

Permaculture Strategies Applied to some North American Landscapes: Cross-country on Amtrak

Michael Pilarski – January 6, 2009.

I am in the process of traveling by train from the West Coast to the East Coast and back again. Here is a report on my trip. I spend most of the daylight hours observing the landscapes I pass through. In much of them I observe paradise lost and think about how permaculture could help make these areas more productive again. Here are some of the major eco-regions I passed through with some observations and suggestions. The long winter nights kept me from seeing and commenting on large swaths of the landscape.

Northern Rocky Mountains.

This region was the most ecologically intact landscape I saw on the whole journey. Strategies:

- 1) Most of the forests are extensive, healthy and doing just fine on their own. No management needed in most places. Just a hands-off approach.
- 2) Forest lands kept in the timber base could use better forestry practices such as longer rotations, less clear-cutting and more individual tree selection. See my 1994 book "Restoration Forestry: An International Guide to Sustainable Forestry Practices". Kivaki' Press.
- 3) There is little cultivated agriculture going on. Farmland in the river valleys is mostly devoted to pasture and hay for livestock. Most of it in relatively good management.
- 4) Diversify crops, agriculture and intensive market gardening around the few towns and cities.

Northern Great Plains. Eastern Montana and the Dakotas (Including around the town of Browning on the Blackfeet Indian Reservation).

An undulating landscape of predominantly shortgrass prairie with low rainfall and high winds. Grazing and cultivation have obviously taken their toll. The strategies that come to mind are:

- 1) Holding the water on the landscape with contour swales, other earthworks and keyline techniques.
 - 2) Creating riparian shrub and tree plantings where runoff concentrates in the draws and folds of the landscape.
 - 3) Hedgerows of drought-tolerant shrubs cross-wind.
 - 4) Restoration plantings of native grasses as well as annual and perennial forbs (herbs and wildflowers).
 - 5) Bring back more of the small and large native animals including buffalo and antelope. Less fences and safer road crossings.
 - 6) Intensive gardens in the towns and homesteads supplied with irrigation water from water harvesting techniques.
- There already are existing examples of these strategies to learn from. Applied to larger and larger areas of the landscape they would gradually restore the land's productivity both of human food and healthy ecologies.

Upper Midwest:

Tall-grass prairies of Minnesota and Wisconsin. Part of the US breadbasket. Deeper soils and higher rainfall than the shortgrass prairies. Larger and more developed riparian areas. The agricultural productivity is very high at this time, but largely dependent on fossil fuels and outside inputs. Strategies to improve:

- 1) More green manure crops, rotations, pastures and integration of livestock. Over five to ten years the soil organic matter will build up, the soils will hold more water, fertility goes up and less outside fertilizers are needed.
- 2) Increase the amounts of trees/shrubs in the landscape with windbreaks, hedgerows and widened riparian zones. Turn grassed waterways into new riparian zones. The additional trees and shrubs will shelter more birds, insects, etc to create better checks and balances for pest control. Choose trees/shrubs which yield crops, firewood and other harvestable commodities.
- 3) Use more horses, oxen and draft animals in the landscape to replace part of the tractor fleet. This reduces inputs and brings more cropland into pasture and hay crops as part of the rotation.

This region has a lot of natural fertility and productivity. These strategies would boost productivity and put it on a more sustainable basis. More farmers would be needed so the area would employ more people.

Mississippi River Breaks.

I only saw the rail corridor for about 200 miles south from Minneapolis. A relatively narrow floodplain and forested slopes with bluffs. Strategies:

- 1) Integrate a lot more native fruit trees along the river corridor as well as perennial herbs to replace the large areas of non-native grasses and weeds.
- 2) Restore more of the natural sloughs, waterways and water basins to reduce downriver flooding and create more diverse fish habitats.
- 3) Establish small fields and terraces along the lower slope areas with intensive food production.
- 4) Intensify and improve forest management. Higher yields of timber and other natural resources and healthier ecologies.

Western Pennsylvania Appalachians

An area of extensive forests and light population. Mostly poor soils, shallow to bedrock. Strategies:

- 1) Allow large areas to go their own way and evolve to later successional forests.
- 2) Intensify forest management on part of the landscape. Natural tree selection aiming for large-diameter, high-quality timber. Restoration and management for medicinal herb understory and other useful harvest.
- 3) Increase population in portions of the more favored, river valleys with intensive, organic agriculture utilizing forest biomass to improve organic matter in the soil, including woody composts, and terra preta charcoal (biochar). Employment and incomes supplied from forest and agricultural production.

