Geoff Lawton’s Permaculture Design Course

Site Design Exercise

For

Ralph and Panda Bennett

513 1st Ave E.

Pacific WA 98047

(USA)

Prepared By

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Introduction:

I chose as my project an urban site, owned by my sister (Panda Bennett) and her Husband (Ralph Bennett), for several reasons:

1. They are committed and have already started building the infrastructure.
2. We have worked together in the past with good success.
3. Both work from home.
4. They like to photo document their work.
5. I live in a rural 32 acre plot with all five zones. So, designing in a much smaller urban area offered me some “outside the box” opportunities.

The Bennett’s primary goal is to grow or raise most of their food needs, with a surplus that can be traded or sold, to meet the food needs they cannot directly produce.

In addition, they would like to reduce offsite inputs of water and energy while at the same time reducing their waste output. They are also expecting to improve their health and well being by eating better and enjoying a more “Permie” lifestyle.

Eventually, Panda plans to be PDC certified, and use their place to highlight various Permaculture techniques.

Below is satellite view of their place, North = top:
Here are two street views looking to the North:

As you can see, it is a small house (980 sq ft), on a nice sized lot (100’ X 140’), with a 600 sq ft outbuilding used for storage and a woodshop. Plus, lots and lots of lawn.
THE CLIENTS:
Ralph and Panda Bennett are seeking a more self sufficient, eco friendly, healthy lifestyle. They are familiar with and support Permaculture Ethics and Principles. The couple enjoys working on projects together, and documenting them on Pandas facebook page:

https://www.facebook.com/PandasTreasure

Ralph works from home as an IT specialist for a major company. Ralphs many assets include great planning skills, nice carpentry skills, and total immersion on any project he undertakes.

Panda owns her own home based business making custom tie dye garments (http://pandastreasures.com/ ) she sells these both online, and at the local farmers market. Panda is good at crafts, has most of the families’ artistic talent, makes friends (and customers) easily, and is a talented arbiter.

THE SITE: (As it was)

LOCATION:
513 1st Ave East, Pacific WA, 98047 USA. The site is in the town of Pacific, which lies in the Puyallup Valley, approximately ten miles East of the Lower Puget Sound, and 1800 feet NW of the White River. Elevation shows 92 feet on Google Earth, but reads 62 feet on a handheld GPS.

CLIMATE:
The climate is Maritime/Cool/Humid with wet winters and dry summers. On average Pacific gets 56 clear days, 151 rainy days, with 3 snow days. Annual precipitation is 40.86 inches with the majority taking place from mid Oct to Late April.

Average Temp is 52 degrees F, with a Jan average high of 45 F/low 34F and an Aug average high of 77F/Low 53F.

Winter solstice brings 8 ½ hours of daylight, with a maximum solar elevation of 19 degrees. Summer solstice gives 16 hours of daylight, with a maximum solar elevation of 68 degrees.

Wind flows primarily south to north up the valley. Occasionally arctic air will flow north to south.

Source: http://www.clrsearch.com/Pacific-Demographics/WA/98047/Weather-Forecast-Temperature-Precipitation
**TERRAIN/WATER FLOW/SECTORS:**
The previous diagram shows the property as it was before we started working on the design.

**TERRAIN:**
The property is basically flat with only 16.3 inches difference from the high point (middle of the sidewalk to the house), to the low point (in the middle of the North East quadrant). In the southwest corner of the diagram, is a square box with the Number 0 in it. This is a storm drain; I used the top of the drain cover as my reference point, to measure the elevation of the site, using a laser level. The small numbers on the map represent the elevation relative to the storm drain cover. The low spot is -10 inches compared to the storm drain cover. The high spot is 6.3 inches higher than the storm drain.

**WATER FLOW:**
Water flow is one of the challenges of this site. The blue arrows represent the storm water flow. During high rain events, the water coming off the street from the south does not flow to the storm drain. Instead most of it ends up flowing through the east half of the property including over the East sidewalk and also through the outbuilding. It pools in the low spot, and then drains away when the rain stops.

Presently the storm drain gets no street water. It does however get all the house roof water through an underground pipe. The outbuilding gutter system needs repair, but was designed to direct the water to the North.

The west side of the property has never shown a visible water flow.

**SECTORS:**

**VIEW:** *(Grey Sector)* the view looking out from the back is a 4 foot high chain link fence looking into the neighbor’s backyards. The client would like to block these views.

