Permaculture Design

Place

County Road, Wisconsin, USA

Presented by Dustin Cote
dustin.cote@gmail.com

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Partially automated by Sweet Tooth Software
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2. **Introduction**

The emergence of today’s modern agriculture has allowed us to meet the growing demand for food by the world’s population. Yields have increased, the price of food has declined, and fewer people are required to farm, allowing for the growth of cities and pursuit of other means of wealth and innovation.

This is an unsustainable process. Since nature is most likely already perfected, innovation and progress in modern farming has been focused on chemistry, genetics, and weather control. Intensive tilling, monocultures, chemical fertilizers, chemical pesticides, and genetically modified genes are necessary to combat the negative results of: intensive tilling, monocultures, chemical fertilizers, chemical pesticides, and genetically modified genes.

Intensive tilling is required for reducing labor and increasing growth, but contributes to less nutrient soil. Chemical fertilizers help counteract less nutrient soils, while poisoning our food and water supply. Monocultured fields mimic the efficiencies of factories, while being detrimental to bees and increasing pests. Chemical pesticides help counteract the increase in pests, while creating more resistant pests and poisoning our food and water supplies. Genetically modifying seeds attempts increase yield and effectiveness of pesticides, while cementing a corporate monopoly through the patenting of these seeds, causing reliance on future purchases of terminator seeds, and exterminating small farms as potential competition through lawsuits and bankruptcies.

It is hard to say how long science can outpace the frankenstein it has created. It is unlikely we will get honest answers from government agencies that are lobbied by dairy and food boards that are chaired by big agri businesses. The evidence we do have, is less nutrient-dense foods at the grocery stores, an increase in obesity, diseases, diabetes, and a decrease in fertility. Even the most skeptical among us who might wish to look the other way, would give pause when asked what the situation would be like in their children’s or grandchildren’s day.

The term “permaculture” combines the the words PERMANENT and AGRICULTURE. It is based on the concern for an alternative agricultural system that is sustainable long term. Instead of leaching the soil of nutrients, it aims to build soil and add nutrients through composting, worm castings, and animals. Instead monoculture, it aims to be as diverse as possible, knowing that different elements stack benefits as they interact. Instead of using chemical pesticides, it looks towards promoting an environment that attracts the right predators.

Permaculture is the design of a human habitat with its food production system. By mimicking the patterns found in nature, a successful implementation will combine the growth of plants, animals, soils, and water into stable & productive systems. While it is important to study each of these elements, the focus is really on the relationships between these elements as they interact with each other, due to where we place them on the landscape.

Geoff Lawton has visually described such a system as: “A spinning wheel that only occasionally needs the push of your hand to keep it going.”

Today, “permaculture” now points to the combination of the words PERMANENT and CULTURE. It has expanded to be applied to other areas of our life, such as housing, social interaction, health, energy, finances, and education. It observes what is wasteful or negative, and seeks sustainable alternatives.
3. Property

3.A Description

3.A.i Overview

This property is a 5.4 acre farmett lot near the town of [redacted], Wisconsin, USA. The owners are originally from this state, but have been living and working in California. After years of stressful rat racing, they have decided to come back near their home town and live in a rural setting.

They plan to grow as much of their food as they can, and become more self-sufficient. They read, study, and attend events that involve Organic farming, sustainable living, and permaculture. They currently have two children, and hope to raise them with this ideals, the value of hard work, exploration, and freedom.

The property used to be a working dairy farm, which is very common in their area due to the shallow and semi-rocky soil. However, growing corn is also quite popular. Below is a picture of a framed aerial shot of the dairy farm from 1957.
3.A.ii Current Status

The current owners moved to this property just 11 months ago, October 2012. Due to the move, they were unable to do any fall prep for the next spring.

So far this year they have begun raising chickens, and are processing them throughout the property with a chicken tractor. They use a mobile pen and surround the area with a movable electric mesh fence. They are big fans of having the chickens scratch and fertilize their property over time. They have recently started raising turkeys for meat, and are enjoying rapid growth and their productive activity.

They have also surveyed a contour on the western half of their property and dug a 100 foot long swale. Half of the swale is a woody bed, in which they hope to enjoy the benefits of hugelkultur. The other half was created the same way, but it was lit on fire and then smothered, in their attempt to create biochar. They hope to compare notes over the years. They plan on chopping and dropping the weeds that have grown on the swale, and have planted apple trees on the end of the swale.