Mid-Atlantic Piedmont. Virginia and North Carolina.

The ecosystems have been pretty hammered in the stretches along the railway that I saw. Almost all forests are at a low level of succession. Most farm soils are depleted. Lots of abandoned and run-down buildings. Most soils have impermeable layers close to the surface both in farmland and forest. Strategies:

- 1) Larger fields need hedgerows and windbreaks.
- 2) Improve drainage on much of the farm fields including keylining where appropriate.
- 3) Combine drainage with the creation of a lot more ponds and water storage for floodwater retention, aquaculture and dry-period irrigation. Spoils from drainage ditches, ponds, etc are used to create well-drained berms which can host a diverse array of perennial crops adapted to deeper soils. These berms can have forest biomass incorporated to improve drainage, soil structure, and organic matter content. This makes soils less acid.
- 4) On farm fields increase green manure crops, pasture in rotation and more livestock integration; all of which build soil organic matter and fertility. Diversify crops, especially more orchard and perennial crops. Less cultivation.
- 5) Intensify forest management aiming for large timber trees and much less reliance on short-rotation pine forests. Diversify timber crops with a larger emphasis on hardwood trees. Hardwoods make soils and water flows less acid as compared to pine forests. Manage forest understory species for medicinal herbs and other commercial harvests.
- 6) Use earth-moving equipment in some flooded forests to create areas with a matrix of water channels and berms. This allows for more a more diverse forest as well as more aquatic life and aquatic crops.
- 7) Dismantle most of the abandoned and dilapidated buildings. Recycle materials where possible. Restore the more historic buildings. Clean up the sites so they can be put to productive use. This will make the landscape much nicer for residents and tourists. Everyone will feel better.
- 8) Greatly increase home gardens and intensive market gardening for local food self-sufficiency and export to regional towns and cities. I paid very close attention to the thousands of house-yards the train passed by on this portion of the journey to survey for home gardens. I only saw 11 home gardens on the whole trip of which only 3 were sizable. This indicates a crying need for a lot more gardening education and extension.

Eastern Kansas

A landscape of large, open, agriculture fields. 90% of the area is under cultivation. Trees still grow without irrigation in farm yards, towns and along riparian areas. Soil is still reasonable. Wind and soil erosion evident. Virtually no planted windbreaks or shelterbelts in this landscape. The productivity could be quite high under sustainable management.

Strategies: Similar to the other prairie regions discussed.

- 1) Put 10% of the cultivated area into windbreaks and hedgerows.
- 2) Unightly mobile homes and mobile home parks are evident, as in much of the US. Someone needs to specialize in permaculture retrofit of mobile homes. Attached greenhouse on the south side. Construct decks and trellises around the trailers and grow vines on them. This would make the living space much cooler in summer and somewhat warmer in winter. It would sure disguise them and make them fit into the natural landscape better.
3. Some tree species of note. Black walnuts, Kentucky coffee-tree, honey-locust, catalpa.
4. I noted one field with broad-based terraces, which is a soil-erosion control method developed in the 1930s (or so). It is a wide swale which tractors and implements can navigate. This is an effective technique which could be implemented on perhaps half of the fields in this landscape.
5. More integration of livestock and more pastures in rotation. See page 125 of Permaculture Design Manual by Bill Mollison for wind affects on livestock and benefits of shelter.
6. Grow fenceposts. A relative shortage of fencepost trees in the landscape. Metal fenceposts are economically and ecologically high priced. Three strategies for growing fenceposts. A) Grow trees in situ where the fenceposts are wanted. Live fenceposts can be grown by direct seeding, by planting seedlings or from stake cuttings. B) Set up coppice fencepost farms which grow selected species at short spacing. After harvest, allow one selected shoot to grow up for the 2nd crop, etc. Many species can grow many rotations of poles before needing to be replanted. C) Grow tight hedgerows which can hold livestock without metal wire. Some livestock are easier to contain than others. Classifying from easiest to hardest to contain (with live fences) I would say sheep, llamas, cattle, horses, goats, hogs. The hungrier they are the harder they are to contain I might add. A livestock expert might give a different rating order. Any comments?

7. Create and/or expand existing and incipient riparian zones in current and ephemeral water drainages including those in fields.
8. Construct more dams and ponds for water storages. There are already plenty of examples of this evident in the landscape. Definitely more than in the northern plains, but there is potential for many more.

