

Producing Forest-Based Food Products in Permaculture Systems¹

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ABSTRACT: The basic Permaculture Principles introduced in this paper are elaborated on with a special emphasis on creating forest-based food production systems. Drawing from Permacultural and other texts, this paper explores the creation of perennial polycultures using the New Forest Farm of Viola, WI and other sites around the region as practical examples.

This paper outlines the practical steps to be taken in order to transition a typical upper midwestern farm into an agricultural forest. Species which are especially well suited to Permacultural systems are listed as well as sources of these plants. Specific groupings of plants (guilds) that have proven to yield well in northern climates will be discussed as well.

Introduction

The purpose of this paper is to provide a basic background to the science of Permaculture, to demonstrate the practical steps needed in order to transition a typical upper Midwestern row-crops farm into a Permaculture system, and to provide the case study of New Forest Farm near Viola, WI (Southwestern WI) as an example of a farm making that transition.

The results gathered from the first four years of the transition show a great deal of promise for the economic development of a diverse, ecologically stable forest-based family farm.

What Is Permaculture?

The actual word Permaculture is an invention of Australian authors and educator/farmers Bill Mollison and David Holmgren. It is a contraction of the words Permanent and Agriculture. The word Permaculture is also used as a contraction of the words Permanent and Culture for the authors of the word realized that without a truly sustainable agriculture, there would be no sustainable culture. It has been the inherent unsustainability of the agriculture of the empire cultures that has helped them all to collapse periodically. It is the unsustainability of our own modern agricultural system that is helping to exacerbate many of our civilization's problems as well. Topsoil loss, groundwater contamination, rising cancer rates, and the bankruptcies of farmers all across this country are common topics in newscasts these days and even topics of presidential commentary. I'm not interested in debating the issues on television and radio. Neither am I out to place blame for the way things are. I'm interested in getting to the roots of the

situation and creating a truly sustainable agricultural system.

In order to continue, we all need to have at least a basic idea of what Permaculture is. Sound-bite definitions cannot possibly encompass all of what Permaculture is and might even cause some folks to pigeonhole the concept. However, if definitions are seen as a foundation upon which we build our house of knowledge, then we will be on the right track toward an understanding of Permaculture. I will use other people's definitions that I have conveniently paraphrased.

Bill Mollison writes:

1. Permaculture (permanent agriculture) is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter and other material and non-material needs in a sustainable way.
2. Permaculture design is a system of assembling conceptual, material, and strategic components in a pattern which functions to benefit life in all its forms. The philosophy behind permaculture is one of working with, rather than against, nature; of protracted and thoughtful observation rather than protracted and thoughtless action; of looking at systems in all their functions, rather than asking only one yield of them and of allowing systems to demonstrate their own evolutions.

With those basic definitions as the foundation that we will build upon, you and I will spend the rest of our

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lives building our house of Permaculture knowledge. As long as there are humans living on earth, knowledge of what Permaculture is will continue to grow, transform and become more refined.

Ethics and Principles

Being that it is an evolving body of knowledge-action that is at the very basis of civilization, Permaculture can be taught as a set of principles or guidelines which are ethical by nature. This paper presents a dramatically shortened set of guidelines that, in my opinion, will give you all of the decision making and conceptual tools you will need in order to apply Permaculture principles in your thinking, in your life and on the farm. Also, since my focus here is on the transition of row-crop agriculture toward Permaculture, I will not be discussing at all strategies for the suburban or urban environment. Neither will I mention techniques that apply within the home and immediately around it. The Permacultural way of thinking however, can be applied in all areas of life no matter who you are or where you live.

Ethics

The primary ethical decision that we must make is to take responsibility for our own existence and that of our children. Every facet of our lives makes physical, social and environmental impacts. Being conscious of our impacts and striving to take responsibility for them is where we all begin.

Care for people and care for the life support systems of the planet we live on are paramount for the future survival and well being of our children and grandchildren. Leaving our children with more cash dollars than we were left is not the only way to take responsibility for the future. Actively creating healthy agricultural ecosystems, clean air, clean water and a safe social order are as important if not more so.

Cooperation, mutual support and information exchange is the basis of the survival of existing life systems and for the future.