They have planted numerous raised beds for their garden, and a traditional garden in one section of their yard. They have first hand experience with shading issues near their house, and the randomly rocky soil when starting their traditional garden.
3.A.ii The Future

I’ve been to the property numerous times, but made a special visit specifically related in walking and observing the property, and taking some photos and video. I had a chance to talk to the owners then and see what visions they had about their property. This made sure that none of my ideas would conflict with theirs. I wanted to make sure that the design I gave them wouldn’t be completely discounted because it hinged on a main feature that was located in the same place as one of their design ideas.

I then went over a very rough draft of my design, which they responded to quite positively. This was quite a relief, and now the design project is going to be fun!

It was very fortunate that we discussed this rough design. So much so, that I will make it a mandatory process in future designs. The owner was extremely knowledgeable in his own property and brought up many aspects that I never would have thought of, and pointed out aspects that would have been mistakes, impossible to implement, or just bad ideas.

- We both agreed on ponds and possible locations
- Owner pointed out existence and location of septic system. Concerns were raised about damaging it.
- When I talked about ideal location of Zone 1 gardens, owner pointed out the desire to have volleyball and similar type of play area instead
- When talking about herb gardens close to the house, the owner pointed out the extrememly tall, mature trees south of the house that cause too much shade for that idea.
- Owner pointed out concern and attempts to solve drifting snow that covers the sidewalk. The obvious solution would unfortunately cause drifting into the driveway/easement shared by neigboring property owners.
- Owners mentioned growing an orchard in the north facing yard by the house. They were agreeable to the idea of an earth berm instead.
- Walking the western fenceline, we both agreed that there was not just one, lowest exit point to the property there, nor did they follow the fenceline. The contour lines are more complicated than everyone’s first impressions.
## 3.B Data Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altitude:</strong></td>
<td>1,178 to 1,202 feet above sea level 370 to 377 MASL</td>
</tr>
<tr>
<td><strong>Coordinates:</strong></td>
<td>Latitude: 63° 59' 2.2341&quot;  Longitude: -88° 54' 43.2008&quot;</td>
</tr>
<tr>
<td><strong>Distance from sea:</strong></td>
<td>900 miles (1,448 km) from Atlantic Ocean 790 miles (1,271 km) from Gulf of Mexico 1,846 miles (2,970 km) from Pacific Ocean</td>
</tr>
<tr>
<td><strong>Köppen Climate Classification:</strong></td>
<td>(Dfa) Hot Summer Continental Climate</td>
</tr>
<tr>
<td><strong>USDA Plant Hardiness Zone:</strong></td>
<td>New 2012 Version: 4b (-20°F to -25°F Average Min Temp) 5a (-15°F to -20°F Average Min Temp)</td>
</tr>
<tr>
<td><strong>Growing Season:</strong></td>
<td>Median: 153 Days 10-90%: 134–160 Days</td>
</tr>
<tr>
<td><strong>First Frost:</strong></td>
<td>Median: October 4 10-90%: Sept 22-Oct 12</td>
</tr>
<tr>
<td><strong>Last Frost:</strong></td>
<td>Median: May 5 10-90%: April 4-May 20</td>
</tr>
<tr>
<td><strong>Maximum Sunlight:</strong></td>
<td>(Summer Solstice)</td>
</tr>
<tr>
<td><strong>Minimum Sunlight:</strong></td>
<td>(Winter Solstice)</td>
</tr>
<tr>
<td><strong>Extreme Weather Examples:</strong></td>
<td>Record High Temperature: 101°F (38°C) August  Record Low Temperature: -33°F (-36°C) January Potential for Tornadoes Potential for Blizzards Very Windy, Potential for 60+ mph gusts Late Frost surprises</td>
</tr>
<tr>
<td><strong>Slope:</strong></td>
<td>0 to 4% on eastern half containing buildings 6 to 8% on western half of property</td>
</tr>
<tr>
<td><strong>Annual Precipitation:</strong></td>
<td>35.5 inches 889 mm</td>
</tr>
<tr>
<td><strong>Surface Area:</strong></td>
<td>5.40 Acres 2.18 Hectares</td>
</tr>
<tr>
<td><strong>Aspect:</strong></td>
<td>The property runs NNW to SSE in a rectangular shape, minus its SSE corner section. The eastern half contains the buildings and is more level at the top of its own small ridge. The western half gently slopes to the West.</td>
</tr>
<tr>
<td><strong>Sun Angle:</strong></td>
<td>Summer Solstice (June 21): 70.4 degrees  Winter Solstice (Dec 21): 23.5 degrees</td>
</tr>
<tr>
<td><strong>AHS Heat Zone:</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>US EPA Ecoregion:</strong></td>
<td>Level 1: 8 – Eastern Temperate Forest  Level 2: 8.1 – Mixed Wood  Level 3: 52 – Driftless Area  Level 4: 52a – Savanna Section</td>
</tr>
<tr>
<td><strong>WWF Ecoregion:</strong></td>
<td>Ecozone: Nearctic  Biome: Temperate broadleaf and mixed forests  Ecoregion: Upper Midwest Forest-Savanna Transition</td>
</tr>
<tr>
<td><strong>Sunset Climate Zone:</strong></td>
<td>Great Lakes, Zone 41 &amp; Great Lakes, Zone 43</td>
</tr>
</tbody>
</table>
3.C Maps
3.C.i Property Lines

