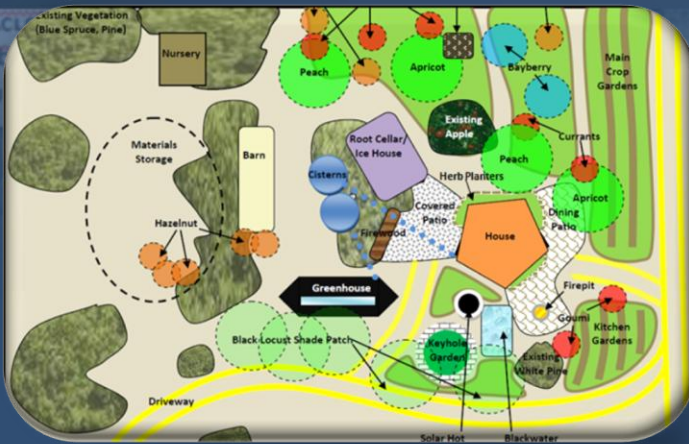




Outline:

- Project Goals, Vision [Pg3](#)
- Site Sector Analysis [Pg4](#)
- Water and Access [Pg8](#)
- Soil [Pg10](#)
- Zones of Use [Pg12](#)
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- Zone 1 Layout Detail [Pg16](#)
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*All maps are oriented with South at the bottom of the page.



Realeyes Homestead Farm Design Plan - January 2014

Vision: This undertaking was inspired by the realization that if the current status quo persists, life will not be viable for most species in the future on this planet. Permaculture offers us the tools to imagine a world transformed into a permanent healthy ecosystem which provides all our needs. So now that we know where we're at, and we know where we need to go, it's a simple matter of getting from point A to point B; navigating any obstacles (inner and outer) that get in our way along this path. This project represents our experiments at finding the way, through the opening of awareness to the patterns and lessons of the land.

This farm will serve as a permaculture research and education site, as well as yielding nourishing produce. The food forest will serve as a mother colony of useful plants; a sort of living ark, which can then be propagated outwards first to the rest of the land, then out into the community.

What use is my retirement savings; what good is raising a child if we allow our life-support systems to fail simply through improper management? Since we have the tools in our hands to do it right, there is no other option but to dedicate all energy and resources to this transformation.