Principles of Permaculture

All of the principles below are linked to one another. None of them stand in separation from the others. They are all part of the functioning whole. This, of course, is one of the principles and that is:

Relative location

Nothing stands in isolation. Every farm is located within a certain bio-geographical region. That region determines what the major weather patterns will be. It determines what plants and animals will be found there and which exotics are likely to thrive. On a smaller scale, every farm is located somewhere in a watershed... up on the ridge, side hill or down in the valley. The valley farm is connected to the ridge farm by landform, water, weather, animal movements and more. On a smaller scale still, an apple orchard is planted in relation to certain aspects of slope, may be surrounded by cornfield, next to the equipment yard or the road. Within that same orchard, the interplanting of other species are in relation to the shady side or the sunny side of the tree, uphill or down hill from etc.

All of the above factors and their relationships have an effect on crop yields, pest and disease pressure, ease of harvest, and disaster survival rate. (drought, flood, wind-shear etc)

Diversity

As a general rule, the more diverse a system is, the more stable it is in the long term. A corn farmer wiped out by hail is finished for the year. Financial hardship will follow no matter how good an insurance policy was carried. A corn, beans and hay farm that finished beef or milked dairy animals would be more stable. In a poor bean year maybe the hay will be better. If the corn gets hailed maybe it'll make decent silage. Year in and year out you can usually come up with something to feed to the cows. However, both of the above farms are very capital intensive and depend upon the wisdom of our elected leaders to write equitable legislation. Times of international financial turmoil and political irresponsibility can undo a farmer as severely as any hail storm. It is especially painful for the farmer because the failure of his business could happen despite the fact that he is an excellent farmer!

The more diverse the system is, the less likely there will be a total loss. Hedge your bets and don't bet on the bankers and politicians!

Energy

Do not consume or export more energy than can be captured and stored by the life forms on your farm. I will use a classic example here of the conventional egg and the Permacultural egg.

Figure 1 is a flow chart that shows the inputs and outputs of a conventionally produced egg. As you can see, it is a rather energy intensive process from the production of the materials for the equipment (tractors, plows, combines, grain elevators, feed mills etc) to the petroleum based fertilizers herbicides and pesticides to the transportation of those materials. The chicken then gets to live in a wire cage which is not the environment in which the animal evolved. Battery egg houses generate a tremendous amount of manure which is costly to deal with, and use more energy.

Figure 2 is an illustration of a Permaculture egg. It is, of course, somewhat of an idealized illustration, but most of the ideas can be used in commercial egg production facilities. Uncaged, free-range chicken eggs are all the rage in the stores these days and the producers receive more for their product. Free range growers can add hedges of seed-producing trees and shrubs around their hen yards, as well as medicinal plants that the animals can eat free-choice to ward off parasites, coxidirosis etc. Electric bills can be reduced when water pumps aren't operated constantly and the roofwater is used in gravity feed watering systems. Most of the energy needed to raise that egg came from the system.

Energy costs money whether it is in the form of electricity for the water pumps or fuel for the combine. Using conscious design we can place food-bearing plants next to/over/with/the poultry. We can design or retrofit buildings to use less energy. Forage chop and deep straw hen yards and pastured poultry all produce chickens and eggs while using less energy.

By no means have I covered the entire topic of energy. Energy and Permaculture systems could be the topic of an entire workshop of its own.

Water

Even though the upper Midwest is an area of adequate rainfall for unirrigated agricultural production, we still experience extremes. In 1996 on my own farm we had nearly a foot and a half of rain in the month of June which included 6 1/2" in one storm. We then had no measurable rainfall until October. 1988 was a drought year and many families lost their farms because of it, but any of you who were here then will remember that during the drought the trees remained green. Water is a form of biological energy. Without it plants and soil life dies. Row crops which have a clean soil surface beneath them tend to allow rain to run right off the fields contributing to contaminated streams and silted

dams leading to angry environmentalists and lake recreationists. Tree crops, however interact with water in many different ways. (see figure 3) The leaves slow the impact of the rainfall reducing the damage to soil structure. The trunk is a bundle of tubes which transport and store water. The roots act like drills which can penetrate any hardpan to help drain wet soil. These same roots allow the tree to access deep water in times of drought that annual crops cannot. Keep your water on your farm and use it by converting it into some kind of living thing. Plants first then animals. Keep the water as high up on the watershed as possible so it can do as much work as it can before flowing out to sea.