Technique: Manually plotting individual points on the property map, which provided the elevation in feet. Then color coding each dot according to elevation, and then drawing lines between each of the similarly colored points to show contour lines by feet.

Each line represents 1 foot.
Data gathered by merging GeoMapApp and Google Earth. [http://www.geomapapp.org/]
5.4 Acres, Wisconsin, USA | Permaculture Design
3.D Climate Zones

"The USDA Plant Hardiness Zones are used to select the correct perennials and fruit trees that will survive over the winter for your location."

<table>
<thead>
<tr>
<th>USDA Hardiness Zones and Average Annual Minimum Temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>4b</td>
</tr>
</tbody>
</table>

Sunset Climate Zone:

Zone 41: NE Kansas & SE Nebraska to Northern Illinois & Indiana, SE Wisconsin, Michigan, Northern Ohio

Growing season: early May to early Oct. Winter brings average lows of -11 degrees to -20 degrees F/-23 degrees to -29 degrees C. Summers in this zone are hotter and longer west of the Mississippi, cooler and shorter nearer the Great Lakes; summer rainfall increases in the same west-to-east direction.

ZONE 43: Upper Mississippi Valley, Upper Michigan, Southern Ontario and Quebec

Growing season: late May to mid-Sept. The climate is humid from spring through early fall; summer rains are usually dependable. Arctic air dominates in winter, with lows typically from -20 degrees to -30 degrees F/-29 degrees to -34 degrees C.

http://plantfinder.sunset.com
3.E Precipitation & Weather

Normal Temperatures

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max °F</td>
<td>24.7</td>
<td>30.5</td>
<td>42.5</td>
<td>56.6</td>
<td>68.5</td>
<td>78.2</td>
<td>81.9</td>
<td>79.6</td>
<td>71.4</td>
<td>59.6</td>
<td>42.8</td>
<td>29.7</td>
<td>55.5</td>
</tr>
<tr>
<td>Mean °F</td>
<td>15.0</td>
<td>21.2</td>
<td>32.9</td>
<td>45.5</td>
<td>57.1</td>
<td>66.0</td>
<td>70.9</td>
<td>68.8</td>
<td>60.2</td>
<td>54.0</td>
<td>34.0</td>
<td>21.2</td>
<td>45.2</td>
</tr>
<tr>
<td>Min °F</td>
<td>6.4</td>
<td>11.9</td>
<td>23.2</td>
<td>34.4</td>
<td>45.6</td>
<td>55.0</td>
<td>59.8</td>
<td>57.9</td>
<td>49.0</td>
<td>37.5</td>
<td>25.2</td>
<td>12.7</td>
<td>34.9</td>
</tr>
</tbody>
</table>

Normal Precipitation

Weather station, 5.17 miles from

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inch</td>
<td>1.27</td>
<td>1.25</td>
<td>2.41</td>
<td>3.34</td>
<td>3.44</td>
<td>4.42</td>
<td>4.55</td>
<td>4.60</td>
<td>3.35</td>
<td>2.55</td>
<td>2.57</td>
<td>1.74</td>
<td>35.49</td>
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</table>

Temperature (°C)

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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</thead>
<tbody>
<tr>
<td>27°C</td>
<td>22</td>
<td>15</td>
<td>14</td>
<td>6</td>
<td>7</td>
<td>13</td>
<td>16</td>
<td>14</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>11</td>
</tr>
</tbody>
</table>

Temperature (°F)

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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</thead>
<tbody>
<tr>
<td>80°F</td>
<td>82</td>
<td>68</td>
<td>57</td>
<td>43</td>
<td>45</td>
<td>53</td>
<td>60</td>
<td>58</td>
<td>49</td>
<td>44</td>
<td>37</td>
<td>26</td>
</tr>
</tbody>
</table>

Precipitation

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>152 mm</td>
<td>33.6</td>
<td>37.3</td>
<td>58.9</td>
<td>93.2</td>
<td>103.6</td>
<td>131.6</td>
<td>119.6</td>
<td>123.4</td>
<td>86.9</td>
<td>68.6</td>
<td>67.1</td>
<td>45.6</td>
</tr>
</tbody>
</table>

Legend:
- Record High
- Average High
- Average
- Average Low
- Record Low
- Precip
5.4 Acres, Wisconsin, USA | Permaculture Design
3.F  Solar

There are three times during the year where it is beneficial to observe the location of the sun at sunrise, noon, and sunset. By taking note of the sun’s angle and shadows across your property, you will be able to apply even better design decisions on your projects.

