought into the idea that timberland investing can make good money while serving a conservation ethic." One landowner, who is managing to maintain bear, moose, deer, and pileated woodpecker, and only harvests trees through individual selection, calculates that, counting appreciation of land and timber, he's getting an 11-17% return on his investment. And this operation has not yet partaken of the potential market benefits of certification.

A common element to all managers mentioned in this article is the importance of long-rotation selective harvests that produce higher quality sawlogs. This is one step toward recovering old-growth forest structure. Another common element is their interest in conservation easements and other mechanisms that can offer tax advantages for good forest management. Government can play a creative role here in support of sustainable forestry. A bill in the U.S. Congress to allow the issue of tax-free bonds through

non-profits is moving through committee review. This legislation, proposed by moderate Seattle Republican Jennifer Dunn, could put an incredibly potent forestland purchasing tool in the hands of local non-profit organizations and land trusts.

With this new possibility for ownership and management of forestlands, we move onto the most hallowed, and dangerous, of grounds, where extra-regional environmental groups look uneasily at efforts by local forest-dependent communities to control their own economic destinies. The issue of local control of local resources is a highly contested one that has been clouded by the disingenuousness of the corporate-inspired Wise Use movement. The key to resolution may be adherence to certification standards.

A new organization, the Redwood Forest Foundation, has been formed in Mendocino county. The board of the new organization is composed entirely of Mendocino residents, environmentalists, mill owners, businessmen, and public servants. Their intention is to acquire large areas of industrial forest lands on the North coast for certified management. Their very existence has been provoked by large timber corporations divesting themselves of substantial blocks of industrial forestland. The new group is being advised by a firm in the Bay Area, Working Landscapes, a subsidiary of US Forest Capital, that is helping communities to take better hold of their economic destinies. In New England a similar call has gone out for acquisition and community-based management of lands being sold off by timber giant Champion International.

It is likely that a lot of industrial forestland will change hands in the next decade as sustained-yield planning by large corporate owners reveals inventories inadequate to substantiate the large returns on investment they deem necessary. This is where the role of patient capital comes in, as well as a place for positive governmental participation. If local and regional non-profits and land trusts can develop financial leverage—and commit themselves entirely to certified forestry—they can help mobilize the broad local knowledge and skills that have been sequestered in non-sustainable industry. Lightening the burden on the forest to produce high rates of return on capital investment is crucial.

Responsible ownership, management, and processing entities, working with growing groups of ethical (i.e., smart) investors or donors, can shift the balance in the Northwest and across the temperate forest lands of North America. Forest ecosystems on a restorative path can become the base for a restabilized economic climate and a factor, along with maintenance of our old-growth reserves, in the restabilization of natural systems, all the way up to the level where global climate is being determined. And, of course, forest ecosystems made productive again by patient reinvestment will provide the basis for healthy local economies.

The stakes, one might say, are high. These new enterprises, if based on real standards, might be the best vehicles to effect ecological sanity over the whole forest landscape. They also may be the only avenue by which we at ISF can reconcile our conflicting heritage, those two compelling voices that struggle for our loyalty. One tells us to love the forest selflessly and the other, to take our living from it. How to pay deference to both is the ongoing challenge to our enterprise. Viewed over the broad range of human activity, it is the ongoing challenge to our species. Δ

David Simpson is President of the Institute for Sustainable Forestry. This article first appeared in their Spring, 1998 newsletter, Forestree News. *Used with permission. Subscriptions to* FN *are with membership in ISF, $25/year to PO Box 1580, Redway, CA 96640. <isf@igc.apc.org> 707-247-1101, fx/-3555.*

Focusing on Restoration—

An Ash Woodlot Prescription

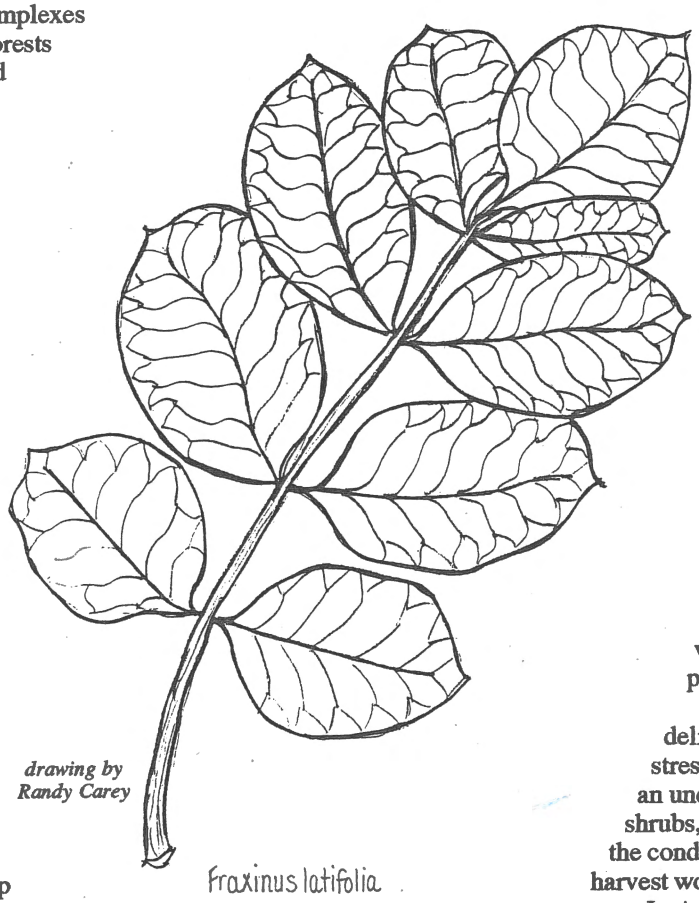
Randy Carey and Tom Ward

There is a small grove of Oregon ash *(Fraxinus latifolia)* bordering two pocket fields on our farm in southwest Oregon. At 1200 ft. elevation, this piece of riparian forest is centered on three seasonal creeks that combine to join Williams Creek. Before general deforestation of the watershed in recent times they may have flowed year-round.

This beautiful bottomland forest is located in the Siskiyou Mountains, one of the most diverse geological and botanical complexes in the world. A lot of the riparian forests here consist of bands of cottonwood *(Populus trichocarpa)*, red alder *(Alnus rubra)*, big leaf maple *(Acer macrophyllum)*, and Oregon ash. In early spring, a beautiful carpet of trillium covers the forest floor.

The climatic conditions in southern Oregon can be extreme. Heavy rains in the winter often result in floods. Summer follows with 100° F. temperatures and no rains for over three months at a time. We knew we needed to be very careful in planning to enter this forest. Some of the trees are well over 100' (30m) tall and over 24" (60cm) in diameter.

Many trees in this ash grove show signs of stress early in the summer season, and some of them have dead tops. Several local loggers had approached us wanting to buy the wood before it was "overmature" and supposedly no good. Feeling that we did not want conventional logging practices on our farm and that something might be done to guide the future of this forest, we came up with our own prescription.



drawing by Randy Carey

This Ash Woodlot Management Plan (or prescription) was developed following ten years of observation and lengthy discussions about climax floodplain forests and ecological succession. We researched the merits and drawbacks of native versus exotic species, and attempted to define the climatic conditions. And we speculated about the desired future conditions of the grove. We adopted a "permaculture" approach in assessing the site and in developing the initial tree planting list. An herbaceous plant list will follow next year and continued monitoring will take place. Collaborators on this project include Randy Carey (landowner and farmer), Tom Ward (forester and botanist), Lorianne White (herbalist) and Chuck Dahl (select cut "light-touch" logger). All have a good understanding of permaculture concepts, yet each person has a different background. We felt this was a balanced guild to design the project.

Long and thoughtful observation of the site, which included frequent visits, has led us to the following conclusions: The approximately 1.5 acre grove appears to have been dying for the last five years. There are no new ash trees growing under the existing canopy: the understory shrubs are mostly the native chokecherry *(Prunus virginiana v. Demissa)*, snowberry *(Symphoricarpos albus)*, and mock orange *(Philadelphus lewisii)*. A few small incense cedars *(Calocedrus decurrens)* seem to be doing well in the shade, but there are no other young trees in the understory. The ecological succession is in a die-back or climax stage and some ash trees are starting to rot in the center. The leaves show spots by early July every year. The spots could be stimulated by drought stress, atmospheric pollution, or a combination of these and other factors. There has been a series of record hot dry summers since 1984 but that is too short a time to make accurate deductions about the reasons for the die-back. Still, the trees appear to be dying and we developed the following prescription as a response.

We planned to thin the forest delicately, starting with the most stressed trees. Then we would plant an understory of desired new trees, shrubs, and herbs. Our goal is to create the conditions for a diverse sustainable-harvest woodlot yielding multiple products.

In August 1997, we cruised and marked the visibly declining trees. One of the main objectives while marking was to avoid opening the canopy. Too much sunlight would let the ready-and-waiting Himalayan blackberry *(Rubus sp.)* take over. We used three distinct marks on the tree trunks, one for sawlogs (lumber), one for firewood, and one for pruning of lower branches (the bottom 50%). The pruning is to improve air circulation, divert water and energy to the healthy crown branches, and to eliminate fire ladders (dead branches upon which fire can climb from the forest floor to the canopy).

By mid-November, we had cut and skidded the logs to the road using equipment that does not compact the soil. This included a 500-ft. cable winch, quick release pulleys for laying out zig-zag skid trails, and snubnose chokers to grab the log ends and reduce hang-ups and soil disturbance. The trees were then

limbed in the forest. Everything over 8" diameter was removed to the road. Most of the slash was piled by hand, and burned immediately. Ash will burn easily when green if you can get it going. A selection of all sizes of material was spread on the forest floor to decompose and build soil, providing habitat for soil critters, and a long-term, slow release of nutrients. All of the rotting and mossy debris was left in place to maintain natural conditions and to provide microsites for the planting.

By mid-February the area had received nearly 30 inches of rain and several of the channels overflowed. We were all very excited when we first walked back into the forest, for you could hardly tell we had been there. The ground was moist, soft and now ready for planting the trees we had obtained after a long winter of research.

To reach beyond local nurseries, we poured over *Hortus West* magazine, Vol. 8, #2, an issue that featured a great list of Pacific Northwest native plants and sources for them. This was our guide to those beautiful and hard-to-find gems like Alaska Yellow Cedar *(Chamaecyparis nootkatensis).*

Locally available, free or cheap trees were brought to the site first and healed into nursery beds. Local watershed councils and non-profits aimed at restoration are great for this type of stock. In Oregon, watershed councils are endorsed by the governor; your state may have similar programs or opportunities.

Next, the more difficult-to-find and generally more expensive natives were researched. After pricing the trees and figuring shipping, we had some choices to make. We saw a great drawing in *Hortus* of a nice old man named Wally Hansen who had a small, high-quality nursery outside of Salem, Oregon. After speaking with him on the phone we decided he was our nursery for the rest of the natives. The Williams Creek Watershed Council provided us with Incense Cedar, Douglas Fir *(Pseudotsuga menziesii),* and Red Osier Dogwood *(Cornus stolonifera).* The watershed council had other species available but they were not appropriate for our site. From Hansens Nursery we were able to get Alaska Yellow Cedar *(Chamaecyparis lawsoniana),* (Yes, there is a grove within 50 miles—near Cave Junction, Oregon, and this cedar does not get the root rot quite as bad as the Port Orford Cedar.), Pacific Yew *(Taxus brevifolia),* Pacific Dogwood *(Cornus nuttallii),* Oregon Crab *(Malus fusca),* Ninebark *(Physocarpus capitatus),* Serviceberry *(Amelanchier alnifolia),* Western Redbud *(Cercis occidentalis),* and Big Leaf Maple. We were unable to find *Viburnum ellipticum,* and substituted the European cranberry bush *(V. opulus)* in its place. Ninebark and Big Leaf Maple were already on the site, so we released them to grow better by clearing a small space around them for better light and air flow. We now had approximately 10 each of our Pacific Northwest natives.

Now it was time for the fun part: selecting and sourcing the exotics; we had already decided these would be North American plants. We thought a lot of eastern North American species would adapt to our climate. As with the Northwest natives, we wanted trees that would offer as many yields and desirable qualities as possible: medicines, lumber, nectar flow, fruit, nuts, adaptability, wildlife habitat, etc. These plants were considerably more expensive, so we had to limit our choices.

When we opened the Forest-Farm Nursery catalog, our heads spun again. Ray and Peg Pragg offer an overwhelming 4000 species, so we were glad we had researched our preliminary list. We picked out Tulip Tree *(Liriodendron tulipifera),* Black Tupelo *(Nyssa sylvatica),* Basswood *(Tilia americana),* Shagbark Hickory *(Carya ovata),* and Witch Hazel *(Hamamelis virginiana).* Another great local nursery called Oregon Exotics and Jerry Black provided us with more trees. This catalog also offers a permaculturist's dream selection of edible and medicinal plants from around the world. We ordered American Persimmons *(Diospyros virginiana)* and Paw Paw *(Asimina triloba)* from them. We were having trouble finding Slippery Elm *(Ulmus rubra)* when a good friend gave us one. Otherwise we had approximately three each of the exotic species.

On a nice spring day in early March, we assembled our trees near the ash grove. Surveying the generally flat bottomland, we looked for subtle differences and microsites that would become good homes for our precious friends.

In siting trees, one must take many things into consideration. Nursery information and our research of these species helped us with this process. We found microsites such as depressions in the ground (natural swales), shady spots under existing trees, little north facing slopes, and openings in the canopy. Friends interested in our project helped us carry the plants into the forest and place them where we thought they might want to be. Bright orange flagging enabled us to see them well for the initial siting and for future watering. We moved a few around and in no time we had the pattern we desired!

The following summer was extremely hot and dry yet we have lost only 15% of our planting. Because we left an almost closed canopy we have lots of shade, and moisture is conserved. It is easy to overthin a grove; you can always cut more down but you can't put em back up!

We will continue to monitor this site, reduce the blackberry, begin to introduce an herbaceous layer, and replace the failed plantings. We chose tree and plant species that can grow in the shade of the existing forest. In fact, these species can grow in the shade of their own kind, and are thus adapted to become the climax species which can perpetuate an old-growth forest. In due time we think the nice old ash trees will enjoy the company of their new friends.

We have attempted to evolve this woodland toward a protected, complex, old-growth forest. As we watch the trees grow, many complex challenges present themselves: A flood plain forest can experience periodic stand replacement where entire strips of forest are swept away and replaced with gravel and debris or a new channel. Ash trees represent an intermediate of succession: What do we really know about this? What should come next? What is a climax floodplain forest if not metastable (unstable, transient, but significant)? And what do mere humans really know about long-term forest succession other than that it exists? With careful observation, as our experiment unfolds, we will probably learn much about New Forestry. Stay tuned…

Resources

Forest Farm Nursery 990 Tetherow Rd., Williams, OR 97544.
Oregon Exotics, 1065 Messinger Rd., Grants Pass, OR 97526.
Hortus West, tel.# 1-800-704-7927
Lawyer Nursery 1-800-551-9875 Δ

With degrees in both Forestry and Botany, Tom Ward has taught permaculture for almost 20 years, designing and implementing many successful permaculture projects. He lives in Ashland, OR, and can be contacted at tomward@mind.net or through PCA.

An organic farmer for 14 years, Randy Carey lives in Williams, Oregon, and helps with permaculture assessment and restoration projects in his watershed. The permaculture project on his farm is entering its fifth year. Write him at williamscreek@a1pro.net or care of this journal.

An Option for Better Forestry

David Martin

The "Tree Farm License" system in British Columbia doesn't work.

It has resulted in "second-growth" forests worth less per 100 acres at 60 to 80 years of age than one five-foot-thick old-growth fir or cedar; (1) salmon rivers degraded or destroyed, hills stripped of their soil, declining employment with increased cut volumes in a rising market: These can only be success in the eyes of accountants fool enough to think they can eat money.

They are obvious failures to the unemployed forest workers of Port Alberni and many other West Coast logging towns They are obvious failures, even evils, among traditional native peoples, ecotourism operators, commercial and sport fishers, and young people who want work. It was time for a change decades ago; now, in the slow time-scale of politics, it is an emergency.

The land that is in TFLs should be put in another kind of care as quickly as that care can be seen to work better. There may be more alternatives but I know of four; two of them preferable and one possibly so. They are:

1. State (Crown) tenure and management by government staff;
2. Family homestead tenure;
3. Community or co-operative tenure;
4. Fee simple ownership.

Of these, homestead and co-operative tenure stand out as the best for both land and people. Fee-simple ("private") ownership has problems which, while different from those of TFL tenure, are comparably severe.

We tend to think of land as being either private or state owned, but that is narrow thinking; it's no more necessary to think of land as being owned than to think of people as potential slaves. About 150 years ago, most societies rejected the idea of slavery, and we now agree this was an advance. I believe that when we reject the idea of treating Mother Earth (her indigenous name in most places) as a commodity, we will be advancing, more precisely, we will be recovering from a degradation of our human nature by "idollartry."

The distinction between homestead tenure and fee-simple ownership is important. Since homestead tenure isn't familiar to most people, and may not exist in current Canadian law, it may help to discuss homesteading in a socio-comparative way.

As Harold Macy (3) pointed out, most of arable Canada was homesteaded. Large parts of the Atlantic Provinces, Quebec, southern Ontario, and the Prairies, were open to settlers on conditions of settlement and tillage. So was much of northern Europe. The Finns and Scandinavians, of which I know more, settled their lands before "real estate" was a concept in their laws.

Homesteads were passed from parents to son and daughter-in-law (occasionally to daughter and son-in-law) in a pattern known to anthropologists as the "stem family," the same pattern that was traditional in Quebec and Ontario. Non-inheriting children in such a family were welcome to remain on the land unmarried but were expected to move away at marriage because the land could not support two households.

An important difference between Quebec and Ontario (the old Upper and Lower Canada) and Finno-Scandinavia is that Scandinavian homesteads usually contained less than half plowland and more than half timberland. With large European markets nearby, Finns, and Swedes especially, have been growing timber as a crop (and marketing it through co-operatives reminiscent of Canadian Prairie co-ops) all or nearly all of this century

Even though their best land is in cropfields and gardens, Finnish smallholders produce sawlogs, veneer peelers and utility poles of Scots Pine*(Pinus silvestris);* sawlogs and peelers of fir *(Picea abies)* and birch *(Betula pendula),* sometimes sawlogs of *B. pubescens.* I saw an order of poles for a 300 kV intercity line marked in a smallholding forest near Hanniskyla in 1977; they were to be cut for export to Egypt.

It is no coincidence that Finnish smallholders produce more (and better) timber per hectare per year than state or large-company forests (5). There are four good reasons:

Bureaucracy is awkward; this should be apparent to readers who have followed the short life of the British Columbia Forest Practices Code. Professor Michael M'Gonigle reported in a newspaper column last year that woodlot holders were giving up their tenures because of the time and money cost of Code compliance. The cost of maintaining a bureaucracy between the site and the decision, with considerable traffic both ways if forestry is to be as site-specific as it should be, is immense.

Nonresidency entails commuting costs which forestall many small intuitive acts of observation and of husbandry that resident holders can perform while walking the forest that is also their big back yard. The absentee owner misses many opportunities. The resident holder can do a half hour's pruning or take a morning to shake the frozen rain from young

saplings where an absentee might spend longer just reaching the forest. The resident holder sees the stand in all weather and all seasons, is better informed in judging spacing, soil adequacy, and a myriad of other factors.

Residence promotes better care

When the forest is home, its care is an expression of self, an act of love and art as well as practical work. A competitor in the global economy lacks the motivation that goes into the Christmas Eve walk in the forest which happens to include a few moments releasing a promising seedling from salal shading or mink-proofing the woodpecker snag. Others miss the satisfaction old Einar Polkki got from the beauty of his stands. These concerns and acts are quite real and the forest definitely benefits.

Over-reliance on money and contracts frustrates husbandry. Forest-product mega-corporations and ministries in mega-governments may well find it efficient to liquidate a 10,000-year-old forest and put the money into other endeavors, because it costs much more to employ a worker for a day than to be one, what with income tax, Workers Compensation, union dues, pension funding, travel to and from work, administration (a big one!) and even the processes the worker goes through to prove ability to do the job and the employer goes through to choose the worker. The money-driven organization needs far more "cash flow" (almost none of which has been in cash for decades) than the homesteader gathering fuel and putting it in the kitchen stove. The organization also gets far less benefit in kind, from stove wood to siding to carving blocks to that Christmas Eve walk.

Recently much Finnish forest seems to have suffered poorer care. Finnish inheritance law requires that each child receive at least half his/her proportional share of the estate (of four children, each must get no less than one-eighth.) If nearly all the "estate" consists of the homestead, the result is ownership by people who have moved elsewhere—and unless they live quite near their forest, such people take poorer care for obvious reasons of distance. (Kauko Koljonen, private communications, 1986, 1988)

The lesson I learned from that Finnish experience was that fee-simple ownership isn't necessarily true homestead tenure. A NuuChahNulth elder and several Metis provided the clue I needed when they said "We consider Mother Earth to be our relative, not our possession." The power to buy and sell land isn't necessarily a good thing. In spiritual terms, it may well be illegitimate. The very idea that you or I can own something like a forest, whose life span runs well beyond our lives, is neither ethical nor humane.

Please don't tell me how important trading real estate is to the economy. The same argument used to be made in support of the slave trade. There may be good reason to trade in urban land—in land whose use doesn't include the care of long-lived trees or even the maintenance of crop fields—and to have some sales of rural land with community supervision. The real estate trade does not include the forest land I'm writing about so the current cohort of realtors have little to fear.

What I'm suggesting is that forest land should be held by people who don't want to make money selling it; indeed who have chosen to care for it, take the timber which naturally results from care and, when they die or are too old to work the land, pass their tenure to a child or apprentice and that person's family. This is Stem-Family tenure and most of Canada was settled this way. This is the tenure that has worked historically when farmland was seldom sold; it is the tenure that made Finland and Sweden examples to the world, and it is the tenure that could best bring ecoforestry to some land which badly needs it.

Land which can be sold, which has real estate value, spurs a landholder's greed. With this option removed, long-term tenure is in the public interest. Consider a neglected 70-year-old site such as Woodlot License Offering #1479 on the Stamp River near Port Alberni, or a high-graded site such as the proposed Bamfield Community Woodlot: Cut-and-run "management" of these sorry-looking sites offers relatively little return for investment and effort. On the other hand, management for future values has both ecological and economic appeal given assurance that the growth fostered by taking the worst stems now will benefit the forest steward who does this relatively underpaid work. Development of stands of quality medium-sized and eventually old-mature timber, even if "privately owned," would benefit the public by making this high-quality wood available to local processors.

In socio-legal language, the homestead tenure concept means the land is held "forever," subject to good stewardship; may be inherited but not sold, and it may not be divided below the size that will support a household comfortably.

An additional specification might be that the tenure-holders live on the land, since residency contributes significantly to good care. Residents are motivated toward good management because the forest is their "yard." They live in it, know it better, enjoy its good qualities continually; commuting swiftly to work gives them flexibility of time allocation. Stepping out the back door, they can do half an hour of thinning when the rain and wind stop. Indeed, they know as soon as the rain and wind stop on the site; they experience the kinship of people and land. (2,3,4)

That tenure might more precisely be called Family Homestead Tenure. There is an alternative, analogous to the common lands of England or the Hutterite farms of the Prairies, which I call Community or Co-operative tenure. The Hutterites, although they live where land is legally a commodity, hold their land in common in the name of their congregation, and live communally. Because of larger numbers, diverse work possibilities for each individual, and more support in time of sickness, they are believed by many to be the most efficient farmers in Canada. Co-operative or community land tenure could follow their model to the extent it can be followed without a faith like theirs (and Aboriginal groups may well show us that it can).

Why, if it is so good, has this idea not found its way into law already? Perhaps because vested interests benefit from the current system in general and deforestation logging in particular, and have had more political influence than have the young and the unemployed. Vested interests might include the few IWA loggers still employed, corporate bureaucracies, perhaps some Forest Service staff who can't see or don't care that homestead forestry would mean more, not less work for good foresters, just as it means more, not less work for good loggers. They are also closer to the levers of power.

It is time we stopped analyzing all of this and changed it.

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Dr. Martin began his research in the sociology of small groups and now also studies rural communities, human carrying capacity, forest and water ecology, and social factors in land stewardship. He was co-organizer of the 1986 Small-Scale Forestry Symposium and associate editor of the Canadian Journal of Statistics *(1973-76). He is semi-retired doing research, gardening, writing, and cooperative organizing from his home near Port Alberni, BC.*

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Citizen Protection of Old Growth Forests

Lee Barnes, ed.

Forests are under threat by worldwide pressures for timber, paper products, and expanding human habitats. Old growth forests are more than just big and old trees; these unique and irreplaceable forest communities are home to rare and endangered plants, animals, and countless smaller organisms, both seen and unseen. Old growth forests are elegant classrooms for observing and better understanding our best regional models of sustainable agroforestry. They contain deep biological diversity, and serve as genetic reservoirs for this changing planet.

Old growth forest ecosystems have evolved their ecological stability over hundreds and thousands of years, and scientists are only beginning to recognize the incredible interconnectedness of the many energy and food cycles within these efficient communities. Foresters and ecologists widely agree that preservation of old growth forests is critical for the conservation of genetic diversity as well as rare plant and animal habitats. Superior plant gene combinations remain to be discovered in even small pockets of old growth forest communities.

An Alliance for Conservation

The Western North Carolina Alliance was formed in 1982, when citizens became aware of potential oil and gas leases in the Nantahala and Pisgah National Forests. Since then, the Alliance has become more involved in monitoring forest management plans and has successfully challenged the Forest Service to reduce the amount of clearcutting in the public forests of western North Carolina.

Through WNC Alliance's involvement, citizens and informed scientists have protested the Forest Service's designation of old growth areas based on inaccurate survey data and the lack of ground-truthing for old growth characteristics. Acting as a regional "forest watch" group since 1987, the Alliance has become more active in monitoring old growth forest areas by sponsoring full protection for the 14,000-acre Big Ivy area, home to more than 47 rare and endangered plant and animal species.

Beginning to See the Forest...

The WNC Alliance acted as a major sponsor of the first Eastern Old Growth Conference, held at Univ. of N. Carolina-Asheville in August 1993, and continued to support protection of regional old growth communities by establishing an Old Growth Forest Committee early in 1994. This committee developed its own citizen-driven old growth inventory project, "Seeking Older Forests . . . Finding Common Ground," due to increasing reports of incorrect data used by the Forest Service in developing the Initial Inventory of Old Growth in the Nantahala and Pisgah N.F., and the lack not only of field studies of these sites, but also of any objective measurements of old growth characteristics.

WNC Alliance's Seeking Older Forest Campaign has three major goals: 1) to increase public awareness, appreciation, and motivation to identify and protect Appalachian older forest ecosystems; 2) to develop training programs and materials which will empower people to identify older forest areas and produce useful maps; and, 3) to promote scientific understanding of the distribution, characteristics, and management needs of older forests and old growth in the Appalachians. We now better recognize that the total value of forests is not just for timber production, but rather includes protecting plant and animal habitat, biological diversity, soil, and water, and providing sustainable production of secondary forest products such as medicinals, mushrooms, craft material, etc. New models of forestry are developing, such as restoration forestry, sustainable forestry, natural selection ecoforestry, stewardship forestry, and permaculture, which all attempt to obtain multiple use and multiple yields from forests managed more as sustainable "gardens" rather than just timber-on-the-hoof.

The Seeking Older Forests Campaign evolved as a three-phase program. The project is first and foremost concerned with saving threatened older forest ecosystems on public lands. There appears to be limited Forest Service protection for old growth sites due to regulation wording which allows salvage timbering and road building in any old growth patch.

Finding the Trail

The first phase of the project involved collecting nominations of forest areas that had characteristics of old growth. We solicited hunters, hikers, horseback riders, mountain bikers, biologists, and anyone who might know specific areas of the forest. Bear and raccoon hunters were particularly valuable contacts since "they know the woods like no other group," and have strong concern for mature forests with good mast feeding sites and rare denning sites. Locating a person who might have a site to nominate often took hours of phone calls. Interviews took place by appointment at people's homes and farms. Additional contacts were found through personal referrals, through press releases and newspaper articles, and by talking to people at country stores, outdoor recreation business, old growth talks, and through extensive phone networking. Showing photographs of old growth sites was one of the best way to get people talking about areas which they recognized as containing old growth characteristics.

A Candidate Site Form was developed to register potential old growth sites, with the nominator's name, address, and phone number and a few simple questions including a description of the site and special features. Nominators were asked to help locate sites on standard Forest Service maps, and to provide directions on how to reach the sites from known landmarks. Project staff and volunteers visited many nominators' homes to verify map locations. These sites were then marked on a clear overlay that matched the April 1994 forest plan revision. To date, over 327 nominations have been received.

A review of the candidate sites reveals the concerns of many

citizens with their uniqueness. Nominators made such comments as "area contains larger, older trees," "unique," "not logged—too steep," "contains old growth characteristics," "not accessible to logging," "prime bear habitat," "inaccessible, diverse, big trees, uneven age," "feeling of being in a special place, many downed oak and poplar," "big trees, standing and fallen snags," "area extends past where the Forest Service has identified as old growth," and "they never got in there, remembers that logging railroad ended when they got to this steep part." These and other comments from a diverse range of people—hunters, hikers, horseback riders, botanists, retired forest workers, and forest activists—lent support to the demand for additional ground surveying to identify specific existing old growth areas and for permanent protection of these forests before they are disturbed by road building, logging, and salvage harvesting.

Citizen Science

Phase two of the project involved gathering field information using volunteer teams. A training workshop was held in spring of 1994 to teach volunteers how to collect simple quantitative data on selected sites. After many recommendations from consulting botanists and foresters, and after field testing with volunteers, a simple protocol was developed for gathering field data. A novice-friendly, tool kit was created with simple explanatory notes and a picture key. The tool kit included a clipboard and two-page field check form, 100-foot cord, a 10-foot cord, dental floss, and a ball point pen. The cords were used to determine a 100-foot long by 20-foot wide survey area, roughly 1/20 of an acre. The dental floss could be wrapped around trees to measure their circumference. For groups accompanied by more experienced volunteers, a set of forestry diameter tapes, Biltmore sticks (for estimating timber characteristics), and increment tree borers for collecting tree age cores were added.

The Field Check Form pulled together team member names, the background on the site's nomination, and the official Forest Service identifying information about each specific site, as well as geophysical data such as elevation, aspect, area size, natural boundaries, and forest type; it also prompted volunteers to observe and record signs of disturbance, tree sizes, standing snags, notes on mushrooms or lichens, pit and mound presence, understory condition, creeks or springs, rock cliffs, and other comments. Site surveyors were also asked to measure the five largest-diameter trees in the site.

Finally, the field check form asked crews to collect specific plot information within a 2000-square foot sample area. This included recording the number of trees in three size classes (i.e., diameters between 5-10", 11-24", and over 24"). Next, the number of different tree species in the sample plot was counted. A sub-plot of 10' x 10' was laid out, and the total number of herbaceous understory species in it was recorded. Volunteers were asked to collect a single leaf or leaf section from each different plant in this area, and simply add up all the different types. Lastly, surveyors were asked to count the number of downed logs over 6" in diameter along a 100' transect, and to describe the most common decomposition class present, based on a standard Forest Service chart provided with the form. The field check form included a picture key showing how and where to make diameter measurements using a Biltmore or Waldee stick or a diameter tape. The key illustrated how to lay out the plot; it also identified pit and mound formation, log decomposition, and gave scaled area blocks for estimating acreage.

Proof Positive

The third phase of data collection involved more experienced old growth observers and trained botanists verifying the site information. This was carried out through September of 1995. Funding only allowed us to check a limited number of sites in the Pisgah N.F., with the hope that future work will include verification of sites in the Nantahala N.F. as well.

Verification surveyors were asked to gather more specific information on canopy types and extent, collect additional tree diameters and age cores, and to produce a detailed narrative description of each site. Sites for verification were chosen based on their inclusion in the current timber base, on multiple nominations, and on the uniqueness of the site. In some instances, far more than the minimum information was provided, including information on area logging and historical railroad locations, soil types, rainfall, personal interviews, land ownership patterns, North Carolina stream classes, tree cores and release/suppression data, location in the timber base, and more.

An extensive tree diameter database with over 1300 dbh measurements has now been compiled, along with a listing of the top ten largest trees by species.

It is obvious to us that many citizens know and care about the preservation of older forests. The WNC Alliance received over 300 site nominations from nearly 100 nominators. Of 244 distinct sites, 61 (25%) were in forest lands managed for timber production. An additional 34 sites were partially in the timber base, making a total of 39% of the sites that had no protection from logging. The remaining 149 sites (61%) are in areas completely out of the timber base. Twenty-eight sites in the Grandfather Ranger District were ground-truthed and over 3700 acres contained old growth.