Figure 4 shows some basic land shaping schemes in order to store water in the farm landscape. Most farmers in this region either have a bulldozer or a neighbor who has one. With a bulldozer to make ponds in the proper place and a one bottom plow to make water catching swales, nearly all water that falls on the farm can be captured and stored in the soil. During catastrophic rain, channels and dams can be designed to allow excess water to run off without any erosion. The topic of pond building leads me conveniently into the next principle and that is this:

Work with nature rather than against it

The classic example of this is the farmer with a low spot on the back forty. Every spring the low spot puddles and remains soggy until the heat of summer finally dries it up. Some years it's dry enough to put in a crop, three times he's gotten the tractor stuck in it and some years he knows better than to go anywhere near that spot. The farmer who would work against nature would go to the bank or the federal government and get a loan for far too much money and have drain tiles installed in the area. Even though all of the farmer's fertilizer now gets washed directly into the tile and into the ditch beside the road, it seems to work for awhile. Eventually, however, the tiles break from freezing and thawing too many times or they get clogged with roots and eventually the wet spot returns. This costs a lot of money, a lot of energy, and time, and in the long run draining didn't work.

The same farmer could work with nature, however and build a pond. The excavation could be big enough and designed so that the fields surrounding it naturally drain into the new pond. It might actually lower the water table in the surrounding fields allowing for higher yields than would be expected from swamp corn. The pond now becomes a new resource on the

farm. It can be stocked with fish and thereby provide additional protein for the family while it gives Mom, Dad and the kids some quality time together. Ornamental wetland flowers, grasses and shrubs can be grown and crafted into saleable goods. Bird watchers and hunters both might enjoy paying for a campsite near the pond. The wet field becomes a resource rather than an expensive nuisance. This leads me into yet another Permaculture principle and that is:

The Problem has the seed to the solution embedded right in it!

The above example illustrates this principle well. Every problem has a creative, productive solution to it. We just have to think at the problem from the other side and accept the answer instead of imposing our will expensively upon it.

The above principles have been more the broad theoretical ones. At this point the principles become a little more specific and directly applicable to transitioning a farm into a Permaculture.

Plant succession

Most people in the area have been able to observe an old field somewhere as it gradually began to turn itself back into a forest. This of course, happens in areas that naturally were and want to be forest. Those who live in the true prairie regions, however, won't see this kind of succession. The old field will eventually get invaded by woody, brushy plants. The grasses give way to Queen Anne's Lace, Goldenrod, Milkweed. Then the brambles move in, raspberry, blackberry, multiflora rose followed by the sumacs and prickly ash. As each wave of plants colonize the site they change the nature of the soil and all of the energy interactions taking place there. This process will happen. The only thing to re-set it is some kind of energy input be it a plow, Roundup or a chainsaw and skidder. It will start over again in its own time in its own way. A Permaculturist will use this natural process to his advantage. When the row crops are no longer grown, it is time to grow brush and brambles followed by shrubs followed by trees. The process will take a significant portion of a human lifetime to accomplish, so it will be best to work with this process. Plant succession also teaches us that to be a Permaculture farmer is not to grow just one thing, A Permaculture farm is constantly changing as the weeks roll into seasons as the years go by. This is the pattern we are fitting into at New Forest Farm. We are not only farming in place, we are farming over time. A

row crops and beef farm has transitioned into vegetables now and will soon transition into brush and brambles then shrubs followed by trees. We will cover the details later.

Stacking

Observation of nature will provide anyone with ample evidence that it lives in three dimensions. Sunlight is gathered 150 feet in the air by the tallest trees and it is gathered by the vines crawling in the trees, the understory trees, shrubs and plants. A Permaculture farm seeks to gather sunlight from three dimensions. A corn field is basically a one dimensional solar collector. The green is only six feet tall at the most. With green from 100 feet up all the way to the ground, the total yield from the same acre of ground in a Permaculture system should be dramatically higher.

How to Get There: a Case Study and a Plan

Now we get down to the nuts and bolts of transitioning a farm from conventional row-crops agriculture into a Permaculture.