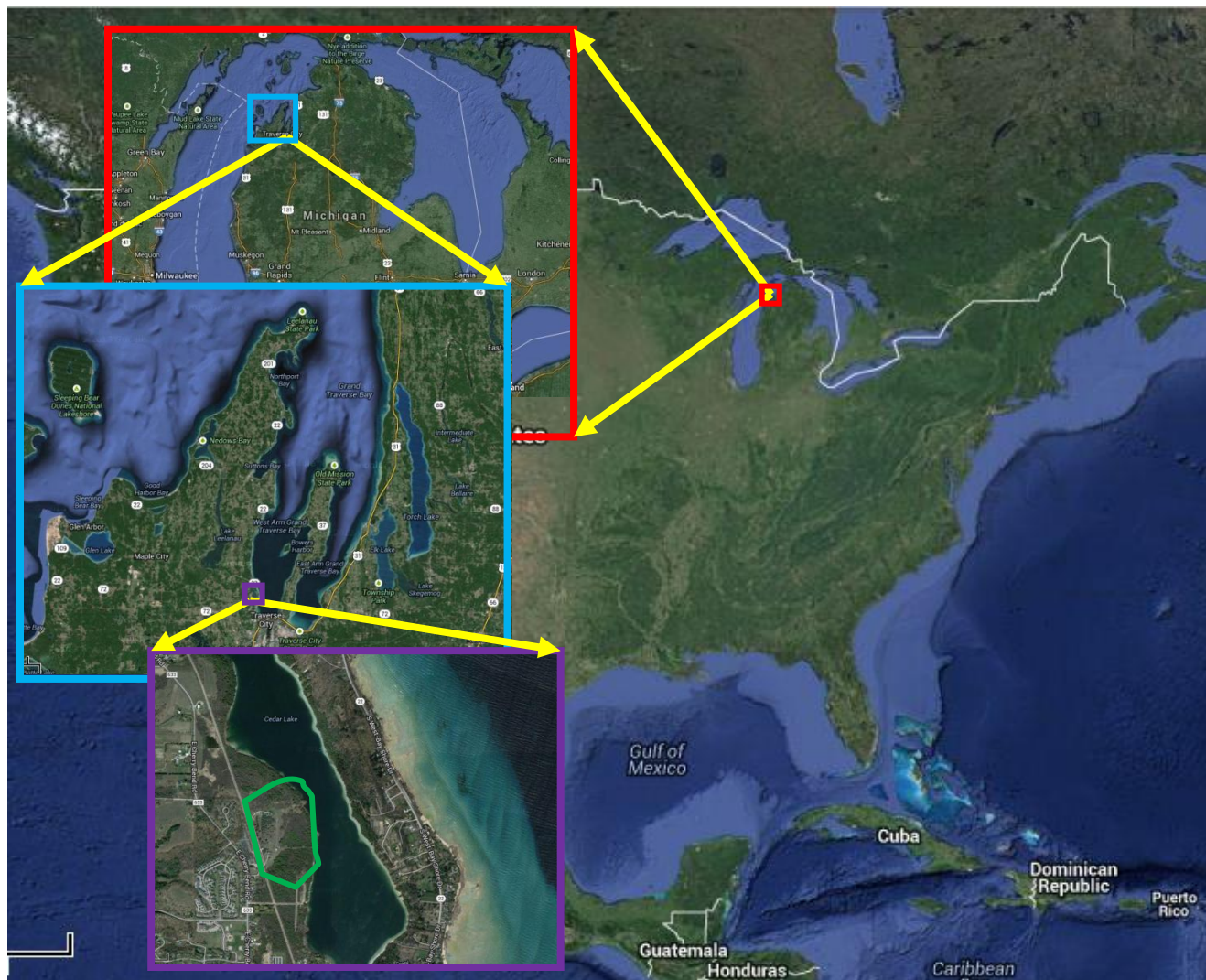
This is a space for the relearning of lost skills, and discovery of new ones, rebuilding our connection with the land and one another, the radical relocalization of our resource supply lines, and for reprogramming our patterns of thought and behavior.

Goals:

- Provide healthy, nutrient dense food for our family as well as surplus for trade and gifts
- Provide ourselves income from the land
- Protect the existing soil and ecosystems and regenerate the damaged ones
- Create a mostly self-managing food forest that will exist for millennia, that expands outwards
- Spread awareness of alternative solutions to meeting our basic needs
- Put the permaculture lifestyle into practice in our lives, producing more than we consume
- Provide the information and tools for others to follow this path
- Be completely off-grid
- Reduce inputs to the system to a bare minimum
- Be of service to our family and community
- Sequester more carbon than we produce
- Understand and use native and introduced plants responsibly
- Create structures and systems which can exist and support life permanently
- Work through any legal barriers to these practices
- Do a "Needs Assessment" of our community and possible ways to utilize existing ecosystems to meet these needs locally and sustainably (harvest acorns, timber lots etc.)
- Produce the majority of animal feed needs on site
- Ensure that this land and these systems are maintained and used into the distant future