The Future of Older Regional Forests

The most recent forest management plan for the Nantahala-Pisgah National Forests established 31 large patches (167,000 acres) for management as potential old growth. These areas are largely already protected as wilderness and roadless areas. Many small- and medium-sized patches of old growth need to be removed from the current timber base. Permanent protection of these old growth areas is in question due to the ten-year cycle of management plans for the forest.

Editor's 1998 Postscript

The Old Growth Task Force have just finished field surveys in the Nantahala National Forest. We have documented nearly 100,000 acres of Old Growth Forest from a half dozen different forest community types in the 1.2 million acres of the Pisgah and Nantahala National Forests. Citizens need to continue pressing the USDA Forest Service to give permanent protection to existing Old Growth Forest areas and to create effective buffer zones. The final report on all studies should be available this summer. Folks can email me directly at <lbarnes@primeline.com>. Δ

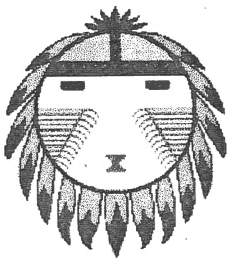
This report excerpted from a summary edited by Lee Barnes for the Old Growth Committee of WNC Alliance: Rob Messick, Karin Heiman, Norma Ivey, Lee Barnes, Bob Gelder, John Hotchkiss, Andrew Hotchkiss, Elmer Hall, and others. The complete October,1995 Old Growth Forest Survey Education Packet - and full 93-page report "Nantahala-Pisgah National Forests Old Growth Survey: Citizen Involvement in Old Growth Protection," including summary, project methods, extensive references, and contact addresses, may be purchased at printing cost. Send $10.00 to Old Growth Survey, WNC Alliance, 70 Woodfin Place, Suite 4C, Asheville, NC 28801. 704-258-8737, FAX/-9141, or by email: wnca@main.nc.us.

New Relationship

Andrew Goodheart Brown

No longer a secret, the story of our connectedness is emerging. It is a tapestry woven of diverse threads: from indigenous knowing of the sacred hoop of "all our relations," to forest ecologists serving notice that indeed, we have not been able to see the forest for the trees.

a limited perspective



We have been as in a trance, our march of mindless destruction accelerating about the time of the industrial revolution, when our educational and scientific systems adopted a mechanical model of the universe. We came to believe that life could be broken down into components that existed separately, and so could be levered or altered without affecting other parts of the system. Our modern ignorance has been staggering.

"hey, hey, up she rises... "

And yet, through a wedding of traditional ways of knowing with current scientific discoveries, and from a groundswell of eco-awareness, pieces of the puzzle are being provided and a picture is coming into focus.

We are relearning that we are co-inhabitants of an awesomely complex, deeply interconnected, finely tuned, and exquisitely choreographed life system: the result of several billion years of natural experiments and other forms of bio-geological evolution.

This simple insight calls for new relationship with our co-inhabitants, animate and inanimate. Everything is more intimately connected than we are capable of understanding, except in micro-moments of numinous experience.

In the late 1940s, Aldo Leopold proposed extending our sphere of ethical behavior to include the land and its inhabitants. Known in ecological circles for his "land ethic," Leopold argued that it is time for us to move beyond our concept of dominion over the earth to become truly members of the life community.

Permaculture has been defined as the harmonious integration of people and landscape. Obviously, this describes an ideal we as a species are far from achieving, since harmony implies co-equal relationships and, from its Greek origins, "a joining, agreement, concord of sounds; a fitting together; adaptation of elements to form a consistent and orderly whole." Our failure to have integrated ourselves harmoniously into the landscape does not discredit this goal, nor diminish its power as a guide to present action; although, according to Wm. Buckley, as idealism approaches reality, the cost may become prohibitive!

So how do we, practicing permaculture and other expressions of conscious living, move toward an ideal of harmony from a cultural reality of living in a wood-dependent culture, when our numbers and our use footprint are so enormous?

asks the prophet...

"Who can separate his faith from his actions, or his belief from his occupations? Who can spread his hours before him, saying, This is for God and this for myself; This for my soul, the other for my body?" —Kahlil Gibran

How can we bridge the gap between what we profess and our daily practices?

back to basics...

The preeminence of forests among terrestrial ecosystems—including their crucial role in generating and conserving clean water and topsoil, is known, and is beyond the scope of this article. But we may acknowledge that a forest is an incredibly diverse, interdependent, and interconnected community of organisms interacting with each other and the abiotic environment. Many of the processes necessary for all life happen in the first few inches of the forest floor (not the least of these is the detritus cycle: the role of the original recyclers).

Trees are the most visible parts of a forest community.

In our highly segmented North American culture, the care of forests has been delegated to foresters. Yet the term "forester" is a misnomer. Modern "forestry" education is concerned largely with timber extraction—the reduction of trees to wood products. Our present measurements of forest value are limited at best, based as they are on the stumpage price of timber. This approach fails to reflect the true value of trees in a forest community. If we anchor our economics not to profit in the market—an artificial notion, but in the awareness of our belonging to the life community—a palpable reality—and in our ethics of care for that larger body of which we are members, then it makes little economic sense to disrupt the vast and complex beneficial functioning of a forest ecosystem by removing its trees.

A more realistic valuation of forests is difficult, but not impossible to state in dollar terms. According to a recent environmental science text, the overlooked values of an average sized tree—totaled over a 50-year span, add up to $196,250 in benefits. Included are:

- $31,200 worth of oxygen produced
- $31,250 for soil additives and erosion control
- $31,250 for fish and wildlife protection
- $62,500 for control and reduction of air pollution
- $37,500 for recycling water, temperature and humidity control, and
- $2,500 for other minor values.

With this more accurate measurement of dollar value, how many trees can we afford to cut down?

Closer To Home

As a member of Earthaven—a developing ecovillage in the Blue Ridge Mountains of western North Carolina, Katuah bioregion, this dilemma is on my front burner, on high flame. Four years ago, after much deliberation— for we considered several hundred properties—we purchased 320 forested acres. It would have been easier to develop a cleared landscape, since that would only have required us to replant a temperate permaculture Garden of Eden, and build our thermally efficient home clusters within it. The burden of our decision lay with the obligation to clear forests for solar access for our homes, infrastructure, and agricultural spaces.

Throughout our short "history" as a community, we've given much emphasis to turning away from a system destructive to the natural world, and creating our world from a new paradigm: building, living, and relating to our natural environment in a more

harmonious and sustainable manner. Foremost among the tests of our wisdom and our integrity is our relationship with our full canopied forest. We plan to keep our footprint small by clustering our homes in several small neighborhoods (selected for solar access potential along with other ecological criteria). Much of the land will remain as regenerating forest. But as we move toward neighborhood development, in other words, as the reality comes closer to home, our dilemma becomes more apparent.

Now that the first two of our neighborhood roads have been completed, with trees pushed over mechanically (by 'dozer), I am left with some feelings of outrage, directed at neither the planners nor the operator.

To finish this thought, I must digress. I am a tree man, and have had extensive training as a tree healer specializing in preventive care, which includes spikeless climbing, surgery, and other forms of work that emphasize tree health.

Through this training and my subsequent work experience, I've come to hold trees in very high regard: I now refer to them as tree people. I am involved in very few "takedowns," and then, only when inevitable. I have walked away from unnecessary demands for tree removal (after first attempting to educate about the true value of trees). And yet, there are times when I do take a tree down. My training was specific in this regard: when a living tree must be felled, the respectful way to do so is to climb the tree, putting one's life on the line (literally), drop its branches one by one, and leave the climbing rope attached high in order to direct the fall.

My own experience has taken me beyond this respectful way, to include making physical contact with the tree, holding a few moments of quiet dialog with its being. Usually I apologize for what is about to happen, thanking the tree for its presence and its contributions. Then I encourage it to give its strength and wisdom to nearby tree beings of its own kind. I invite the tree to enter me, and to take with it knowledge of the two-leggeds, to share among the others. I also ask for it to share its knowledge with me, so I can be more effective as an intermediary between the two kindoms.

If possible, I make this intimate contact in advance, for this is a life, not different from my own, that I am taking. I then stand with my back to the tree, facing the direction in which I would like it to fall. I make the cuts lovingly, taking great care not to damage other trees in the felling. And often, as the tree falls, I weep. In finishing the process, I place my hands on the stump, count the years of growth, and again, bless this passing.

Trees talk to me. Their voices come to me gently, revealing their presence as a clear intuitive feeling. I certainly talk to trees, and consciously open my awareness to their presence. Not all that is transferred comes into my consciousness: sometimes I register only a small portion of what I feel is passed.

The outrage I feel is a tree feeling coupled with my own. Its flip side is a deep sadness, and a feeling of estrangement. How can we—as a people, as a community—move forward and exhibit the same caring and sensitivity we would want if the evolutionary script had been reversed?

Prior to the main clearing undertaken for the village center, I performed a pipe ceremony on site, for the trees. In the quiet afterwards, a clear message appeared in my awareness, telling me how we can move forward consciously in a way more palatable to the tree people. (The trees in a forest are all communicatively connected, through root networks. What befalls one is common knowledge among them all). Their message is: attitude and intent matter. My takedown ritual described above came directly from this quiet communication.

Most of the trees taken down in Village Center were felled by chainsaw. Many I took down, using the ritual described above. In working with others, I shared my technique. There were too many trees to climb them all—since there is just one of me, and much work needed to be done—so I focused on the physical touch and communication described above. Most of the trees cleared will become part of our council hall: everything else that was millable has been turned into board feet on our community sawmill, and will be used for buildings on the land.

The tree people don't like to be felled: it's not an experience they would choose. However, conscious felling and the good use of their bodies, along with communicating our intent to create and model sustainable relationships with the land we steward (and all its inhabitants), softens and redeems their passing. An individual tree is a representative of the forest entity, and if the forest is protected, honored, and given standing (literally), most individual trees will gracefully transfer their spirits back to the forest.

deeper connections...

What has been communicated thus far is just the first aspect of new relationship, albeit an important part. There is another entire realm based upon our relationship to the living forest.

Since any sustainable forestry has to provide for the needs of the human forest dwellers too, forest care must embrace the sound use of forest products and ways of making livings without destroying or diminishing the forest base. The best of "New Forestry" is concerned with the overall health of forests, with an emphasis on what is left in place rather than what is taken out. We new foresters need a greater perspective than has prevailed in the past. We need to leave the best trees for the forest, and figure out how to use the others. Clearcuts are abominable. They remove more than the trees: this practice destroys the forest community (within our timeframe).

Beyond clearing for roads, homes, and agriculture, small openings can be made in the canopy, mimicking Nature. Natural forests are in dynamic equilibrium: there is no such thing as a climax condition. Within the forest, individual trees are always coming and going. Succession is a continual process. Often disturbance happens on a small scale, creating "windows" in the canopy.

Cuttings, occurring on a small scale also, can mimic these windows. Careful planning can result in multiple phases of succession within a maturing forest, thereby increasing diversity and forest health. Nature does this all the time.

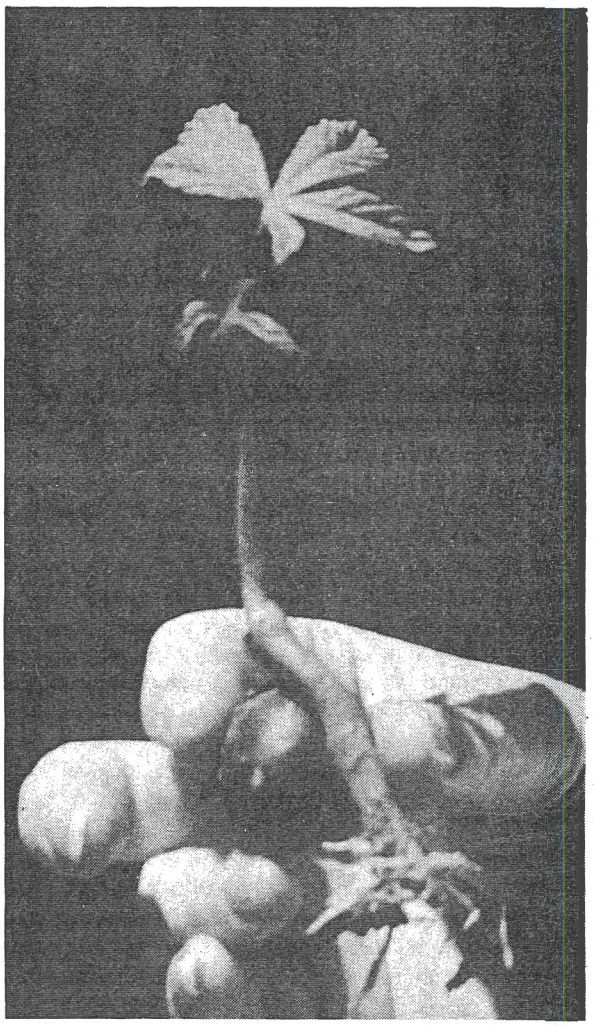
We need not give in to the mantra that says a tree must be cut in its prime, because it would otherwise go to waste. Not only is there no waste in a forest—all parts of everything are recycled and used—but there is a need to leave the tree elders. They are most often the superior trees, the progenitors of healthy forests to come. And they provide the forest many gifts that the younger trees cannot.

After all is said and done, the footprint of new forestry needs to be a healthy forest left in place after any activity. In regard to new relationship with our surroundings (biotic and abiotic), we must stop acting as if we are the center of creation, and all other forms of life here to serve us. In creating a workable model for sustainable relationship with each other and all other co-

inhabitants of this precious spinning jewel, our Earth, we need to deepen our moment-to-moment consciousness—our daily walk—by developing a working respect for other forms of life, like the tree beings, whose very presence is life-enhancing for all of us. I hope the steps I have presented will start the deeper dialog. Δ

Andrew Goodheart Brown describes himself as a practical mystic —first and foremost; tree healer, gardener, elder-in-training, permaculture fool, soil enhancer, bread baker, beer maker, gourmet vegetarian cook, and all around general biophiliac.

Rhizosphere Wars



Alex Shigo

The rhizosphere is the absorbing root-soil interface. It is the zone, about one millimeter in width, surrounding the epidermis of living root hairs and the boundary cells of mycorrhizae as well as hyphae growing out from some mycorrhizae.

The rhizoplane is the boundary where soil elements in water are absorbed into the tree. Under an electron microscope, the rhizoplane appears as a jelly where microorganisms and tree cells mix, making it impossible to tell which side is tree and which is soil.

A constantly changing mix of organisms inhabit the rhizosphere and surrounding soil. Bacteria, actinomycetes, fungi, protozoa, slime molds, algae, nematodes, enchytraeid worms, earthworms, millipedes, centipedes, insects, mites, snails, small animals, and soil viruses compete constantly for water, food, and space.

The rhizosphere is a battleground and the wars are continuous. Amoebae are eating bacteria. Some bacteria are poisoning other bacteria. Fungi are killing other fungi. Nematodes are spearing roots. Fungi are trapping nematodes. Earthworms are eating anything they can find. Sometimes the victors benefit the tree and sometimes they do not.

Every tree treatment affects the rhizosphere in some way. The more you know about the rhizosphere, the better the chances are that your treatments will lead to benefits rather than harm.

Declines and the Starving Rhizosphere

Go anywhere in the world and you will learn that some local trees have a "new" decline problem. Declines usually mean the trees are sick because there is a problem in the rhizosphere.

Trees die, as all organisms do, in three basic ways: depletion, dysfunction, and disruption. Disruption means wounding, severe mechanical impacts and fracturing. Dysfunction means some parts and processes of the living system have developed problems that retard or prevent their functioning and growth. Depletion means that the basic substances for life begin to decrease to the point where injury and death are certain. One of the ways depletion injures organisms is by starvation.

Soils and wood share a common problem: They are thought of as dead substances. This has come about because wood-products research gained an early lead over research on wood in living trees. Many texts still define soils as "loose material of weathered rock and other minerals, and also partly decayed organic matter that covers large parts of the land surface on Earth."

Sapwood in living trees has many more living cells than dead cells. In upper layers where most absorbing roots of plants grow, soils have more soil organisms than grains of weathered rock. In great disrespect, most people still refer to soil as dirt! When researchers first discovered the great value of soil microorganisms for human antibiotics and profit, the living nature of the soil began to emerge.

A more correct definition of soil should be that it is a substance made up of sands, silts, clays, decaying organic matter, air, water and an enormous number of living organisms. Survival of all living systems depends greatly on synergy and efficiency to optimize the functioning of all processes and to keep waste as low as possible. When synergy and efficiency begin to wane, declines follow. Trees are dependent on the light from the sun for their energy; water and 14 elements from the soil for their building blocks of life. Some trees decline when incorrect treatments or abiotic injuries lead to starvation of organisms in the rhizosphere. When there are troubles in the rhizosphere, there will be troubles with the tree.

Energy & Root Exudates

Microorganisms compete in the rhizosphere, an area rich in exudates from the tree. The exudates contain carbohydrates, organic acids, vitamins and many other substances essential for life. From 5-40% of the total dry matter production of organic carbon from photosynthesis may be released as exudates! When trees begin to decline, the amount of organic carbon released as exudates increases. Mineral deficiencies, low amounts of soil air, and severe wounding are major causes for the increase. Another way to say this is that an increase in exudates would be caused by over-pruning, construction injury, planting too deeply, over-watering, compaction, and planting trees in soils that have a pH too high or too low for their optimal growth.

You would think that a tree in decline would decrease, not increase, exudates. A possible explanation might

come from the self-thinning rule of ecology, which states that when energy input into a site equals output, there will be no further growth unless some trees die. As many suppressed trees die, a much smaller number continue to grow bigger. Simple. Or, on the basis of the mass-energy ratio law, as some trees on a site get bigger, many smaller suppressed trees will die. As the suppressed trees decline, they contribute a higher percentage of their soluble carbohydrates to the rhizosphere.

The increase in exudates from a declining tree with a defense system weakened by low energy reserves would give root pathogens an advantage over other soil organisms. When the tree dies, its dead wood adds a great amount of carbon to the soil, thus benefiting all soil organisms. If this scenario is correct, then the codes for the increase of exudates as trees decline would have been set in the genes of the forest trees. Then, even after trees are taken out of their groups in forests and planted as individuals, the genetic codes for increasing exudates as the tree declines would still be in effect.

A tree does not "know" why it is dying. In a crowded, growing, young forest, the self-thinning rule of ecology does benefit tree survivors and all soil organisms. But, when one or two trees in a yard, city, or park start to decline, their early death may benefit only the root pathogens. And even worse, since the tree will be cut and removed from the site, there would be no benefits from added carbon to the soil.

A Closer Look at Roots

Woody tree roots are organs that support the tree mechanically, store energy reserves, transport water and the substances dissolved in it, and synthesize substances such as growth regulators, amino acids, and vitamins that are essential for growth.

Trees have different types of root systems. For example, mangroves along coastlines have stilt roots. Many trees growing in tropical areas have aerial roots that become prop roots when they grow into the soil. Other trees have strangling roots that eventually kill the host tree that first supported their growth. Trees in sandy soils can have roots that grow downward over 90 feet. Palms have roots that are adventitious and grow from meristematic regions in their base. Many tree species have deep roots when they are young and more shallow roots later. It would be nearly impossible for the strongest person to pull out young saplings of beech, oak, or hickory from forest soil.

Woody roots have cells with walls of cellulose, hemicellulose, and lignin. Lignin is that natural "cementing" substance that gives wood its unique characteristic for strength. Woody roots also have an outer bark or periderm made up of three layers: the phellogen, phelloderm and phellem. The phellogen is the bark cambium. The phelloderm is a thin layer of cells on the inner side of the phellogen. The phellem is the outer corky layer. Phellem cells are impregnated with a substance called suberin, which is a fatty substance that prevents water absorption.

Some characteristics of woody roots are:

- They do not absorb water.
- They have no pith.
- Their conducting elements are usually wider than those in the trunk.
- They have a greater proportion of parenchyma cells than is usual for trunks. The living parenchyma store energy reserves, usually as starch. A soft cortex without chlorophyll may be in the bark. In some tree species that thrive in wet soils or have deep roots, the cortex may have many open spaces that act as channels for air to reach the living cells in the roots.

It is important to remember that the parenchyma in the woody roots store energy reserves, and root defense is dependent on energy reserves. When reserves are low, defense is low. When defense is low, weak or opportunistic pathogens attack. It is Nature's way.

Non-Woody Roots

Non-woody tree roots are organs that absorb water and elements dissolved in it. The two basic types of non-woody roots are:

1. Root hairs on non-woody roots are extensions of single epidermal cells. Common on seedlings, root hairs grow to maturity in a few days. They function for a few weeks and then begin to die. On mature trees, they are usually not abundant. When they do form, they do so when soil conditions are optimum for absorption of water and elements. I have found root hairs growing in non-frozen soils beneath frozen soils in winter.
2. Mycorrhizae are the other type of non-woody roots. Mycorrhizae are organs made up of tree and fungus tissues that facilitate the absorption of phosphorus-containing ions and others essential for growth.

The fungi that infected developing non-woody roots to form mycorrhizae were very "biologically smart." Rather than competing with other microorganisms in the rhizosphere for exudates from the tree, the mycorrhizal-forming fungi went right to the source inside the tree. And, even more to their advantage, many of the mycorrhizal fungi grew thread-like strands of hyphae—long, vegetative tubes of fungi—out from the mycorrhizae. This inside and outside presence gave the fungi a distinct advantage over other microorganisms in the rhizosphere.

The tree gains efficiency with mycorrhizae in several ways.

1. With their extended hyphae, mycorrhizae not only greatly extend the absorbing potential [of the roots] into the soil, but the hyphae may connect with other hyphae on other trees. In this way, the mycorrhizae serve to connect trees of the same or different species. This leads to the conjecture that the connections that developed over long periods in the natural forest may have some survival value. That is why forest types are often named for the groups of species commonly found growing together. For example, we speak of the birch-beech-maple forest, or the pine-oak forest. From a practical standpoint, when trees are planted in cities and parks, there may be great survival advantages to planting groups of trees made up of the species that are normally found together in natural stands.
2. The mycorrhizae have been shown to provide some resistance against root pathogens. It may be that the pathogens would have difficulties in building their populations in the rhizosphere dominated by the mycorrhizal fungi.

Perhaps the most important feature of the mycorrhizal fungi is that their boundary material is mostly chitin. Chitin differs slightly from cellulose by a chain of atoms that contains a nitrogen atom. This slight change in some way makes chitin a material better suited for absorption of elements. Remember that the fungal hyphae gain all their essentials for life by absorption through their boundary substance.

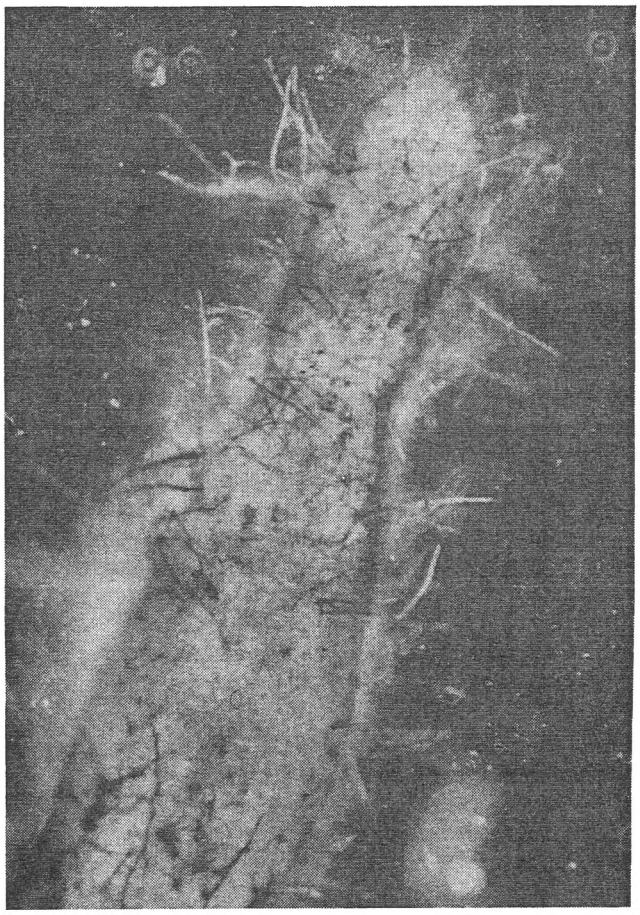
There are other advantages to the chitin and the tube-like hyphae that ramify the soil in the rhizosphere and beyond. When the hyphae die, they become a nitrogen source for other organisms. Also, when the hyphae are digested, they leave tunnels in the soil that are about eight to 10 microns in diameter. For the bacteria, these small tunnels may mean the difference between life and death. The bacteria quickly colonize the tunnels. The advantage here is that the major threat to their survival comes from protozoa that are usually much larger than 10 microns. So the hungry amoebae are not able to get at the

bacteria inside the eight-micron tunnels.

A common treatment for compaction is to fracture the soil. The fracturing allows air to penetrate the soil, but does not provide any eight-micron tunnels for the bacteria. The only way to bring back the tunnels is to bring back the fungi in well-composted wood and leaf mulch, as Nature does, or by inoculating the mulch with mycorrhizal fungi.

Who Was First?

I do not know if the fungi were the first to grow into the root to get at exudates or whether it was the bacteria. Regardless, bacteria and their close relatives, the actinomycetes, also infect non-woody roots to form organs that serve for the fixation of atmospheric nitrogen. Fixation means that the nitrogen that makes up almost 80% of our air is converted to a soluble ionic form by the action of the bacteria and actinomycetes within the nodules on the roots. (Some free-living soil bacteria can also fix nitrogen.) An enzyme called nitrogenase is the catalyst for the reaction, which will take place only under very exacting conditions. There must be soluble molybdenum and iron and no free oxygen available. These conditions are present within the nodules. Here again, the microorganisms benefit the tree by



providing a source of soluble nitrogen, and, in turn, the bacteria and actinomycetes get first chance at exudates. Even more importantly, the nodules protect them from foraging protozoa.

Infections that result in benefits to both parties are called mutualistic. When the benefits are greater than the sum of the parts, the association is called synergistic.

Species of legumes commonly have bacterial nitrogen-fixing nodules and mycorrhizae. The mycorrhizae facilitate absorption of elements, and the nodules provide a nitrogen source. Many species of trees have actinorhizae, which are the nodules formed by the root infections by actinomycetes. Species of *Alnus* have very large nodules. The actinorhizae are common on tropical and subtropical trees, and especially on trees that have adapted to soils low in available nutrients.

On some subtropical and tropical trees, such as the macadamia, multi-branched clusters of non-woody roots called proteoid roots form. The proteoid roots alter the rhizosphere by acidification processes that facilitate the absorption of phosphorus-containing ions. When I examined the roots of dying macadamia trees in an orchard in Hawaii, I could not find proteoid roots, yet only a few days earlier I had found them on macadamia trees growing in the wild. I learned later that the orchard where trees were dying was heavily and regularly fertilized with phosphorus.

Another type of nodule forms on species of cycads. These nodules harbor blue green algae, or cyanobacteria, that have the ability to fix atmospheric nitrogen. My point is that many different synergistic associations have developed in, on, and about non-woody roots that provide elements, not an energy source.

These associations are of extreme benefit to all connected members. At the same time, the conditions that support the associations are very delicate and exacting. It does not take much to disrupt them.

It Does Not Take Much to Disrupt Them

This statement deserves repeating and repeating. The delicate "threads"
that hold these powerful associations together need to be recognized and respected. Trees in cities grow only so long as these "threads" remain connected.

Trees grow as large oscillating pumps, with the top trapping energy and pumping it downward. The bottom absorbs water and elements and pumps them upward. The pumps have developed over time to work on the basis of many synergistic associations that maximize benefits for all connected members and to minimize waste.

Many of life's essentials for the bottom associates come from the top of the tree. And the top works only because the bottom works. Energy is required to move things, and elements and water are required to build things.

Tree Treatments and the Rhizosphere

When trees are over-pruned, the top will be injured first. When it is injured, it will not serve the energy requirements of the bottom. Soon root diseases start and are blamed for the decline or death of the tree. Where over-pruning is common. so are root diseases.

Compacted soil blocks air and water to the bottom and crushes all the microcavities where the microorganisms live. In nature, decomposing wood and leaves keep conditions optimal for the rhizosphere inhabitants.

Over-watering stalls the respiration processes in the roots. When respiration stops, carbonic acid is not formed. When carbonic acid is not formed, ions necessary for the absorption process do not form. When absorption is down, the tree system is in trouble. Fertilizers can be of great benefit to trees growing in soils low in or lacking elements essential for growth.

Elements or molecules made up of a few to many different atoms enter the roots as ions. An ion is a charged atom or molecule. Ions with a positive charge are cations, and those with a negative charge are anions. Each particle or granule of fertilizer

is a salt made up of a lattice of anions and cations, just as ordinary table salt is made up of a grand lattice of connected sodium cations and chloride anions. When salt as sodium chloride dry granules is poured into water, the sodium and chloride ions separate. When they separate, they carry electrical charges and are called the sodium ion and the chloride ion. When a cation enters a root, another cation must exit.

This is very important, as we will see. When nitrogen enters a root as a nitrate anion, a bicarbonate anion from carbonic acid exits. The bicarbonate ion is the second most important compound in nature, next to water, because it drives the absorption process. When a bicarbonate ion exits into the rhizosphere, the pH increases.

When urea is used in fertilizers as the nitrogen source, the pH in the rhizosphere could increase by 2 or more pH units. The chemistry behind this is complex, but here I present only the conclusion, because a common problem with trees in some high pH soils is chlorosis. There is no easy field method for measuring the pH of the one-millimeter-wide rhizosphere. The rhizosphere could be pH 8, and the bulk soil would measure pH 6. As pH increases, the availability of elements such as iron and manganese decreases.

In soils, it is one thing to have an element present and another to have it in ionic form available to the plant. As pH increases, iron and manganese form molecules that precipitate in water rather than ionize. If they are not available as ions, they will not be absorbed. And, if they are not absorbed, several enzymes essential for chlorophyll formation and photosynthesis will not form.

When the energy flow from the top of the pump is blocked, the bottom does not get enough energy for growth and defense. The pathogens invade, and the tree declines. This scenario does not mean that every time you use urea, trees will decline from chlorosis. But the use of urea could be a contributing factor where trees with genetic codes for growth on low pH soils are planted in high pH soils. If fertilization is a desired treatment, then a fertilizer with nitrogen in a positively charged form, such as an ammonium ion, would help to reduce the rhizosphere pH. When the ammonium ion enters the root, a proton of positive charge will exit. The protons in rhizosphere water will bring about more acidic conditions, so there is a way out.

In summary, fertilizers can be very beneficial for health and survival of trees planted outside their forest homes. How beneficial will depend greatly on an understanding of many of the points mentioned here and of some basic chemistry.

Primary Causes of Diseases

It is often very difficult for people to recognize the importance of small organisms in small places doing big things. Blame for the death of a tree is often placed on big things that can be seen or felt. Most pathogens are opportunistic weaklings waiting for a defense system to decrease. Many small disrupting events often lead to the decrease in a defense system. Then after the tree has been weakened, the final agent comes along and gets the full blame for the cause. A perfect example is the canker on honey locust. Flush pruning is usually the real cause.

Pumps and Food

Trees are oscillating pumps. When the pump begins to wobble, some parts will begin to weaken. When they weaken to the point where some other agent causes a part to break, the pump will stop. It is very difficult to determine where problems start in an oscillating pump. Symptoms may be in the bottom, but the cause may have been in the top. Or, it could be the other way around.

I go back to two points that may be part of the answer: exudates and the self-thinning rule of ecology. All living things require food and water for growth. Leaves and photosynthesis provide the energy at the top of the pump. The non-woody roots and the rhizosphere provide the elements and water at the bottom. Photosynthesis will not work without water and elements, and the absorption processes will not work without an energy source.

Trees became trees growing in groups in forests where the self-thinning rule had strong survival value. Not only did exudates provide quick energy for the rhizosphere organisms, but the carbon in the wood that fell to the ground also provided a long-lasting energy source for a succession of organisms.

Reports from some countries indicate an abundance of soluble nitrogen compounds in runoff water and even in ground water. This is a strong indication that the carbon-nitrogen ratio has been disrupted in the soil. It is well established from studies of the physiology of fungal parasitism that the degree of parasitism is often determined by the carbon-nitrogen ratio. It is probably similar for other organisms.