In the northern hemisphere, the Summer Solstice occurs most years on June 21st, considered the longest day of the year. The sun is considered to be at its highest angle in the sky, and shadows will be at their shortest. On either side of this date, time marches towards March 20th and September 22nd, the Vernal & Autumnal Equinox. These are the dates the sun is directly overhead at the Equator. The range in sun angles and shadow lengths from these dates are important in cooling designs in the summer and gardens that need the correct amount of sunlight.

The Winter Solstice occurs most years on December 21st, and is considered the coldest day of the year. The sun is considered to be at its lowest angles in the sky. The range in sun angles and shadow lengths from here to the Equinoxes are important in heating designs in the winter.

http://www.suncalc.net
3. G Soil
3. G.i Soil Map: Lines

3.G.ii Soil Map: Legend

- **DgB2** Dodgeville silt loam, 2 to 6% slopes, moderately eroded
- **DgC2** Dodgeville silt loam, 6 to 12% slopes, moderately eroded
- **DgD2** Dodgeville silt loam, 12 to 20% slopes, moderately eroded
- **DhB2** Dodgeville silt loam, deep, 2 to 6% slopes, moderately eroded
- **DsC** Dubuque silt loam, 6 to 12% slopes
- **JuA** Jackson silt loam, 0 to 2 percent slopes
- **SoB2** Sogn and Dodgeville silt loams, shallow, 2 to 6% slopes, moderately eroded

3.G.ii Soil Descriptions

**Dodgeville Silt Loam:**

“The soil of the Dodgeville silt loam is a dark-brown to nearly black silt loam ranging from 8 to 10 inches in depth. The subsoil is a compact silt loam of a light reddish brown or yellowish color, becoming more compact in structure with increase in depth. This type is often less than 3 feet deep, and in such cases the subsoil next the rock often consists of a heavy, dense, reddish-brown clay, containing angular, cherty limestone fragments. Again, this clay stratum may be nearly absent and immediately over the rock there occurse an inch or two of material having the appearance of a yellowish sand, but which is really composed principally of sharp calcium-carbonate crystals, easily disintegrated.

The soils where there is a depth of 2 feet or more is free from stones, gravel, or coarse materials. It is generally friable, loose, and easily tilled, and contains a fair amount of organic matter.

This type of soil occupies the upland prairie sections of the eastern portion of the county, and consists of high plans and ridges. None of the type is found below 1,000 feet. It extends east from Dodgeville across the county on what is known as Military Ridge. Its continuity, however, is broken at Ridgeway, where a strip of Knox silt loam cuts through....

On the eastern edge of the county this soil is rather shallow, probably averaging less than 3 feet in depth, though in many places it is more than 3 feet deep. Frequently on hills and on slopes near stream courses the rock is either exposed or covered with a few inches of soil usually mixed with cherty limestone fragments.

The surface is undulating to gently rolling, and rarely hilly, while some of the broader areas are nearly level. The type has good natural drainage, and there is little or no need for artificial drainage anywhere.

In origin the Dodgeville silt loam is essentially a residual soil, derived from the decay of rocks once superimposed above those now existing. It is possible that there is incorporated with this a small amount of loesslike material. The dark color of the surface soil indicates the presence of organic matter, the accumulation from the decay of prairie grasses which formed the chief original vegetation.”

-Field Operations of the Bureau of Soils, 1910
**Sogn Silt Loam:**

“The Sogn series is made up of dark-colored, shallow silt loams on upland ridges. The soils are well drained. They are generally on steep slopes or near the breaks to steep slopes. Their slopes range from 2 to 30 percent. The soils formed in a thin covering of silty material over shattered limestone bedrock. In many places in the cracks in the bedrock, there is a dark reddish-brown clay that weathered from the limestone.

The Sogn soils are near areas of Dodgeville soils. Typically, they have a surface layer of black silt loam, and the lack a subsoil. Depth to bedrock generally is less than 12 inches. In many places rocks are on the surface and throughout the profile.