Site Sector Analysis

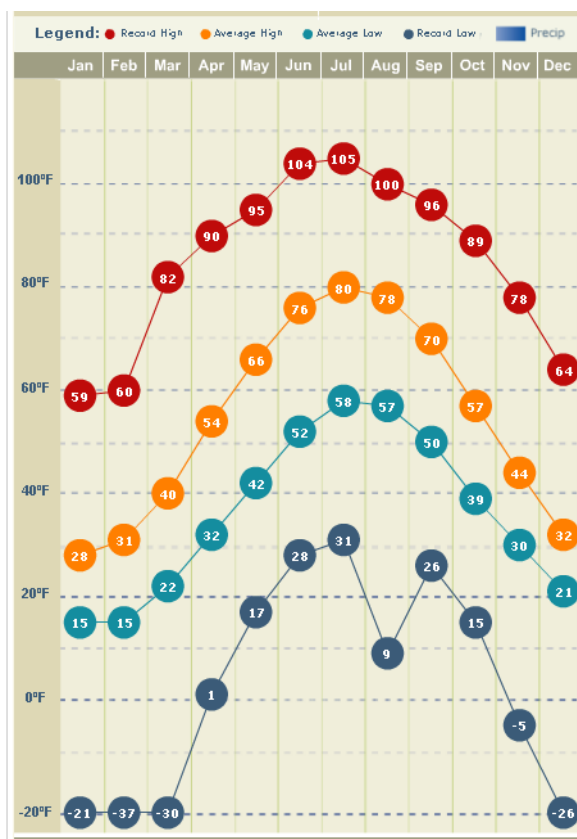
Location: Elmwood Township – Leelanau County - Michigan - USA – Earth



Region: Cold-Temperate, Zone 5b, We have four seasons which means a fresh start every spring, and long growing days in the summer. However this makes for a relatively short growing season so provision for food preservation and storage is essential.

Altitude: 590-620ft

Precipitation: Average rainfall is 3 inches per month. Autumn has the highest precipitation. Late winter has the least precipitation, but due to the snow melt, is one of the wettest times. The largest single historic event was 7 inches in 24hrs. There is some potential for droughts, especially with the changing global climate and the local sandy soil conditions.



Traverse City, MI Weather Facts

- On average, the warmest month is July.
- The highest recorded temperature was 105°F in 1936.
- On average, the coolest month is February.
- The lowest recorded temperature was -37°F in 1979.
- September is the average wettest month.

Latitude: 45 deg N

Threats: Intense Snow Storms due to Lake Effect Snow

Habitat Types: 1. Cedar-Birch Swamp 2. Shrub Thicket (Dogwood, Autumn Olive, Elderberry, Highbush Cranberry) 3. Beech-Maple-Basswood-Oak Dominant Climax Forest (max age ~100yrs) 4. Cleared farmland, primarily Sheep Sorrel and Spotted Knapweed 5. Inland Lake-Bass, perch, bluegill, seaweed, cattail, reeds, clams, muscles

Land History: This site has been in my family for several generations and used to be an active family farm. They produced mainly corn and beans and also had gardens, cows, pigs, chickens and more. It hasn't been farmed in 40 years, and was planted out to Blue Spruce for Christmas trees 30 years ago. Most of these have now grown over 40ft and are spaced very close together. There were some apple trees planted on the property long ago which are still growing and producing well, although they could do better with some underplanting, mulching and pruning, and perhaps a foliar spray to deter fungal disease, and pests.

Average First Frost Date: September 17th

Average Last Frost Date: June 9th

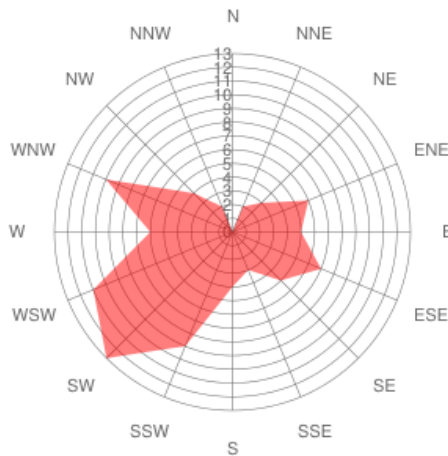
Wind: Prevailing wind out of the South/SW, confirmed by local wind flagging

Statistics based on observations taken between 12/2009 - 7/2013 daily from 7am to 7pm local time. You can order the raw wind and weather data in Excel format from our historical weather data request page.