The organisms in the rhizosphere and surrounding soils have many different ways to weather rocks and to get nitrogen and other elements essential for their growth. What they cannot get in the soil is a sufficient energy source. Yes, some small animals die and provide carbon, and some microorganisms can get energy by chemosynthesis, but the requirements for carbon are much greater than what could be supplied by those sources alone. Carbon must come from the top of the pump. When the energy source from the top begins to decrease, the rhizosphere organisms will begin to starve.

The oscillating pump model soon takes on the form of a circle, because now it could be said that the top did not work efficiently because the bottom had a problem first, and this could be so. My point is that the energy problem does play a key role in declines. If a single tree is already very low in energy reserves, it cannot contribute much to the rhizosphere even if the genetic codes rule that exudates should increase as a tree begins to decline. Soon we will be faced with the chicken or egg problem.

I believe there is a way to decrease the potential starvation problem. In forests, more wood should be left on the ground, and in cities, more composted wood and leaves should be added in correct quantities to the soil about the base of trees. Incorrect treatments of pruning, watering, planting, and fertilizing should be corrected, because they often start the pumps to wobble. If these simple adjustments can be made, rhizosphere starvation will decrease and our trees will lead healthier and longer lives.

Author's Note

Much of the information here has come from several books I found very helpful in preparing for this article.

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Forest Farming

Deborah Hill

Forest farming is one of the five temperate agroforestry systems, and may, of all of them, be the most practical economically, the easiest to implement, and the one to give quickest results and returns. All of the systems share the characteristics of being INTENTIONAL, INTENSIVE, INTEGRATED, and INTERACTIVE—the four 'I's of agroforestry. The other techniques: alley cropping, silvopasture, riparian buffer strips, and windbreaks, involve introducing trees into existing agricultural systems— crop fields, streamsides, or pastures.

Forest farming, on the other hand, is working with an existing forest or woodland, and intentionally cropping something other than trees. It may or may not involve cultivation—the intention to **manage** the forest for non-timber crops is the important point. Forest farming can be done in any kind of forest, indeed, has been done traditionally in all parts of the world. With careful planning, forest farming can be done in conjunction with other agroforestry practices, with the possible exception of silvopasture. Forest farmed products include exotic mushrooms, botanicals of medicinal or culinary value, fruits and nuts, craft materials, maple and other syrups, and baled pine straw. Other, more traditional wood products such as fenceposts and fuelwood are also possibilities, while the raising of honeybees (apiculture) is yet another option.

Exotic Mushrooms

People who enjoy hunting mushrooms in the woods are probably familiar with morels *(Morchella spp.)*, chanterelles *(Cantharellus spp.)*, boletes (Boletaceae) and honey mushrooms *(Armillaria mellea)* along with several other edible species. Most of these are only seasonally available, and one must be VERY sure that the mushrooms in question are the edible ones—not look-alikes that may be poisonous! High quality and exotic mushrooms may be forest-farmed, on the other hand. These include culinary mushrooms such as shiitake *(Lentinula edodes)*, maitake (Hen-of-the-woods, *(Grifola frondosa)*, oyster mushrooms *(Pleurotus spp.)*, Lion's Mane *(Hericium erinaceus)*, King Stropharia *(Stropharia rugosoannulata)* as well as a primarily medicinal mushroom, reishi *(Ganoderma lucidum)*. The majority of these mushrooms grow an wood fiber and can be inoculated into small diameter (3"-5") logs.

Production of these mushrooms can return enough economic benefit to justify thinning and culling forest stands to upgrade the quality and improve the health of the remaining trees. Because small logs are preferred for mushroom production, large branches can be used as well as small diameter trees.

Shiitake and oyster mushrooms are probably the most familiar of the exotic mushrooms. These, along with Lion's mane, reishi, and maitake can be inoculated into drilled holes in logs harvested during the dormant season (November-February in the central U.S.). The objective is to inject the active mycelium or "root" of these fungi into the wood that they will ultimately consume at a time when it contains the maximum amount of sugars. This season begins when the tree is shutting down for the winter—having shed its leaves—and runs through the time it gears up again in the spring, preparing for the new year's growth.

Trees used for this purpose must be alive at the time of cutting. Even though the fungi feed on dead wood, it is important to get the desirable mycelium into the wood before some other bacterium or fungus begins the decay process. Log lengths vary, but most people cut lengths they find easy to handle. All my experimental work has been done with logs one meter (39") long, but other people have worked with logs both longer and shorter. Cutting logs shorter than 24" could create problems with the mushroom spawn drying out.

My own experiments, as well as those of people in Ohio, Oklahoma, Minnesota, and Wisconsin, show that shiitake will grow on almost any species of hardwood tree, although oaks—especially the white oaks, are favored. It is possible to grow these mushrooms on conifers, but this has not been very successful.

Once the logs have been inoculated and sealed, they need to be placed in a relatively cool, moist environment for the fungi to grow (run) through the entire log. Ideally this would be a wooded site with some mixture of conifers (so that there is some shade year round), and near a water source. Monitoring the moisture content of the logs is important; supplemental watering may be necessary in hot, dry weather. Production usually begins 6 to 18 months after inoculation and continues seasonally with the right combination of moisture and temperature. The logs usually produce about 10% of their original weight in mushrooms over their productive life. Shiitake logs can be sterilized and reinoculated with oyster mushrooms when the shiitake production declines.

photo credit Peter Bane

The forest floor provides excellent microclimate for the culture of shiitake mushrooms on hardwood logs.

Markets are available and increasing in many parts of the country. If you expect to sell mushrooms, however, it is important to locate your own markets before inoculating any logs.

The fungi that do not grow on logs—stropharia and morels—grow on the forest floor. Stropharia can be "seeded" into wood chip beds in the forest and watered like a garden until they begin to produce mushrooms. Even though these mushrooms can grow to remarkable sizes (big enough for a child to sit on!), they are

marketed when relatively small—roughly the size of large commercial button mushrooms.

Morels are a little trickier to grow—their life cycle is known, but it is still difficult to produce them at will. Kits are available, and at least two companies are producing morels commercially under controlled indoor conditions. They too require a prepared "bed" in the forest floor and need to be kept moist until they produce. Under outside conditions they will only produce in season, which is late spring to early summer.

Botanicals and Medicinals

Every culture has had people in it who knew which plants to collect in the forest and how to use their different parts to remedy various ills. Botanicals such as echinacea (purple coneflower) and St. John's wort are now available in outlets from your local pharmacy to Wal-Mart. Some of the forest-based botanicals include herbs such as goldenseal *(Hydrastis canadensis)*, black cohosh *(Cimicifuga racemosa)*, bloodroot *(Sanguinaria canadensis)*, and blue cohosh *(Caulophyllum thalictroides)*, as well as bark from such trees and shrubs as witch hazel *(Hamamelis virginiana)*, slippery elm *(Ulmus rubra)* and sassafras *(Sassafras albidum)*.

Probably the best known and certainly most valuable botanical is American ginseng *(Panax quinquefolium)*. Ginseng grown under forest conditions, so-called woods-grown, woods-cultivated, or wild-simulated, has maintained a stable price of close to $300 per pound for some time.

Most of the herbaceous and shrubby botanicals are marketable for pennies to dollars per pound, and there an several national herb companies that will buy dried material from producers.

Several of these herbs can be encouraged to grow in larger patches than occur naturally, by techniques that disturb the forest soil very little. Both herbaceous medicinals and exotic mushrooms prefer a forest canopy—usually with fairly dense (75-85%) shade, so minimal alteration of the overstory is needed. As with most plant cultivation, the problems are competition for water and nutrients, so some weeding may be necessary.

Most of these herbaceous plants, especially those with marketable leaves, seeds, and fruits, bear annually. Harvesting roots may take longer. Goldenseal, from which both root and leaves are marketable (and seed for that matter), takes two or three years to develop a large enough root mass to market. Ginseng commands a high market price because it takes five to ten years to develop the kind of root that brings top dollar.

Ginseng plants usually begin to produce seed in their third year, and the seed can be a product in itself. The planting market demands both seed and 1st- or 2nd-year rootlets, so small roots can also be marketed for transplanting.

The greatest challenge in growing ginseng to fruition is keeping it until it's big enough to sell. In the central U.S.—and the Appalachian and Ozark Mountains in particular—theft of nearly-grown ginseng is widespread. Ginseng is considered by the federal government to be a threatened plant, and its harvesting is restricted to certain months of the year and to certain ages of root, but there is considerable disregard for those laws, and little enforcement by local officials.

Trees and shrubs from which roots (sassafras) and bark (witch hazel, slippery elm) are taken for their medicinal use, require a different kind of management. Witchhazel is best managed by cutting the stems fairly close to the ground, then stripping the bark off. Cutting the stems encourages resprouting while taking the bark off the standing stems would probably kill the whole plant. Slippery elm, which can grow into a large tree, can either be managed—like the witch hazel—by coppice when young, or could bear some vertical strips of bark being removed from a mature tree, as long as most of the bark is left around the trunk to keep its circulation functioning. Some of the roots of sassafras may be removed without killing the whole tree; alternately, only the smaller shoots may be harvested, roots and all.

Fruits and nuts

Native fruits and nuts are other options for forest farming, and can include such species as persimmon *(Diospyros virginiana)*, pawpaw *(Asimina triloba)*, hazelnuts *(Corylus spp.)*, pine nuts *(Pinus spp.)*, and walnuts *(Juglans spp.)*. Unfortunately, one of the greatest nut trees of all time, the American chestnut *(Castanea dentata)*, no longer grows big enough to produce nuts. It occupied some 20% of the eastern deciduous forest and was effectively wiped out by an exotic disease in the 1920s.

As with apiculture and maple syrup production, farming of the desired fruiting species requires adjustment of the forest canopy (more water, nutrients, sunlight) to allow for better growth of the crop trees. This usually means removing the surrounding trees whose crowns touch the crowns of the crop trees (you can then use some of the harvested wood for mushroom production, fenceposts, or firewood for boiling maple syrup!).

Crafts Materials

Working crafts materials as part of forest farming ranges from collecting pine cones and gilding them for decorations, or waxing them for fire starters, to selecting odd-shaped branches or burls on trees for carving. There are many plant species at all levels, from herbs to shrubs to vines to canopy trees, that may produce something harvestable for crafts. Grape vines are collected for fashioning into decorative wreaths, while small diameter (<10") white oak saplings are the ideal size for making splints for white oak baskets. People have even made (beautiful) baskets from kudzu vines, so opportunities live greatly in the eyes of the beholder. One enterprising company injected dyes into very young pine saplings (<2" in diameter) and then cut the stems and branches into disks that were made into jewelry—the color already in them.

Crafts from wood are the dominant types produced in Kentucky and probably in most of the mountain regions of the central United States; they are also the most economically valuable. Greens and grasses used in the floral trades may be more valuable in areas like the Pacific Northwest. Alaskan entrepreneurs make silly-faced "things" and jewelry out of moose

droppings! Although many of the forest resources for crafts may be obtained by collection or "wildcrafting," some of the most desirable species can be "farmed" by intentionally altering the habitat to increase their production.

Maple Syrup, and syrup or "beers" made from other tree saps, have been produced for centuries in North America. Native Americans figured out how to get this sweet material long before Europeans came to this continent. A "sugarbush" is simply a forest where the owner has selected for maple trees, specifically sugar maple *(Acer saccharum)*. Maple syrup can be made from the sap of any maple tree species but the sugar content of sugar maple sap is higher than that of the other maples, and it therefore takes fewer gallons of sap to make a gallon of syrup (with sugar maple the ratio is about 40 to 1, so it's a lot more work to get the syrup from the others).

Management of the sugarbush requires spacing the trees far enough apart that they form large crowns (when the trees are all crowded together in a normal forested situation,the crown of any individual tree is not particularly large). Large crowns mean a lot of leaves, and a lot of leaves means high syrup production.

The expense of maple syrup production lies in the fairly substantial capital investment required for the tapping (buckets or plastic tubing), boiling, and bottling equipment and materials. People who do this every year build a "sugar shack"—a building that houses the boiling pans, with lots of roof ventilation for the steam to escape, and a long, deep fire pit for heating the sap. Scrap wood from other forest management operations can be used to fuel the sugaring process. Labor is intensive during the production process, but the season of work is short, lasting usually four- to six-weeks in the spring—when days are beginning to warm but nights are still cool, and before bud break The result is a very high value-added product.

Pinestraw

Pinestraw is the annual needle drop of pine trees. Commercially, it is baled from under long-needled pines in the Deep South, specifically loblolly *(Pinus taeda)* and longleaf pines *(P. palustris)*. This material makes excellent mulch, especially for landscaping. There have even been experiments to color the pine needles for interior landscaping so that they can match the decor of the room! Even though harvesting removes organic material from the forest floor, and thereby reduces the amount of nutrient cycling available to the stand of trees, people have found that it is possible to rake and bale the pinestraw from the same location every other year or every third year without markedly affecting the nutrient balance. Pines with long needles are preferred because these take longer to break down. The pinestraw is baled much like hay, and can return a significant short-term economic benefit while owners are waiting the 20-30 years required for the timber crop to mature. Managing for pinestraw production means planting the trees in widely-spaced rows to accommodate the movement of the straw harvesting machinery.

Fenceposts

The most desirable tree species for fenceposts in the eastern United States are black locust *(Robinia pseudoacacia)* and Eastern red cedar *(Juniperus virginiana)* In the west, it is probably redwood *(Sequoia sempervirens)*. These species are desirable because of their natural resistance to decay—locust posts may last for decades without chemical treatment, whereas other species, even with treatment, may not last as long. Management consists of favoring the growth of these species over others and providing access to maximum water, light, and nutrients in the system where they are growing. Fenceposts are also an option as an intermediate product in the crop tree rows of an alley cropping system. Black locust, for example, can grow large enough to to be harvested for fenceposts in 12-15 years, while black walnut may take three times longer than that to reach a size that would be considered marketable.

Fuelwood

Fuelwood, or firewood, is more of a byproduct of other management for forest farming than perhaps a specific activity, unless the forest is managed to encourage the the growth of trees that are known to be excellent fuelwood, such as black locust or some of the less commercially desirable oaks (post oak, *Quercus stellaria,* or blackjack oak, *Q.marilandica)* Exhausted mushroom logs can be used for firewood also, although they maybe punky enough that they are better ground up and used for mulch.

Apiculture

If agroforestry is "the intentional integration of agronomic crops with tree crops or livestock with tree crops," then with apiculture in forest farming, the "livestock" are very tiny! It has been estimated that one in every three bites of food we eat is dependent on active pollination of plants (active = animal or insect pollination; passive = wind or water-caused pollination). The insect world, specifically bees and wasps, are the major operators in this case.

The European honeybee *(Apis mellifera)* is the best-known of these insects, although it is not a native species. It has a couple of characteristics which make it particularly valuable. One is that honeybees show species fidelity, which means that they will use

Forests provide both cover and food for bees.

the same source of nectar to make honey until that source is exhausted. This enables them to make "specialty" honeys from crops such as buckwheat, tupelo, and sourwood. Another is that they collect pollen, along with nectar, and use both to raise their young, but also collect it in sufficient volume that it can be harvested without compromising the health of the hive.

Managing honeybees is not difficult, and getting set up with bees and hives is neither particularly expensive nor complicated. Extracting honey from the combs is an expensive proposition (extractors are costly), but it is possible to get good equipment second-hand. The current problem with raising honeybees is that they are being assaulted by a combination of two mites, both of which can be lethal to the hive. One is a tracheal mite that lives in the windpipe of the bee, and can be controlled with camphor or menthol, and by planting mint around the hives.

The Varroa mite is an external parasite and is more difficult to control, but medications are available. Some varieties of honeybees are more resistant than others. Two or three years ago, it was estimated that 90% or more of the wild, or feral, populations of honeybees were gone, and some 50% of the domestic honeybees did not survive over winter. Recent anecdotal reports indicate that wild swarms are beginning to appear again, and have been observed taking over abandoned hives. If some bees have developed resistance to the dual attack of these mites, it is very good news indeed.

Trees are flowering plants, and they depend on pollination just like agronomic crops (particularly orchard and squash family crops). Loss of the wild honeybee populations has probably affected fruit and seed production on forest trees as well as on crops. Forests can be managed to favor trees that honeybees particularly like, such as basswood (or linden, *Tilia americana),* and black gum (or tupelo, *Nyssa sylvatica),* providing extra light, water, and nutrients for those trees, as well as exposing the crowns to maximize surface area for flower production.

Average production for a hive is 50 lbs. of honey per year. It is also possible for a hive to produce 50 lbs. of pollen in a year. Products from the hive include: royal jelly (the super-rich food fed in tiny amounts to all honeybee larvae, but the exclusive diet of the queens) popular in both the health food and cosmetic markets; propolis, another product used in food supplements; and beeswax, used for candle-making and other crafts. Pollination itself is another saleable service, as hives can be transported from place to place to pollinate crops. And some alternative health practitioners use honeybees for their venom, which anecdotally is said to be extremely helpful to people suffering pain from rheumatoid arthritis, or other joint problems.

Summary

Farming the forest provides many options for annual (maple syrup, crafts, some botanicals, mushrooms) and longer-term (fuelwood, fenceposts, ginseng) commodities, along with the possibility of timber crops. Production of these commodities may involve altering the forest canopy (shade for mushrooms and botanicals, crown spread for apiculture and maple syrup) or making changes in the forest floor (sowing medicinals such as ginseng and goldenseal, inoculating for morels or stropharia). Many of these options could also be implemented in the tree rows of alley crop plantations, as well as in the selection of species for windbreaks and riparian buffer strips. One or more of these options can provide annual cash flow and can be managed by various member of a family. Implementing several of them will bring greater biodiversity to the existing forest, thereby enhance its health, while supplementing annual income from the land. Δ

Deborah Hill is professor of forestry at the University of Kentucky, Lexington, working through the Cooperative Extension Service. In addition to offering talks and workshops on forest farming and permaculture, she contributes to books and journals in the field of agroforestry. She is currently developing a forest farm on 25 acres near Lexington.

Non-toxic Wood Preservative Controls Termites

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The Hope of Woody Agriculture:
Fixing Carbon, Building Soils, Growing Food

Philip A. Rutter

The possibility that woody plants could be further domesticated and grown so as to provide food production equal to traditional cereal crops while simultaneously producing fuelwood promises enormous benefits. Current reliance on annual plants for food results in the world's most fertile soils being rendered sterile and non-photosynthetic for large parts of the growing season, due to the requirements of constant planting and tilling. Woody plants offer a greater wealth of genetic variation to select from than annual crop plants, and in temperate regions calculations show that woody plants can fix more than three times as much carbon dioxide per year as annual grains such as maize.

In a paper presented to the North American Conference on Preparing for Climate Change, I pointed out many of the theoretical considerations which indicate that such development is possible (1), and gave details of specific plants and cultivation systems which would allow food production equal to that of annuals, plus production of wood fiber for fuel or other uses. These models include both large-scale mechanized systems and "human powered" alternatives. Co-production of food and fuelwood from the most productive agricultural lands could do much to alleviate fuelwood shortages, and would relieve pressure on the forests of developing nations. This could contribute greatly to stabilization of watersheds, water tables and soils, and could also contribute further to carbon dioxide removal by allowing forests to grow undisturbed.

Present estimates of the annual increase in atmospheric carbon are around 3 gigatons. Calculations indicate the presently highest yielding temperate woody plants can fix 1.82×10^{13} grams of carbon/10^6 hectares/year. Since there are some $1{,}500 \times 10^6$ hectares under cultivation in the world, conservative calculation leads to the conclusion that planting one-quarter of world crop lands to woody plants would result in 5×10^{15} g of carbon (5 gigatons) absorbed above that absorbed by present crops, enough to completely counteract the carbon dioxide overload.

Development of woody plant crops is possible. Intensive worldwide programs to develop them for the different climatic regions may be the most effective, least expensive, and most beneficial response humans can make to the global warming threat. This paper will deal with some benefits to climate and environment and also with some social aspects of making such a large change in agricultural practices.

Basic Principles of Woody Agriculture

Because woody plants have permanent leaf supporting branches, in the early part of the growing season they do not have to grow their photosynthetic collecting structure. In temperate regions, much of the available sunlight strikes the earth each year before annual crops have enough foliage to intercept it. Consequently, woody plants are intrinsically much more efficient collectors of solar energy. Even in tropical regions where more than one crop per year is raised, substantial amounts of sunlight fall on the bare fields required by traditional plowing and planting, and woody crops could certainly be of greater benefit there (4).

The two species I personally work to develop are chestnuts *(Castanea)* and hazelnuts *(Corylus)*, which are well adapted in temperate regions. Their seeds could easily be substituted for all needs currently filled by maize and soybeans. Both of these crops can be developed for either mechanized or hand labor technologies.

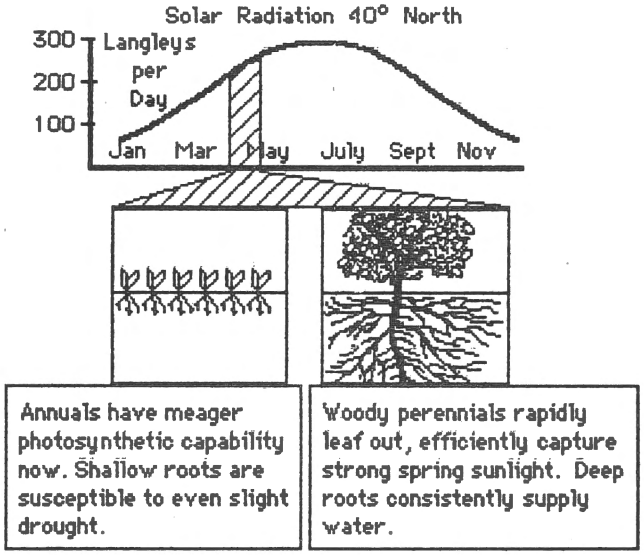

Figure 1

For mechanization, they would be planted solidly in a field, grown as bushes, not trees, in such a fashion that they could be harvested by a combine machine, similar to those currently used for maize or soybeans. Following the harvest of the seed, it would also be possible to harvest the woody stems mechanically; right down to the ground. The wood can be used for fuel or industrial processing; the established root systems will rapidly grow new tops, and will bear a seed crop in one or two growing seasons, depending on the circumstances. Such a crop system is already in commercial use for raspberries *(Rubus)*, and on a limited experimental basis has now been demonstrated in the cropping for both chestnuts and hazels.

The other alternative is a more traditional "agroforestry" approach; where trees are grown in orchard formation, seed is gathered either by hand or mechanically, and the land area between trees is either grazed by animals or intercropped. Machinery to mechanize production and planting of woody plants for such large scale use already exists.

Additional Benefits

There are several benefits and important impacts that woody agriculture would yield:

1. Direct reduction of fossil fuel use. Woody plants only require replanting once in 25 or, in some cases, once in 100 years. Usually there will be no planting or cultivation necessary once the crop is established (3 years). There would also be secondary reductions in fossil fuel use due to the cost of

transporting machinery to the fields, reduced lubrication and maintenance of machines, reduced manufacturing costs due to long machine life, and reduced fuel needed to produce and transport the diesel fuel itself.

2. Reduction of draft animal energy costs, and animal methane production. In areas where tillage is accomplished with draft animals, there would be a significant reduction in the burden of caring for and raising feed for draft animals, since power needed for harvest is a small fraction of that required for plowing. Fewer draft animals could mean less animal methane production, a significant factor in greenhouse warming, and perhaps more protein available for human consumption.

3. Woody plants not only stop soil erosion, but actually build soil, by bringing nutrients up from deep soil and rock, and adding them, via leaf litter, to the topsoil.

4. Since the soils are not tilled, they are less compacted, and will absorb more rain without run-off; significant both in capturing water in the soil for later use, and in decreasing the likelihood of flooding.

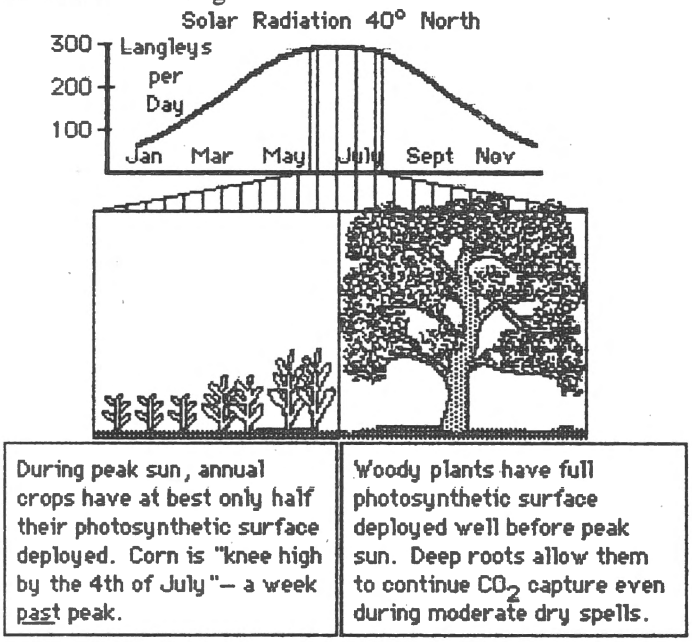

Figure 2

5. Woody agriculture should both require less fertilizer and result in less run-off pollution. Fertilizer is not likely to wind up in the water supply. With extensive deep permanent roots, woody plants should capture almost all nutrients applied. Since much fertilizer is applied to annual crops when they have small, underdeveloped roots, it is easy for rain simply to wash it away, or carry the fertilizer below the roots, where it can find its way into the water table. The escape of some of the applied fertilizer often leads to the application of more fertilizer, in turn leading to higher costs and greater likelihood of water contamination. The actual fossil fuel requirement for nitrogen supplied to maize in the U.S. is three to four times the cost of tillage. Reduction in fertilizer requirements represents another large potential direct reduction in fossil fuel burden.

Particular Benefits for Developing Nations

1. Simultaneous production of food and fuelwood. The fuelwood shortage is a major crisis in developing countries, and places heavy burdens both on the people who must struggle for enough fuel to cook their food, and on the overtaxed forests. The destruction of forests also leads to degradation of soils, greater floods, loss of biological diversity, less photosynthetic capability of forests to counteract the CO_2 buildup, and ever decreasing fuelwood supplies.

Many agencies are advocating the planting of more trees to counteract the greenhouse effect, but in most cases those suggestions are limited to the planting of trees on otherwise unproductive lands. The development of woody agriculture would allow us to utilize the best soils, producing the same amount of food currently produced, while simultaneously producing very convenient and substantial quantities of fuelwood.

2. Woody plants are less sensitive to minor drought. Many of the projections for climate change include the possibility that acres now under cultivation may be subject to increased drought. Annual crops are very sensitive to drought during germination and establishment of the crop; a brief dry spell may delay germination or growth and result in very substantial crop losses. Once more, because of the large permanent root systems of woody plants, such brief droughts will commonly have no effect at all on the final yield. While this factor is important everywhere, it is particularly devastating for the developing nations to have to deal with extensive crop failure. When all resources are already being stretched as far as they will go, having to import food means fewer schools, hospitals and new business enterprises. Recurrent crop failures can eventually destabilize national economies and even political systems resulting in upheavals which can only further retard the progress of the country. Woody crops are by no means immune to long droughts; but they are less affected by minor fluctuations, leading to some increased stability in food supplies.

3. Woody agriculture does not necessarily require the extensive application of expensive "high technology." While it can be developed as a highly mechanized system, it is also possible to develop crop systems which would rely on traditionally available labor.

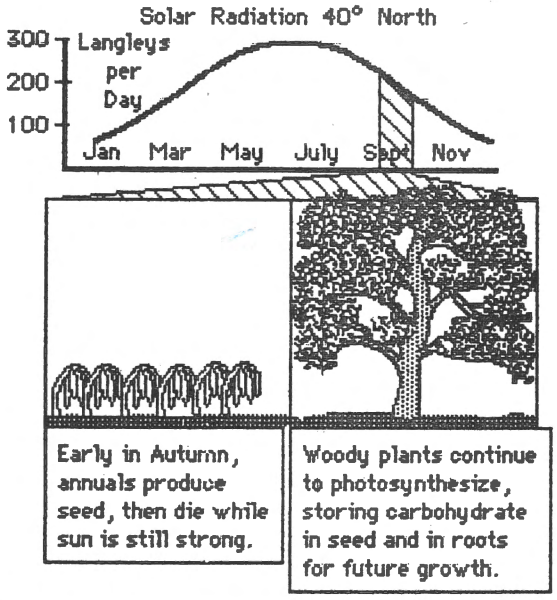

Figure 3

Problems

It should not be imagined that woody crops represent a magic solution to all difficulties. Many requirements of food production will remain the same, and it is possible there may be new problems associated with the different treatment of the land.

1. Intensive, high-tech breeding will be required to develop

plants suitable for these crop systems.

2. Fertilizer will still be required for good yields.

3. Insects, weeds, and other pests must still be controlled.

4. Mammals and birds are likely to become more important pests. One benefit of standard tillage is that habitat for small animals is constantly destroyed in crop fields. Birds and mammals are quite likely to find untilled fields covered with bushes or trees to be quite attractive, however. Some of them will prove beneficial, but others will certainly feed on the bark, foliage, seed, and in some cases control will probably be necessary. Integrated Pest Management technology should prove effective. On the positive side, the improved habitat for small animals could provide increased biological diversity, and could yield some direct benefits to humans.

5. Response to newly evolved plant disease will be slower than for annuals. Currently, for annual crops, we attempt to stay ahead of new plant diseases by maintaining collections of diverse and hopefully resistant germplasm. When a new disease is identified, annual crops can be rapidly bred which will incorporate the necessary resistance. Then the new seed is increased, and in a relatively short time, perhaps only a year or two, will be available for planting. For woody plants, the same basic process must be used. Breeding of woody plants can be done just as rapidly as for annuals (when the necessary precocious strains are developed) (1), and the new resistant plants rapidly increased. However, there will always be a two- to three-year wait after planting before the new fields will bear a crop.

Two actions will counter these difficulties. First, plantings of woody crops should never be allowed to become genetically uniform, regardless of economic pressure to plant only the most productive varieties. While a single field will probably consist of one or two clones, it should be a matter of policy that the plantings in a region should be as genetically diverse as possible. In this way the probability of a new disease attacking all fields will be substantially decreased. Second, a field destroyed by a new disease certainly need not be left unproductive. Annual crops can be planted to provide food production while woody replacements are being developed, and annuals can be intercropped while the new woody plants are growing to productive size.

6. Acceptance of new crops has been a problem in the past. In some cases, newly developed high-yielding cereals have been rejected by those they were intended to benefit because the taste was unacceptable. There should be no particular difficulty with achieving acceptance of crops from woody plants; in most cases they will be derived from plants which are already accepted in the regional cuisines, and are often considered delicacies. In any case, new crops can achieve widespread acceptance when economic or other factors are compelling: witness the fact that 40 years ago, no one in the U.S. grew soybeans; now, however, more than 25 million hectares are planted there every year.

Development Already Underway

Woody agriculture is not merely theory. I have personally been collecting, screening, and breeding hazels and chestnuts since 1981 with these goals in mind, and the work of many other researchers could also be applied to this concept. At this point in my own investigations I am convinced woody agriculture will work, based on genetic variants found and created, and on yields already achieved.

• One of my hazel selections, G-228-S, produced a crop which, rather conservatively extrapolated for a field planted to this one cultivar (less 10% for travel area) would have yielded about 2200kg of kernel/hectare (nutshells excluded) (5). For comparison, soybeans, the crop most comparable, yield an average of about 2100kg/hectare in the U.S. This plant was 8 years old, grown in a situation most amenable to hand harvesting. The crop was borne in spite of extreme drought and no fertilizer in 1988.

• Another selection, G-105-N, was cut to the ground in early spring of 1988 (i.e., the wood was harvested), regrew without fertilizer and in extreme drought, and in 1989 bore the equivalent of 764 kg of kernel/hectare. The lush regrowth of the plant demonstrates further potential for shunting photosynthate into seed production, and away from wood. This selection represents only the very crudest and earliest attempt to identify plants capable of bearing seed quickly after having the wood harvested.

• The amount of kernel produced by a plant may be limited by the number of female flowers it can set. Most hazels set an average of 3-5 nuts per cluster, but I have been able to identify some individuals which typically set much more: up to 14. The potential is here to develop a hazel which bears seed almost in "cobs" rather like maize, greatly facilitating harvest.

Progress with Chestnuts

• Ultra-precocious multi-species hybrids have been made which are able to flower and produce useful pollen only three to four months after the germination of the seed. This can tremendously accelerate breeding projects aimed at transferring genetic traits from one line to another.