**SUN SECTORS:** *(Yellow)* the small yellow sector is the winter solstice sun sector, with the large yellow sector being for the summer solstice. Elevations are 19 degrees in winter and 68 degrees in summer.

**WINDS:** *(blue)* Winds are normally from the South; however winds from the North are possible in the winter bringing in freezing arctic air.

**SOIL:**
As all Permaculture projects should start, I dug a hole. I dug the hole in the lowest part of the property. This is what I found:

0-3 Inches = Green lawn and roots.

3-21 inches = Nice dark moist sandy loam (there had been no rain and no watering for over a month). Zero rocks.

21-26 inches = Very (fully) saturated clay. The clay had no rocks, and was very moldable. I would imagine it could easily be used as potters clay.
26-31 inches = “Peat”? This layer took me by surprise. The best way I could describe it would be coarse peat. It was a definite layer composed of spongy little chunks of wood, twigs, roots, and other organic material. The smell was rather nice, and the material was not slimy at all.

31-48 = Wet Sand. After the “Peat Layer”, I hit very fine sand. It was much finer than typical beach sand. The deepest I could go with the post hole digger was 48 inches. The sand was so wet, the post hole digger could not hold on to the sand to bring it out of the hole. Also the sides began collapsing. The hole filled in to 37 inches with water. We left the hole open for over a week and the water level remained at 37 inches.

The Puyallup Valley has great soil. Fed by floods and the volcanic lahars of Mount Rainier every 600 years or so, the soil is mineral rich. Unfortunately, most of the valley has been filled in and covered with warehouses and urban sprawl. The Bennett’s place was built in 1915, and was one of the first farmhouses in the area. So the soil is good.

**ONSITE ASSETS:**
The house is small by today’s standards, but suits the couple well and both are able to work out of the home, including Panda’s garment productions. There is a covered back porch with a solid disability ramp coming off the North side leading towards the outbuilding.

The outbuilding is currently houses a riding lawnmower and trailer, a wood shop (where we built six top bar beehives (two for the Bennett’s), general storage, and a large energy efficient chest freezer. The structure has no insulation, so working in the winter or the hot summer can be a challenge.

There are also seven raised beds made with cedar. The earthworms migrate to these beds during winter rainstorms.

They have two top bar beehives under a grape arbor.

There are six 50 gallon plastic food grade barrels (pulled from a waste stream).

**External Factors:**
Electricity, natural gas, water, and sewer presently all come from offsite. Electricity is relatively inexpensive and most is hydro, wind, and nuclear. Washington State has no coal powered electricity plants.

BIO mass, in the form of wood chips from local tree trimming services, is free and abundant in the city. Ralph does tip them to ensure the flow. This is a great asset found in suburban areas. I expect as Permaculture takes hold, this resource will go away, or become very costly. Interestingly, it is much, much, harder to obtain ready made wood chips in the country.
Wood Chips are abundant.

The Plan:
The Bennetts were very excited to get started. So we identified some known structures to be built while the rest of the design was being worked on. They plan to do most of the work themselves. So, some of the plan has already been implemented.

Their main objective is to achieve food independence including for their animals. If they are unable to achieve complete independence, then they would like to have enough sales to buy the food they can not produce. An important secondary goal is to manage the excess water coming onto the property.

Below is a diagram of the completed design:
The Plan: (Cont.)
The Plan: (Cont.)

ZONE 1
The first structure added was the greenhouse. We placed it directly off the back porch steps for several reasons:

1. It gets very nice sun there.

2. The greenhouse will be primarily used to start seedlings to plant out in the annual beds, as they need daily attention the location is easily accessible from the house.

3. It is the driest spot on the property.

They built the structure using 16’ cattle panels for the arch on top of a 2 ft high base. Notice the lower vents drawing cooler air from the shade. The shade cloth can be easily removed or attached in minutes. The greenhouse is already being used to start the winter crops for the garden. In addition, they plan to raise some early/late crops in the raised bed inside the greenhouse.
Next, they decided a fence to block off the back yard was needed. The primary reason was for safety, as as several ponds will be part of the backyard. Second was privacy, as some animal harvest will take place there. This project will be completed very soon.

The next project should be the chicken coop. The birds have been researched (Sussex), ordered, and are now in the incubator. The chicken coop will first act a a nursery. The sixteen chicks will eventually be culled to four, all roosters harvested when they begin to crow, excess hens will join my flock.