Figure 5 shows three illustrations of a farm in transition. Year one shows what looks like a grain cash crop and that is all. The year 4 illustration shows what the farm would look like after a few basic steps were taken. These steps are as follows:

Windbreaks/hedgerows

The crop yield benefits from windbreaks are documented so thoroughly that a new continuing enrollment Conservation Reserve Program was founded which will pay farmers for the land taken out of production and will cost-share the installation of trees. Windbreaks and hedges will collect organic matter which will decompose and enrich the surrounding soil, and will cause snow drifts which are effective ways of catching and storing water on the farm. Desiccating winds will be slowed down, crop leaf and stem damage from thrashing in the wind will be lessened. Beneficial insects and birds, the ones that eat your pest insects will have new habitat. Some windbreak species are nitrogen fixing, adding extra crop yields by collecting fertilizer from the atmosphere. At New Forest Farm we began with living snow fences. Beginning in 1995 and continuing up to the present we have been planting Badgersett Hazels alongside all of our vehicle lanes. The land immediately alongside the roads isn't really used effectively in crop production anyway, so we really

didn't lose any production. We utilized otherwise useless land. As of this summer (1998) we have nearly 1,200 hazels in the ground some of which will bear next season.

Another great place to begin planting windbreaks/hedgerows is immediately on the line between fields. These lines are usually on contour and can be avoided by machinery without too much difficulty. Within a year of doing this in our hay ground, we noticed larger snowdrifts accumulating on the contour between fields solely due to the fact that there was now a mohawk of grass in line with the trees. These hedgerows can be installed one year at a time. Permaculture is a process and a way of thinking. Going bankrupt because you spent too much money planting trees is not Permaculture. You've got to be financially prudent and patient.

It's my opinion that the years mentioned in figure 5 are somewhat unrealistic for the upper Midwest. We've been planting since 1995 and to the uneducated eye our fields still look like fields. They don't look anything like year 4 in figure 5.

Guilds

Once the primary species of trees have been planted in the windbreaks, the species diversity and the yields can be increased by the creation of guilds. In Permaculture a guild is a community of plants that have proven themselves to live well with one another in close association. In figure 5 you can see that in year 4 other trees and shrubs have shown up in the picture. They will show up anyway because you have ceased cultivation of that area and plant succession is in action. By carefully observing nature around you and observing orchards as well, you can learn which plants grow well with one another. At New Forest Farm the two areas from which we expect to earn a living from perennials are guilds based on Apples as the primary specie and Chestnuts. Both guilds have been experimented with for several years, observed in the wild, or at other orchards. I will begin with the Apple orchard.

New Forest Farm's Permaculture Apple Orchard

Most people, I assume, have seen an apple orchard. It typically consists of apple trees growing in well mowed grass. Some orchardists use Roundup beneath their trees to prevent weed growth and competition for water and nutrients. Others use tillage devices such as

the Weed Badger brand orchard tiller to maintain a bare soil beneath their apple trees. The reason for the mowing, tilling and herbicide is that the feeder roots on apple trees and sod utilize the same layer of soil. The grasses, being more vigorous growers can utilize nutrients and water more quickly during the season causing slower growing trees and reduced apple crops. How do we eliminate sod beneath apple trees? How we arrived to the point where we are today at new forest farms began with a childhood memory that I have of an apple orchard in full bloom beneath the apple trees were multitudes of daffodils. Grazing in the orchard were sheep with their bells tinkling beautifully. As a landscape designer I planted daffodils and apples for their beauty and over the years, through research and experimentation came up with some elements of the system. Also as a child, I observed my fathers suburban plantings and learned a lot. As an overworked machinist he rarely had time to adequately care for his few backyard trees. His love of nature and gardening kept him interested in all kinds of berries and vines. They received care for their first season or so and then were neglected in favor of the next tree or shrub. What survived this somewhat random mixture also lead me to the system we are using today.

The apple trees are heirloom varieties or new genetic developments which all show resistance to pests and diseases. The trees were EMLA 7A rootstock planted beginning in 1996. Rows are spaced 20 feet apart (too wide for a high density, modern orchard) and the trees are planted 15 feet on center within the row. Beginning in 1997 the rootstocks were spring grafted to the desired varieties.

Beginning at one end of one orchard row, the complete orchard guild was planted. Beneath the apples are daffodils, which out compete the sod, provide early spring pollen for wild pollinators and yield cut flowers for sale. Surrounding the daffodils is a band of Comfrey. Comfrey is excellent as a salad or steamed green, loosens the soil, accumulates calcium, out competes sod and can be harvested for multiple medicinal uses. It is in this apple understory that I see the greatest potential for the production of medicinals and ornamentals, both of which assist the apple tree by providing beneficial insect habitat. Other medicinals in the apple guild are spearmint, wormwood, calendula, and echinacea. On the north side of the comfrey in the shade of the apple tree we have planted Red Lake Currants, a high yielding juice, confection and eating currant cultivar. In between the apple rows we have planted grapes. They will eventually be trellised in such a way that air flows downhill beneath them and

the sunlight reaches over the tops of them to shine on the entire apple tree.