• Perhaps most significantly, during a recent trip to the People's Republic of China, the Hubei Academy of Agricultural Sciences requested a seminar on the subject of woody agriculture which generated great interest. At their request, I now have an agreement with scientists in the Academy to cooperate in the continuing development of chestnut for woody agriculture, and I will be sending them some of my more advanced chestnut strains for them to begin making woody agriculture type plantings in the PRCC. They will also be cross-breeding my strains on their own, to further develop the crop potential, and we will continue to exchange visits, work, ideas, and genetic material.

The Chinese are now interested in developing other woody crops along these lines. While there I was introduced to a plant new to me, the "camellia oil" bush. This is a relative of tea, traditionally grown for the oil pressed from the large seed, but never developed much beyond very basic selection of slightly more productive wild bushes. In a few years of work, however, the Chinese scientists have already, through simple use of pruning, grafting, and fertilizing, increased their traditional yield by 150%. The great potential for further yield gains by cross breeding their best selections is the next avenue they are going to explore. "Camellia oil" is a perfect example of potential woody agriculture crop plants, already used traditionally, but virtually unimproved. Such plants exist in every region of the world, awaiting our attention.

Suggested Criteria for New Crop Species

In order to be most effective, the development of woody agriculture should proceed simultaneously in many parts of the world, with many different species of crop plants. It may be helpful to point out some factors which will increase the success of new woody crops.

• The crop product must be a fruit or seed which can be easily preserved and stored in bulk, in common facilities, like those for cereals and pulses. Perishable and fragile fruits are not desirable.

• The plant should be one which regrows rapidly and easily after it is cut down.

• Species which naturally grow in dense stands, or thickets, will probably prove more disease resistant when planted in

uniform fields than those which naturally grow widely separated from other trees or bushes of the same species. Thicket forming species may also be better adapted to growing well in crowded, competitive conditions.

• In order to develop a new crop species, it will be necessary to find or breed strains of the plant which produce seed at a very young age. I have found and bred hybrid chestnuts which produce pollen only 4 months after germination of the seed; similar precocity can be achieved in most species, but finding the most naturally precocious material to start with will greatly speed the process.

• It would be best to select potential crop plants from among large plant families. In this way access to much larger genetic variability, through inter-species hybrids, can be made available to breeders. Choosing a plant with no close relatives will limit the potential of the crop.

Time

Could woody agriculture be part of a planned response to the possibility of global warming? Certainly, but it is a practice with a very long lead time. My own optimistic guesses about how long it would take for extensive plantings of woody crops to make a significant impact on global CO_2 concentrations, provided an organized effort were mounted to make this strategy work, are as follows:

1. Time to identify regionally useful crop candidates and create working research plantings - 5 years.
2. Time to select first generation crop clones, and develop large scale production techniques - 10 years.
3. Time to make substantial first planting and bring them into production (1 x 10^6 hectares) - 6 years
4. Time for significantly large planting to be made and profitably managed - 10 yrs. (subsidized), - 30 years (unsubsidized).
5. Unforeseen circumstances - 10 years.

TOTAL 40 to 60 years.

Inevitably, this seems like an impossibly long time. However, when considering the slowness with which the globe reacts to any changes, this is actually quite a reasonable response to consider.

A significant factor on the side of using woody agriculture as a response to global warming is the fact that the other environmental benefits of the concept are so large that it is worth undertaking for those considerations alone, regardless of whether one believes in the inevitability of global warming. It should not be nearly as difficult to "sell" as cutting back on "development" and economic growth. It might actually be an important factor in making "sustainable development" a reality, rather than a hope.

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This paper was presented to a conference in Cairo, December, 1989 and was subsequently reprinted in : 80th Annual Report of the Northern Nut Growers Assoc., pp107-113. It is used here with the author's permission. Phil Rutter operates Badgersett Farm in southeast Minnesota, where he conducts research into commercial applications of woody agriculture. For a catalog of plant material or further information, write Rt 1, Box 141, Canton, MN 55922. On the Web: www.badgersett.com

"Gone Nuts..."

Creating a Legacy for Permanent Agriculture

Mollie Curry

Badgersett Research Farm (BRF) is an amazing, if unassuming, place. It doesn't look amazing—a birds-eye view would show 160 acres of well-used, somewhat hilly farmland, part of which is coming up with trees and shrubs in an organized-looking fashion—the amazement stems from knowing the incredible genetic potential represented in the plants themselves.

Phil Rutter, who started this whole enterprise almost 20 years ago in the southeast corner of Minnesota, is developing woody plants—specifically perennial nut crops like chestnuts and hazelnuts—as profitable food staples. His goal is to develop crop systems with "realistic scenarios for integration into the present world agricultural systems:" to co-create "perennial crops which can and will be adopted, for economic reasons." He's getting results that bring us closer to the goal of permanent agriculture every year.

For instance, the Badgersett hazelnuts could replace soybeans. Though at the moment hazelnuts are mainly used for candy bars, "hazel butter," and mixed shelled or crack-your-own table nuts, they could serve most if not all of the niches now filled by soybeans: as ingredients in human food, salad oil, animal feed, etc. Whereas most cultivated hazelnuts prefer

cool summers and mild winters and are highly susceptible to a serious blight, the hybridized Badgersett hazelnuts have proven exceedingly cold-hardy and disease-resistant, which greatly extends the area where they could be grown.

As for chestnuts, if you cloned one of BRF's prize trees into a field-full, it would produce more food per acre than corn, and

need replanting only once in a lifetime! The potential for Rutter's hybrid hazels and chestnuts to fit into an integrated polyculture designed to feed humans and animals is exciting! Rutter doesn't have to convince permaculturists that "woody agriculture" is easier on the planet than annual crops.

Rutter began serious nut-breeding experiments at Badgersett in 1981. He has since (with help) planted about 25,000 chestnuts; 50,000 hazelnuts; a patch of seedling shagbark hickories selected by Carl Weschcke for thin-shelled, larger-than-average nuts; an area of American (non-hybrid) chestnuts; and a plot of black walnuts representing the entire range of *Juglans nigra.* Active development of the hickories and walnuts is on hold while Badgersett focuses on hazels and chestnuts. All four of these genera of nuts hold a wealth of genetic diversity that remains relatively untapped in terms of breeding for human use.

Hazelnut Facts

Depending on how you count them, there are at least nine species, and many named and unnamed varieties of hazelnuts *(Corylus spp.),* ranging in origin over the entire temperate belt of the Northern hemisphere, from the west coast of North America through Europe and the Middle East across Asia to Japan. Hazels bear both male and female flowers on the same plant, are wind-pollinated, and are usually self-sterile, which means they need to receive pollen from another individual. What makes hazelnut breeding so exciting is that all hazels have been proven capable of interbreeding with the cultivated species, the European hazel! Breeders (and Phil Rutter is not the first) have mainly concentrated on crossing the European hazel with others in the genus, then selecting the best resulting plants and further breeding them.

The European hazel *(C. avellana),* also known as the edible hazel, has a long history. It was the first shrubby tree-type plant to appear in northern Europe after the last wave of glaciers receded, dominating the area for quite a long time: Pollen counts dating from 8,000 to 5,500 B.C. show that hazel pollen exceeded the amount of pollen of all other species by 75%!

These days, *C. avellana* forms the basis of commercial hazelnut cultivation throughout the world. About 65% of the crop comes from the Black Sea coast of Turkey—one of four areas of the world where *C. avellana* thrives. The most of the rest comes from parts of Italy and Spain bordering the Mediterranean, and from Oregon's Willamette Valley. Climate is a large factor in this: *C. avellana* prefers cool summers and mild winters in Zones 6-8.

Unfortunately, the European hazel, which has larger nuts and thinner shells than other hazels, is also very susceptible to eastern filbert blight (EFB), a disease endemic to populations of wild North American hazels, especially in the East. ("Hazel" and "filbert" are two names for the same thing.) The blight has prevented establishment of the European hazel in parts of this continent where otherwise it would flourish. EFB has now spread to previously uninfected Pacific Northwest orchards.

The Badgersett Hazels

At Badgersett, the hybrid hazels consist mainly of various crosses between *C. avellana* and the two North American hazels, *C. americana* (American hazel) and *C. cornuta* (beaked hazel). The natives—which evolved with the local weather and microbes—lend disease-resistance and cold-hardiness to their hybrid offspring. Instead of starting with pure strains of these different species, Rutter carefully selected from previously crossed and selected stock, building on the work of other dedicated nut breeders. The genetics of other *Corylus* species are also represented at Badgersett.

The results of years of breeding and selecting are finally becoming clear. As Rutter says in his newsletter: "It works. The hazels are a real crop." These hybrid seedlings are productive, disease-tolerant or resistant, and cold-hardy: a revolution in the hazelnut world.

Badgersett is also employing some revolutionary methods. For instance, the Pacific Northwest growers spend time and energy pruning the European hazels into tree form and keeping the ground below them clear so that their mechanical harvesters can come in and sweep the nuts up after they have fallen to the ground. Rutter doesn't fight the shrubbiness of his hybrids, but instead is developing a combine-like machine that harvests the nuts before they fall (they are ripe—and attractive to pests—before they fall out of their husks). Then the nuts are stored until the husks loosen and they can be threshed with another machine. If the hazel bushes get too big, they can be coppiced—cut right down to the ground—and they will quickly recover. Some have even borne fruit just 18 months after coppicing! This periodic coppice also serves to renew the plants, eliminating dead, weak, or diseased stems.

photos by Mollie Curry

Rows of hazelnuts

Hazelnuts grown in the Pacific Northwest are large because they have been selected for the table nut trade. However, in the European market, where hazelnuts are very popular in candy bars, there is a high demand for smaller nuts. The nuts on Badgersett's hybrid hazels are smaller than the West Coast commercial nuts, but are well within the range for commercial processing.

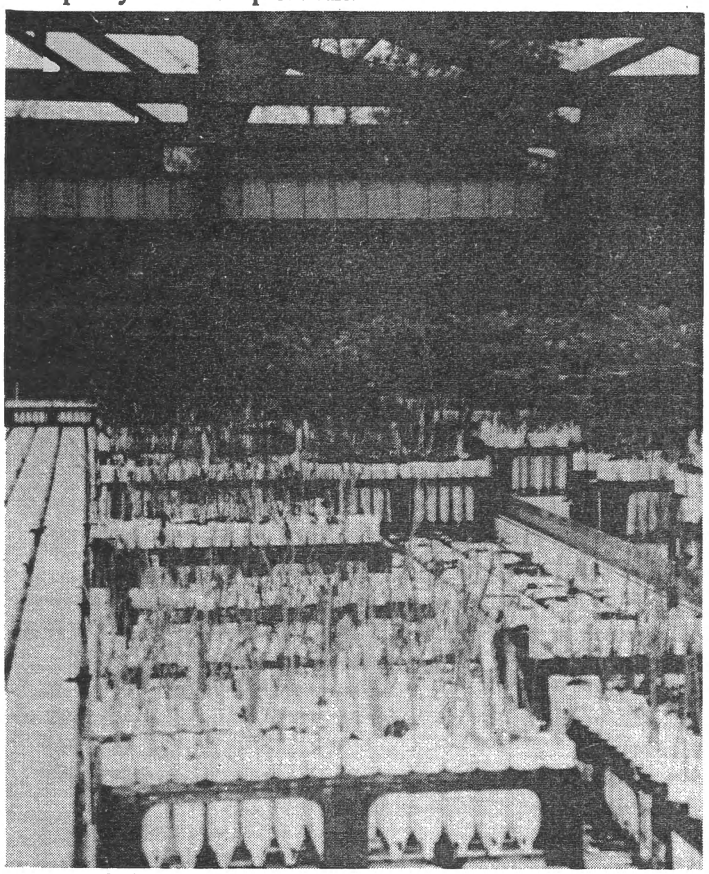
Seedlings being genetic individuals, they show variability from plant to plant in the size of nuts, as well as in shell thickness and growth habit. For instance, some bushes seem to have more nuts than leaves! Rutter even calls one bush the "cob" hazel, because its clusters of nuts are so big and long, like a corn cob. It has about 18 nuts per cluster, against the usual three to five.

As a group, the Badgersett hazels have experienced a 4°F. (-16°C.) freeze while in full flower and still made nuts! They can

survive being submerged at times, which makes them good for riparian areas and flood plains. They also seem to fare well in drought conditions.

Into the Marketplace

After several years of concentrating on research and breeding, in 1992, Rutter began commercial production and sale of his hybrid hazelnut seedlings. They are intended mainly for small or medium-sized plantings, since a group of seedlings (all genetic individuals, no clones) doesn't have enough uniformity for large-scale machine-harvesting. BRF is encouraging use of their hazels for hedges, windbreaks, living snow fences, wildlife plantings, and "pick-your-own" operations.



"Tubelings" are used to grow out hazels and chestnuts.

In the nut and fruit tree nursery industry, it is unusual to grow and sell seedlings; grafted clones are the norm. So why isn't BRF propagating their plants vegetatively? For one thing, the breeding work is still in process. For another, neither hazels nor chestnuts graft or grow from cuttings as easily as do many other plants. In fact, hazels are usually layered to produce more of the same cultivar (clones). With this method, there's a lot invested in the "stools" which comprise the nursery stock—it's hard to change cultivars if they aren't working out well. And, not least, coppicing is part of the plan for cultivation, and you can't coppice grafted bushes!

A Minnesota group is presently developing alternate rooting techniques for the Badgersett hazels.

Tissue culture, a lab procedure in which whole new plants grow from a few cells, is a good, flexible way of mass-producing plants, but the start-up costs are high. Rutter says that when the plants are ready for cloning, BRF will license that work to others. He is wary of creating large plantings of genetic clones that could suffer unforeseen disease or other problems, so he is spreading genetic diversity as more of the seedlings are tried out in different conditions.

Plenty of folks are excited about the hybrid hazels, and have been gobbling up the available stock. In 1998 BRF produced more than 60,000 hazel seedlings—the first time their supply met the demand. This followed several good seed years and BRF's increased ability to grow the seedlings in their greenhouse.

Chestnuts-Stories of Tragedy...

Perhaps you know of the former grandeur of the American chestnut *(Castanea dentata)*, source of the essential genetic material for the Badgersett hybrids. Astoundingly, the chestnut comprised one out of every four hardwoods within its range, which reached from Maine to Alabama, and through Tennessee, Kentucky, and southern Indiana to southern Ontario. In some sections of the Eastern Hardwood Forest, tall, straight chestnuts made up to 50% of the canopy. Tragically, in 1904, a deadly fungal blight, which had been accidentally imported from Asia, began killing off the highly susceptible American chestnut. By the 1940's, most native chestnuts had succumbed to the disease.

Not only had these trees been a staple in the diets of humans, bears, turkeys, deer, and other animals, they also produced beautiful and highly rot-resistant wood useful in many applications, from furniture to fenceposts (no need to use chemical preservatives). In testimony to their staying power, huge old chestnut stumps still endure in places, and even produce small trees from "stump sprouts—" some growing up from roots that are hundreds of years old. Unfortunately, almost all of these "young" trees die from the blight before becoming mature enough to produce seed. Some stands of large American chestnuts, probably planted, have managed to avoid the blight in the Midwest, but they are not particularly blight-resistant, apparently.

The decrease in food for wildlife and the loss of human quality of life as a result of the decline of the American chestnut are staggering. Though BRF's breeding efforts are aimed primarily at food and fuel production, Rutter was also instrumental in launching The American Chestnut Foundation (TACF), which supports returning chestnuts to the forests of North America. Their breeding programs in Virginia are producing chestnuts through backcrossing that are 15/16ths *C. dentata,* and 1/16th *C. mollissima* (Chinese chestnut), which provides the blight resistance that enables the trees to survive.

Though most Americans are now unfamiliar with what was once a fondly relished food ("roasting on an open fire"), chestnuts are still known in Europe and Asia as a delicious and useful food. Street vendors in France sell them roasted and hot to winter holiday customers. Fresh, they spoil easily, but can be dried, canned, frozen, or made into flour. Though considered a luxury in China, where most of the world's chestnuts are grown, they are nonetheless called "the rice that grows on trees," a name that acknowledges their potential as a staple crop.

Quite starchy, chestnuts are more like a grain in nutrition than other nuts, being low in fat (5%) and high in carbohydrates (40-45%). They are about 40% moisture and 5% protein. The protein is complete, and one cup of fresh peeled chestnuts contains 6.3 grams of protein.

They were once a staple in the diet of native Americans, while early settlers fed large herds of pigs and other livestock from the trees' profligate abundance. The passenger pigeon too, once a billion-strong in the skies over North America, was an avid feeder on chestnut mast. It is a matter of speculation whether the decline of the birds—extinct by 1913, may have contributed to

the subsequent weakening and sudden death of the chestnut forest.

...and Hope

Like the Badgersett hazels, the chestnuts at BRF are inter-species hybrids, mainly between the American chestnut *(Castanea dentata)* and the Chinese *(C. mollissima)*. The Chinese genetics lend blight resistance and larger nut size to the American trees, which are considered the best-tasting, and are much more cold-tolerant. Pure Chinese chestnuts freeze to the ground every year in southeast Minnesota (Zone 4), but the hybrids thrive. A variety of other *Castanea* species are also represented at Badgersett, including Japanese, "Manchurian," Korean, European, chinquapin, and sequin.

One of the most exciting results of BRF's chestnut trials is a group of "ultraprecocious" plants, all of which flowered within three months of germination of the seed! These plants are recognized and are being used as a powerful new tool in the quest to produce superior trees. They promise to shorten breeding cycles so that valuable crosses may be made and tested more quickly.

Of great promise for advancing commercial production is one short, spreading little chestnut that bears a remarkable quantity of nuts—the one that if cloned would theoretically beat out corn acre-for-acre. The catch is that, unlike most chestnuts, which bear both male and female flowers, this tree is wholly female. While this may have something to do with its prodigious nut production, the unfortunate fact is that it must be interplanted with trees bearing male flowers in order to set seed. Since chestnuts don't produce much pollen, the pollen-providing cultivars must be closely interplanted, reducing the overall yield per acre.

Still, this heavy-bearing plant could be part of the lineage of future highly productive chestnut orchards—a prospect that could reduce our current reliance on destructive annual tillage.

Though they are not yet as well-developed as the hazels, the hybrid chestnuts at Badgersett are still the best available anywhere for the cold climates of the upper Midwest. Rutter has discovered that they do not yet come as true from seed as the hazels, but many of them do closely resemble their parents. BRF sells them in three classes: nut-type, tree-type, and all-purpose. The nut-types are smaller trees with relatively large nuts; the tree-types are big trees with small nuts, and the all-purpose fall in the middle.

Nuts and Bolts

With the meticulousness necessary to good research, BRF keeps track of each individual tree or shrub, its parentage, its nut yields every year, its cold hardiness, disease resistance, ripening times, precociousness (fruiting or flowering early in life), shell characteristics, and more. This has only become possible with the advent of small computers, one of BRF's most important tools.

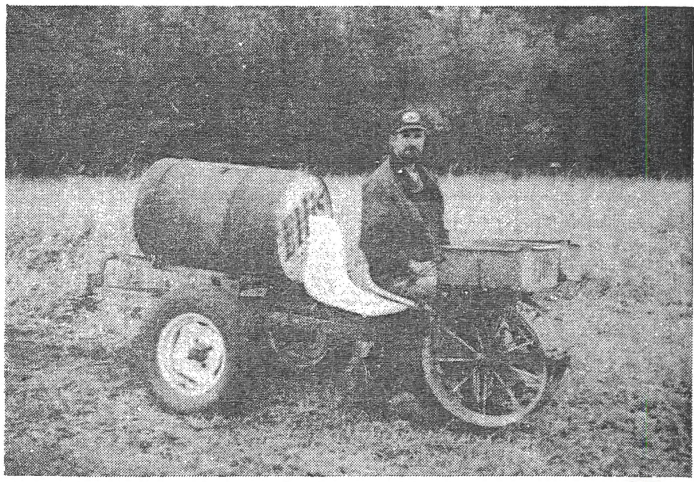
Other essential facilities include a greenhouse and a freestanding "screenhouse." Nuts being very concentrated and attractive food for many animals besides humans (birds, mice, etc.), the screenhouse is designed to keep pests out while the nuts are being stored, cleaned, and sprouted.

The greenhouse is jam-packed with seedlings on big rolling trays similar to movable library stacks. Everything is designed for function and efficiency: little space is wasted on aisles since you create the "aisle" when you part the trays. The trays allow the plants to be watered from below, ensuring a more even and thorough soaking.

The nuts remain attractive for quite a while even after the trees have sprouted, so seedlings must be protected as well. To reduce rodent and bird thievery in the orchards, BRF installed three tall dead tree trunks with some branches still attached as perches for hungry raptors.

After planting thousands of bareroot seedlings by machine, Badgersett switched to growing "tubelings" (seedlings grown in 6-8" tubes). Though these had to be hand-planted until recently, they can go into the ground anytime from late spring through autumn, an important advantage over the bareroot trees, which can only be planted in late winter/early spring. This year, in what has been a major technical breakthrough, BRF finally located a machine that would plant the tubelings.

The machine is an Ellis tobacco/vegetable transplanter discovered by Mark Shepard of New Forest Farm. Rutter is practically ecstatic to have it, as it greatly speeds the process of turning open ground into hazel and chestnut groves—it can be 50 times quicker than hand planting the tubelings.



Mark Shepard found this Ellis vegetable transplanter for BRF.

Making a Transition

Though breeding work will continue, a 1997 decision to begin nut production as rapidly as possible led Rutter to place 53 acres in the USDA's Conservation Reserve Program (CRP). While neither hazels nor chestnuts qualify for the CRP's cost-sharing program, participants still receive acreage payments for taking marginal land out of active annual agriculture. Putting erodable land into a CRP may be a way for some annual-crop farmers to try out Badgersett's hazels and chestnuts.

Rutter is very conscious of the need to encourage farmers to begin growing these new crops. He introduces the concept to local farmers while selling Christmas trees and cider produced on his farm. Shoppers are treated to nut-filled baked goods. They can plainly see the acres of trees all around: the hope is that they will become interested in growing some themselves.

Rutter has a broad vision of changing the face of agriculture by creating better alternatives to annual tilled crops: in fact, he left an academic career to put his ideas into action. Now, he's working hard to make woody agriculture economically viable.

If we are to reduce our reliance on the energy-intensive, soil-destroying cultivation of annual crops, we need dedicated, meticulous, thoughtful pioneers like Phil Rutter and his helpers at Badgersett to provide us with plants that are up to the task.

Resources

The American Chestnut Foundation, 469 Main St., PO Box 4044, Bennington, VT 05201. 802-447-0110; email: chestnut@acf; web: http://chestnut@acf.org.)

Badgersett Research Farm offers a catalog of hybrid hazels and chestnuts at their website: www.badgersett.com, or write Rt. 1, Box 141, Canton, MN 55922. Mollie Curry is associate editor of The Permaculture Activist.

New Forest Farm

Mark Shepard is a man of enormous vitality, which is well, because he's taken on a big task. With the help of his family and the support of a financial partner, he's attempting to turn a sorry piece of worn-out Wisconsin hill land into a lush regenerating forest farm. He aims to make a living at it, and you know—after being with him for a few minutes—that he's darn sure gonna have fun doing it.

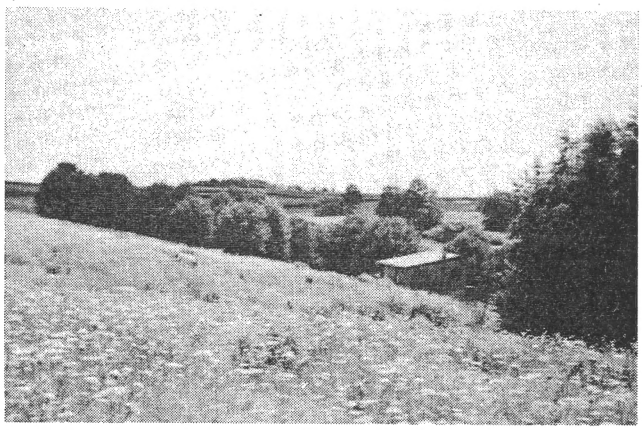
We met in a fit but completely unexpected setting, a banquet celebrating the 10th anniversary of C.R.O.P.P. (Coulee Region Organic Produce Pool), the nation's largest and oldest organic producers' cooperative. Mark is the vegetable pool coordinator for CROPP, and when we contacted him on our way through southwest Wisconsin last summer, he was one foot out the door to the biggest social event of the season. "Meet us in LaFarge, you can come as our guests," he offered. And so, with little further ado, we were swept up, along with parents, mother-in-law, a pair of interns (both named Josh), wife Jen, and two precocious future farmers, sons Eric and Daniel, in a noisy whirlwind of congratulatory speeches, the clatter of wine glasses poured and emptied, and boisterous applause. Mark filled our ears with the story of CROPP (which was also droning on in the background with slides and folksy stories from the podium). Reports of dry weather and harvest and organic farming banter, family history, and above all the story of his ambitious project: New Forest Farm, rolled seamlessly off his muscular tongue between bites of dinner, while from across the school gymnasium—where we sat among 200 growers, employees, family, and guests—an unending parade of local teenagers and grandmothers carried steaming bowls of broccoli, platters of rare roast beef, and more luscious local fare to our table.

If you wanted to secure your future as a small farmer, the upper Midwest, with its tradition of progressive and cooperative politics, offered a better hope than most parts of the country, Shepard opined. Here in the middle of the Driftless Region (so-called because unlike most of the surrounding six states, it was never glaciated)—with its rolling hills and beech-maple woods reminiscent of New England—cheap farmland, and good access to markets lent further support to an ambitious start-up strategy. Wisely, Mark had plunked himself down in the epicenter of this region's revival, the organic cooperative that was paying for our dinners.

The picture in the Driftless Region hadn't always been hopeful. CROPP grew out of the farm crisis of the '80s when so many farmers went bankrupt, or worse. Always marginal in the era of big fields and commodity monocrops, the area's small dairy and mixed farming operations struggled under the dual oppressions of high interest and low prices. What was different here from many other parts of the country was the work of the National Farmer's Organization (NFO). Going beyond the politics of lobbying Washington, local farm activists organized a producers cooperative to secure better markets for their dairy products. Ten years later, the cooperative brings $27 million a year into the local economy, CROPP, under its Organic Valley label, markets high quality organic produce, cheeses, eggs, meats, and value-added products from Wisconsin to buyers all over the nation and as far away as Japan.

Our curiosity and Mark's enthusiasm took us out to the farm the next day. As we roamed over a rolling, windswept landscape, he told us the story of the place and of his dream. —*Peter Bane*

photos by Peter Bane



Mark Shepard

In 1993, three unlikely partners met at a Permaculture design course at the Central Rocky Mountain Permaculture Institute in Basalt, Colorado. From their conversations was hatched the idea of a large-scale permaculture farm.

The concepts of Permaculture design have been implemented successfully for years on homesteads and in remote villages across the globe. What had not been done before was the conscious construction of a farm-scale permaculture in the U.S. Many rotational grazing operations come close because they operate with low energy inputs, and so are more sustainable than annual chemical and tillage farms, but to our knowledge, no one had yet assembled a large multi-storied agricultural ecology that included trees, vines, shrubs, forbs, root crops, livestock, and wildlife.

With this in mind, we purchased 106 abused acres near Viola, Wisconsin in 1994. The land included approximately five acres of woods; the rest was heavily grazed pasture with an occasional large, open-grown tree and a few scattered young trees that had somehow managed to escape the devastation. All over the farm, the turf had been grazed as close as a golf green: roots from the sods went no deeper than six inches, and the forest floor was bare earth that had been heavily trampled by cattle.

Starting with beat-up land posed challenges: building soil fertility, etc., but it kept our purchase costs lower, eliminating any need to clear forest. It also put us on a sound ethical basis: we are restoring a degraded landscape, returning it to health, vigor, beauty, and productivity. I recommend this approach to all aspiring permaculture farmers. Poor land has often not been as heavily chemicalized as more fertile soils.

In the spring of '95, our family took up residence on the farm, and we began to implement the permaculture design. Our original plan called for the three partners to share the property, but before we bought the land, one dropped out, while our other partner, Rand Burkert, moved to Italy, where he lives on his wife's family farm. Though Rand has never lived here, he continues to support our project fully. Without his financial cooperation, this would not have been possible for us.

Market Garden

In the middle of the farm is a gently sloping peninsula running roughly east to west. If fully utilized for market garden it would afford us close to five cultivated acres. By 1998 we had brought four of these acres into production. The gardens have been laid out in contour strips to minimize soil erosion. We have built fertility in our worn-out pasture soils by planting cover crops of Alsike clover, field peas, and triticale. We have also brought in hay, sawdust, and other rough material for mulch. These are conventional organic fertility strategies, adapted for our area. But we have gone further in planting peashrub and black locust as a nitrogen-fixing windbreak hedge. Interplanted with these legumes are wild plums that we will eventually top-graft to more marketable varieties of cold-hardy plum. The hedge will provide habitat for pest predators including birds and beneficial insects. We plan to integrate poultry as fertility cyclers and insect predators into our garden system when we are ready to handle them. This will mean harvesting the birds too.

We have established a commercial planting of asparagus which is beginning to yield significant quantities for home consumption. Next year we expect to market asparagus. Other perennials we have introduced to the market garden zone are red raspberries. This block planting of cold-hardy varieties is intended as a propagating bed that will allow us to spread the berries to the orchard, savannah, and timber zones as understory interplants.

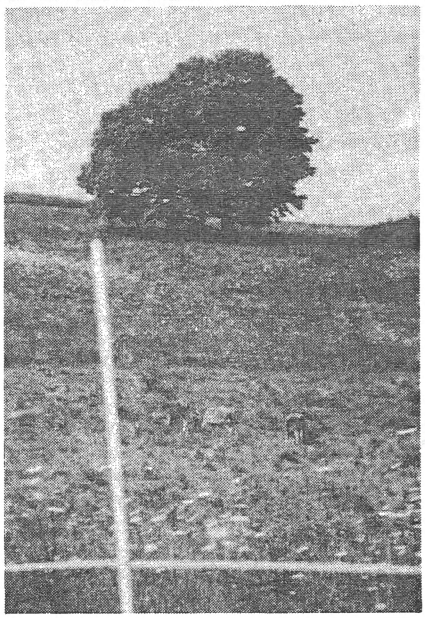
We have had good success (and quite a few failures along the way) with pumpkins and squashes, cucumbers, beets, cabbage, carrots, sweet corn, green peppers, and zucchini, all marketed through CROPP. By our third year, 1997, we showed a significant profit on vegetable operations: enough to pay the taxes and buy some new farm equipment, more trees, and organic fertilizer for the first time. Δ

Forage Savannah

Southwest Wisconsin at the arrival of Europeans was a unique place: truly a crossroads of biology. The forests typical of northern Wisconsin existed in suitable microclimates here as did the eastern hardwoods, tallgrass prairie, and oak savannahs. Desert plants such as cacti were found here as well as arctic flora.

At New Forest Farm, about 30 acres of grassland is punctuated by huge, open-grown trees: maple, basswood, and a few oaks. It is quite possible that these trees are old enough to be pre-settlement survivors. The main inspiration for the forage savannah are three enormous white oaks spaced approximately 60 feet from one another. This spacing has allowed the trees to grow to their maximum spread, while enough light passes between them to support a grassy understory. Starting from these trees as the nucleus, we are creating an artificial savannah (artificial because we do not intend to restore a native savannah ecosystem), an analog with marketable and useful species occupying the available niches.

As a part of this, we have planted a rotational grazing system on ten acres with white oak as the "key" tree species. The oaks are planted on contour 60 feet apart in 60-foot wide rows. We have plowed furrows on keyline contours just uphill from the trees to move water from the valleys out toward the drier ridges. Heavy rains immediately after the contouring proved the value of our work. Nearly 18" of rain fell in two months yet not a drop was lost!



Savannah is a native Wisconsin ecosystem.

Between the long-lived and slow-to-mature oaks we have introduced smaller and faster-growing species with the emphasis on livestock forage. In 1995, we planted 100 white oaks, along with 50 American x European hybrid chestnuts *(Castanea dentata x sativa)*, 200 honey locusts *(Gleditsia triacanthos)*, and a smattering of nut trees that probably won't survive in this climate. Two years later we planted Siberian peashrub *(Caragana arborescens)* around the oaks to supply nitrogen. We have also planted several hundred hybrid poplars *(Populus sp.)* at the upper edge of the savannah to serve as a windbreak for the market garden and to trap snowdrift and windblown debris to enrich soil and recharge groundwater in the area.

Permaculture texts describe the establishment of systems such as these, and their long-term productivity is tremendous. One problem we have already discovered that is not mentioned in the Pc texts is that of plant succession. Mollison and others claim that livestock should not be introduced into these systems for five or more years. However, in this climate, if we waited that long to reintroduce the animals, the quality of the grasslands for grazing would have declined greatly as woody plants, brambles, and pioneer trees colonize fallow land. We are solving this problem by installing movable, solar-powered electric fencing. This will protect the trees from livestock and will allow us to rotate the animals through the pasture. We have also cut hay from this section in order to arrest the succession of woody plants.