Western Kansas. Strong City going west.

Topography diversifies with bluffs, rocks, ridges and hills. A smaller % of the landscape is in cultivation and the valley riparian areas are wider and more forested. The elevation is higher as snow is now evident. The sedimentary rocks are flat on two sides and well disposed for building houses, walls, etc. A local resource. Trees grow on hill slopes.

Strategies:

- 1) Reopen the small town, train stations that now sit empty and boarded up. This will increase economic life.
- 2) Increase the field edge forest strips which are now evident as well as shelterbelts and windbreaks.
- 3) Plant live fences.

Short grass prairie. Eastern Colorado

Very few woody plants in the landscape. Some red cedar (*Juniperus virginiana*). Overgrazed landscape. Lots of bare soil surfaces. Erosion evident. Buffalo country. Cholla cactus appear and more yucca. Water courses are mostly ephemeral. Many incised streambeds. Extremely low population density with miles between habitations.

Strategies:

- 1) Water harvesting earthworks to store water in the landscape such as swales. Spot plantings and plantings in the watered areas created. Reseed swales.
- 2) Take cattle off most of the landscape and do good grazing practices where retained.
- 3) Reintroduce buffalo
- 4) Do cryptobiotic crust restoration.
- 5) Put networks of gabions in the incised streambeds to slow water and reverse erosion.
- 6) Investigate wadi culture techniques of middle east and north Africa and begin experiments to determine usefulness in this context.
- 7) Put in seed farms to grow out seed for native grasses, forbs and shrubs for revegetation efforts.
- 8) Create small reservoirs to capture and store runoff. Covered to reduce high evaporation rates.
- 9) Take advantage of north facing slopes to put in plantings.
- 10) Take advantage of drift snow accululation micro-habitats to do plantings. Create more of these deliberately with snow fences and plantings.
- 11) Restoration communities can be established in the favored valleys where irrigation water is present.

New Mexico.

Tourism is an important part of the economy at this time. What is the new economy going to be when tourism inevitably drops off?

Strategies:

- 1) Urban areas need to engineer to catch all city run off from streets, etc to percolate into soil for city plantings. This initial runoff has much less salts than runoff taken from watercourses further downstream.
- 2) Study ethnobotany and ethnoecology of native tribes. What plants did they utilize. How can they be used today? How do we increase them in the landscape and do sustainable harvesting.
- 3) Net & pan water harvesting on slopes to establish single trees.
- 4) Stop head gully erosion.

Arizona.

Anticipate increasing infrastructure deterioration. Highways, roads, bridges, buildings, etc.

Indian housing subsidized by government usually lacks vegetation, landscaping, traditions, energy generation, water harvesting. Bleak, bleak, bleak.

Poverty is very obvious from many of the residences observed.

Strategies:

- 1) Capture and mine soil from rivers. Silt banks obvious in braided river channels when not in flood.
- 2) Create series of riverbank gardens utilizing river silt, organic matter debris and water.
- 3) Revegetation with shrubs and trees in river bottoms and conifers on rocky uplands.
- 4) Do more detailed work on weed species as indicator plants. Indicators for water, soil pH, soil chemistry, soil types, etc. What useful species (native and non-native) can be used as replacement species on each of the different habitats indicated. What are uses of the different weeds?
- 5) Construct perimeter water interception banks at the base of runoff slopes to capture water and lead it to infiltration areas for agriculture. Research the Nabatean runoff agriculture systems developed in the Negev Desert for information on how to do this. See especially Michael Evenari's book "The Challenge of the Negev".

Sedona, Arizona.

I was fortunate to get off the train and spend a week in the Sedona area. Sedona is set in one of the most spectacular landscapes in the US. Many tourists come to visit its redrock canyons and mesas. At the same time it is a daunting landscape for food production. I observed only two vegetable gardens while in Sedona. It is almost totally reliant on imported food. The soils are non-existent to thin. The rainfall is low and the summers are hot.