It is also a good time to build the chicken run around the west and north perimeter. The run will provide a slug and insect barrier. Plants chickens enjoy like strawberry, will be placed just outside the runs making it easy to toss the overripe fruit and vegetables right into the runs. Also included is a pen around the beehives that the chickens can be let into to provide pest control.

“Fedges” will be planted between the chicken run and the perimeter fences. The fedges will probably be a combo mulberry, grape, kiwi fedge. The mulberry will eventually be espaliered into a living fence. Excess overripe fruit will fall directly into the chicken runs.

Just north of the chickens will be an outdoor nursery for propagating trees, bushes, and other perennials. These will not only populate their place, but hopefully produce extras to sell or trade. Presently, they are looking at specializing in “Permaculture” type plants. The demand for these types of plants should dramatically increase as more people bring their own systems online.

Currently all roof water on the house is sent to the storm drain via an underground pipe. This can be easily modified to fill a rainwater catchment system to be used in the green house, chicken coop and rabbit hutchs. To cover the long summer dry period, a small backyard well will be dug, and a small solar pump will be used to keep the collection tanks topped off. A solar pump can also be used to provide waterfall aeration for the pond.
Three more beehives will be added bringing the total to five. Five keeps you in the hobbist category, and is more than enough honey to supply the bees, themselves, while still having some left over for barter. This is the couples second year raising bees and they really enjoy it. The bees are raised naturally. Bees require very little effort when seen over an entire year and they make your garden happy.

The raised beds will be built by digging out the paths and mounding the soil on the beds, and then heavily mulching both the paths and the beds with readily available wood chips. The paths will be tied in with the ponds. These beds will have a variety of plants including perennials like asparagus, garden sorrel, good king henry, borage etc. Providing; food, fodder, mulch, etc.

The raised beds already in place will be kept and used for high maintenance annuals. The reason -comfort, all of the existing beds have nice seats along the edge, so it is more comfortable to spend time there. The existing raised beds have been heavily mulched with woodchips and are producing very well with very little (once so far) watering required.

The Bennetts were so impressed with the current raised beds, they wanted to try a larger bed, heavily mulched, for calorie and sprawling annuals. This approach has been used before in similar climates and is shown in the video “Back to Eden”. http://vimeo.com/28055108 . After using the space for a year, they plan to add beneficial perennial after observing through the seasons. However, a Herb Spiral and a climbing structure will be in the “Back to Eden” bed.

The pond will be the main centerpiece of the garden and will serve many functions. First, all of the wood chip filled paths will connect with the pond and diffuse winter water accumulation around the backyard raised beds. This should both mitigate flooding and help with moisture retention in the summer. The pond will also provide food, fodder, habitat, and an insect watering station. Waterchestnut, duck weed, and other aquatic plants will be used. The common goldfish, and some algae eaters will be introduced as the Bennetts do not want to raise edible fish at this time.

The Rabbit Hutchess are conveniently close making daily care easy. Worm compost barrrels are right next to the rabbits to accept manure and uneaten weeds. Also, it is a good place for some rain catchment for their water.

An outdoor garden processing bench is located on the north Side of the porch. This will include a washing basin, lots of counter space with hay, straw, and animal feed storage underneath the counter. This keeps the dirt in the garden where it belongs.

The morning daily path will be out the north door onto the raised porch, providing a quick view of zone one. Next, you walk down the steps to the west and into the green house to check on the starts. Exit the greenhouse to check if the Kiwi Arbor needs trimming. From there look at the Chickens filling the feeding tube if needed and let the Chickens out of the coop for the day. From there, wander through the north garden, past the pond. Grabbing rabbit food if needed from under the processing area to feed the rabbits, empty the pellet collection box into the worm barrell back up the stairs and you are
done. You could have even carried a basket and collected a breakfast of potatoes, eggs, peppers, tomatoes, herbs, and fruit on the way.

**ZONE 2**

The most important feature needed is a shallow swale along the Southern border which will direct excess street water into the storm drain. This should stop the water flowing through the outbuilding and flooding the back yard.