Future species to be planted along the contour rows include mulberry *(Morus spp.)*, hazel *(Corylus spp.)*, more Siberian pea, autumn olive *(Eleagnus umbellata)*, and apple. A winter yard for livestock will be planted with honeylocust as the dominant tree because it bears its highly nutritious pods late in the season. The long-term livestock plan calls for cattle (analogous to the extirpated native Bison), hogs following the cattle, and turkeys following the hogs. These animals will all benefit from the tree crops in addition to the forage between trees. Δ

Five Micro-Regions

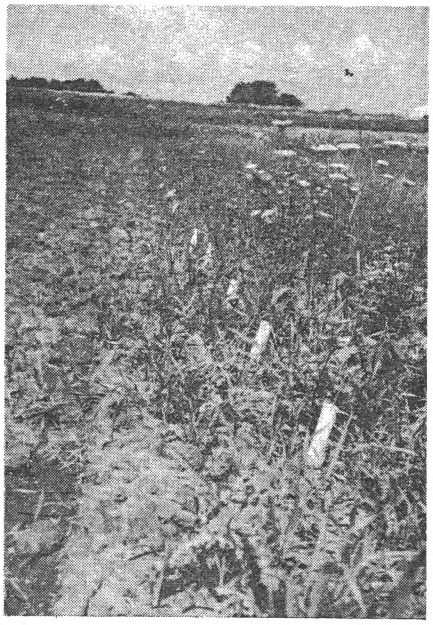
The Permaculture design for New Forest Farm (NFF) is essentially an extension of what natural order remained on the farm when we arrived. The landscape is made up of five ecotones blending one into another with no hard boundaries. These five micro-bioregions are woodlands, savannah, open pasture, a permaculture orchard (which includes our family residence), and a market garden for annual vegetable production and income. While modeling the natural ecosystems of this place, we have planned for a succession of economic yields over time. The market garden is bringing income from annual crops, while the orchard plantings mature. In a few years fruits and nuts will provide a major part of our income. We are raising three beef steers on the forage savannah now, primarily for our own use with a little extra meat sold to cover some costs of feed and butchering. But in another five years the forage plantings will support a more extensive (and profitable) livestock operation. The woodlands will not yield much money over the next 20 years, but we will have fuelwood, some construction timber, mushrooms, and other non-timber benefits from them during that period. As the present plantings begin to mature, we will thin the woods to release superior trees. By 30 years out, when the boys are raising their own families, the maples we have planted should be producing enough sap to support a sugaring operation. And from there on it's continuous yield.

As with natural ecosystems, permaculture systems have many niches to be occupied—often more than we have expected! In keeping with the ecological model, we believe there are more human niches available here too. Some of the obvious are those of forester, market gardener(s), orchardist, nursery operator, grazier, egg flock keeper, shepherd, cut flower grower, plus others we might not be aware of yet. In the past we have cooperated with groups and individuals whose roles in life fit into the farm ecosystem in a mutually beneficial manner. Instead of the traditional landlord/tenant, employer/employee, or expert/intern relationships, we have encouraged more ecological links, offering opportunities for individuals to create their own agricultural enterprises within the system. Our two "interns" this season are actually managing their own small-scale truck gardens, selling the produce directly to CROPP. We welcome the appearance of other cooperators as new economic niches open up. NFF will ultimately support a number of livelihoods; even our whole family can't possibly fulfill all the income potential of this landscape.

New Forest Farm is an infant. Its life cycle, however, is long. With species such as oak and maple living longer than 300 years, a "simple" crop rotation could take 1500 years to complete. I certainly don't

Forest

To the west of our house is a five-acre remnant of the woodlands that once existed on the farm. In the first year after cattle were removed, a layer of organic matter began to accumulate. This young forest, which is recovering from logging in the early 1970s, has been "fattened up" with plantings of oak, hickory, and maple from seed. A few specimens of white pine were planted the first year as well as the shade-tolerant eastern hemlock *(Tsuga canadensis)*. Some 40 acres of the farm have been designated as a forest recovery zone. Half of this is north-facing slope which we planted to sugar maples *(Acer saccharum)* in 1995 for a future "sugar bush."



Tree tubes protect future forest plantings.

Succession of the forest will be guided somewhat over the years by the planting of trees, the creation of mulch-catching wattles, and selective thinning to achieve a maximum density of healthy trees, with the emphasis on maintaining a steady supply of fuelwood, building materials, wild edibles, and wildlife habitat. We have adopted forest management techniques as described by Orville Camp in his writings on Uneven-aged Natural Selection Ecoforestry (see *Restoration Forestry*, Pilarski, 1993)—in simple terms, "leave the best, take the rest."

In the area of the future sugar bush, more northern species have been planted both to take advantage of and to create a northern microclimate: white spruce *(Picea glauca)* on the uplands, and balsam fir *(Abies balsamea)*, white cedar *(Thuja occidentalis)*, and white ash *(Fraxinus americana)*, in the wet areas.

To the remaining 20 acres, we have added 500 black walnuts *(Juglans nigra)*, 100 or so Quaking aspen *(Populus tremuloides)*, Ponderosa Pine, Douglas Fir *(Pseudotsuga menziesii)*, White Pine *(P. strobus)*, Black Locust *(Robinia pseudoacacia)*, and others. Moisture-loving species—Basket Willow, Biomass willow, Eastern Cottonwood *(Populus deltoides)*, and Black Alder *(Alnus nigra)*— were planted in low areas.

Many of our early tree plantings were put in without tree guards. These plastic sleeves are designed to prevent rodents from eating young seedling trees. Textbooks say that if you plant trees and ignore them, you can expect that 30% of them will survive to maturity, the early years being critical. At first a 30% survival rate didn't seem all that bad, but as we have seen how much money and labor goes into tree planting, we have decided that a 30% success rate is no longer acceptable. Now we are using tree guards (rather than rodent poison) on all our new and surviving old plantings.

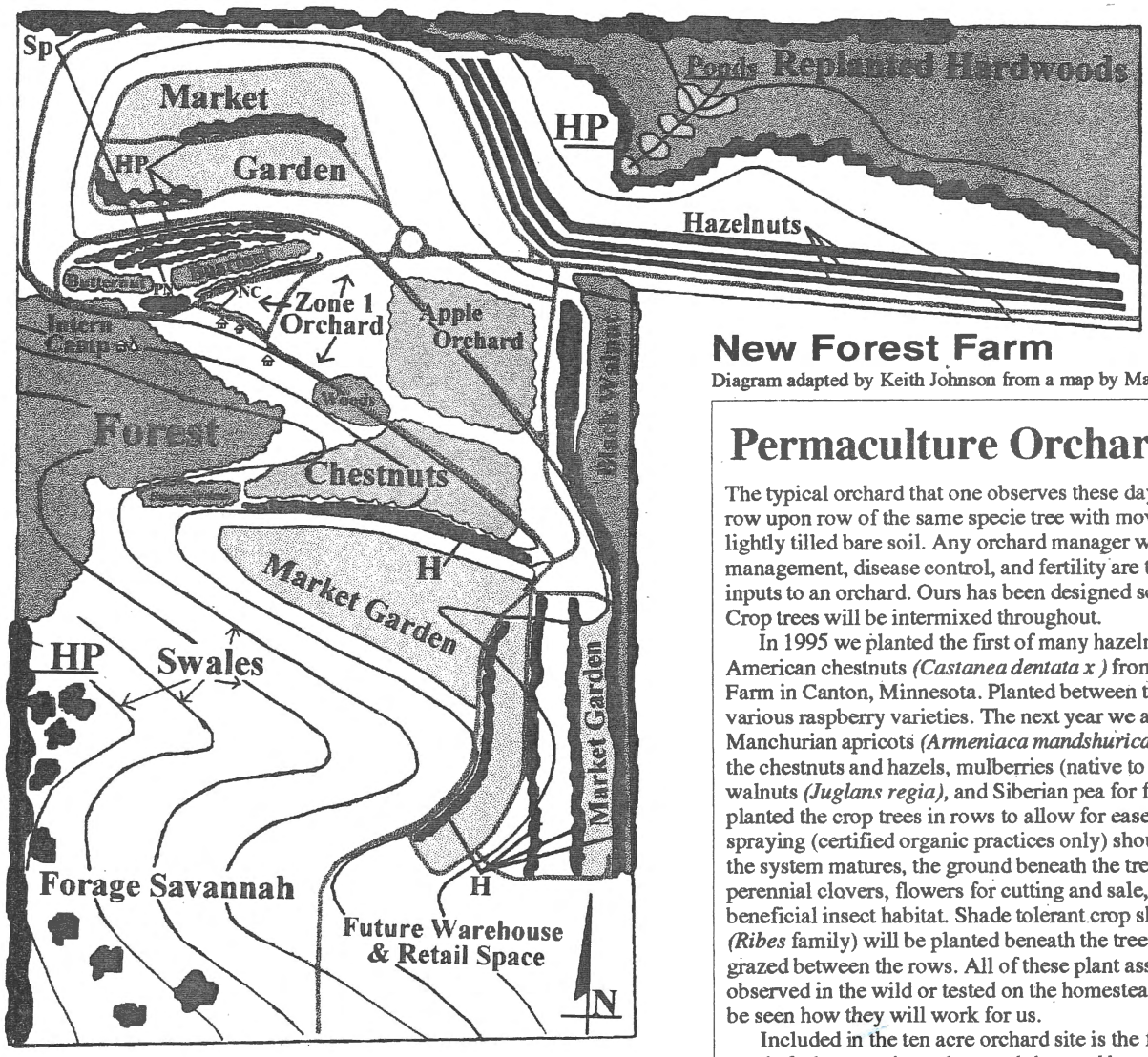
Along an eastern fence line, we have planted a dense block of black walnut, partly for privacy, partly for a windbreak, but mostly as a chemical interception barrier. The neighbor to the east, I must give him credit, is one of the best chemical farmers that I've ever seen. By my observations, he always applies his chemicals properly, under the correct conditions. Nevertheless, we are planting a barrier to protect both our market garden areas, and our tree plantings from accidental chemical drift. Badgersett Chestnuts have shown a particular sensitivity to herbicide drift, which was the cause of a recent crop failure at their nursery.

Because the black walnuts grow so slowly, we have added about a thousand hybrid poplars along the western edge of the walnut planting to form a fast-growing screen. Since the wood from hybrid Poplar is nearly useless at this time, we treat them as sacrificial trees. They are the front lines, so to speak: inexpensive, easy to propagate, quick to grow. They will extract tons of CO_2 from the atmosphere, begin to change the pasture soils into forest soils, and their large leaves and many branches stand in the way of any moving cloud of chemicals.

Many years worth of reforestation remain ahead of us. Sugar Maple will continue to be planted in the "sugar bush." Red and White oaks, and Shagbark Hickories *(Carya ovata)* in large quantities will be planted along with smaller numbers of Red Pine *(P. resinosa)*, White Pine, Eastern Hemlock, American Beech *(Fagus grandifolia)*, Black Cherry *(Prunus serotina)*, and... Δ

expect to live that long, and perhaps the project won't even last half that long…time will tell. What we will learn in our lifetime will be of tremendous benefit to humankind and to the earth as well. To live in a mutually beneficial relationship with our life support system, Earth, is a lesson we all need. Perhaps our work will inspire others to do the same. Perhaps conventional farmers will see the wisdom in our methods (if there is any to be found) and in 100 years this whole continent will be scattered with permaculture farms within a wilderness matrix. Δ

New Forest Farm, PO Box 24, Viola, WI 54664.
<marksh@organicvalley.com>



New Forest Farm

Diagram adapted by Keith Johnson from a map by Mark Shepard

Open Pasture

On one ridge of the farm we have approximately five acres of sandy loam soil, some of the finest in the county. This patch borders the woods, the forest recovery zone, and the homesite area. We have left it unplanned in order to reserve future choices for ourselves, and to allow Nature to surprise us. It is now in open prairie, though not in native species. Bobwhite quail, bobolink, meadowlarks, and other grassland birds nest there. Prairie falcons, eagles, and owls hunt there as well as coyotes. This area, because of its excellent soil and flat topography would be the best location to harvest hay, should we choose to go that route. If we should want to grow grains for market, this field would be the likely place to do it. If the yields of the savannah system exceed our expectations, we might create one on this ridge as well, or the orchard or woods could expand into it. Until we have made deeper observations of our system, and tested some of our ideas, we are content to leave this ground in prairie. Δ

Permaculture Orchard

The typical orchard that one observes these days is a monocrop of row upon row of the same specie tree with mowed grass beneath or lightly tilled bare soil. Any orchard manager will tell you that pest management, disease control, and fertility are the biggest energy inputs to an orchard. Ours has been designed somewhat differently. Crop trees will be intermixed throughout.

In 1995 we planted the first of many hazelnuts and hybrid American chestnuts *(Castanea dentata x)* from Badgersett Research Farm in Canton, Minnesota. Planted between the chestnuts are various raspberry varieties. The next year we added 300 apples, 100 Manchurian apricots *(Armeniaca mandshurica)*, another 100 each of the chestnuts and hazels, mulberries (native to the site), Carpathian walnuts *(Juglans regia)*, and Siberian pea for fertility. We have planted the crop trees in rows to allow for ease of harvest and for spraying (certified organic practices only) should that be required. As the system matures, the ground beneath the trees will be planted to perennial clovers, flowers for cutting and sale, as well as for beneficial insect habitat. Shade tolerant crop shrubs such as currants *(Ribes* family) will be planted beneath the trees and sheep will be grazed between the rows. All of these plant assemblies have been observed in the wild or tested on the homestead scale. It remains to be seen how they will work for us.

Included in the ten acre orchard site is the family residence, a south-facing, passive solar, earth-bermed home with a roof catchment water system, alternative toilet, earth-tube air conditioning, and solar electric power: over 1200 square feet built for less than $10,000. Around the home is the kitchen garden, a chicken coop, an extensive windbreak planting, and a grove of over 100 butternuts and Nanking cherries *(Prunus tomentosa)*, with room for more. We intend to establish a windbreak of Limber pine *(P. flexilus)*, an extremely cold-hardy edible nut pine, to the windward side of the house, and to take advantage of the needle mulch and acid soil conditions that the pine create to sustain plantings of blueberry *(Vaccinium corymbo-sum)*, cranberry *(V. macrocarpon)*, strawberry, and lingonberry *(V. vitis-idaea minus)*. Immediately to the north of the house will be a Buartnut *(Juglans cinerea x ailantifolia v. cordiformis)* grove and an arboretum of useful, cold hardy trees, shrubs, and vines.

Our long-term plan for the orchard is to create a multi-storied, mixed species system that is still easy to harvest commercially. Apples will form the canopy layer, with grapes to the sunny side of the apples, and currants to the shady side. Herbs and flowers for cut harvest appropriate to the sunny and shady microenvironments will provide groundcover.

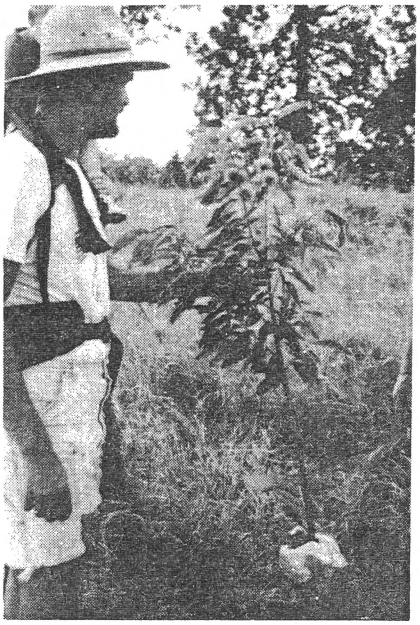
continued, next page—>

Permaculture Orchard, continued

In order to allow adequate air circulation and sunlight penetration, the lanes between the rows of apple trees needed to be 20 feet wide: room for a row of grapes, a row of currants, and a tractor laneway between the apples. The risk for us is that if the multispecies concept does not work, we have planted ourselves into a bind, as there will not be room to plant additional rows of apples and still have tractor access. It was quite terrifying to plant trees in a way that could very well prove economically disastrous ten years from now!

A more experimental planting involved double rows of apples with no vehicle access. Siberian peashrub was interplanted to provide additional nitrogen to the apples and to yield a high-protein seed crop to be harvested by poultry on range in the orchard. The birds will also provide pest control. As these apples mature, sheep are likely to be introduced to the system as grazers.

On the opposite slope from the apple orchard, chestnut plantings continue to expand. An extreme cold snap (-52°F) in the winter of 1995 froze the tops of our early plantings, but most of the trees sprouted back from lower on their trunks. Planting of 200 more hazels will follow establishment of the chestnuts in this area.



A precocious Badgersett Chestnut

We have continued to plant apple rootstocks and to graft them to over 40 disease resistant varieties of apples.

Of major import for forest farming as a practice has been our demonstration (in conjunction with Phil Rutter of Badgersett Farm, MN) of successful mechanical planting of hazel seedlings. Using a vegetable transplanter manufactured by D.R. Ellis of Verona, Wisconsin, we put 300 hazels in the ground in 20 minutes last summer. The results were nearly perfect and the savings in labor is revolutionary! Hand planting of these trees would have taken 50 times as long. The promise of this technology could be the future of the American farm. We have shown that it is possible to establish woody agricultural systems quickly and at relatively low cost. We are excited to imagine soon planting the entire open acreage of New Forest Farm to Chestnuts and hazels as a commercial crop. Δ

Rainforest Regeneration

Ernst Götsch and his family live amongst a remnant of Atlantic rainforest in the south of Brazil's Bahia province, where he has refined a model by which abandoned pastures and badly degraded soils can be brought into high productivity as diverse agroforests in a period of five to eight years. Matt Kovacs, who worked alongside Ernst in his forest, summarizes the basic principles and methods of this system.

Matt Kovacs

Ernst's experimental agroforest is located in a region of Bahia which used to be Atlantic rainforest, but is now significantly altered by timber extraction and shifting agriculture, primarily cultivation of manioc *(Manihot esculenta)*. The site was selected because of two main features, firstly for its classification as "poor soils," and secondly for the presence of one of the last stands of primary Atlantic rainforest in the region.

The terrain was formerly occupied by small farmers who raised pigs in the lowlands and cultivated manioc on the hill slopes. There was an historic trend toward ever decreasing productivity, and in the small farmers' words, "poor soils."

When Ernst and his financial backer, a Swiss architect, made the decision to purchase and repair the land, the small farmers had left the area.

The site is characterized by two main soil types: ullisoils, which predominate on the slopes and hilltops, and oxisoils, which predominate about the creeks. Both soil types are very acidic, with pH readings of 5.0 and 4.2 respectively. The climate is characteristic of tropical premontane moist forest with an evenly spread average rainfall of 1400mm, and average temperatures of 25° C. in January and 20° C. in July.

Learning by Trial and Error

Ernst has lived 15 years in the humid tropics, developing his system by a process of trial and error. When he started repairing these spent soils, he found that his previous methods of agroforestry were inadequate. He worked initially to improve these impoverished soils by planting four pioneer species known to do well in the region, manioc, cowpeas *(Vigna sinensis)*, *Erythrina sp.*, and *Inga sp.* Of these, only manioc managed to establish itself, and poorly at that.

Amongst these introduced species grew native pioneer species, from which Ernst selectively removed only the grasses, herbs, and vines whose ecological niches could be replaced by cultivated species. All other native herbs, trees, and palms were allowed to grow, fulfilling their function in soil improvement.

Ernst found the cultivated plants grew well in the presence of the native species, this is how he came to the practice described as "selective weeding."

Ernst now takes full advantage of the biological and genetic potential of the native flora and fauna, which occur spontaneously on the plots. If properly managed many native plants growing spontaneously make excellent companion plants to crops, as they are naturally well adapted to the existing edaphic (soils) conditions. When immature they stimulate the growth of the crop species and fend off pests and diseases, as well as protecting and ultimately improving soils.

After two years of selective weeding, Ernest observed that the cultivated plants were exhibiting signs of decreased growth, and it appeared that the maturing native shrubs and trees were now inhibiting the growth of the crop species, primarily cacao, banana, and pineapple. This proved to be the key, as once the maturing pioneer

shrubs and trees were cut back entirely—if being substituted by crop species—or pruned, by removing all mature plant parts or thinning out crowns by 50-60%, the entire plant community was invigorated, and burst into a new phase of rapid growth. This is how Ernst came to his conclusions about forest regeneration.

Selective pruning has many effects on the agroforest which are summarized below.

• Growth rate of the entire plantation is accelerated by rejuvenating maturing plant parts presumably releasing chemical or other signals to neighboring plants.

• The cut material of pruned plants is placed on the ground, in contact with the soil where possible, (especially the woody material), along the contour, where it acts as mulch.

• Soil texture is improved, and earthworm and other soil organism numbers dramatically increase.

• The future generation plants are given more light, space, and stimulus to grow.

• Pruning serves as an effective instrument for speeding, and directing species succession by the possibility it offers to influence the growth parameters of individual plants.

• Periodic rejuvenation of plants by pruning prolongs the life of short-lived species, thereby enhancing their ability to improve soil.

Species, Diversity, and Timing

When the cacao trees first began to bear fruit, Ernst noticed that the sites with poorer soils were more productive than those with richer soils. On richer soils, the crop species grew vigorously in the shade of the native and introduced trees for the first three to four years, but when those trees began to mature and as they were cut back, the cacao no longer bore fruit, while the bananas died back, both exhibiting signs of increased susceptibility to pest and insect attack. But those plants that were in the shade of a transitional to primary forest tree remained healthy and highly productive.

On the plots with initially poorer soils neither banana or their native counterparts established themselves. This provoked Ernst to plant, at a high density, a large number of species known to do well under these conditions. Planting leguminous pioneers, fruit, nut, and timber species, Ernst ensured himself of medium- and long-term yields. This approach proved highly fruitful, but only where the bigger individuals of the already established vegetation were pruned or cut back before introducing the new species. Subsequently, the whole plant community began to thrive and now represents the most productive parts of the plantation.

It therefore appears that the "critical factor in determining the health, growth rate, and productivity of the system was not the initial quality of the soil, but rather the composition and density of individuals of the plant community, and a pattern of successive removal of maturing plant parts."

Ernst also observed the importance of the order in which crops are planted, whereby those that were planted at that time when they could come to dominate the community, established and grew vigorously. It can be generalized that, if in the following succession:

1. herbaceous annual and short-lived perennial pioneers (1-2 years)
2. pioneer trees (4-6 years)
3. pioneer, transitional-to-primary forest species (20-80 years)
4. primary forest trees, (200 years),

each species is introduced when the preceding one is established and commencing its phase of vigorous growth, that a succession of dominance of the respective species will optimize the potential for the growth and health of the community. If the four representatives of the succession are introduced simultaneously the transitional-to-primary forest trees are likely to have difficulty in establishing themselves.

Ernst thus perceives the critical factor for a plant's establishment and healthy development as not so much the factor of light, but the order and timing of its introduction in the species succession. The above observations suggest that "species succession is one of the driving forces in natural systems." (Götsch,1992). At present, Ernst has come down to planting trees, in new plots, at a distance of about one meter from each other.

Natural Succession in Soil Recovery

In nature, the recovery of depleted soils may take many human generations, but can occur much faster—well within the life of a human. The critical factors Ernst sees in determining the time in which natural soil recovery occurs are:

• composition of the plant community,

• the order in which species are established,

• the timing of the appearance of these species for each dominating cycle,

• the nature of their interactions with microorganisms and wild animals,

• and climatic factors.

Ernst has evolved strategies for accelerating the process as follows. Firstly, identify the optimal species, guilds, and successions of guilds that occur in similar soils and climates. Plant these species, or their crop substitutes in their respective guilds. Secondly, introduce species that have beneficial effects on the soil and which help keep unwanted insects from the crops. Thirdly, identify optimal timing for the initiation of each successional cycle, ie., the planting of a new guild, so that each species will find optimal conditions in which to grow and finally dominate and drive the community. Fourthly, accelerate the growth rate and succession by pruning and removing plants once they begin to mature and have accomplished their function in improving the soil and setting conditions for the next generation.

Conclusion

Of critical importance in the development of sustainable agriculture such as agroforestry systems, natural soil recovery and reforestation is the comprehension and modeling of natural species succession. In order to apply the Götsch system to other regions of the planet, an intimate knowledge of the regional ecology is required. Many older members of rural communities and small farmers are well versed in the ecology of their regions. They still have vestiges of the knowledge their ancestors had of the use of plants for food, medicine, construction, and so forth.

In natural soil recovery the dominant species in the succession are generally ones which have a high lignin content and produce small seeds and large amounts of organic matter that does not readily decompose. Once these species have died they are replaced in the next cycle by species with a higher protein content, and whose carbohydrate, instead of being fixed primarily in lignin, is also stored as starch or sugar. As a result, such species are preferred by animals, as they often have many larger fruits and seeds, and are overall characteristic of a lusher vegetation. This natural process of succession is favored and accelerated by the effects of herbivores, wind, lightning, and flooding, and is duplicated in Ernst's agroforests by the above described practices such as selective weeding and pruning.

Reference

"Species Succession in Agroforestry and Soil Recovery." Ernst Gotsch, 1992.

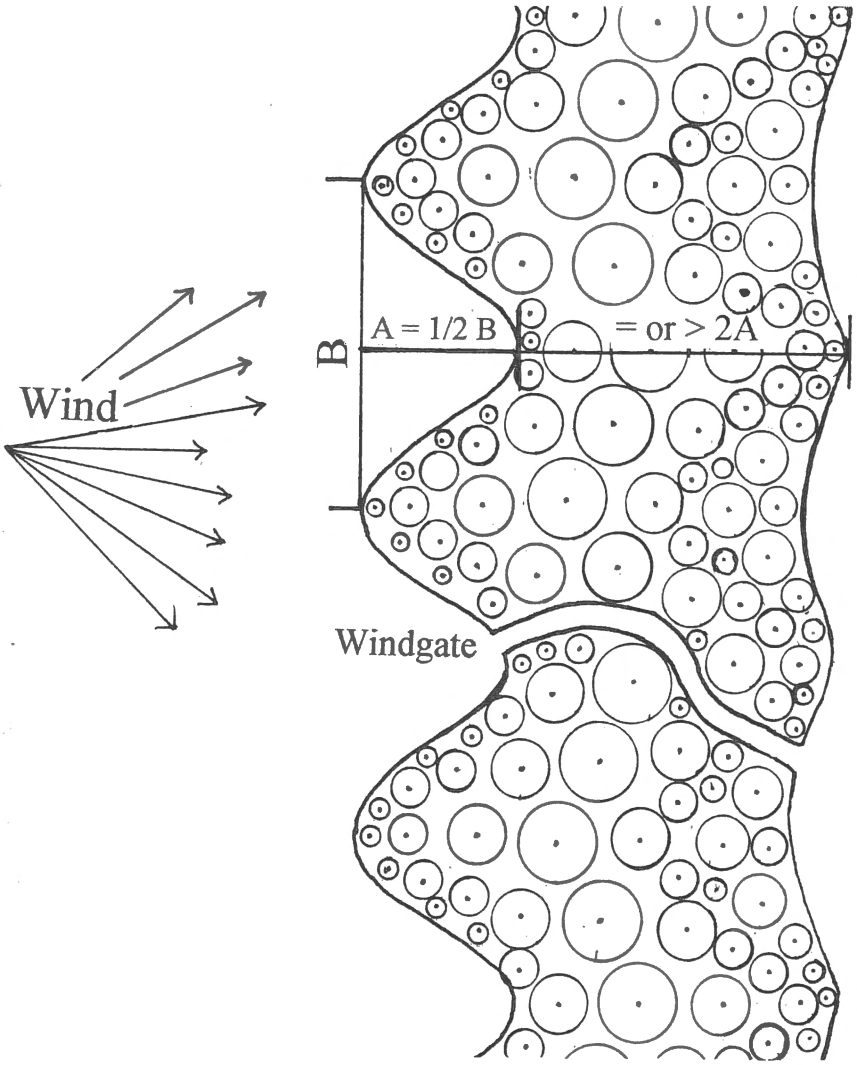
Ernst Götsch, Fazenda Tres Colinas, Agrosilvacultura LIDA, Pirai do Norte, BA 45436-000 Brasil.

Matt Kovacs is a Australian permaculture teacher and designer.

The Crenelated Windbreak

Christopher Meuli

Wind is a dynamic force, capable of constant changes in direction and velocity. Several years ago I was walking along a mature windbreak on the high-plains desert near Moriarty, New Mexico. A high wind was blowing and I noticed a shearing force that appeared faster than the actual wind itself. The wind was impacting the windbreak at an angle of about thirty degrees from the perpendicular. As the wind compressed against the windbreak, it sped up dramatically.



That observation and subsequent study led me to understand that when the wind attains certain velocities at various critical angles to a linear edge—the form of the traditional windbreak—a threshold is reached when wind shear begins along that edge. Wind shear scours the adjacent land and dries nearby plants. The occurrence of these conditions is affected by the unique topography of the site and by the windbreak's direction, shape, surface texture, thickness, and penetrability, the latter quality varying seasonally with the deciduous cover of the trees.

Traditional windbreaks can't intercept the wind optimally all the time. Rarely does the wind blow directly perpendicular to a linear windbreak. Even an L-shaped windbreak can boost the speed of the wind along at least one of its two wings. Wind speed and direction can change dramatically. Most texts on windbreak design consider only two or three dimensions, when we really need to consider at least four: length, height, depth, and variation over time.

Permaculture design teaches us to apply the patterns we see in nature to our constructed systems. In a natural landscape, we frequently encounter a complex edge. Consider for instance, the transition zone where meadow meets forest. This ecotone can show a great variety of taller grasses, herbaceous plants, and shrubs grading into the thick, short trees of the outer forest. These edge trees meld into thinner, straighter, and taller trees within the deeper forest. The forest may also have indentations along its edge, forming a series of pockets. This crenelated edge creates a variety of microclimates because of its varying aspect to sun, wind, and slope.

With natural patterns in mind, over the past decade I've been redesigning windbreaks. I have established both living and non-living berms to intercept the wind. I've come to see the wind as an energy flow over the landscape. Similar to water, it has direction, velocity, and volume.

I've also learned to treat the wind as an intermittent flow pattern that, like water, directly impacts the brittleness of a desert landscape.

In the desert, wind and water challenges are tied together in a continuous knot. The daytime wind speed at my site averages 5-15 MPH, but during the prolonged dry spells of spring we experience frequent gusts into the 15-45 MPH range. We also have occasionally heavy winter snows, with subsequent high winds, which can blow the snow off the open rangeland into deep drifts around structures, fences, and the few trees able to endure this harsh climate. Any thoughtful intervention will try to transform the energies of both sectors—wind and water—in mutually beneficial ways.

To slow down the flow of water across the landscape, we increase the surface available for infiltration. This gives us the pattern of the swale, where water is spread out across a long contour, giving it time and space to soak into the ground.

The same principle applies to slowing the wind. By increasing the surface of contact between the windbreak and the wind, complexing the edge, we can scatter

the energy of the wind, rendering it less harmful.

This has led me to design the crenelated windbreak. But just how does it work?

In a crenelated or scalloped windbreak, a portion of each crenelation will always be perpendicular to the incident wind. This creates a pattern of repeated horizontal compressions along the entire windbreak, in addition to the vertical compression created by the upright nature of the trees themselves. These multidimensional compressions quiet the wind, regardless of its speed or angle of incidence, virtually eliminating any shear force.

Like any good design, crenelation offers multiple benefits. It creates a range of microclimates. It traps other incoming energies and materials, enhancing the collection of sunlight, moisture, seeds, detritus, and snow. Each crenelation creates its own microenvironment, with a unique combination of soil characteristics and plant diversity.

Clumps of compatible trees and shrubs can be planted to form chains of guilds along the windbreak. This pattern is visually pleasing, and it gives the windbreak variable densities, with different infiltration rates, that further mix and slow the wind. Each guild should contain some evergreen plants, while recognizing that winter-barren deciduous plants also slow the wind considerably. I plant the hardier trees on the windward tips of each guild pocket, placing the more wind-sensitive plants to the lee side.

Swales lying in any direction to the windbreak can still work well. If perpendicular, they may need to be very short and dug by hand between the trees. Diversion drains—bringing additional water from nearby slopes or roads—can be extremely beneficial in establishing windbreaks by augmenting irrigation during major rain events. Sponges of newspapers, magazines, and cardboard dug into the ground uphill from each tree and covered with leaves or straw will absorb and hold the runoff, releasing moisture slowly over time.