Month of year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	SUM
	01	02	03	04	05	06	07	08	09	10	11	12	1-12
Dominant Wind dir.	↖	↖	↗	↗	↘	↘	↗	↖	↖	↖	↖	↗	↖
Wind probability ≥ 4 Beaufort (%)	9	8	7	9	4	2	1	2	4	4	6	7	5
Average Wind speed (mph)	6	6	6	6	5	5	5	5	5	5	6	7	5
Average air temp. (°F)	28	30	39	44	59	68	75	73	60	50	42	32	48
Select month (Help)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year

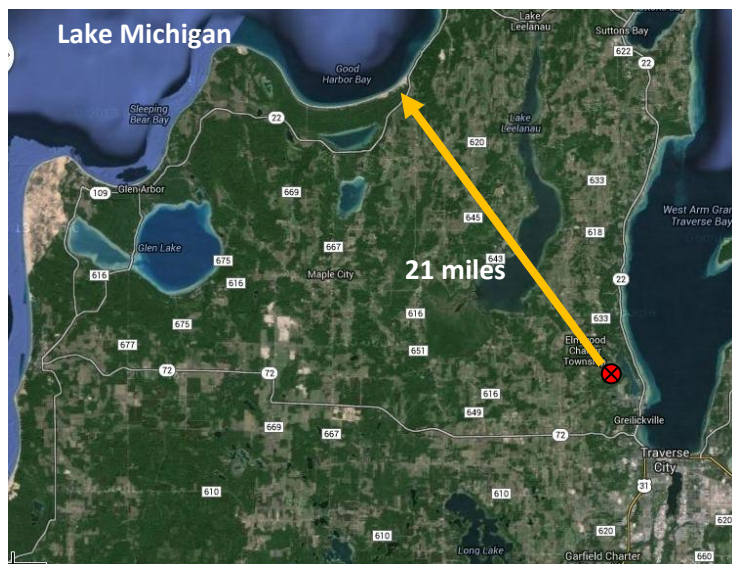
Wind dir. distribution Lake Leelanau / Bingham all year

© windfinder.com



[source: http://www.windfinder.com/windstats/windstatistic_lake_leelanau_bingham.htm]

Distance to Large Water Body: Lake Michigan - 21 miles which creates significant lake effect snow, and moderates local climate. The site also borders the inland Cedar Lake to the east.



Existing Species on Site:

Trees: Apple, Mulberry, Maple, Oak, Basswood, Ash, White Pine, Blue Spruce, Cedar, Service Berry, Weeping Willow, Birch, Poplar,