These soils have a very low moisture-holding capacity and moderate natural fertility. They are droughty. The hazard of erosion is moderate to severe.

Generally, the Sogn soils are not suited to crops, and they are mostly in pasture. The soils are shallow, and they require care to protect them from erosion.

Because the areas are small and too intricately mixed with the shallow Dodgeville silt loams, the Sogn soils are not mapped separately in Iowa County. The Dodgeville soils with which they are mapped are similar to the Dodgeville silt loams and shallow. “

- **Soil Survey, X County Wisconsin (Series 1953, No. 21) (Issued June, 1958)**
4. **Design**

4.A **Zones**

**Zone 0:** House, dwelling.

**Zone 1:** This area should be as close as possible to your dwelling and kitchen, to save on distance travelled. This will be well-travelled paths that you can easily view and see what needs harvesting and maintenance. Using curved paths provide more edges. Using nutrient rich soils and compost, you will be able to intensively garden in these smaller spaces, and have the time and energy to do so due to proximity to your dwelling. It should also be very attractively designed and beautiful for the same reasons.

**Zone 2:** This area accommodates some of the larger and slightly less frequently used elements. Traditional gardens, bee hives, chickens, compost piles, and fruit trees as examples.

**Zone 3:** This area most resembles traditional farmland. Once this area is established, it should only require minimal maintenance. Main crops (potentially for commercial use), large tree orchards, nut trees, and livestock pasture.

**Zone 4:** This zone is a managed wilderness zone. Wild foods could be gathered, timber to cut, and wide grazing pasture.

**Zone 5:** Natural wilderness. An opportunity for no intervention, and allowing nature to take its course.
4.B Zone 0

4.B.i. Introduction

The Dwelling is 39’ x 24’, and originally built a hundred years ago. It is currently heated by natural gas, but has an alternative heating source with its wood burning furnace. Future improvements inside the home should consider similar sustainable alternatives to provide redundancy in temperature control, water, recycling, and reuse.

4.B.ii. Windows

Adding more windows or larger passive solar windows to the south-facing walls of the home will allow much more sunlight in during the winter months, lowering the cost of heating.

By adding the correct angled eaves, we will block the mid-day sun during the summer months.

Diagram created by Hawk Ridge Eco-Home
http://www.ecohomeduluth.com/design/passivesolar.html
4.B.iii. **Rain Catchment**

Retrofitting the roof and gutters towards a rain barrel will allow an estimated 466 gallons per inch of precipitation. While a metal roof is the best option for clean rain catchment, this may not be an option on the main dwelling. While rain running off of modern shingles could be filtered for drinking purposes, it is probably not necessary due to the working well on the premise.

Thus, despite the roof's composition, the water collected here can be minimally filtered and allow for easy watering of plants, herb spiral, and vegetable gardens in Zone 1, and the overflow could be released towards paths filled with gravel sloping towards the front yard pond or bushes to the east that line the easement.


4.B.iv. **Greenhouse Attachment**

The owners properly pointed out that most of their front yard to the south is shaded by the extremely tall & mature trees, especially on the west side. The only place open to almost day-long sun is on the east side of the front yard.

This would be a great location for a greenhouse attachment to the house. A door could be added on the east wall of the mud room. The entire attachment should be wood braces and glass, to allow as much sunlight in on this small structure.

This should help enforce composting scraps from the kitchen as it is very close to the kitchen but far enough away as not to cause any smells or attract gnats.

Since there will be a main greenhouse on the property, the items to grow here should be anything you’d like quick & frequent access to.

Alternatively, if you’d like to go extreme, one could super heat this during the summer and grow tropical plants that thrive in the summer, and survive the winters. Dwarf citrus trees would be a possibility.
4.B.v. Root Cellar

The house’s basement is not full height, and it is hard to stand upright unless you’re a kid. Converting this into a root cellar will work well. Root cellars will be necessary as gardening skills increase over the years, and you produce more than you can consume. Also, harvests often occur at the same time during the year, unless you purposely stagger your garden or set up multiple growing seasons (difficult in temperate climates).

Being able to extend your food and canning will ensure that your healthy and home grown food feeds you throughout the year, including those long winters.