Curvilinear paths (windgates) can be easily established to provide access through the windbreak without creating wind tunnels or visual disruptions. Crenelated windbreaks can be quite natural in appearance, elegant in design, and require little maintenance.

The sizing and proportions of the crenelations (edge harmonics) are a subject for further research: access to a wind tunnel would be fun and informative. The time (5-15 years) that it takes to establish a drylands windbreak requires us to be very thoughtful about these relatively permanent interventions. I feel that the depth (A) or radius of each concavity should be equal to one-quarter to one-half the width (B) between the tips of each crenelation, as shown in the diagram. These arcs will be able to catch the full range of incoming winds. The lee side of the windbreak may also be slightly crenelated. The windbreak should always have a depth of at least 2 x A.

The crenelated windbreak is an elegant solution to the common problem of harsh and variable winds. By rearranging the physical elements of the windbreak, its basic functions are enhanced by many small and large ecological benefits. I believe this assembly should become a basic word in the vocabulary of Permaculture design. Δ

Chris Meuli is a family physician and a Board member of Permaculture Drylands Institute. He has harvested a number of mistakes during two decades of hands-on experience using simple tools in the high-plains desert of New Mexico. He invites comments on this new concept. E-mail: <cmeuli@pol.net> or write him at PO Box 759, Edgewood, NM 87015.

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The Story of the Understory:
A Tale of Community Development

Colin Donohue

I work for a member-based community development non-profit called Rural Action. We work with our neighbors in the forested hills of southeast Ohio to regenerate our ham-strung economy, dispirited communities, and damaged ecosystems. Our goal is to empower each other to revitalize our communities and to create a just and sustainable society.

We want to make a difference.

We don't lobby for legislative fixes or organize protest marches. Instead, we want to catalyze a large-scale movement by ordinary folks, so we network, organize, train, and support people to do the work of fixing their broken communities. We don't try to tell them what they should or shouldn't do, but rather help them to determine their own priorities. We pay attention to what people feel is important. With tangible support, they develop confidence and inspiration to take on bigger tasks, and to become responsible for more of their world.

By listening, we have learned a lot.

Most people describing a vision for their community include something about a clean environment. The level of understanding of ecological complexity and interconnectedness may be basic, but this is less important than the feeling of care for the natural world. Empowered communities with good information about the state of the planet will learn the meaning of "biodiversity" and "ecological integrity."

Our economic programs in sustainable forestry and agriculture open up doors to more ecologically sound relations with the land. People are far more likely to change their attitudes and behaviors toward the environment and their communities if adopting those new views and actions supports a sound, prosperous, and healthy way of life!

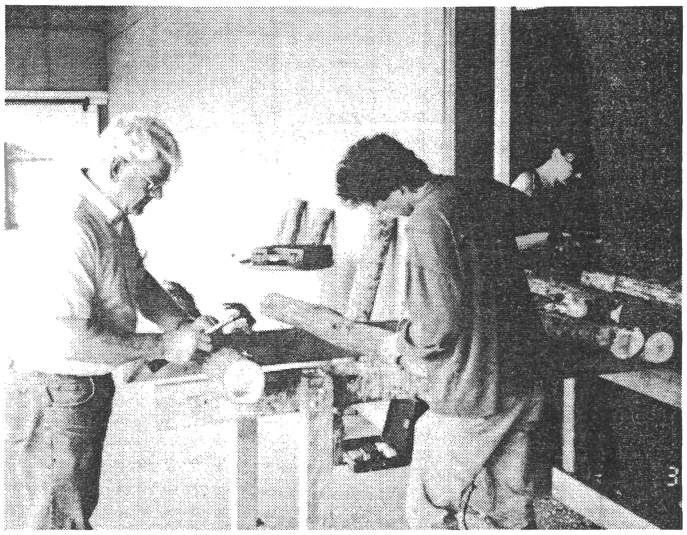
We do not intend just to develop economic activity in a region. In equal balance with economic needs our community has social and ecological needs. As we reinvest economic capital in our region, we are also looking to restore the "environmental capital," ranging from topsoil and forests to finely-tuned ecosystems free of invasive exotic species.

We also reinvest in the social capital of our region. Rather than driving wedges of opposition between community members through protest, etc., we support the development of trust among people, foster consensus when possible, and facilitate collaborations between groups that may not otherwise relate.

We have looked into the mirror and seen the enemy. And we are determined to make peace and get to the serious work of regenerating our crumbling, chaotic society with the vision of a long-term sustainable culture that treasures biodiversity, supports creative livelihoods, and promotes cooperation.

Forests: The Base of our Common Wealth

Like our regional economy, farming and forestry occupations have been declining for several decades. We began our work by asking: What values of the forest and what economic possibilities are being overlooked by current forestry and land-management approaches? We developed a list of Non-Timber Forest Products (NTFPs) with direct economic benefits that could be produced locally, such as grapevine wreathes, pine boughs, ginseng and goldenseal, wild berries, and mushrooms. Non-timber values of the forest also include the less quantifiable benefits of clean water and air, recreational opportunities, and spiritual renewal that come from the presence of healthy forests. We wanted to develop NTFPs with visible economic benefits to the community while "doing no harm," and so have turned our attention to cultivated medicinal herbs and mushrooms, two crops that show economic promise for our area.



Mushroom growing workshop for local landowners

With well-established and growing markets, and production based on existing forest surpluses, mushrooms are one of the easiest NTFPs to introduce to foresters and others who work in the woods. Mushrooms do not preclude traditional timber harvest or compete with existing forest uses, rather, some mushroom cultivation practices actually enhance timber values. With mushrooms as with medicinal herbs we have emphasized cultivation over wild-harvesting because we want to protect our vulnerable forest ecosystems even as we rebuild economic opportunities in the region. The global market is a Pandora's box: six billion "consumers" could strip our woods of entire species quicker than the big machines strip mine our coal.

Forests in our area have been "high-graded" in the past, and are just now growing back in many places. In response, foresters have encouraged landowners to thin their woods so that healthy stands of mature trees can develop which will again yield high-value sawlogs and veneer logs. However, there is a financial impediment to this otherwise sound advice being followed. The wood harvested from thinning operations is not commercially appealing, and its value when sold to paper mills is often not enough to cover the labor costs of harvest. Apart from low-value sales as firewood, there has been little way to make economic use of small diameter logs.

However, small diameter logs from forest thinnings are

perfect for growing shiitake and other species, so we can convert this "waste" wood into valuable gourmet and medicinal mushrooms. This appeals to foresters especially, as thinning for them is key to the long-term productivity of forests. Even where timber is not harvested, "crop tree release," also known as selective thinning, or timber stand improvement (TSI) can increase the production of acorns and other wildlife food, and can develop old-growth characteristics in a forest more quickly than natural regeneration.

Reaching Out

A seasoned local mycologist and advocate for sustainable and holistic forestry, George Vaughan, has provided much technical assistance, advice, and support for our NTFP work. In the last two years, his business, Mushroom Harvest, another local firm, Understory, Inc., and Rural Action have together put on workshops for more than 70 people in learning how to grow shiitake and other mushrooms for "Food, Fun, and Profit." Participants have ranged from counterculture college students to local and low-income folks looking for a hobby or a way to earn more income.

Reaching out to local folks and to area foresters has been a big job: we've promoted our efforts on the radio and in newspapers, and sent posters to over 100 grocery stores, libraries, and other places where folks who don't read the paper find out about events. Our efforts have been largely successful, with most workshop participants now being ordinary people who are neither the avant-garde of agroforestry nor permaculture pioneers.

My work as sustainable forestry coordinator at Rural Action has been sometimes delightful, sometimes overwhelming, and generally rewarding. This year has been particularly exciting, with the high-point being a workshop on Special Forest Products which we co-sponsored with Soil and Water Conservation Districts from four counties, the Ohio Division of Forestry, the Division of Wildlife, Mead Paper Company, and other agencies.

It was a great compliment to be invited to organize a workshop on the very "fringe" subject that I had been developing at Rural Action. The invitation indicated that mainstream agencies were starting to consider NTFPs as part of the natural resources landscape. For it to be further considered as something to "put in the toolbox," a strong turnout by landowners would be extremely important.

Partly through the participation of Deborah Hill, University of Ky. Extension forester and NTFP enthusiast, and David Cooke of West Virginia Univ. Extension, and partly through our own outreach efforts, the event attracted 165 people, the largest number ever to attend an extension field day. It also attracted the attention of *The Columbus Dispatch* and of a freelance radio-journalist who produces for National Public Radio.

Since then, we have held two more workshops on cultivating ginseng and other forest herbs, which have been attended by a total of more than 90 people. Our database of interested persons has grown to include over 400 names.

The next step is to bring this interest into effective action. With mushroom cultivation as an enterprise, we emphasize that marketing is extremely important. It is difficult to compete with large-scale producers on price, so we encourage our local growers each to identify and develop a unique market niche.

"It looks good on paper..."

Many agency staff feel that NTFPs have relatively small markets, and that we should proceed cautiously. If the 400 landowners in our area each grew ten acres of goldenseal, their production could flood the market and depress prices. Four years down the road we would have lots of cheap goldenseal and a lot of angry growers. Out of 400 landowners, however, only 100 will be entrepreneurs, and of these, only a few will actually create a viable business.

This year we will work with 10-20 landowners in our area to grow goldenseal. The number is limited by the convergence of several factors including landowner interest, good goldenseal sites, and the money to buy planting stock. We hope to be able to provide funds for planting stock as well as offering guidance on cultivation and marketing. Upon harvest, the seed money would be repaid into a loan fund for sustainable forestry and agricultural businesses. Donations or loans from outside our area will likely be needed to develop this as a meaningful economic opportunity.

With time the numbers will grow, and when they do, we will face other challenges. It is likely that Appalachian Ohio alone could produce all the additional goldenseal the market will bear. Mushrooms too, have a limited fresh market in our area. Other forest herbs—apart from ginseng—have fairly narrow markets. We envision 100 diversified herb growers with patches of goldenseal, ginseng, and other lower-value but promising crops. If we can create meaningful work for just 20 people, or supplemental income for 50 we will have made a significant impact!

Once growing is underway, however, development of value-added products can have an even larger effect on the local economy. Washing, drying, grinding, and encapsulation of herbs can provide additional local jobs. Marketing directly to consumers allows herb-producing communities to move further "up the food chain"—capturing more of the profits, and advancing from the role of supplying raw materials to become full players in the economic arena.

Marketing is the missing link. Often growers do not have the temperament, skills, or inclination to market their products effectively. Stories abound of well-intentioned growers who invested time and energy and produced a crop only to find that they had no market for it! Through marketing assistance, and possibly development of a marketing cooperative, we can help growers get what they deserve for their crops.

Because of consumer concerns about over-harvesting of goldenseal, many in the herb-industry are moving towards cultivation of native herbs now rare in the wild. Through our market research efforts we identified a small herb company that was willing to pay twice the market rate for a crop that had been organically certified.

Down on the Farm

I live at Edges, one of the many communities that surround Athens, Ohio. We are a community of six adults and five children living on 95 acres of hilly land across two hollows with about equal amounts of cleared land and woods. It has been very useful to me in learning about NTFPs to have land to work. I have tried plantings of ginseng and goldenseal which did not succeed; I've searched 95 acres for 1/10 of an acre of good goldenseal ground —and learned just how rare the right conditions are. I've also been able to add shiitake and oyster mushrooms to my stir-fry.

The biggest challenge of the land for NTFP cultivation is finding good sites to plant medicinal herbs. Locating a north slope with 70% cover, not too steep to plant on, and close to the house isn't easy! Many areas that meet these criteria still don't offer desirable sites because they are dominated by multiflora rose and honeysuckle.

This latter challenge, however, presents an ecological opportunity. For many landowners, the restoration and management of forests, including the elimination of exotic species, falls way down the list of priorities. At Edges, building our community house, establishing the solar and wind power

systems, and starting large gardens to cover a good portion of our food needs came first.

With herb cultivation in mind, however, restoration of the forest becomes a priority. The prospect of the understory generating income makes it worthwhile to clear multiflora rose, dig up honeysuckle, and otherwise tilt the balance away from exotics that threaten to choke out more valuable species. Sun-loving exotics, such as multiflora, are weakened by the shade of regrowing forests and can be far more easily controlled under the forest canopy than on the edge of the woods.

Many new and idealistic communities start with a "hands-off" approach to land management, and later end up with exotics destroying the biodiversity of their forests. I think herb cultivation can provide a much needed motivation to reclaim the understory. If herbs are intensively cultivated you may create a monoculture of one species in an area, but the overall effects are positive. The cultivated species will not overtake and dominate the understory as exotics can, while the broader landscape benefits as birds plant the seeds which help to restore wild populations of these precious native plants.

Planting goldenseal

Bringing it all back home

Applying these ideas and processes of ecological and social regeneration to stimulate community economic development requires careful assessment of local resources and conditions.

Our area is blessed with a good climate and abundant forests for the cultivation of medicinal herbs. Copious quantities of local hardwoods are going to the paper mill that could be diverted into mushroom production, and among the state's 11 million people are many wealthy urbanites who want to buy gourmet mushrooms. To these underlying conditions we then add our special resources: a 10,000-log shiitake producer in our area is willing to help market mushrooms from other growers to his buyers at upscale restaurants in Cincinnati. Rural Action, with VISTA volunteers and staff who can help with technical assistance on production and marketing, gives our region yet another advantage.

We have quite a few assets that make it likely we will succeed. However, if forest communities across the continent followed our example in the large-scale production of goldenseal, it could depress the price, and make the undertaking not profitable.

What are your local assets? Whether your non-timber forest assets are pine boughs, flowers, maple sap, medicinal herbs, or mushrooms, begin with what you have. Assets also include institutions or agencies (supportive or potentially supportive), easily accessed markets, a regional mystique or reputation, skilled craftspeople, etc.

Don't forget wood! Forestry can be ecologically harmonious, and there is both enormous economic opportunity as well as a pressing need to change current forest practices. For small landowners, bandsaw mills, solar kilns, and small furniture shops offer opportunities to reap greater economic rewards with little or no additional "throughput" of primary product. Just remember that, as with non-timber opportunities, marketing is KEY! Δ

Colin Donohue is the Sustainable Forestry Program Coordinator at Rural Action. Readers who would like to sponsor a grower or donate to the start-up revolving loan fund may contact him at PO Box 157, Trimble, OH 45782, <Rural3@frognet.net> or Edges at <archer@eurekanet.com>

Dedicated to Success

When our project succeeds it will be as a result of the efforts of many people.

The cornerstone of the herb community in our area is Paul Strauss, a grower and researcher who has been quietly making medicine from goldenseal and other plants. He has attracted a "critical mass" of herb-oriented people to the area, from which much activity has arisen. Paul hosts a yearly conference of United Plant Savers (UPS), a group dedicated to the preservation of rare medicinal herbs, and will be helping UPS set up their first Botanical Preserve in our area. He also conducts classes and makes presentations on herbs and land stewardship and has recruited numerous herb-people to buy and protect land in Meigs County. Indeed his efforts have greatly raised awareness of forest herbs in our area and have attracted another of our prime partners, the National Center for the Research and Preservation of Medicinal Herbs (NCPMH). To learn more about U.P.S., write PO Box 98, East Barre, VT 05649 or info@plantsavers.org.

Frontier Herbs, an active member of United Plant Savers, recently purchased 68 acres of land adjacent to Paul's as a research station for NCPMH, which has hired Tim Blakley, an herb grower and educator of 20 years experience, and the co-author of *Medicinal Herbs in the Garden, Field, and Marketplace.* Along with his partner Heather, Tim's job (and personal mission) at the NCPMH is to find effective ways of growing "at-risk" medicinal herbs, many of which have never been cultivated commercially. Tim's knowledge of herb growing and marketing and his abilities as a speaker have greatly accelerated our progress in working with landowners. He can be contacted at 33560 Beech Grove Rd., Rutland, OH 45775, or <tim.blakley@frontierherb.com>.

Our closest collaborator through the years, though, has been Understory Inc., a local business which has been working to identify income opportunities for Appalachian Ohio residents from Non-Timber Forest Products. Early on, Understory involving me in their work on a grant relating to NTFP markets. Working with Craig Kinzelman, George Vaughan, Chris Chmiel (the Paw-Paw guy), and Jan Salick from Ohio U. on the Understory grant has provided great insight into NTFP markets and the conservation implications of opening up a global market for a finite amount of a wild plant material. Understory can be contacted at 178 Mill St. Athens, OH 45701, or <ckinz@frognet.net>.

Without the foresight of Understory Inc., the long-term dedication to herbs by Paul Strauss, and the forward-thinking efforts of UPS, Frontier, and Tim Blakley, progress would have been slower and opportunities would have been missed. Currently we are developing a Citizen Science Council to improve the coordination of area groups researching NTFP cultivation and to publicize findings of area researchers ranging from growers to academics. Δ

Coppice-with-Standards:
New Forestry with Ancient Roots

Peter Bane

Permaculture has always looked as much to traditional cultural practices as to modern science not merely for its inspiration but for practical techniques and understandings of the natural world. The forest-dwelling cultures of northern Europe, tribal and folk ancestors of many North Americans, developed cultural methods of woodland management well suited to sustaining both permanent forest and a continuous flow of woodland products to support their societies.

A permanent system of forest cultivation called coppice-with-standards evolved in the British Isles over the past thousand years, which provided a large range of products—from construction timber to fencing and furniture parts to fruits, nuts, honey, and wild game—while maintaining continuous forest cover. "Coppice" is the practice of cutting trees to the ground purposely to stimulate resprouting. The word also refers to the regrowth itself. Standards are the trees selected (often planted) to grow into large timber.

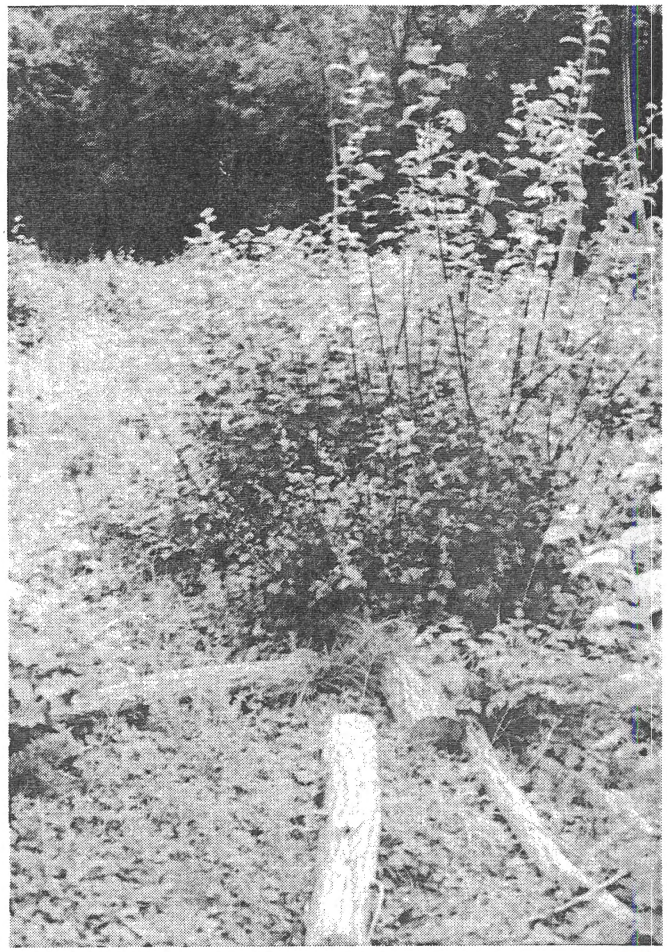
The continuous cutting of small blocks of coppice creates a mosaic of environments that offers much more diverse habitat for game animals and birds than the native forest itself. These "fells," or management blocks—usually no more than an acre in size—also provide patches of higher light intensity within the forest, which in turn stimulate a tremendous profusion of flowering and fruiting shrubs and wildflowers. This pattern of widely scattered small woodlands intensively managed for many species and many kinds of yields has so shaped the appearance of the English countryside that it has become a part of the national identity, as hallowed by Britons as the standing stones of Avebury or the Gothic towers of Westminster Cathedral.

Although some coppice systems still maintained in England today pre-date the Norman Conquest of 1066 A.D., similar practices were well known in other parts of Europe from very early on. The French, whose forests were more extensive and more diverse than those of Britain, have a description of the classes of standard trees that includes the term *écorce-vieux,* translated to English as "oldbark." The 16th-century Flemish painter, Pieter Breughel, depicted the gathering of fuelwood from pollarded trees in his masterpiece, "Winter," from the famous landscape series, The Seasons.

Pollarding is similar to coppicing in that the trees are regularly cut back in order to rejuvenate the tops so that small diameter fuelwood can be harvested. However, pollarded trees are cut not at the ground, but about 2m (6 feet) above the ground. This practice preserved the basic tree form and also prevented animals from browsing the tender new sprouts.

Unlike most coniferous trees, virtually all deciduous hardwoods will resprout vigorously from the stump when cut. Although some of the roots die back when the top is cut, much of the original root mass of the tree survives. From reserves of energy in the roots, the tree regrows very rapidly, often sprouting 10-30 new stems, which can grow 4' to 15' in a single season.

Traditionally, most woodcutting was done during the autumn and winter, after the agricultural harvest, when attention could be



photos by Peter Bane

Coppice stool showing regrowth and fuelwood harvest.

put on less critical chores. Besides helping to balance the annual cycle of domestic labor, this practice had many other advantages. Wood harvested while the trees are dormant is lower in moisture and makes both longer-lasting timber and better fuel. Winter cutting also conserved the tree's energy by matching the natural cycle of vegetative regeneration. Temperate zone root energy reserves are highest in the dark months of the year as the trees adapt to cold weather by shedding their leaves and preparing for new growth in spring.

The repeated cutting had an additional benefit that is not immediately obvious: it prolonged the life of the trees, often two, three, or four, times their "natural" span. There are ash "stools" (the stumps from which regrowth occurs) in England over a thousand years old still growing coppice.

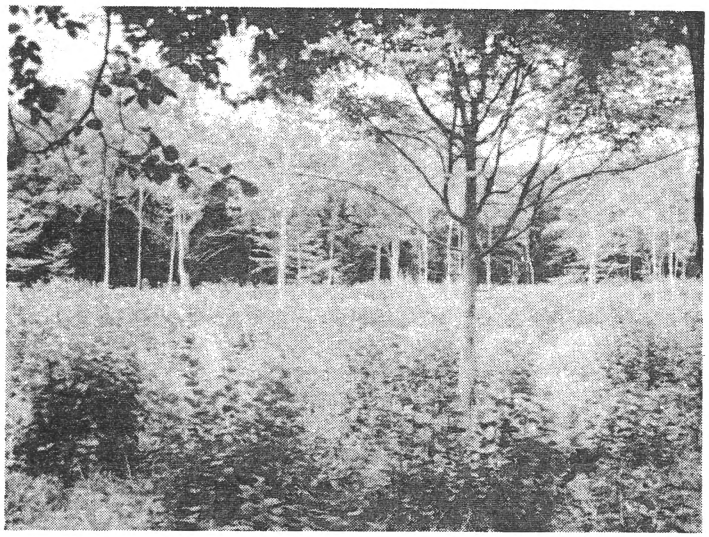
The primary design of coppice-with-standards, however, is to support the yield of many forest products from a small area.

As each fell of mature woodland was harvested, the regrowth would be graded by the woodsmen. Superior stems would be selected as "tellers," the young precursors to "standards." In addition to tellers there were two classes of standards. Older yet were the "veterans," and in the French system, the "oldbark"

were yet more venerable. Inferior trees, whether slower growing, prone to disease, or misshapen, would be coppiced for poles, wattle (smaller pieces for weaving into hurdles, a kind of movable fencing for livestock), and fuelwood. "Spray," the tops, and "brushwood," the branches, were sometimes fed to cattle as fodder.

In modern management of coppice-with-standards, young tellers are often planted from selected stock after the harvest of mature overwood.

Fells were harvested about every six to seven years, the irregularity permitting adaptation to a variable climate: a cold summer or a dry year with poor growth could be accommodated in the system. The thinning of the tellers and of the subsequent classes of standards was done with a mind to maintaining an open canopy where about half the light came directly from the sun and the other other half indirectly from the sky. The overstory was thinned to maintain optimal growth conditions both for the remaining trees and for the underwood.



Young beech tellers form the light canopy of a "fell" one year after coppicing of the underwood.

The regular harvest of young trees and of coppice kept timber and wood processing labor to a minimum, a factor of critical importance to a society lacking power tools or fossil fuels. Timbers were shaped with adze and froe, by hand. Firewood and poles were cut with an axe.

The splitting of large logs, whether for firewood or fencing, was a custom adopted by Americans in response to the conditions of their forests: vast numbers of huge trees covered the continent when the first settlers moved westward. In preindustrial Europe, the notion of growing a tree to a great size, only to chop it into small pieces, was seen as wasteful of human energy. Poles and timbers were grown to the size needed, and no more, while firewood was cut at just the dimension required for stoves and fireplaces.

Overstory and underwood were usually of different species. This made the woodland ecologically resilient, as canopy and ground cover exploited not only different soil layers and nutrients, but grew at different seasons. The coppice and groundcovers did about two-thirds of their photosynthesis for the year before the overstory came into leaf.

Oak, ash, beech, and elm were commonly the standards, while hazel, alder, lime (linden, *Tilia cordata)*, willow, and hornbeam were often grown understory. Hazel yielded not only edible nuts, but fodder from the young shoots, and like willow, made excellent basketry, while lime leaves were eaten and the trees usually allowed to flower before harvesting, to provide a favored honey crop. Lime was also made into greenwood furniture, while hornbeam went for fuel, and alder (a nitrogen-fixer) bolstered soil fertility. Many of these same species have additional medicinal or craft use, providing dyes, seeds, and flowers of value.

The understory was made more complex by the retention or cultivation of many fruiting shrubs such as crab apple, rowan, service tree, wild cherry, and roses. Wide pathways through the woods, called "rides," made access to the forest easier, and gave a place for much of the woodcraft to take place. They also introduced more edge that increased the available light and enhanced the productivity of the woodland. After each felling there would be an explosion of wildflowers the following spring, while greenwood growth increased the forage for wild game, an important meat source.

Coppice management was much more labor intensive than modern forestry. Two men working full-time would typically be employed to work an 80-acre woodland. Contrast the industrial model of forestry which requires 400-1000 acres to sustain each job. Coppice-with-standards produced many and varied wood products for a society for which wood was the primary plastic material, the mainstay of packaging, construction, energy, industry, and commerce. In a time of poor roads and limited transport, much woodworking actually took place in the forest.

> "The leafy lanes and grassy glades 'where sheep do gently graze' of summertime were transformed in the winter to resemble a widespread factory, with geese, swine, and cattle being driven past the loggers, sawyers, rivers, turners, coopers, treeners, charcoalers, and others all plying their trades close to the felling line." (3)

Coppice-with-standards—and strict laws requiring the retention of at least 8-20 large trees per acre—ensured the presence of all age classes of major timber trees in a small area, while enormously increasing the diversity and productivity of the forest. The system maintained undisturbed soil cover, provided timber of the sizes required for construction with minimal added processing, gave constant employment for foresters, bodgers (greenwood craftsmen), carpenters, and herdsmen, while providing a steady stream of useful products for the household and local economies.

Because of its importance to the traditional appearance of the countryside, local councils in England are taking a renewed interest in the maintenance of existing coppice, providing support monies for management and regeneration.

Coppice systems have been adapted to other parts of the world. In Korea, a system called *sunchon* is used to grow pine standards between rows of locust *(Robinia sp.)* coppiced for fuelwood, while in southern France, Aleppo pine is grown over evergreen oak. In India *sal (Shorea robusta)* is grown over teak, the overstory providing frost protection during cool winter months to the more sensitive teak below.

We can learn much from this ancient woodland art as we too seek to regenerate both forests and forestry.

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REVIEWS

The Fruit of Long Years...

Review by Keith Johnson

The Apple Grower
MICHAEL PHILLIPS
Chelsea Green Publishing Co.
1998.
242 pp. $35 paper.

I live in a region of the Southeast where there are hundreds of apple growers, but to find a LOCALLY-grown organic apple is nearly impossible. The growers are mostly of the opinion that "It can't be done." This, despite the fact that our great-grandparents managed to grow plentiful good fruit without biocides. How'd they do it? How can it be done today?

Michael Phillips, in his well-researched new book, reveals a simple secret that should come as no surprise to thoughtful permaculturists. All it takes is hard work and a willingness to learn from nature.

This book is a culmination of years of observation and study, in which I feel a great deal of pride, since I actually lived on the land described therein in the late 1980s, and worked with Michael in the early years of his adventure with apples.

Michael's commitment to the goal of poison-free fruit has required a willingness to pay constant attention to the unfolding patterns and cycles of his local ecology and to adopt practices that support whole systems. He counts on the support of beneficial insects and other organisms as well as the beneficence of people who share a similar commitment. Thus, this text reflects the wisdom of past and present genius, from Liberty Hyde Bailey and Sir Albert Howard to biodynamicist Ehrenfried Pfeiffer and Acres USA publisher Charles Walters.

Armed with the best of both old and new science, Michael serves up a generous helping of encouragement to present and future growers. He enthusiastically plunges into siting, layout, and planting of orchards, soil-enrichment through cover cropping and mulch, foliar feeding and Biodynamic treatments, and cultivar selection. He focuses intense scrutiny upon the care of the orchard through careful pruning, optimum pollination, frost protection, orchard floor management, and old orchard restoration.

We aren't the only organisms who like apples. With the coming of toxic agriculture, crop pests have increased as they adapt to the challenge of each new poison, so, organic fruit is today that much more difficult. Since he must deal with many of them, it is with open eyes that Michael proceeds to enumerate the pest problems and the range of options available to reduce their impact.

The outcome of all this attention will be, with luck, a large crop of outstanding fruit which must be harvested and marketed. Michael offers clear guidelines regarding when to pick, necessary equipment, hiring help, packing and sales, advertising, barter, CSAs, cidermaking, and storage. His orchard is sited next to a one-hundred-year old water-powered cider press (upgraded to electric power from an on-site hydro plant) where he markets cider jelly, vinegars, apple butter, and other value-added products like maple candy and beeswax candles.

Michael polishes off this juicy book with three appendices which list a compendium of orchard tasks, materials sources, and a bibliography.

A special thrill for me personally was to page through the pictures and see the treasured places that were so familiar to me. "I" pruned and harvested those trees. "I" potlucked and partied with those people...and special people and places they are. This book has a lot of heart and soul. If you've ever thought about growing apples, pick up this book. You'll be glad you did. Δ

Deep in the Woods

Reviewed by Keith Johnson

Ecoforestry: The Art and Science of Sustainable Forest Use
Edited by Alan Drengson and Duncan Taylor / Foreword by Jerry Mander New Society Publishers
$24.95, 312 pp, paper.

Industrial forestry is an oxymoron like military intelligence. Enormous costs in ecosystem degradation and social erosion are regularly overlooked and ignored in order to justify the continuation of the extractive model. As Jerry Mander notes in the foreword to this hopeful and positive anthology, "In the case of forestry, the immediate need is to abandon the industrial forestry model as quickly as possible, and seek to apply such principles and practices as express a reciprocal relationship with nature, beyond the rules of the machine; a human-nature collaboration rather than a human-machine one."

In the pages of this book, the words and wisdom of 35 practitioners and theorists in the movement toward ecologically responsible and sustainable forest use have been gathered into a penetrating synopsis of this new (and ancient) paradigm. Amongst them are folks like Orville Camp *(The Forest Farmer's Handbook)*, James Agee *(Fire Ecology of Pacific Northwest Forests)*, Bill Devall *(Deep Ecology: Living as if Nature Mattered, Clearcut, The Tragedy of Industrial Forestry)*, Arne Naess *(Ecology, Community, and Lifestyle*, coined the word ecosophy), John Seed (deep ecologist, coedited *Thinking Like A Mountain: Toward a Council of All Beings)*, Gary Snyder (Poet and author, *The Practice of The Wild, Turtle Island)*, Ruth Loomis *(Wildwood: A Forest for the Future)*, Chris Maser, *(The Redesigned Forest, The Forest Primeval* and *The Global Imperative: Harmonizing Culture and Nature)*, Herb Hammond (founder of SILVA Forest Fdn., *Seeing the Forest Among the Trees: The Case for Wholistic Forest Use)*, Nancy Turner (ethnobotanist, *Global Biodiversity)*, and a hos of other inspired eco-luminaries.