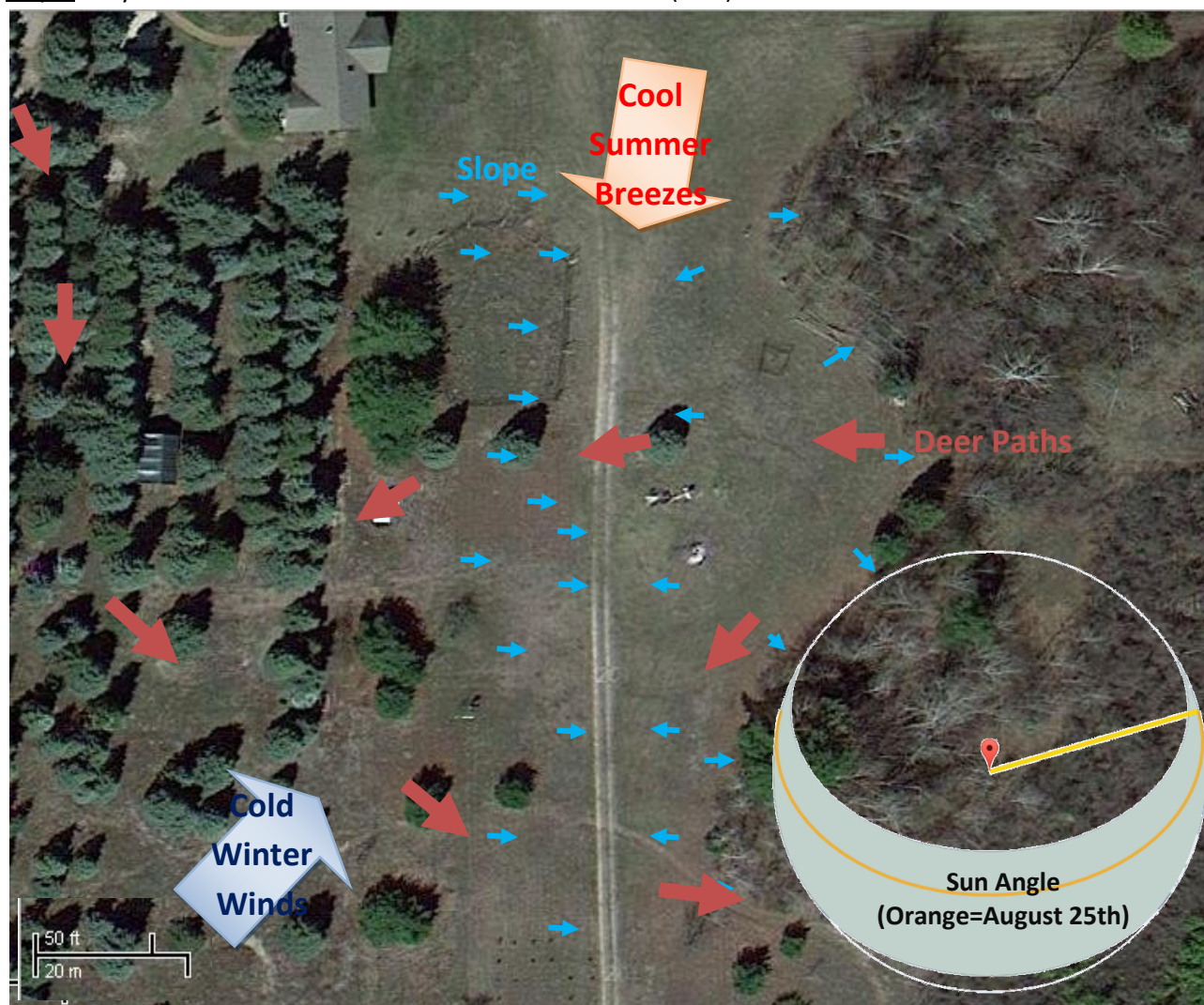
Shrubs: Autumn Olive, Grey dogwood, Red Osier Dogwood, Highbush Cranberry, Elderberry, Saskatoon, Stag-horn Sumac, Honeysuckle

Herbs: Sheep Sorrel, Burdock, Dandelion, Purslane, Mullein, Goldenrod, St. Johns Wort, Wood Sorrel, Lambsquarters, Grasses, Lilac, Brown eyed susan, Red Clover, White Dutch Clover, Horsetail, Cetum, Jack in the Pulpit, Wild Leeks (Ramps), Boneset, Joe Pye Weed, Daisy, Cattail, Water Reed, Mint, Wild Grape, Spotted Knapweed, Virginia Creeper, Trilliums, Queen Anne's Lace, Raspberry,