Root cellar storage examples:

**Cold & Moist (32-40° F; 80-90% Humidity)**

Potatoes, Cabbage, Cauliflower, Apples, Grapes, Oranges, Pears, Quince, Endive, Escarole, Grapefruit

**Cool & Moist (40-50° F; 85-90% Humidity)**

Cucumbers, Sweet peppers, Cantaloupe, Watermelon, Eggplant, Ripe Tomatoes

**Cool & Dry (32-50° F; 60-70% Humidity)**

Garlic, Onions, Green soybeans

**Moderately Warm & Dry (50-60° F; 60-70% Humidity)**

Dry hot peppers, Pumpkins, Winter squash, Sweet Potatoes, Green Tomatoes

-Data gathered from “Root Cellaring: Natural Cold Storage of Fruits & Vegetables” by Mike Bubel

Photo: Jennifer May; 2009 Issue of “Edible Hudson Valley”
4.C  Zone 1

4.C.i.  Introduction

This zone has three main areas. Southwest of the house is quite sunny, but has been requested by the owner to be converted into a play area such as a volleyball court. Southeast of the house will contain the typical Zone 1 raised garden beds and herb garden. The cement pathway that connects the house to the drives (and runs down the middle of the first two sections mentioned) will be covered with trellises that grow grapes.

The third area is north of the house, and is quite shady due to the house & sun angles, and numerous mature trees in the area. This area is designed with an earth berm, enclosing an area into an extended dining and cooking area, with a pond.

4.C.ii.  Map
Flowers for your bees. On the downslope away, hopefully keeping bees on opposite side of your rest area.

Bamboo Tree Wall (Noise & Wind)

Blueberry, Blackberry, Blackcap, Gooseberry Bushes, and Cherry Trees
4.C.iii. Earth Berm

The owners first pictured their north yard containing an orchard one day. The downside of this location is heavy shade due to the house and some very large, mature trees. This is a windy property, and windbreaks would be needed to keep orchard trees from growing with wind shear. This would also be exposed to travelers driving by on the highway, and there are no water benefits from swales here.

By taking these negatives issues, we will make them the solution. Summers in Wisconsin get very hot and we’ll create an environment that is even more shady than it is now.

An earth berm will start on the west and east sides of the houses and go north, forming a semi-circle. It starts very shallow, eventually getting deeper as the sides go north. The steepest areas will be the north wall.

This earth berm will act as a natural wind break, and reflect noise from the highway. Planting a line of tall bamboo trees, other trees, vegetation and bushes will increase the effectiveness against noise & wind. We are designing a pocket. A self-enclosed box of cool shade, augmented by water from a pond and waterfall. This will create a microclimate that is drastically different from anywhere else on the property. Hummingbirds, frogs, and other wildlife will flock here and never want to leave. Either will the humans a hot summer day.
4.C.iv. Outdoor Dining

The owners are gracious hosts. They often have numerous families with children enjoying their time on the property with the animals and gardens. Large meals are common at night. During one birthday party, I noticed that there wasn’t nearly enough room for everyone to sit around the dining table.

Behind the head of the table I noticed a door that led to the back porch. Just a few steps away lies the solution. By taking the event outside, the entire party can congregate back together at an outdoor dining area. This could start simply by putting two picnic tables together, and maybe some day upgrading to a proper feasting table worthy of a beer hall or castle.

By taking down the porch rail and adding wrap around steps, the proximity of this outdoor dining area should be in close enough proximity to the kitchen for transferring items to eat.
4.C.v. Outdoor Kitchen

Eating outside could also be further served by cooking outside with a summer kitchen. This can include a barbecue grill, a pizza oven or rocket stove, and a processing table. This processing area can double as a place to clean vegetation, plucking chickens, cutting fish and more.

Photo example from HowToSpecialist.com
http://www.howtospecialist.com/outdoor/pizza-oven-free-plans/

4.C.vi. Pond & Waterfall

Although not drawn to scale, this gives a visual idea of the pond & waterfall design for the earth berm. The calm noise from the waterfall will help drown out the passing traffic, which will already be dampened due to the earth berm & foliage. Consideration should be given for a solar powered water pump to move the water from the bottom to the top. Although this pond structure will not be the main aquaculture growth for fish, goldfish should be the absolute minimum used to eliminate mosquito larvae.

The construction should consist of rock & wooden ledges that would encourage & allow kids to climb and jump around in this area. Kids absolutely love this combination of climbing & exploring edges of waterways. This is a safe enough & challenging way for children to gain confidence and joy in this physical activity while allowing their imaginations to roam. As visiting parents relax around the fire pit, their children will be kept busy nearby.
4.C.vii. Herb Spiral

The owners are big fans of using herbs in their cooking and food supply. An herb garden near their front door will help them this way, while providing a unique structure.

One should plant herbs that need the least amount of water at the top, and working their way down to the herbs that require the most water at the bottom.

The size of the herb garden should allow for an arm to reach the center. This will guarantee easy plantings, weeding, maintenance, and harvesting.