I offer a sampling of essay titles (and brief commentary) to whet your appetite for this delicious compilation:

- Critical Elements of Forest Sustainability (Weaving the web.)
- The Battle for Sustainability (Our weapons: intelligence, gentleness and courage.
- Forest Managers Focus on Fungi as Part of the Big Picture (essential decomposers)
- The Ecological Role of Coarse Woody Debris (a global mulch)
- Water and Connectivity (Really going with the flow)
- Driftwood and How Forestry Affects the Ocean (a missing link in forest AND ocean health)
- Fire in Our Future (global warming and cooling processes)
- Respecting the Forest (R-E-S-P-E-C-T! Find out what it means to trees!)
- AForestForScotland(Only2%remaining!)
- "The Earth's Blanket:" Traditional Aboriginal Attitudes Towards Nature (Never waste anything!)
- Standards For Ecologically Responsible Forest Use (certification - some parameters.)
- The Economics of Ecoforestry (Hint. It pays off. Long term.)
- The Heart of the Forest ("A forest that is not deep, has no heart." —Naess.)
- Nature as a Reflection of Self and Societ (Who are you? Where are you?)
- Beyond Empire Resourcism to Ecoforestry (beyond hierarchy and patriarchy)

If these aren't enough to encourage you to race out, find, and devour this book, let me finish with: THE ECOFORESTER'S WAY: An Oath of Ecologically Responsible Forest Us

1. We shall respect, hold sacred, and learn from the ecological wisdom (ecosophy) of natural forests with their multitudes of beings;
2. We shall protect the integrity of full-functioning forests;
3. We shall not use agricultural practices o the forest;
4. We shall remove from forests only values that are in abundance and only to meet vital human needs;
5. We shall remove an individual instance of value only when this removal does not interfere with full-functioning forests: when ir doubt, we will not;
6. We shall minimize the impacts of our actions on the forest by using only appropriate low-impact technology and practices;
7. We shall use only nonviolent resistance in our protection of the forests;
8. We shall do good work and uphold the Ecoforester's Way as a sacred duty and trust.

So, what are you waiting for? Go! Now!

Welcome to Mycotopia

Review by Keith Johnson

PAUL STAMETS
Growing Gourmet and Medicinal Mushrooms
Ten Speed Press
554pp, paper, $40 US (available from Permaculture Activist)

We recently built a new road into our undeveloped neighborhood at Earthaven ecovillage and in the process harvested a lot of wood; big logs, poles, firewood, and about 250 shiitake mushroom logs of oak and maple. For guidance we turned to the mushroom cultivators "bible," a hefty tome written by mycological trailblazer Paul Stamets and copiously illustrated with photographs and drawings.

Professional researchers and growers repeatedly describe this work in glowing terms as "the most comprehensive," "extremely informative," "will certainly become a standard reference," "a mycological classic," and even "a sacred text for spiritual growth." Odds are pretty good that if you like mushrooms, you will like this book...a lot!

Stamets even offers a look at Permaculture with a Mycological Twist in Chapter 5, a story we published in *The Activist,* issue #31. There are probably several places for mushroom propagation on any site, including beds in the vegetable garden, in the wood chip mulch around trees and shrubs, on stumps, and on logs buried in sawdust or gravel. The landscapes created by these outdoor techniques can yield excellent loamy soils, fodder for livestock, and soil nematode control as by-products of mycological growth and decomposition. Mushrooms can even be grown indoors in urban settings with spectacular results.

For those inclined to explore the prospect of growing commercially for local markets, Stamets offers detailed instruction on the culturing of mycelium on agar medium, spawn production on grain, sawdust, or wood chips, prevention of contamination, and propagation in various containers including trays, wall culture, and plastic bags (or columns).

The bulk of the book is devoted to very complete descriptions of the parameters necessary for the growth of 25 popular species of edible and medicinal mushrooms including shaggy manes, enoki, shiitake, seven varieties of pleurotus or oyster, psilocybe, King Stropharia, straw mushrooms, reishi, lion's mane, morels, and hen-of-the-woods.

Practical advice for harvesting, storing, and packing is followed by a scrumptious collection of recipes. Stamets concludes his text with several appendices which offer recommendations for designing and building a spawn laboratory and a healthy growing room for healthy mushroom formation and development, a resource directory, many useful charts and tables, a glossary, and an extensive bibliography.

By the time you read this review we should have all those logs inoculated with early, mid- and late-fruiting shiitake whose ultimate yield could pay for the cost of our road. At the very least we can look forward to many meals of health-promoting nutritious fungi with our friends and family. Try this at home. Δ

Polyculture: A Family Business

Review by Keith Johnson

JOEL SALATIN
You Can Farm: The Entrepreneur's Guide to Start and $ucceed in a Farming Enterprise
self-published, 480 pp, $30, paper

Fascinating book! It reads like a cross between *Mother Earth News, The Permaculture Activist, Acres USA, Psychology Today, Entrepreneur,* and *The Nation*...AND it lives up to its title.

Joel is one of those relatively rare breeds, a successful organic farmer whose land is a role-model for profitable, ecological, small-scale poly-agriculture. One indicator of his accomplishment was the appearance of almost 800 visitors from 35 states and three countries at a workshop, field day, and barbecue he hosted at his Swoope, Virginia farm last July. It is believed to have been the largest agricultural event ever held in the state.

In his own words, "...the opportunities for a farm family business have never been greater. The aging farm population is creating cavernous niches begging to be filled by creative visionaries who will go in dynamic new directions. As the industrial agriculture complex crumbles and our culture clamors for clean food, the countryside beckons anew with profitable farming opportunities."

Note: nowhere in his book does he say its going to be easy.

Nevertheless, his goal is "to empower others with new confidence, new vision, and a new direction," and Joel doesn't kid around on this promise. He reeks of positive, "can do" spirit, and tackles the challenges and misconceptions honestly and seriously.

With inspiration from Wendell Berry, Wes Jackson, Sir Albert Howard, Bill Mollison, Allan Savory, Louis Bromfield, and others, Joel has observed the outcome of thoughtfully applied principles and thus gained a true recognition of real values—it adds up to a good life.

You Can Farm builds upon the success reported in his first two best-selling books, *Pastured Poultry Profits,* and *Salad Bar Beef.* You can read the story behind these books in issue #32 of *The Activist* in an article we titled "Animal Polyculture: The Farm of Many Faces."

Joel has originated and refined many farm practices that are now bringing success to other growers who apply his hard-earned lessons to their own farms. Among them are eggmobiles, pig-aerator pork, and turkey/corn guilds. Even his son Daniel, age 16, advances the evolution of these strategies as he develops the art of pasturing rabbits with a technique that has cut feed costs by 65%, yields $4500/acre, and pays him about $90/hr. for processing labor.

Joel's not shy about offering his opinions and criticism. He's also ready to back them up with experience. Describing "farmers" who barely stay ahead of their expenses, he notes, "...looking at the way many of us farmers value our worth, you'd think we were masochists. We love to enslave ourselves to dead-end vocations just for the thrill of being called a farmer. I'm here to tell you life is way too short for that."

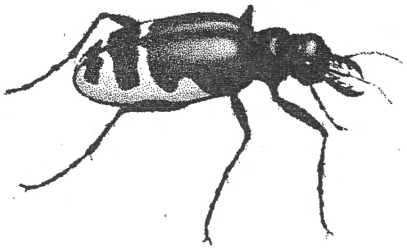
In a chapter subtitled "Lessons from the Lemonade Stand," Salatin lists some basic guidelines for success:

1. Do something you enjoy.
2. Find a niche.
3. Spend 5-1/2 hours in marketing and promotion for every 30 minutes in production and do your marketing before production.
4. Sell retail.
5. Add value to your products.
6. Diversify your portfolio.
7. Enjoy people. You'll need them.
8. Don't be afraid to dream.

Further advice is offered in later chapters:

- The Ten Worst and Ten Best Ag "Opportunities,"
- The Ten Best Complementary Enterprises,
- helpful recommendations on land acquisition,
- being a good neighbor,
- when, what, how, and where to buy things,
- where to get information,
- the importance of biodiversity, soil fertility, and water,
- letting animals do the work,
- synergism and stacking functions,
- labor and accounting,
- marketing, promotion, pricing, and more.

In summary, Joel asserts, "I do believe strongly that our world is full of people who could enjoy higher expectations, higher callings for themselves and their families. You may be one of them. If you are, my prayer is that you will be committed to truth, that you will be dedicated to people, and that you will be reverent towards God's creation. If enough of us will accept this challenge, we can make a difference. Let's do it." Δ



more Reviews...

Meet the Beetless!

Review by Arjuna da Silva

The Beetless' Gardening Book
CHRIS ROTH, editor
Carrotseed Press, Cottage Grove, OR, 1997
112pp, paper, $8.95

I've found the ultimate permaculture book! It stacks functions like functions could be going out of style: it's an instruction manual for the sustainable garden and the environment; it's entertaining (I mean, get ready for those old-fashioned, side-splitting rolls on the floor); it's memory enhancing (it's quite a rush to suddenly remember a tune that's been buried in your subconscious for a couple of dozen years); it nurtures a taste for nostalgia; and—not the least of its talents—it provides musical opportunities for your group or family's choral enjoyment and a wealth of options for the next amateur skit or talent show you have to perform in.

What the heck am I writing about? It's the new *The Beetless' Gardening Book, An Organic Gardening Songbook/Guidebook,* edited and annotated by Chris Roth, with a foreword in verse by the Research Director of Seeds of Change, Alan Kapuler, Ph.D. Roth is a gardener and organic gardening instructor at Aprovecho Research Center in Oregon. As Kapuler puts it, "...we chant, rant and cant/to love the gift of life we grow..." and yes, based on old and familiar Beatles tunes, the book is a chanting, ranting, canticle to the garden, the environment, the heart and soul of Earth-love, and those four fab fellows, herein renamed Jam Lemon, Pear Machete, Joychoi Heirloom, and Rutabaga Variety.

Let me be clearer: this is not a book about a garden without beets (or without beats, for that matter). In fact, the beat is essential, and often the only thing that can help keep you on track with the funny and curious lyrics these folks have devised for our educational and rhythmic pleasure. The titles to these rewrought ditties follow fairly closely to the original titles, but you have to be willing to stretch your tongue and lips a bit to fit the words in between the familiar Beatles' beats.

So what's your favorite Beatles tune, anyway? How about Blackbird? In the new songbook, it's "Earthworm." Here's a phrase: "Earthworms working in your garden soil/ Contribute to a rich ecology...." Or what about Fixing A Hole—remember that one? It's been transformed into "Fixing A Tool." I'll bet it rings true for lots of us: "I'm fixing a tool/And it's raining again/This wasn't broken yesterday/I don't think so...."

How's your soil? Here's a jingle to sing if it's "A Hard Clay Soil": "I've got a hard, clay soil/And I've been working like a dog/To add humus so that when it rains/I've got a garden, not a bog..."!

The authors have recommended these songs not be performed for profit, as the tunes are copywritten. To stay perfectly legal and fair, I also won't keep quoting the lyrics at you, either. Here's a few more titles to whet your appetite for this inexpensive little mood-booster, which is a great stocking stuffer for your favorite baby-boomers, as well: "I Wanna Dig By Hand" (I Wanna Hold Your Hand); "You're Gonna Lose That Soil" (You're Gonna Lose That Girl); "Lucky Stiffs, Their Land Is Paid" (Lovely Rita); "Maxwell's Plastic Bucket" (guess!); "She Said She Composted In Windrows" (She Came In Through The Bathroom Window); "Paperback Mulcher" (guess again!); and so on!

The Beetless' Gardening Book also has an extensive glossary that backs up its song-by-song permaculture lessons with helpful definitions and examples. What a refreshing function-rich production! Kudos to Roth and all the cohorts who made the publication possible. Enjoy! Enjoy! Δ

Making a Difference

Review by Fiona Campbell

Getting Ready
...a guide for international NGO, permaculture, and community development workers.
THE AUSTRALIAN PERMACULTURE & DEVELOPMENT TEAM
116 pp. AUD$28. (incl. overseas postage)
Discounts on bulk purchases.
Send payment with order to:
Action for World Development,
8th floor/8-24 Kippax Street,
Surry Hills NSW 2010 Australia.
Tel.: +61 2 9212 5275.

How can we assist people in developing countries to meet their needs?

This book has plenty of practical and inspiring suggestions. *Getting Ready* brings together the experience of people who have worked in developing countries, and those in developing countries who have hosted visiting Australian aid workers.

Getting Ready is a book to help you assess your readiness for development work and to analyze your experience when you return home. It is a book for people who want to make a difference.

We are getting great feedback from readers. People who have worked overseas or are going to work overseas say it is really helpful with all the personal stories and information to know about before you venture into overseas development assistance work. Δ

Go On Home, Now...

Review by Peter Bane

Short Circuit:
Strengthening Local Economies for Security in an Unstable World
RICHARD DOUTHWAITE
Lilliput Press, Dublin
1996, 386 pp, $20

This big book on an obtuse subject (economics) is cause for celebration. It's so full of intelligence you can't help smiling when you read it. And I mean the intelligence not only of the mind but of the immune system, for reading *Short Circuit* is a prescription for good health. Ed Mayo and Helena Norberg-Hodge introduce this juicy volume as "the most extensive survey yet of community economics in the industrialized world." It is "one of those rare books that will change the spirit of our age," and "an indispensable tool-kit for communities seeking to initiate their own renewal from within."

If you aren't on the global economic bandwagon, you're being run over by it...Douthwaite makes a simple case out of complex information, starting with three value-rich assertions:

1. Local resources should meet community needs first and foremost.
2. World market prices should not determine what we produce.
3. Our key production processes should need no inputs from the world economy.

In a chapter titled "Creating Enough Elbow Room" he goes on to outline four primary means by which local communities can break their dependence on the international economy

- create your own currency
- establish your own banking system
- develop your own fuel and energy suppl
- grow and distribute your own food

Subsequent chapters in the book expand on these four key strategies, drawing examples from all over the industrialized world but most heavily, and charmingly, from the author's native Ireland, a human-scale country with a relatively recent history of peasant (self-relian culture.

Douthwaite's economics is firmly rooted i spiritual and moral inquiry. To the conventional mechanics of "making and getting" he applies the obvious question, "How much is enough?" Without answering the latter, no amount of economic theory can make sense.

His analysis is eminently practical too. It i aimed at liberating ordinary people from the onerous burden of a greedy, chaotic, soulless, and increasingly dangerous economic monster Fears of the millennium computer crisis are only the latest iteration of the deep concern w should all have for the costly, energy-inefficient, and destructive system that is swallowing our lives in the name of "free trade." Big, scary and faceless enemies can be

especially disempowering, but remember, David slew Goliath, and Douthwaite offers some important insights that may yet allow the small and clever to prevail over the giant forces loose in the world.

"The industrial system's long and elaborate distribution network charges as much or more for getting the product to the consumer as those products cost to make....these networks are the industrial system's weak spot and a key area for attack in any effort to increase local self-reliance....Short circuiting as much as possible...by selling direct is therefore the key way to open up a wider range of profitable local production possibilities."

Globalism is the one-size-fits-all, easy answer, fast track to disaster. Local self-reliance, not surprisingly, depends upon a sensitive interplay of physical, intellectual, social, and spiritual forces. So, while explaining the differences between local and national currencies, or untangling the elements of housing finance, interest rates, and the politics of credit institutions in not one but several western nations—each subject presented with a plethora of current and recent historical examples—the author continues his prescription for economic recovery ("My name is Peter, and I'm in recovery from the IMF and the Federal Reserve...") with a chapter on

continued, next column, top—>

attitudes appropriate to community economics. Yes, attitudes: Unbridled competition is incompatible with the bonds of local community. Enshrining the market at the arbiter of social values is a guarantee of community disintegration, human misery, and cultural doom. Look around you. New ways of taking stock, sharing, meeting real human needs, moving from motives of curiosity, love, and service; these are the basis of a future I would choose to live in.

"After another survey showed that economics professors gave less to charity than other academics, the researchers conducted a study that showed that it was the economics training that made people less public-spirited rather than the innate disposition of people who took up economics." Ideology matters, too.

Treat yourself to a dose of sunshine and a cup of truth; get ready for the millennium now; learn what your neighbors (and you) really need; be prepared to rewrite history. Read this book about the heroics of living on earth and get to work! Δ

Bent and Twisted

Review by Keith Johnson

JIM LONG
Making Bentwood Trellises, Arbors, Gates & Fences
140 pp, paper $19.95

BRENDA & BRIAN CAMERON
Making Bent Willow Furniture
155 pp, paper, $19.95
both from Storey Books Rustic Home Series (www.storey.com)

Prunings into functional art? Why not? There's a long, long history of tradition to recommend it. Baskets, chairs, benches, fences, beds, tables, shelves, and more. Sell, trade, or give them away, earn spare cash, win praise from friends, reap thanks from loved ones. All this from a brush pile? Such a deal!

Grow the raw material as coppice and harvest a cottage industry for yourself or a neighbor. Why, you could even grow it in your neighbor's yard or get it free from landscapers.

These two books are just the ticket to get you started. Included in them are short photo albums of easy-to-difficult projects with detailed assembly instructions, lists of suitable species and some of their characteristics, necessary tools and equipment, and the finish and care of your product.

Could be the start of a wonderful relationship. Δ

...from the Regions

The True "Green Revolution" in El Salvador

Tucked between rows of cornfields in the El Salvadoran countryside, lies a 26-hectare oasis of organic gardens and primary and secondary forest. While neither large nor, as yet, well known, this terrain may well be one of the most important pieces of agricultural land in the country. It is the site of a project undertaken by the organization CESTA (El Salvadoran Center for Appropriate Technology).

Founded in 1980, CESTA has been working on a variety of projects throughout the country to create an environment of thriving communities and healthy ecosystems.

This particular undertaking, Ecocentro Cojutepeque, is a permaculture school and center for: research and experimentation with landscape designs, viable agricultural alternatives and appropriate technology; production of organic foods, medicines, and seeds; and a place for natural regeneration and protection of the native ecology.

A Renewal of Agriculture

The volcanic soils of El Salvador are very fertile, and today 80% of its roughly 13,000 km², is given over to food production.

Unfortunately, the fertility of the past has been diminished by monoculture plantations for both export and local markets, poor agricultural practices influenced by poverty or industry, loss of forests, changing climatic patterns, and the wake of devastation following 12 years of civil war. Productive, sustainable practices, coupled with careful land-use planning are therefore of prime importance to this country whose large population, and whose economy, rely so heavily on its soils.

As a demonstration, research, and training center for alternative ideas and practices, Ecocentro has the potential to initiate a land-use and agriculture revolution in El Salvador by training outreach workers as well as local farmers, so that these people can in turn sow permaculture ideas across the country.

Permaculture systems will not contaminate the soil or the water, will provide healthier food and higher quality market produce, with increased productivity and lower land requirements; thereby leaving space for forests and other landscapes to regenerate. These improvements hold out to local farmers the promise of greater economic security, and to the nation the hope of a healthier environment and a better way of life.

Although there are many hurdles to overcome on the path to permaculture, in Ecocentro Cojutepeque the seed has been planted for a truly green revolution.

Permaculture Teacher Sought

In order to bring their many projects together in a coordinated way, and to bring permaculture to devastated communities across the country, CESTA needs a permaculture instructor to run courses at Ecocentro for CESTA staff and for local farmers, so these ideas and inspirations can be spread. In the past some Australians and volunteers from other countries have gotten projects underway, but at the moment CESTA lacks anyone trained in permaculture. Though there is no money to pay such a person from here, it is possible, even likely that a position could be funded through another group. CESTA has received international acclaim for many of its undertakings and is an effective and well-respected force for bettering the environment. Δ

Contact Centro Salvadoreño de Technologia Apropriada, Apdo. 3065, San Salvador, El Salvador. phone +503-225-6746, <cesta@euromaya.com> for further information.

Argentine Permaculture Teachers Step Forward

Gustavo Ramirez & Silvia Balado

After a whole year of preparations that we will not forget easily, we presented our first course as teachers of Permaculture in March. Despite enormous challenges, it was a great success. To work as a team made it more dynamic, since Gustavo carried out the theory and practical aspects and Silvia conducted the group activities and video shows.

After the Pc design course given by Max Lindegger in December, 1996, we felt strongly

that it was necessary to disseminate the Pc teaching in this South region.

Max encouraged us to "jump" and to start giving Pc design courses using our own experience and local knowledge. Then he gave us his invaluable notes and sent us a lot of information (book and videos) from Australia. We also had Max's course recorded on videotape, which became a wonderful help for our preparation, since we could review every bit of information he had presented to us.

Organization

With the help of a group of full-time volunteers, the residents of the ecovillage here organized the cooking and the maintenance to offer a very warm welcome for the participants. There were some problems, such as a flu that kept some residents and participants in bed for a few days. However everyone worked harder and all the activities were carried out successfully.

Group dynamics

The course drew an amazing and challenging group of 23 people who were keen to put Pc principles into practice in their countries. They came from Brazil (3), Uruguay (4), Chile (2) and from different regions in Argentina as well. Some of them are developing ecovillage projects in their countries.

The group was very heterogeneous, but well balanced at the same time. It included agronomists, a chemist, a biologist, a doctor, computer technicians, veterinarians, a sociologist, a feng shui specialist, young farmers, and craftsmen.

We also had the special participation of Greg Smyrel, an Australian Permaculture designer, who, by happy coincidence, was spending some weeks in the ecovillage with his family. He joined our group, contributed to the Design team work, and also offered an interesting slide show.

We showed some Pc videos translated into Spanish, which were very useful to illustrate the theoretical topics.

There was also time for recreation, music, songs, sacred dances...and the circle always joining us, as a way to connect with each other, and with the whole universe in perfect harmony.

The Site

After a year and a half of putting the Pc principles into practice here, the ecovillage turned out to be the ideal place for the course activities and practices. We could show the growing windbreaks, an orchard, the mulch garden, and our local experiences on self-fertilizing pioneer plants, or how to suppress the grass. Participants were able to view in detail the alternative technologies we are using in our daily life: dry compost toilet, high-efficiency wood stove and oven, solar cooker, solar heater, and wind generators. At the same time, the whole 20.3-hectare property offered a great opportunity for the design team work.

The ecovillage also provided an adequate infrastructure for this type of course: a big classroom (for 40 people), two smaller classrooms for the design team work, shared rooms (for 40 people), and beautiful natural areas in which to rest and also to work.

The network is growing

A real interest and commitment was born within the participants to keep connected in order to continue the research and share our local experiences. We started the exchange of organic seeds from different regions. Some participants offered to help in the translation into Spanish of Pc material (book, videos), and to spread the information into their home regions, through introductory Pc workshops, radio programs and local press.

The greater Southern network is growing, too: we are now connected with other Permaculture Institutes in Mexico, Brazil, and Bolivia.

More committed people are now looking forward to attending Max's Advanced Pc Course, which we hope may be possible next year.

On behalf of Centro de Permacultura de Asociación Gaia we commit ourselves to offer another Pc Design Course by the end of 1998, and to keep on the rhythm of at least one course a year. Δ

Asociación Gaia, Almafuerte 1732, San Martín (1650), Buenos Aires - Argentina, Tel / Fax: 752-2197, email: gaia@wamani.apc.org

EVENTS

8th Annual Permaculture Design Course

Lost Valley Center, Oregon

Date: November 29-December 12, 1998

Location: Lost Valley Educational Center, Dexter OR.

Description: This two-week course will cover permaculture philosophy and methodology in depth, and will explore and integrate such topics as appropriate technology and housing, energ conservation, low maintenance organic gardening, edible landscaping, tree crops, perennial edibles and medicinals, water and soil management, community economics, and more. Lost Valley is an intentional community, a non-profit educational center, and a developing permaculture site located on 87 acres near Eugene.

Instructors: Rick Valley is owner and operator of Northern Groves Bamboo nursery in Corvallis, OR. He is particularly knowledgeable about wetlands restoration, under-utilized plant seed gathering, culinary herbs, and fiber plants. Jude Hobbs is owner of Cascadia Landscape Design and an associate with Agro-Ecology Northwest, a business that does research and consultations with small scale farmers. Jude helps create edible, bird-attracting, and native landscapes while integrating permaculture principles, with a special interest in hedgerow development. Tom Ward is a wildcrafting expert and herbologist. He has published *Greenward Ho! An Ecological Approach to Sustainable Health*, and has developed and taught a permacultur curriculum at D-Q University, a Native American/Chicano college in Davis, CA. Toby Hemenway is associate editor of *ThePermaculture Activist*, at work on a book about permacultur sites in North America.

Cost: $750-$950, sliding scale, includes tuition, organic vegetarian meals, lodging, field trips, curriculum materials, and a subscription to *The Permaculture Activist*. Limited work exchange available.

Contact: Lost Valley Educational Center
81868 Lost Valley Lane, Dexter, OR 97431
541-937-3351

Permaculture Design Courses

Sonoma County, California

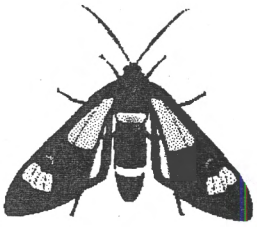
Dates: February 27-March 12 and September 18-October 1, 1999

Location: Occidental, California

Description: Residential intensive course leading to Pc Design Certificate. With art studio guest cabins, and 25-year old organic vegetable gardens, OAEC offers comfortable accommodations amidst spectacular cultivated diversity. The course presenters are Northern California's leading Pc teaching team.

Instructors: Penny Livingston, Brock Dolman, and guests

Contact: Occidental Arts and Ecology Center
15290 Coleman Valley Rd.
Occidental, CA 95465
707-874-1557, fx/-1558. <www.oaec.org>



13th Annual

Permaculture Design Course

Central Colorado

Dates: August 24-Sept. 5, 1999
Location: Basalt, CO
Description: Certificate training in Permaculture philosophy and design, local self-reliance, appropriate technologies, marketing strategies, medicinal herbs, Integrated Pest Management, greenhouse technology forest gardening, and much more...Join our expert instructors from around the country for this incredible opportunity.
Instructors: Jerome Osentowski, Director CRMPI; Francis Harwood, Anthropologist, Rio Grande Bioregional Project; John Cruickshank, Appropriate Technology Expert and designer of the Sunny John moldering toilet at Sunrise Ranch; Dan Howell, Water-Use Expert and Desert Homesteader; Ruth Chalfont, Permaculture Gardener and Landscape Designer; Dennis Stensen, Biodynamic CSA Farmer, Ken Kuhns, Local CSA Farmer; Diana Christian, Editor *Communities Magazine* and community living consultant; Michael Smith, Cob and Straw Bale Expert, Cob Cottage Company, Sub-Tropical Agriculture, Teaching in Third-World Countries; Hilary McCurry and Jodi Halsey, Certified Clinical Herbalists
Cost: $800 til July 24, $850 after. Includes all meals, housing or tenting sites, tuition, and some materials. Please contact CRMPI for more information or send a deposit of $100 to reserve a place. The courses fill quickly!
Contact: PO Box 631
Basalt CO, 81621
(970) 927-4158 ph. & fax
E-mail: permacul@rof.net

Eastern Pc Teachers Association Gathering and Teacher Training

Dates: Mar.13-14,1999(EPTAmtg.)
March 15 (Teacher Training)
Location: Freeland, MD
Description: A weekend of organizing, networking, and skills sharing for Permaculture teachers in the eastern U.S. and Canada, followed by a one-day training in non-lecture methods, facilitated by Dawn Shiner and sponsored by Dancing Green. Inc. and the Greater Baltimore Permaculture Group. EPTA invites members to propose agenda items in advance. A facilitator may be provided. EPTA members are invited to stay over at Heathcote for the training session.
Cost: A sliding scale of $20-$60 per person facilities cost for the meeting. Please bring potluck food for two lunches and one dinner. Friday night arrivals are welcome.
The cost for the teacher training will be $50 (US or Cdn.) per person.
Contact: Linda Felch, EPTA
21300 Heathcote Rd.
Freeland, MD 21053
410-343-DIRT
lfelch@jhu.edu

Permaculture Design Course

Island of Kauai

Dates: Febr. 28-March 14, 1999
Location: Kilauea, Kauai, Hawai'i
Description: The course will be held at a site near Kilauea on Kauai, the oldest of the large Hawaiian islands. Kauai has the most weathered and sculpted landscape and the deepest soils in the archipelago, and displays both a wet side and a dry side with dramatically different climates and vegetation. The island's human population could become more self-reliant, economically prosperous, and ecologically sound. Emphasis will be given in the course to developing strategies for this transformation.
Instructors: Michael Pilarski, Douglas Bullock, Bruce Hill, and John Valenzuela
Cost: $875.
Contact: Ray Maki, Pc Kauai
PO Box 498
Kilauea, Kauai, HI 96754
808-634-5412
or: Michael Pilarski
Friends of the Trees Society
PO Box 4469
Bellingham, WA 98227
360-724-0503

Fundamentals of Permaculture

Southern Ontario

Dates: June 10-18, 1999
Location: Orangeville, Ontario
Description: Fundamentals of Permaculture covers cultural transformation, permaculture ethics and principles, ecosystems, pattern, forests, soils, water, microclimate, earthworks, home systems, building design, animals, plants, aquaculture, waste treatment, tools, gardening, mapping, permaculture for cities and villages, and financial systems. The course provide 44 hours of preparation for the Permaculture Design Certificate.
Set among 200 acres of native forest in the Niagara Escarpment Hills, the Ecology Retreat Center offers comfortable accommodations and excellent food in a rustic natural setting only 50 km north of the Toronto Airport. Enjoying the varied, temperate, and lively climate of the Great Lakes region and adjacent to excellent recreational opportunities such as the Bruce Trail, this landscape of open meadows, spring-fed streams, and rolling hills offers easy access to the full range of rural, wilderness, and urban environments of Canada's heartland.
Instructors: Peter Bane, Richard Griffith, Jillian Hovey, Keith Johnson & guests
Cost: $900 Cdn. includes tuition, meals, shared lodgings, curriculum materials, and a subscription to *The Permaculture Activist.* $50 discount for registration by May 10th.
Contact: Ecology Retreat Centre
RR 1, Orangeville, ONT.
L9W 278 Canada
519-941-4560 voice
fax/- 942-3951

Once in a Blue Moon...

Fundamentals of Permaculture

Middle Tennessee

Dates: April 23-May 1, 1999
Location: Summertown, TN
Description: The 8th presentation of Fundamentals of Permaculture at Ecovillage Training Center covers global transformation, permaculture ethics and principles, ecosystems, pattern, forests, soils, water, microclimate, earthworks, home systems, building design, animals, plants, aquaculture, waste treatment, tools, gardening, mapping, permaculture for cities and villages, and financial systems. Well-developed energy, waste treatment, and garden systems, a seasoned and brilliant teaching team, and a cutting-edge facility for cultural change set amidst an internationally famous 30-year old intentional community make this a perennially popular course. "Life-changing," "outstanding," and "a profound experience," are comments regularly reported from participants. Come and see for yourself.
Instructors: Patricia Allison, Peter Bane, Albert Bates, Andrew Goodheart Brown, Chuck Marsh, Keith Johnson
Cost: $600 includes tuition, meals, dormitory lodging, curriculum materials, and a subscription to *The Permaculture Activist.* $50 off for registering by March 15, 1999.

Advanced Pc / Village Design

Dates: May 28-June 2, 1999
Location: Summertown, Tenn.
Description: The Ecovillage Training Center, part of the Global Ecovillage Network, is a pioneer in the development of new and appropriate forms of human settlement for the 21st century. Sustainable physical and social technologies are here put in the context of the worldwide crisis of resource depletion, expanding population and deteriorating ecosystems. The course addresses the essential skills and awarenesses required to establish new communities or transform existing ones using ecological, democratic, and skillful means: finances, visioning, locating land, community glue and governance, recruitment, design and building technologies. Appropriate for developers, community activists, architects, urban planners, municipal officials, and all who see their future in a renewal of human-scale living.
Instructors: Patricia Allison, Peter Bane, Albert Bates, Andrew Goodheart Brown, Chuck Marsh, Keith Johnson
Cost: $400 includes tuition, meals, dormitory lodging, and curriculum materials.
Contact: Ecovillage Training Center
PO Box 90
Summertown, TN 38483
931-964-4324
fax 964-2200
ecovillage@thefarm.org
http://www.thefarm.org/permacultur/

Fire Strikes, Nature Rebounds

Rick Valley

The Opal Creek area in the Oregon Cascade Mountains is famous being the largest intact forest in that heavily logged region. In August '98 the first permaculture design course there was hosted by the Friends of Opal Creek at their Jawbone Flats Education Center. Jawbone Flats is an intact Cascade Mountain mining camp, a double file of small, weathered buildings with steep roofs to shed heavy snows. Just weeks before the course two cabins burned, an ironic lesson in design for catastrophe: That morning the community held a fire drill, and the hydro generator was shut down to allow the water to be used in the hoses. Without electricity, a guest lit candles in a cabin…

Between class and my cabin lay the charred and twisted remains, a great new opening to the sky. The 60-year-old cedars, hemlocks, and Douglas firs that had towered over the cabins were black spikes, with a few rust-colored needles still hanging. Depressing. The course convener and our cook had lost all their possessions. But I noticed some large insects one morning. and looked closer: on the sunny side of a blackened bole there was an orgy going on.