Strategies:

- 1) Review and apply traditional farming strategies of Arizona tribes such as the waffle gardens of the hopis and water catchments of the Zuni, etc.
- 2) Restoration and enhancement plantings of native food plants in the towns and surrounding landscapes to enable subsequent, sustainable wildcrafting.
- 3) Create water catchment systems to capture roof, yard, streets, and parking area runoff for diversion to plantings, gardens, ponds, etc. This will reduce erosion, irrigate food plants and landscaping and fill underground aquifers. Water catchment includes small-scale systems for individual landowners and larger-scale public systems.
- 4) Plant fruit and nut trees and other useful trees and shrubs in public areas, and in yards and along streets.
- 5) Make careful use of all organic matter to build soils. This includes all kitchen waste going to compost piles or to feed chickens and small livestock. Consequent manures can be composted and returned to the soil. All prunings, trimmings, tree removal, etc to be used for gardening or chipped for composting.
- 6) Set up community gardens on public and private lands so that everyone who wishes to can have a garden plot.
- 7) Conduct trainings and classes on permaculture, organic gardening, fruit growing, chicken raising, etc.
- 8) Research and draw up a list of recommended soil amendments, fertilizers, microbial inoculants, etc to improve local soils for gardening.
- 9) Research and publicize species, varieties and techniques for winter gardens.
- 10) Research and publicize materials, species and plantings for shading summer gardens from excessive sun and heating.

Los Angeles Basin.

Lots of urban brownfields to rehabilitate. Almost all rivers and streams that I observed are now concrete, channelized drainages. I noticed many leguminous trees in the landscapes both as ornamentals and as weedy pioneers. I noted bunya bunya (*Auracaria bidwilli*) trees in the city and wondered if they produced nuts here?

Strategies:

- 1) Daylighting creeks and restoring natural water flows. This means that runoff must be collected and channeled into infiltration areas for gardens, urban plantings, etc.
- 2) Reduce the percentage of surfaced runoff areas. Rooves and streets are a high % of the surface area.
- 3) Plant viewbreaks to block out ugly views. More greenery in the landscape. Vines on trellises and walls to hide buildings and ugliness.
- 4) Plant many more live fences and fedges in the landscape to replace the proliferation of constructed fences, barbed wire, etc.
- 5) A wide range of urban gardens, urban agriculture, etc etc. Urban permaculture in general.
- 6) Replace non-functional ornamental trees and plantings with more functional, useful species.
- 7) Research and distribute lists of fruit, nuts, nitrogen-fixing and other useful plants which are well adapted to the area. This strategy is appropriate to every locality in the US.

Populated foothill areas north of Los Angeles.

Fire adapted chaparral is the dominant native vegetation.

Strategies:

- 1) Incorporate Jean Pain's strategies of fuel breaks and chaparral thinning which he developed in France. Along with shredder chippers to turn thinned brush into energy and compost for gardenings. See Jean Pain's book "Another Kind of Garden".
- 2) Gabions in the eroded stream channels
- 3) Stop human-accelerated erosion.
- 4) The usual strategies of capturing runoff and implementing urban and suburban gardening and agriculture. Replacing useless ornamentals with useful ornamental plants.

Countryside north of LA's suburbs.

The dominant feature of this landscape is cattle ranches on the lower slopes and chaparral on the upper slopes. Accelerated erosion from poor grazing practices is ubiquitous.

Strategies:

- 1) Pastures are very wind-swept and hedgerows and windbreaks are called for.
- 2) Large-scale, native plant restoration.
- 3) Reduce livestock in the landscape and diversify types of livestock (almost solely beef cattle now).
- 4) Introduce better grazing management such as rest and rotation, HRM, Voison, etc.
5. Gabions in the gullies. Riparian plantings along streambeds and ephemeral streams.

- 6) This is a great area for permaculture and restoration communities. The climate is wonderful and there is still a lot of soil. The productivity currently obtained from cattle could be increased one hundred fold if intensive permaculture was done in this area.
- 7) Plant edges of gullies and heads of gullies to stop the growth of the gullies and gradually reclaim them.
- 8) Introduce the Jean Pain strategies as noted in the previous section.

Inland coast range. After leaving San Luis Obispo the train route swings inland and goes through a series of coast ranges and valleys.

Cattle grazing is a dominant use of the landscape and accelerated erosion is very evident including extensive gully erosion.