Yields

The only crops yielding so far in the apple orchard are the daffodils and medicinal herbs. We have not marketed any of these yet because they aren't producing in volumes sufficient enough for us to wholesale them. We're well known locally for giving away lots of daffodils in the spring!

Mowing

It is hoped that sheep or geese will be used to mow the grass between rows so we will not have to mow mechanically. Now that the trees are still small, we are able to fence them with portable electric fence and graze young steers in the rows between trees. It hasn't always worked that well, and we aren't recommending that people do it until we work the bugs out of the system. Figure 6 shows the Apple guild at New Forest Farm.

The Chestnut Orchard

Beginning in 1995, we began planting chestnuts on a north facing slope. Rows were planted 25 feet apart with chestnut trees planted 15 feet apart within the row. Since then we have planted some every year and the number totals somewhere around 400 trees. Since we began, we have learned a great deal about the chestnuts and the plants that associate with them. Future chestnut plantings will not be planted in this configuration. The rows are planted too close together to allow for the addition of sun loving "weeds" such as grapes, raspberries and vegetables. Future plantings will allow room for the addition of extra plants.

Chestnut Varieties

We have planted several different varieties of chestnuts but only one in any quantity. The only chestnuts that have shown any promise on our farm are the Badgersett Hybrids. They are bred for ultra precocity (they bear nuts at a young age), nut size and survivability on a cold, dry, windy Minnesota site. Our first nuts were borne in 1997 on a three-year old tree and this summer (1998) we had two trees bearing and a dozen or so flowering.

Future Plantings

The inspiration for the chestnut guild and orchard layout that we will be planting has come primarily from observations at Badgersett Farm itself. It's the only producing chestnut orchard that I know of in the area. What I have looked for at Badgersett is spacing for one. Phillip Rutter, the proprietor has been learning on that site for nearly twenty years. By observing his plantings we should be able to accelerate our own learning and not repeat the feedback that he has already experienced. I have also been careful to observe his weeds, the plants that volunteered in his orchard.

The predominant weeds with commercial equivalents in the plantings at Badgersett Farm are the following: Grapes, Currants, Gooseberries, Deadly Nightshade, Raspberries and various wood consuming fungi. There were many flowering plants as well which I did not catalogue. Since the above mentioned weeds occurred in all of the Badgersett plantings, they obviously do well living in association with chestnuts and hazels. Select cultivars of grape, raspberry and currant will be used instead of wild varieties. For Deadly Nightshade we will substitute commonly grown vegetables in the nightshade family, specifically Peppers, Tomatoes and Eggplant.

The Layout

Future plantings of chestnuts will be 15 feet between trees in the row with rows 60 feet apart. In between the rows will be a double row of hazels planted 6 feet between rows and 7 ½ feet between trees within the row. This spacing allows for maximum sunlight and bearing surface on the trees and leaves room for the intentionally placed weeds.

To the south of a chestnut row will be a row of trellised grapes. In the space between the grapes and the hazels will be the Peppers, and beneath the Hazels will be cultivated culinary or medicinal fungi. On the shady side of the chestnuts will be a row of currants and between the chestnuts will be raspberries.

Figure 7 shows the chestnut orchard layout to be implemented at New Forest Farm.

Planting Strategy

Establishing a Permacultural system on the farm scale requires a long-term view, willpower to resist short-term economic temptation, and patience. The first trees

to be planted should be the ones that are the slowest to mature. It will take longer for them to yield a return so it is important to get them planted first. Planting hundreds or thousands of trees will also be somewhat costly compared to other phases of the transition. Most nurseries offer substantial per-tree discounts for large orders. Fast-growing perennials are generally less expensive than trees and reproduce much faster. A nursery bed of a commercial raspberry variety can quadruple in numbers of plants each year by suckering. Currants and grapes can be reproduced easily by cuttings, flowers can be divided every other year or so for more planting stock.

Going back to figure 5 we can see how New Forest Farm has followed the basic transition pattern.