For a few days, starting as the morning warmed, a species of large wood-borer beetle occupied the hot spots. New arrivals would fly in swiftly, land and jump on or be jumped by another. I've not identified the species yet, but it wasn't the small metallic green one I've always known; this one is the size of the green ones I've seen used as jewelry by tropical people. And of course, they weren't green. If you're going to party on charcoal, you should be black with natty silver-grey pin stripes. With no other burn for miles, these beetles homed in on the place to be.

Before the end of the course, the beetles' party was over. Now the trunks were being probed by Ichneumid wasp ovipositors seeking beetle eggs, and foraging Downy woodpecker couples as well. The first bracken fern fronts were unfurling over the ashes now that a single rain had wakened them. That forest is certainly a working ecosystem, and it doesn't wait long. The burn no longer looked depressing to me. We have taken on quite an agenda—modeling ecosystems after natural ones!

Any design course has its own flavor. At Jawbone '98 one aspect was Haiku.

woman's body round
stones shaped to fit and hold
nature is flat-free

pool and rock patterns
carved by force, spirit, and need
flash of leaping fish

3rd Annual Elfin Pc On-Line Permaculture Design Course

Elfin Permaculture's 3rd Annual Permaculture Design Course Online will begin at the end of November, 1998, and run 5-6 months, depending on class needs. The course includes home reading assignments, instructor's "lectures" distributed by email, email class discussion of current themes and student projects, a number of special student reports, and a permaculture design project completed by each student. Successful completion of all course requirements leads to certification as an entry-level permaculturist.

The course is particularly suited to people who cannot take two or three weeks for a live permaculture course, people living in areas distant from live courses, and people seeking in-depth training in permaculture. Advance students may arrange to take the course at an advanced level.

A very limited number of scholarships is offered: there is a backlog of qualified applicants.

Elfin Permaculture has arranged alternative approaches for people who want exposure to the course material but cannot take the course at this time. Monitor status is available at a nominal fee, so people can follow the course reading, receive special instructor's materials, and read class discussion as they see fit. In addition, a complete set of reading assignments and course notes is offered, on disk or in print. Class materials are available by mail. Also, up one or two conventional correspondence students may be engaged, either by mail or email.

The broad course outline follows:

Section 1: Introduction and Basic Principles

a) World ecological problems and interrelationships.
b) Principles of natural design.
c) Permaculture design concepts.
d) Classical landscapes.
e) Patterning, edges, edge effects.
f) The Permaculture Design Report
g) Principles of transformation (in process—you will get as much as we have worked out at the moment—this is not part of ordinary permaculture design courses).

Section 2: Appropriate Technologies in Permaculture Design

a) Energy—solar, wind, hydro, biomass.
b) Nutrient cycles—soil, microclimates gardening methods, perennials, tree crops, food parks, composting toilets, livestock, "pest" management, food storage, seed saving, cultivated systems, forests, etc.
c) Water—impoundments, aquaculture, conservation, etc.
d) Buildings.

Section 3: Social permaculture. Design Report.

a) Design for catastrophe.
b) Urban permaculture.
c) Bioregionalism.
d) Alternative economics.
e) Village development.
f) Final design reports and critiques.
g) Final evaluation.

For more information, request the course protocol and reading list from Elfin Permaculture at Permacultr@aol.com

P.O. Box 52, Sparr FL 32192 USA.
YankeePerm@aol.com

Permaculture Design Course
Southwest Oregon

Date: June 14-25, 1999
Location: Williams, OR
Description: This two-week course will cover permaculture philosophy and methodology in depth, and will explore and integrate such topics as appropriate technology and housing, energy conservation, low maintenance organic gardening, edible landscaping, tree crops, perennial edibles and medicinals, water and soil management, community economics, and more.
Instructors: Jude Hobbs, Tom Ward
Cost: $750-950, sliding scale
Contact: Scott Wilson
963 Panther Gulch Rd.
Williams, OR 97544
541-846-6407

Permaculture Design Course
Northwest Pennsylvania

Dates: August 8-22, 1999
Location: Sandy Lake, PA
Description: Intensive certificate training at Three Sisters bioshelter and market garden farm. Students will develop a design to bring the complex site closer to an ideal of sustainability. Focus includes further development of pond and gardens, application of appropriate technologies to the bioshelter, and addition of more perennials to the landscape. A unique opportunity to evaluate and design a working permaculture ten years into its development. Besides the farm and bioshelter, we will study a nearby 10-acre woodland homestead. Text *(Per maculture: A Designers Manual)* is required reading (not included in fee).
Instructors: Course leader Darrell Frey is a consultant to Harmony Homestead at Slippery Rock University. He has over ten years experience teaching Permaculture. Additional instructors will be announced.
Cost: $750 covers food, camping, materials.Registerwith$100depositbyJuly15th
Contact: Darrell Frey,
Three Sisters Permaculture
134 Obitz Road,
Sandy Lake, PA 16145
defrey@bioshelter.com
412-376-2797

Fundamentals of Permaculture Village Design Practicum
Black Mountain, NC

Dates: July 9-17, 1999 (Fund'ls)
August 6-14 (Practicum)
Location: Earthaven Village, near Black Mountain, NC
Description: Fundamentals of Permaculture covers cultural transformation, permaculture ethics and principles, ecosystems, pattern, forests, soils, water, microclimate, earthworks, home systems, building design, animals, plants, aquaculture, waste treatment, tools, gardening, mapping, permaculture for cities and villages, and financial systems.

Village Design Practicum covers design process, broadscale agriculture, pattern languages for human settlement, wildlife and landscape restoration, mapmaking and presentation skills, ecoforestry, natural building methodology, economic and social design.

The Village Design course also covers organizational, educational, and governance aspects of community, enriched by the ongoing experience of village building at Earthaven. The courses may be taken separately, although the Fundamentals course or a background in sustainable systems design is recommended as preparation for anyone interested in Village Design who does not already have Permaculture training.

Participants completing both sections will receive the permaculture design certificate.

Instructors: Peter Bane, Chuck Marsh, Patricia Allison, Andrew Goodheart Brown, Keith Johnson, and guests

Cost: $550-800 for each course includes tuition, meals, camping, curriculum materials, and a subscription to *The Permaculture Activist.* $50 off for registering by June 1, 1999. $50 discount if taking both courses. Other lodging options available by arrangement.

Contact: Culture's Edge, 1025 Camp Elliott Rd., Black Mountain, NC 28711. 828-298-2399.culturesedge@mindspring.com

Permaculture Work Study Program
Earthaven Village at Black Mountain, North Carolina

Dates: July 7-August 18, 1999
Location: Earthaven Village, near Black Mountain, NC
Description: A six-week immersion experience in building permaculture systems from the ground up. Participants will work daily to create sustainable systems for Earthaven Ecovillage: natural building, ecoforestry, streambank restoration, garden agriculture, alternative energy systems, aquaculture, and greywater treatment. In this residential setting, community living skills, consensus decision-making, and conflict resolution will be taught and practiced. Participants will share group meals and exercise responsiblity for meeting daily needs of the community. The Program includes the Permaculture Fundamentals and Practicum courses leading to a Certificate of Permaculture Design Apprenticeship.

Instructors: Mollie Curry, Peter Bane, Chuck Marsh, Patricia Allison, Andrew Goodheart Brown, Keith Johnson, and guests.

Cost: $1800 includes tuition, meals, camping, and curriculum materials. Apply early, places are limited. $100 deposit and completed application with references required by June 1, 1999.

Contact: Culture's Edge
1025 Camp Elliott Rd.
Black Mountain, NC 28711
828-298-2399
culturesedge@mindspring.com

Networks & Resources

from Certified Forestry News - *Vol. 2, Number 2, April 1, 1998*

Wisconsin Forest Owners Launch Wood Marketing Co-op

A group of landowners in Southwestern Wisconsin is joining together to manage, harvest, process, and market value-added timber crops in a "new generation" cooperative. The Sustainable Woods Cooperative, based in Spring Green, will be organized using the best ideas from around the world. Included will be innovative practices from Sweden where the majority of landowners have already joined together in cooperatives to manage their resources and increase individual income with value-added manufacturing.

The Sustainable Woods Cooperative is the result of 25 years of work done by Jim Birkemeier on his family-owned Timbergreen Farm. "Over the years we have learned to grow large high-value trees, carefully harvest the timber, and produce an annual income through our farm's lumber sale business. We have sold wood to people in 34 states plus Canada from our sales barn. By selling kiln-dried timber, flooring, millwork, and other finished products, we can multiply our income many times, compared to just selling trees to a sawmill. Lumber is one product that can be manufactured easily on a small scale with basic machinery. According to our regular customers, our Solar Cycle dry kilns produce better quality lumber than most large commercial operations."

As an example of value-added processing, Birkemeier explained the manufacturing of a good red oak tree, "A 24-inch diameter red oak tree will produce many products. This tree has 560 board feet (according to the Scribner tree scale) and would sell for about $335 as a standing tree in the forest. Value-added processing will yield over one face cord of fuelwood worth $100 delivered to Chicago, five wooden pallets worth $35, three hundred square feet of knotty oak flooring for $885, eleven hundred lineal feet of millwork for $950, and 100 board feet of architectural lumber, or furniture stock, worth another $600. This brings our retail sales from this tree to over $2,500. If we install the flooring, or make cabinets, furniture, crafts, etc., we can raise this figure even higher. The more creative and industrious you are, the higher the value possible."

That value-added profit is what the new Sustainable Woods Cooperative will capture and use to carefully manage an owner's timber for the future, as well as increase their regular income from the forest. Local manufacturing will produce many new jobs and keep the added revenue in the local community. Logs will be processed into as many high-value forms as possible, and sold at retail prices to maximize the returns for the forest owner. Some logs may be sold through a collective sort-yard system. A computerized bar-code system will be used to track every log and board through the cooperative.

All aspects of the cooperative will be controlled by a forest-owner board of directors. A volunteer steering committee is currently developing the new venture until the permanent board is elected. A charter membership fee of $100 will be used by the forest owners committee to build the cooperative over the next several months.

SWC foresters will follow the standards for sustainable management developed by the Forest Stewardship Council and the coop is currently pursuing certification through the SmartWood program. Certification of the coop will not only help assure members that their forests are being well managed but it will help find new markets for the many different products the coop plans to produce.

Forestry staff will develop management plans, mark timber for cutting, and closely monitor all harvesting work. Foresters will be paid an hourly wage. No one person, except the forest owner, will benefit from a timber harvest on a percentage or commission basis.

SWC-trained logging crews using horses, pre-haulers, and mechanical skidders will harvest the trees. Woods workers will be paid higher than average wages per unit volume, due to the careful selective harvesting required for future-oriented management. Low-damage logging is critical to protecting the environment and future timber production.

Institute for Agriculture and Trade Policy is helping establish the coop. Mark Ritchie, president of IATP, spoke of the new effort in Spring Green. "To my knowledge, this is the first certified value-added wood marketing cooperative in the entire United States," said

Ritchie. "Private forest owners will be able to improve their forests and earn a lot more money through the cooperative organization. I have talked to forest owners in Northwest Wisconsin, California, Minnesota, and the Southeast U.S. who are closely watching this effort so they can replicate this service in their own area. I urge all private forest owners to consider joining this group. It will provide a locally controlled management and harvesting system that a forest owner can trust and believe in to make them the maximum income. The April 2nd inaugural meeting of Sustainable Woods Cooperative was an historic night."

A brochure and membership information is available from Sustainable Woods Cooperative, PO Box 430, Spring Green, WI 53588. (608) 588-7342, fx/-7651.

Second Forest Co-op Imminent

After visiting the Sustainable Woods Cooperative (SWC) in Southern Wisconsin, landowners in Buffalo and Trempealeau Counties in Wisconsin and Winona Co., Minn. are working to establish the Hiawatha Sustainable Woods Cooperative, what hopes to be the second FSC-certified cooperative in the country. Jim Beeman, a biologist and logger from Fountain City, Wisconsin has been the driving force behind this effort. Jim's 20 years of experience working in the forest and producing finished products have led him to believe that a co-op of this nature has tremendous potential. He and other landowners in the three-county area want to avoid highgrading and over harvesting their forests, and see the SWC as a useful model to replicate.

The two co-ops would like to share resources and market jointly when both are in operation. The initial members of HSWC feel the time is right for this kind of effort because of the rapidly rising prices for hardwoods, the increasing environmental awareness of landowners, and the bad experiences many have had with conventional logging.

Cooperative Development Services of Madison, Wisconsin is helping HSWC with their organizational efforts, and the Institute for Agriculture and Trade Policy is advising the co-op about achieving certification. These two organizations have been contacted by other landowners in Minnesota, Wisconsin, Ohio, and Tennessee about the possibility of forming similar cooperatives. This interest is leading to a collaborative effort between these two organizations to provide assistance to groups who are interested in developing certified forestry cooperatives.

For more information on the Hiawatha Sustainable Woods Cooperative contact Jim Beeman at 608-687-8193.

Start Your Own Timber Co-op

The Institute for Agriculture and Trade Policy would like to hear from landowners who are interested in forming their own forestry cooperatives. IATP has witnessed the extraordinary interest generated by the Sustainable Woods Cooperative in addition to receiving inquiries from people all over the country wanting to start their own coops. Consequently, IATP is in the process of developing a program to help forest cooperatives get started and get organized.

If you would like information on the new program, contact Philip Guillery at IATP, email: pguillery@iatp.org, Tel: 612-870-3456.

Web Sites on Certification and Forestry

Forest Stewardship Council:
http://together.net/~fscus/index.html

SmartWood:
http://www.rainforest-alliance.org/swm.html

Certified Forest Products Council:
http://www.certifiedwood.org/

Scientific Certification Systems:
http://www.scs1.com/

Timbergreen Forestry:
http://www.execpc.com/timbergreen/index.html

The Forest Partnership:
http://homepages.together.net/~wow/TFP.html

Temperate Forest Foundation:
http://www.forestinfo.org/

Canadian Forestry Certification Coalition:
http://www.sfms.com/welcome.htm

GoodWood Alliance (list of certified sources):
http://www.goodwood.org/goodwood/goodwood_list/goodwood_list.html

The Forest Partnership:
http://homepages.together.net/~wow/TFP.html

C.I.F.O.R.: Intl. Center for Forestry Research:
http://www.cgiar.org/cifor/INDEX.HTM

AmericaForestMagazinehttp://www.amfor.org

Current forest density in the US:
http://www.sciam.com/1998/0498issue/0498scicit4.html

University of Minnesota Extension
http://www.extension.umn.edu/Environment/

Certified Forestry News is a bi-monthly publication of the Institute for Agriculture and Trade Policy highlighting events, activities, and resources for individuals and groups interested in independent third-party certification of forests and wood products. Subscriptions to the electronic version (email) are free. Send an email message to iatp@iatp.org. In the subject line say: Subscribe Certified Forestry News. Back issue of all IATP on-line publications are available in a searchable archive on the World Wide Web at: http://www.sustain.org/bulletins. Email news about events, activities, and new resources to <pguillery@iatp.org>.

Southern Sustainable Agriculture Conference & Trade Show

Five hundred farmers and other agriculturists from the South will gather for a winter working-holiday on Jekyll Island—six miles off the coast of southeast Georgia—from Jan. 15-17, 1999, at the Eighth Annual Southern Sustainable Agriculture Working Group (SSAWG) Conference and Trade Show. Anyone interested in learning more about sustainable farming while having fun is invited to join them.

This year's conference will feature activities for the entire family, from 36 workshops on sustainable production techniques, marketing approaches, management strategies, and farm policy issues to entertaining sustainable ag. activities for children. Fifty to 75 vendors will exhibit products and services that can help enhance the long-term viability of family farms. One of the most popular and fun-filled events of past SSAWG conferences—the Organic Cotton and Alternative Fiber Fashion Show and Auction—will be held following a banquet of food and beverages produced by Southern farmers using sustainable practices. Registration includes a reception feast of delicious Southern fare.

Among Jekyll Island's many attractions are a national historic landmark district of 33 Victorian structures, beach fun, four golf courses, biking and jogging trails, shopping, seafood dining, fishing and boating. The Clarion Resort Buccaneer hotel will offer $45 per diem room rates for conference goers who want to arrive early or stay after the conference to enjoy a winter vacation on the island. Conference events will be held at the nearby Jekyll Island Convention Center.

Special discounts for early conference registration are being offered—$65 per person for conference events, $40 for children's program participants and $18 per banquet ticket.

The Southern Sustainable Agriculture Working Group consists of 50 farm organizations representing over 7,000 individuals in 13 Southern states who endeavo to use a whole systems approach to support family farms. SSAWG welcomes membership from individuals and agricultural organizations in the South. SSAWG members receive the organization's quarterly newsletter, *Southern Sustainable Farming*, which contains descriptive articles about the latest trends and develop ments in sustainable agriculture in the region.

Conference contact information

To register for the conference, contact:
Jean Mills, Conference Coordinator
14430 Jackson Trace Rd.
Coker, AL 35452. ph. (205) 333-8504
jeanmills@aol.com

For hotel reservations, phone the Clarion Resort Buccaneer at (912) 635-2261.

For additional conference information or publicity materials, contact Chris Campany, Publicity Chairman, at (504) 336-9532.

To learn more about Jekyll Island attractions, call (800) 841-6586 or visiting the island's Internet website at http://www.jekyllisland.com.

A schedule of SSAWG conference events and registration form are available at http://www.attra.org/ssawg/

Networks & Resources

1998 Bioneers Conference Draws 1,000

Darrell Frey

The annual Bioneers Conference, held in San Francisco, October 23 - 25, was hosted by Kenny Ausubel and Nina Simons and produced by the Collective Heritage Institute (CHI).

For three days nearly a thousand people gathered each morning to listen to a series of speakers and share in ceremony. The afternoon sessions offered about a dozen presentations each day. Between events attendees browsed several dozen exhibits and the hundreds of books on sale.

Founded in 1990, CHI "seeks to promote a solutions-oriented culture of environmental restoration" and "to cultivate both a material and spiritual basis for conservation of the cultural and genetic diversity of the Earth." The annual conference proposes to draw together presenters and attendees who are in the vanguardofamoresustainableculture—"bioneers."

This year's speakers came from a wide range of backgrounds and interests. John Mohawk of the Seneca Nation provided a Native perspective on western culture and eloquently described the Iroquois vision of peace and justice. Starhawk and Donna Reed spoke on the brutal suppression of women and diversity in the cultural history of the West. David Orr and Fritjof Capra shared their clear vision for greening environmental education. John Todd, Anna Edey, and Paul Stamets addressed biological wastewater treatment. Jerry Mander wove together the themes from his various books to present a case against the global economy. Kent Whealey shared the work of Seed Savers Exchange. Penny Livingston presented her work in permaculture and her site at the Pc Institute of Northern California.

Other topics presented included native agriculture projects, youth activism, biodynamic agriculture, food and chefs, environmental justice, and natural design.

The highlight of the conference for me was meeting and networking with people of like mind. I attended impromptu meetings of gardeners and permaculturists, sharing our work and talking about our gardens.

In any event this size it is possible to find things to critique. Perhaps the plenary sessions could have allowed more feedback, or the panel sessions could have been better moderated to keep questions and answers focused. Long spells of sitting and listening were trying. Lunch options were delicious, but expensive. The dinner event was out of our budget. A networking session for Pc people would have been appropriate. But these are minor details. All things considered, I highly recommend the Bioneers Conference and applaud the work of the Collective Heritage Institute.

For more info on CHI or the Bioneers Conference: Collective Heritage Institute, 826 Camino de Monte Rey, Building A6, Santa Fe New Mexico 87505 or www.bioneers.org

Australia Begins Production of Non-Toxic Termite Barrier

With its extensive areas of warm, dry climate, termites represent a major hazard to wooden buildings in Australia. Application of long-lasting and highly toxic organochlorine insecticides beneath the slabs and foundations of new buildings has been an almost universal practice there.

Rising concern over environmental poisoning led to a ban on below-ground applications of these toxins as of June 30, 1998. The response of Australia's scientific and industrial research community should be of interest to all natural builders and owners of wooden homes in temperate as well as tropical climates.

Demand for the termite barrier Granitgard® has soared since June. Quarries in all Australian states will soon be producing it under an agreement between its developers, Granitgard Pty Ltd, and CSR Readymix.

Granitgard consists of finely graded stone particles, and is laid beneath the concrete floors of new buildings or around foundation stumps. Research has shown that termites cannot penetrate it because the particles are too large and heavy for them to shift, too hard for them to dissolve with their saliva, and too closely packed to provide a way through. The Australian Building Codes Board has awarded it national accreditation as a control method for newly constructed buildings.

American research had shown that stone particles can block termite movement. To see whether Australian stone extracted from quarry waste would have the same effect, CSIRO (Commonwealth Scientific and Industrial Research Organization) and Victoria quarry operator E.B. Mawsons conducted a range of field and laboratory trials.

The particles proved highly effective, and the research provided the data needed to achieve accreditation for Granitgard. Australian Standard AS3902 sets out quality assurance requirements for the product, which include testing a sample from every second tonne produced against CSIRO specifications. Continued work at CSIRO, by a team including Granitgard's R & D Manager Don Ewart, includes the development of new placement technologies and field testing regimes.

According to Ewart, Granitgard is being installed in hundreds of new buildings each week— "since the end of June numbers have gone through the roof." So far there have been no reports of it failing to keep termites out.

"Consumer satisfaction is high," he says. "Termite protection is now a whole new ball game, and physical barriers seem to be the way it's happening. I think Australians are world leaders in the use of physical barriers." Δ

Top UK Timber Trader to Demand FSC Label

LONDON, UK, October 8, 1998 (ENS) - Meyer International, the UK's largest timber trader, has announced that it will only purchase timber that has been certified under the International Forest Stewardship Council (FSC) scheme for sustainably managed forestry.

The decision was hailed Wednesday by the World Wide Fund for Nature (WWF), as "one of the most significant things to happen in the timber trade for decades." The WWF started the Forest Stewardship Council in 1993.

The UK is the second largest net importer of timber in the world, and Meyer is "central" to this industry, WWF UK forestry campaigner Steve Howard said.

He predicted that the announcement would have ripple effects worldwide—Meyer is said to source timber from 40 countries. The company's commitment to the scheme represents a significant challenge for the FSC as well as an opportunity, Howard said. "It's a sign of the FSC coming of age."

Meyer has pledged that 80% of its timber will be FSC-certified within five years. According to Amanda Burton of Meyer, the firm has "always kept a close eye on the development of certification and now, as the FSC is entering the mainstream we can see that it presents an exciting commercial opportunity."

Forest certification is the process of inspecting forests to see if they are being managed according to an agreed set of standards.

The FSC's scheme for certification is distinct from the ISO environmental management standard. FSC certification is based on specified performance standards that must be met by the forest operation.

The environmental management system standard from the International Standards Organization (ISO 14000-series) is a process standard. It specifies how a company's management system must be organized to address environmental aspects and impacts of its operations. ISO certification does not result in a product label.

FSC and ISO are fully compatible and can be complementary, according to a statement by the Forest Stewardship Council.

ENDS Environment Daily contributed to this report. Europe's choice for environmental news. Environmental Data Services Ltd, London. http://www.ends.co.uk; Email: <envdaily@ends.co.uk>

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LETTERS

Botanical Chimeras

Dear Friends,

I graft "weeds." And strange things happen.

For instance, I grafted globe artichoke scions onto two varieties of "weed" thistles. The plants transformed into 2-in-1 "chimeras."

All of the bull thistles died that winter. Frozen artichoke cells? Death-dealing infection? The Canada thistles survived. So did their globe artichoke cells. The altered thistles produced fragrant flowers, ornamental outer stem fibers, and leaves that tasted like artichokes. (Both the leaves and stems still require dethorning before use, but I do use them.)

"Weed" honeysuckles change their ways when pruned properly. They may also be grafted with purebred relatives. Likewise with wild grapes and mulberries.

Poison ivy is very tricky to work with. I grafted them with their harmless relative, red staghorn sumac. The grafted stems first turned into 2-in-1 chimeras and then they "infected" others.

The same surprise occurred when I grafted garlic mustard with its ornamental (and still edible) relative, Chinese lunaria. A lot of dry silver spikes have been appearing around here ever since.

Lilies, orchids and English ivy can also chimeracise. They can do this with highly endangered relatives. They can be persuaded to produce living chimeras by grafting them with tissue taken from fallen flowers or one sliver of either leaf or leaf stem.

Cacti, apples, and their close relatives tend to keep their grafts where you put them...although my experimental raspberries produced both species graft growth and chimeras. Milkweeds also seem able to do both...when they or their scions survive.

Chimeras sometimes produce species pollen and all conserve species cells: My house plants conceal cells from plants you "can't grow indoors" in their species forms.

Yours very truly,
Louise E. Rothstein
2912 Zollinger Rd.
Columbus, Ohio 43221

Editor: American Heritage Dictionary *defines "chimera" as "An organism, especially a plant, containing tissues from at least two genetically distinct parents." Have any other readers experienced these or related phenomena?*

Asking the Right Questions

Dear Peter,

What a fantastic issue!(#39). I found your description of the California calamity quite tame—I don't understand the vitriolic response it elicited. Your attempt to elevate the debate beyond the actual event, to its greater implications, is most relevant for our time. However the culture of denial runs deep—why should one expect Permaculture to be denied its own portion of that? At least someone is asking the right questions!

Thank you,
Mary Woltz
Mt. Airy, NC

Kenyan Pc Project Seeks Tools

Dear PCA,

Greetings from Kitale, Kenya, East Africa. I am currently establishing a Permaculture farm in Kiminini near Kitale Town. The aims of the project are:

a. Improving local diet by organizing and setting up home gardens;

b. Promoting the knowledge and use of indigenous vegetables, fruits, pulses, etc. by better selection, preparation, and distribution;

c. Training local personnel to teach about gardening and nutrition;

d. Setting up a tree nursery to provide grafted fruits.

To establish a nursery requires simple tools which we do not have. Thus I am writing for assistance. The tools would cost about Kshs.25,000 (US $500). If your readers can help us in this matter, we would be most appreciative.

Yours faithfully,
Joshua Machinga
P.O. Box 2487
Kitale, Kenya

Next *PcA*, Issue #41
Natural Building

Deadline for submissions: February 22nd

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Miscellaneous

Seeking source for seedlings of Elaeagnus multiflora and Maclura pomifera. Devoe, Rt 1, Box 529KF, Bonners Ferry ID 83805. -40a

Situations Wanted

Civil engineering graduate with natural building experience seeks sustainability-oriented design/consult/build work with registered professional engineer. Matthew Goike, PO Box 1644, El Prado NM 87529. goike@hotmail.com -40a

Seeking summer internship with non-profit, permaculture-oriented social action group. Eli. eliza@frontier.net (970) 382-8633. -40a

Help Wanted

Volunteer program leading to possible co-ownership of 25-acre tropical property, breathtakingly beautiful, unique topography, 20 years subsistence arboriculture, rainforest conservation, constant cornucopia, wildlife communion, Spanish, yoga, healing, spiritual growth. http://www.santocristo.com/santocristo/fincabrian.html. Write: Brian Trentham, Apdo. 2-8000, San Isidro Gral., Costa Rica. -41a

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We are fulfilling a vision of vibrant community living in awareness of the spiritual unity of all creation, in ways that heal, nourish, and connect us with the natural wourld. Earthaven's learning center, Culture's Edge, has presented courses in sustainable living since 1995.

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Property for Sale

Permaculture Farm / Wildlife Refuge. 40± acres. Turn-of-century partially-restored farm house, 1600 sq. feet of living area, 3 porches. Excellent location, 35 miles southeast of Austin, Texas, 3 miles off major highway on dead-end county road with 2700 feet of county road frontage. Colorado River bottom sandy and clay loam soil. Fruit and nut orchards - 38 mature native pecan trees. Underground irrigation. Pond, swales, chicken coop, yards, and forage area. Horse stalls, tack room and pasture. Small commercial shiitake mushroom operation. Wildlife exemption for low taxes. $175,000 cash. 512-237-2007. Ohana Farms, Rt. 3, Box 253-C, Bastrop, TX 78602. -40a

Historic Tucson home for sale. Large double lot, adobe greenhouse, organic gardens, native and fruit trees, 1500-gal. cistern, automatic irrigation, pond, fire pit, sweat lodge. Half mile west of downtown near desert greenbelt. Good neighborhood. $137,000. Serious inquiries only, please. 541-488-4647 or 707-923-9350. Peter. Leave message. -40a

Residential Development: Skull Valley Preserve. 20 min. & a hundred years from Prescott, AZ. Five parcels inside 30-acre permaculture preserve secured by covenants. $70K-$125K. 602-443-0386. -40a

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CALENDAR

November 29-December 12. Dexter, OR. Permaculture Design Course. Lost Valley Educational Center, 541-937-3351.

November 30-December 13. Harbin Hot Springs, CA. Larry Santoyo & Assoc., 309 Cedar St. #85, Santa Cruz, CA 95060. dotcalm@got.net; 800-469-5857. www.permearth.org

January 20-23, 1999. Pacific Grove, CA. Ecological Farming Conference. CSA, 406 Main St., Suite 313, Watsonville, CA 95076. 408-763-2111, fx/-2112. www.csa-efc.org

February 27-March 12, 1999. Occidental, CA. Permaculture Design Course. Occidental Arts and Ecology Center, 15290 Coleman Valley Rd., Occidental, CA 95465. 707-874-1557, fax/-1558. www.oaec.org

March 13-14. Freeland, MD. Eastern Permaculture Teachers Assn. Meeting. Linda Felch, EPTA, 21300 Heathcote Rd. Freeland MD 21053. 410-343-DIRT. lfelch@jhu.edu

March 15. Freeland, MD. EPTA Teacher Training. EPTA. 410-343-DIRT. lfelch@jhu.edu

April 23-May 1. Summertown, TN. Fundamentals of Permaculture. Ecovillage Training Center, PO Box 90, Summertown, TN 38483. 931-964-4324. ecovillage@thefarm.org Web: www.gaia.org

May 14-16. Black Mountain, NC. Introduction to Alternative Building. Culture's Edge. 1025 Camp Elliott Rd., Black Mtn. NC 28711. 828-298-2399. culturesedge@mindspring.com

May 28-June 2. Summertown, TN. Advanced Permaculture/Village Design. Ecovillage Training Center, 931-964-4324. ecovillage@thefarm.org

June 6-12. Taos County, NM. A Natural Building and Permaculture Convergence. Permaculture Drylands Institute, PO Box 156, Santa Fe, NM 87504-0156. 505-983-0663. PDrylands@aol.com

June 10-18. Orangeville, Ontario, CANADA. Fundamentals of Permaculture. Ecology Retreat Center, RR 1, Orangeville, ON, L9W 2Y8 Canada. 519-941-4560, fax/-942-3951

June 12. Black Mountain, NC. Forest Gardening Workshop. Culture's Edge. 828-298-2399. <culturesedge@mindspring.com>

June 14-25. Williams, OR. Permaculture Design Course. Scott Wilson, 963 Panther Gulch Rd., Williams, OR 97544. 541-846-6407.

July 7-August 18. Black Mountain, NC. Permaculture Work/Study Program. Culture's Edge. 828-298-2399. culturesedge@mindspring.com

July 9-17. Black Mountain, NC. Fundamentals of Permaculture. Culture's Edge, at Earthaven Village. 828-298-2399. <culturesedge@mindspring.com>.

July 31-August 2. Celo, NC. Sixth Annual Southeastern Permaculture Gathering. The Summer Gathering, Celo Community, 272 Seven Mile Ridge Rd. Burnsville, NC 28741. SASE Please.

August 6-14. Black Mountain, NC. Permaculture Village Design Practicum. Culture's Edge at Earthaven Village. 828-298-2399. culturesedge@mindspring.com.

August 8-22. Northwestern PA. Permaculture Design Course. Darrell Frey, Three Sisters Farm, 134 Obitz Rd., Sandy Lake, PA 16145. 412-376-2797.

August 24-September 5. Basalt, CO. CRMPI, Box 631, Basalt, CO 81621. Ph/fx: 970-927-4158. Email: permacul@rof.net; website: www.rof.net/permacul/

September 27-October 2. Black Mountain, NC. Building with Earth and Straw. Culture's Edge, at Earthaven Village. 828-298-2399. <culturesedge@mindspring.com>.

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