Photo from: “Permaculture, A Designer’s Manual” by Bill Mollison.

4.C.viii. Grape Trellis

The owners have been working on a solution to snow drifts covering their sidewalk between their house and driveway during the winter.

A Grape Trellis will help in this regard, and also provide a unique walkway and become an edible food source some day.
4.D  Zones 2-4  

4.D.i. Introduction

These zones represent a lower intensity of work requirement and availability, a longer distance from your home to travel to and from, and lowered yields compared to Zone 1. However, they are larger in size, and include other elements you wouldn’t want near your home, such as livestock.

The size of the property currently excludes areas suitable for Zone 5.

4.D.ii. Map
4.D.iii. Bee Hive

When bees fly through the air, the friction of the air upon their bodies causes them to become positively charged. When they land on flowers, this charge will automatically attract pollen to stick to their bodies. And while the bees are there to gather nectar to create honey, they secondarily are pollinating plants to produce. This pollen will also show up in the honey. As much as as 60 grams of fresh bee pollen can be contained in each 16 ounces of honey.

By eating local, raw honey, you are ingesting these pollens from flowers of the vegetables, trees, plants, and weeds from the surrounding area. The theory is that your blood is building up antibodies to these allergens, and reducing the negative effects during “Allergy season”.

The property owner is currently suffering from a serious allergic reaction to Ragweed (Ambrosia) pollen. We suggest adding a bee hive to the property, to possibly help in this regard. Even without allergies, we would suggest this most honored profession.

Benefits of Beekeeping:

- Increase in fruit and vegetable yields due to guaranteed pollination
- Local honey is expensive to buy
- Pesticides containing Neonicotinoids have been recently been linked to the reason behind honey-bee colony collapse disorder observed over the last couple of decades. The European Union has since banned this substance, but the United States has not. There is a noticable reduction in bees today, and it makes sense to host your own colony. We believe it is only a matter of time until will be mandatory for adequate pollination.
- Stress relief
- Educational

Considerations in positioning the hive on the property include a safe distance from your house and where children may play. However, just placing it on the farthest corner of the property could either put it too close to a loud highway, close to a neighbor’s house, or near the neighboring farmer’s corn field, which could make them ornery on heavy tractor days. Facing the southeast to catch the morning sun can get the bees working earlier in the morning. They will need access to water, which won’t be a problem on this property. However, making sure they have their own source to choose from, will lower the chances they get their water from livestock troughs or sources near the home.
4.D.iv. Septic System

Although it would be ideal to create swales across the entire property for retaining water, it’s important that the drain fields stay dry for proper leaching. It’s also important that there is not too much foot traffic due to compaction. And it’s even more important that shrubs and trees are not built in the area, or its roots may rupture the tank or pipes.

Edible foods should not be planted on the area, or be recipients of potential bacterial water at the end of the drainage fields.

At first thought, the septic tank and drainage fields need to be designed AROUND. However, this is just another opportunity to add diversity to the property. This would be a great location for the bee hive and for adding numerous flowers for them to harvest. Choose wildflowers that do well in dry soils, such as Prairie Smoke, Pasqueflower, and Oxeye. Native prairie grass does well in your soil type, and will provide year round cover.

If possible, the property owners should find out exactly where the underground components are. Historical pictures show fields get quite close to the drainage field. In this design we padded extra land downslope just to be careful.

**Manholes:** Apple barrels or something similar could be used to cover the septic manholes & easily moved when needed.

If constructed properly, they could become planters for flowers or vegetables to add functionality.
4.D.v. Water Catchment

**BARN:** The roof of the barn is about 3,000 square feet. With about 24 inches of rain that falls between April to September, an estimate of 36,000 gallons (136,000 Liters) can be collected.

By installing a water tower, a completely off-grid water solution is available for drinking and garden irrigating. Wells can fail, get low during droughts, and very occasionally get contaminated. Once the water tower is full, additional runoff can overflow in a controlled manner towards a nearby pond.

The size of this pond could be based on the equilibrium required to maintain its full water capacity. In temperate climates, a maximum of 9 inches of surface water can be lost to evaporation, and up to 2 inches in seepage. At 11 inches per month, or 66 inches in our 6 month calculation, the largest surface area we could have is 872 square feet (29.5 feet square). Any more surface area, and evaporation will exceed our 4800 cubic feet of rainfall replacement.