The front yard will be primarily fruit and nut tree guilds, with an emphasis on perennial flowers. Each guild will have: mulching plants, nitrogen fixers, insect attractors etc. For example an Apple guild may have comfrey, borage, daffodils, tulips, Sea Berry, strawberry, rhubarb, etc. Each plant filling a niche, and fulfilling a function that aids the guild, while at the same time providing a yield to the owners. It will appear as a well tended fruit orchard, but in fact is a well tended food forest.

The front porch will have Grapes vining on the sides. The garden beds on each side of the porch will have espaliered olive trees along the south side of the house taking advantage of the warmer microclimate. Also, the bed will have perennial sunflowers, calundulla, and chamaemelle.

A low barrier of Lavender and blueberry bushes will help define parking along the road. The edge along the sidewalks will be planted with low lying perennial herbs such as thyme, that will self trim by walking on them, aromatic herbs would work well.

The plan calls for construction of a carport on the southeast corner of the property. This will serve as parking space and a sales area when needed. The roof of the carport would make a nice platform for solar collectors and needs further consultation to see if it is cost effective. With the current incentives it would probably pay for itself within five years on a system that would run for twenty five years, at a minimum.

The fence between the house and outbuilding has a 10 foot double gate. This allows the Bennets to store their utility trailer out of view from the street and gives an open work area when needed. The entire property will be covered in woodchips to emulate a forest floor.

Raspberries are a fairly high value crop and do well in the shade. There are both determinant and indeterminant varieties as well as different colors of raspberries. The Bennets will have a wide variety of types, giving a prolonged harvest. This is the predominant crop on the East perimeter. A shallow swale will be dug along the East perimeter with overflow going to the main backyard pond.

There is also a ZONE 2 in the northwest corner of the property. It contains the beehives, grape arbor, and some clumping bamboo as well as a chicken pen. This area only needs to be tended at certain times of the year. At other times the chickens should be able to keep the area clear.
ZONE 3:
A Zone 3 would not be appropriate for this design. Zone three would be for animal grazing type systems, and incorporate larger swales, ponds etc.

ZONE 4:
I did build a zone 4 just to try and provide some more wildlife habitat. It will be primarily a Cattail bed fed by overflow roof runoff from the outbuilding. Cattails can survive periods of relative dryness so the winter rains would work well without having to water in the summer. Periodically some cattails can be harvested, but the primary purpose will be wild habitat.

There will also be a small sitting area hidden somewhere in the Zone 4.

ZONE 5:
Given the surrounding environment a Zone 5 is also impractical at this time.

PLANTS:

There are an incredible number of plants that grow well in the wet temperate maritime climate of the Pacific Northwest (PNW). The climate allows for a winter crop that is stored right in your garden. The leading expert in year round harvest for the PNW is Linda Gilkeson author of “Backyard Bounty.”


Linda’s book has some great advice, plus a large list of plants that work well in the PNW. This is a valuable resource as most US garden books do not focus on this region and climate.

Another good resource is Temperate Climate Permaculture (http://tcpermaculture.com/site/plant-index/)

It has a nice plant index sorted by nine layers of the Permaculture food forest, down to the fungal layer.

Most plants that work well in England, Japan, and Germany will also work well here.

In addition, there are opportunities for warmer areas such as the south side of the house.

There are some good nitrogen fixers that provide other benefits. For example: Sea berry (fruit), lupine (flowers, bee attractor, and mulch), most legumes (food, fodder, mulch) etc.

Nut trees include: Walnut, Heart Nut, Filbert, Oak, and chestnut.
Fruit trees and bushes: Apples, Peaches, Plums, Cherries, Pears, Figs, Apricots, Nectarines, Paw Paw, Persimmons, Blueberries, strawberries, grapes, and many more.

CONCLUSION:

This was a great exercise for me as it tested my skills to design a highly productive system for a couple that will be implementing many of these recommendations. This made the exercise real for me. It also let me approach Permaculture from a different perspective as our place is much larger and incorporates all five zones on a much larger scale.

This design incorporates many different Permaculture principles and techniques:

1. Each system is placed close to the other systems it interacts with.
2. Heavy inexpensive mulching will dramatically reduce both the workload and resources required compared to “traditional gardening”.
3. Edges are maximized to increase yield.
4. Deciduous plants are used for summer shading and allow the sun in the winter.
5. Water management is addressed as a primary design consideration.
6. Wildlife is integrated into the system and used to increase yield.
7. Excess biomass is returned to the soil increasing abundance.
8. Most importantly, action is being taken!

I thoroughly enjoyed the exercise.