Strategies:

- 1) Reforest the ridges and upper slopes.
- 2) Take cattle off a lot of the landscape.
- 3) Erosion control is a major consideration. The technical solutions are well-known and documented in hundreds of publications. In some cases the edges of gullies need to be rounded off and planted. This includes the use of heavy machinery. The various kinds of bio-engineering are particularly useful here. The keyline system of soil and water management developed by Australian P.A. Yeoman will be very useful here including the use of the keyline plows and keyline patterning developed by Yeoman. Combined with swales, water diversion channels and revegetation, the water which dumps into the gullies is diverted and downcutting ceases. This allows for the gullies to develop into stable riparian communities.
- 4) The labor to do all of this can be supplied by restoration communities and volunteers. The end result will be much more productive ecosystems which produces the wherewithal to feed and support the population doing the work and export surplus to California cities.
- 5) Develop the best soil areas on the lower slopes to intensive agriculture, permaculture, agroforestry and forest gardens.
- 6) Native plant restoration in all habitat types.

Eastern Oregon north of the Klamath Falls area.

Strategies:

- 1) Forest restoration is a major strategy including thinning.
- 2) Enrichment plantings of native fruits, edible roots, medicinals and other useful native plants.
- 3) Sustainable wildcrafting can provide local employment.
- 4) Create irrigated oases with intensive gardening/farming in better favored lowland riparian areas. This has to be done with sensitivity to existing water rights and stream flows. Water harvesting and pond building may be more appropriate in some instances rather than pumping from in-stream flows.
- 5) Restoration communities can be established on ranches as they come up for sale.

Willamette Valley, Oregon

One of the premier agricultural areas of the Pacific Northwest with abundant soil and water resources. Currently a large area of the farmland is devoted to growing grass seed for lawns.

Strategies:

- 1) Convert a large % of the grass seed fields to intensive agriculture. Seed for food crops can be one of the specialties. As the US goes through a transformation from a consumer culture to a relocalized culture there will be much less need for grass seed and more need for vegetable seed. Realizing that in the long run, most areas should rely on locally-produced, climatically-adapted seed.
- 2) The Willamette valley also has a large nursery industry for ornamentals. I believe it is the largest nursery production area in the US. This nursery production can switch it's emphasis on ornamentals to fruit, nut and other useful species.
- 3) Large open fields of monoculture crops is very common. Diversify crops and cropping systems and incorporate many more hedgerows and windbreaks and break up the large field areas.
- 4) More livestock integration into the cropping system and more live fences rather than barbed wire fences .
- 5) Give attention to planting field edges with perennial crops.
- 6) Improve drainage in some fields.
- 7) Build more ponds to retain water for dry season irrigation.
8. Reforest more of the riparian areas along rivers, streams and ephemeral waterways.
- 9) These last three strategies will contribute to reducing flooding and improving water quality.
- 10) Convert some agricultural fields to community gardens near towns and cities so that everyone who wants can grow food gardens to their heart's content.

All in all, I saw a lot of territory from my train window on my cross-country journey. Almost everywhere are ecologically-impooverished landscapes which could benefit from beneficial human attention and ecological restoration of native habitats and species. The restoration can be combined with permaculture, organic agriculture, and sustainable forestry methods to create a much greater production of human food crops and natural resources. Done with long-term

sustainability in mind and with much less reliance on fossil-fuel inputs. To do all this work will require many millions of people working on the land. This will create a lot of employment. The ranks of unemployed people in the US are vast and growing. We have the people to do the job. Housing for this increased rural workforce can be supplied by fixing up the existing housing base and building more housing with local, natural materials. Home gardens, intensive agriculture and ecological, broad-scale agriculture can feed this workforce plus provide food which the nation needs. This is a win-win situation for all the people involved, the nation in general, as well as future generations of humans and the native species of this great land.

My train trip crossed 20 states and more than 4,000 miles. It enabled me to see many American landscapes. Applying my permaculture training as I went was highly entertaining. I hope that this brief report will inspire some people to undertake the vast amount of work this nation needs to repair the damage done by previous generations to restore our landscapes to a higher degree of biological productivity and health.

Obviously these very brief comments are only the tip of the iceberg. This is just an introduction to how one permaculturist perceives the landscape and the possibilities for improvement. For each region we could come up with hundreds of additional strategies. Also many of the strategies touched on here could be applied in all (or many) regions. Each piece of property needs its own analysis and design. Permaculture design and implementation can help bring any property or landscape back to a high degree of productivity and ecological health.

I encourage everyone to put their shoulder to the wheel and dig in to their local community with useful work that will benefit their local community and ecosystems. Don't wait for permission and don't wait for someone to pay you. We are going to have to create a new economic paradigm to get this work done. I hope to see thousands of restoration communities springing up across this great continent.

Best wishes to all,

Questions? Comments?

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