These estimates are extremely conservative, as spring numbers for evaporation should be much less. Precipitation from around the barn and even the surface area of the pond will also accumulate above our estimates for catchment. Eventually, vegetation and trees planted around the pond will help create enough shade to reduce evaporation even more. Being conservative in our estimates and building a smaller volume pond will allow errors to result in overflow that will flood the spillway and drain towards the swale and next pond downhill. Whereas an error in too large of a pond volume would result in an empty or marshy bog, or numerous refills of water pumped from the well to maintain its capacity.

800 Gallon tank example (about 1,600 pounds; 725 kilograms). This also has a pipe and valve setup for immediate release of water under high gravity pressure to use during forest fires.

-Pictures captured from Wranglerstar YouTube channel.
4.D.vi.  Ponds

Six great reasons to have ponds on your property:

1) Pest Managements. Homes for snakes, lizards, frogs, dragonflies, help manage the pests in your gardens
2) Noise reduction
4) Flood irrigation. By turning a dam, can flood irrigate system in the food forest. Beneficial microorganisms, bacteria, nutrients from fish & detritus.
5) Microclimate. Can absorb heat during the day, and releases at night.
6) Biomass. Plants that can be occasionally harvested for nutrient-rich feed to chickens or mulch for gardens.

- Data gathered from PermacultureArtisans.

Equisetum are a great plant to grown on the edges of ponds: Reedy, great biofilter for ponds, pulls up nitrogen, has beneficial bacteria, great breeding ground for damsel flies & dragonflies. Kids use them as pretend fishing poles.

Because Swales are developed on contour, the water it catches will spread out in both either direction along the entire path of the swale. Thus, swales can be used to connect ponds. It will also catch water along an entire length of the swale, capable of filling a damn anywhere along the swale’s length.

Water held in a swale after a rain, will absorb into the soil, eventually saturating it. This causes underground water to flow every slowly down the landscape. After years, the land will have maximum water content, causing springs to appear down slope.

In extreme weather, if there is too much water being held back by ponds and swales, a spillway can be inserted near the pond or along the swale. At a level lower than the crest of the spillway or dam, this wide & hardened area acts as a controlled overflow mechanism that will allow water to escape before flooding over the crest and causing massive erosion.

Example: Arrows represent level collection and flow of water caught by swale. Spillways allow water to flow through a lower gap in swale:

A greenhouse will help jump start the summer growing season, allowing growth straight from seedlings if wanted. One can also extend their season if necessary into the fall’s frost. However, one of the best features of a greenhouse is allowing a winter-friendly garden sit in perfect stasis, waiting to be picked. While a root cellar is a good example of extending a harvest, and canning necessary for storing an abundant harvest, plants still healthy in the ground are in the perfect position to be picked when you are ready to eat them.

The location of this greenhouse faces south, hoping to catch as much sun as possible. None of the nearby buildings should block the sun. Due to the cold winter wind, a straw wall could be constructed along the north wall, and possibly part of the east and west walls to help retain heat. Digging the floor deeper into the ground to mimic an earth-sheltered greenhouse is a great way to tap into the passive heat from the earth.

Alternative: An even better location would be an extension of the barn. The barn would act as the north wall of the greenhouse. This will increase warming options without losing sunlight. A vent could even be used to share heat from the barn if it is heated by a rocket stove, or livestock.

However, this would limit the usefulness of the barn doors located there.
5. Conclusion

- Start small and build from each success. This design does not need to be installed all at once to see results.

- Observe what works, and expand what comes naturally. Please use aspects of this design that you like. Feel free to disregard or change anything you desire without any concern or disappointment from me. A thousand eyes would give you a thousand different designs.

- Your property begins at the top of a ridge. This keeps you uphill from any runoff from neighboring farmers. Your risk of pesticide runoff is at a minimum. You have shown interest in purchasing more land to the west as time & money allows. (And potential retirement from the selling farmer) This is a great idea, as you will continue down-slope from your design. Each swale and pond that you extend with, will accumulate more and more nutrients and diversity. Water retention (and thus pond size) will continue to increase.

Farming pesticides can take as little as 18 months to effectively disappear (compared to 7 years for today’s domestic yard pesticides!) Cover crops, mulching, and earthworks projects should be done during this time before finally growing vegetables for consumption.

Beware purchasing the land at the bottom of the valley. While safe runoff of your land from the east will be safe, this area will also receive runoff from the land to the west. You will need to review their farming practices and consider how you would use the land there. This could be a great location for a major pond, but consider what that pond water would be accumulating.

- You’ve expressed the possibility of building another housing structure at the bottom of your slope, sometimes called the “Mother-in-law suite”. This holds great possibilities. Most properties build at highest altitude to get the best view. However, the best locations are at the bottom of the property. The biggest ponds can be created there, and your Zone 1 gardens will have the most nutrients possible.