Year 1-3: Plant windbreaks, hedgerows, living snow fences, and orchard rows continue with conventional farming between rows of trees, be it row crops, grains, or grazing. Grazing is an ideal low-energy, Permacultural farming strategy. Permaculture guilds as livestock forage systems should work on the farm scale and need more experimentation by innovative farmers.

Year 4-7: Begin to harvest earliest hazels and chestnuts and replant the seed in animal-proofed nursery boxes. Begin planting faster growing perennials...brambles, bushes, vines, bulbs, medicinal herbs and flowers. Continue with conventional farming between rows of trees.

Year 7-10: Hazels, Chestnuts and Apples reach production levels as do berries and vines. Deep shade beneath hazels provide suitable conditions for fungus culture. Conventional farming may no longer be needed as primary source of farm income.

Year 10 +: As a pioneer Permaculture farmer you will be learning how to manage a three dimensional, food producing forest-based polyculture. Your system will be resilient in the face of climactic and weather extremes. You will be harvesting products throughout the entire season instead of just in the fall. You will have a wide variety of high value products to hedge against commodity price swings. You will have been liberated from the annual tillage treadmill. You will have drastically reduced chemical and fertilizer bills.

You will not be bored! You will have plenty to do and plenty to learn.

Year 12-15+: Fastest growing trees used in

windbreaks can begin to be harvested for firewood and pulp. Sawlogs should be ready in 25 years or so. Figure 8 shows what an intentionally designed Permacultural food forest would look like when mature. As you can see, sunlight is captured and food is produced from the canopy, nearly 100ft up to shade tolerant plants and root crops on and under the forest floor.

Conclusion

Permaculture principles and practice as demonstrated at New Forest Farm and other sites around the world show a practical and affordable method of transitioning an energy intensive, conventional farm into a management and biologically intensive forest-based farm in a relatively short period of time. Yields of multiple products over time (seasons and years) can protect the farmer from unstable markets, unpredictable weather, and will yield indefinitely in an ecologically sound manner.

Appendix I.

Permaculture Species List

This is by no means an exhaustive list of the plants with potential for use in Permaculture systems. These are merely the ones that have been trailed by the author and proven to be successful at New Forest Farm, Viola, WI(USDA Zone 4-) in various plantings in Anchorage, AK(USDA Zone 3) and Susloisna Valley, AK (USDA Zone 2-) The following species will survive in the upper Midwest.

Fruits and Berries:

Apple- *Malus* spp.
Apricot-*Prunus armeniaca mandishurica*
Blackberry-*Rubus* spp.
Blueberry-*Vaccinium* spp.
Currants-*Ribes* spp.
Cherry-*Prunus* spp.
Cranberry-*Viburnum* spp.
Elderberry-*Sambucus* spp.
Grape-*Vitis* spp.
Gooseberry-*Ribes* spp.
Kiwi-*Actinidia* spp. (Arctic beauty will survive in this region)
Mountain Ash-*Sorbus* spp.
Mulberry-*Morus* spp.
Plum-*Prunus* spp.
Raspberry-*Rubus* spp.
Serviceberry-*Amelanchier* spp.

Strawberry-Fragaria spp.

Nuts or Pods

Beech -Fagus spp.

Butternuts, Buartnuts, Walnuts-Juglans spp.

Chestnuts-Castanea spp.

Hazels-Corylus spp.

Hickories-Carya spp.

Honey Locust-Gleditsia spp.

Oaks-Quercus spp. (White oak and burr oak have the lowest amounts of tannins in the nuts)

Pine Nuts-Pinus spp. (P. flexilus, P. korianensis, and P. Cembra have been trailed by the author.)

Siberian Pea shrub-Caragana spp.

Nitrogen Fixers

Black Alder-Alnus glutinosa

Black Locust- Robinia pseudoacacia

Siberian Pea shrub-Caragana spp.

Appendix II

Sources of Permaculture Species

Bear Creek Nursery

PO Box 411

Northport, WA 99157

offers a wide variety of hardy fruits, nuts and berries and scionwood for over 200 apple varieties for grafting.

St Lawrence Nursery

Rt 2

Potsdam, NY 13676

offers a wide variety of zone 3 hardy fruits and nuts as well as uncommon species and varieties.

Lawyer Nursery

950 HWY 200

Plain, MT 59859

offers a large selection of tree seedlings and rootstocks in bulk quantities

Badgersett Farm

RR1 Box 141

Canton, MN 55922-9740

offers the hardiest and most productive chestnuts and hazels available.

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