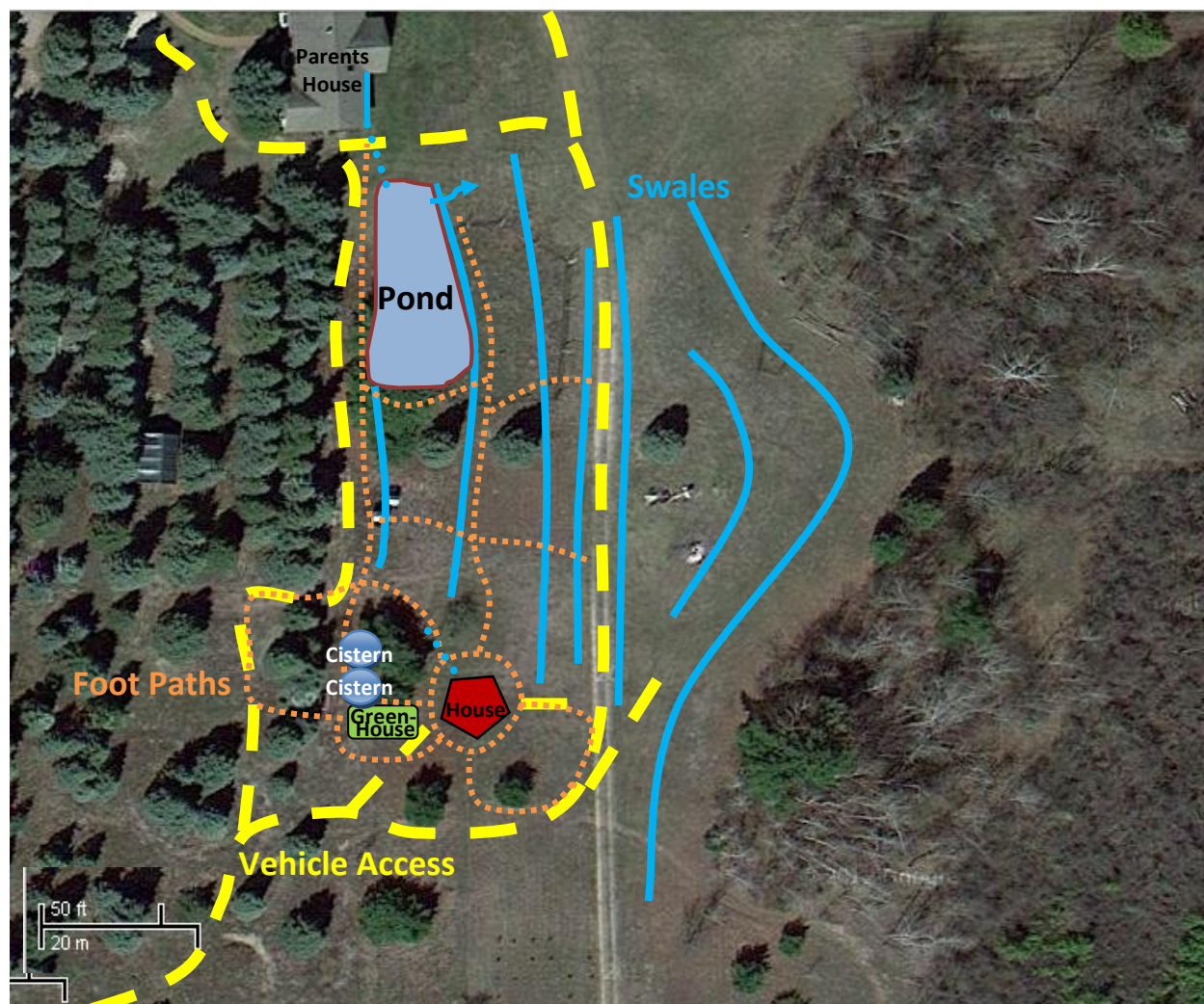
Animals: Humans, Deer, Squirrel, Coyote, Fox, Skunk, Raccoon, Chipmunk, Hawk, Robin, Blue Heron, Seagull, Geese, Ducks, Rabbits, Frogs, Clams, Muskie, Bluegill, Perch, Bass, Pike, Trout, Crow, Eagle, Swallow, Bats, Bees, Hornets, etc.

Sun Angles: *Winter solstice:* 22deg off horizon. Rises 67deg east of due south and sets 67deg west of south, *Summer Solstice:* 70deg off horizon. Rises 116deg east of due south, and set 116deg west of south.

Slope: Very minimal. About 2ft over 100ft towards the lake (east)



Water and Access:



Approach: The principles that inform my water management strategy are...

- Capture all the water that intersects the site
- Slow it, spread it, and soak it
- Plan for flood and drought
- Store it in higher elevations if possible for gravity irrigation
- Move fertility where it's needed
- Move it towards zone 1 (the house)
- Have various sources of water to draw from
- Use water bodies to create microclimates

Swales: Since the slope is gradual, the swales can be shallow and wide. They will be spaced far enough apart to allow vehicle access between them. The existing two-track is the lowest point and tends to collect water, so I will build swales on either side to capture and soak the water where it's needed before it goes onto the road. Because the soil is so sandy it absorbs water very fast. I'm not sure if swales will be the most effective earthworks so I'll monitor their efficacy over time.

Pond: The pond location was chosen because it can be fed from the roof runoff, and is still a higher elevation than most of the swales and gardens, to allow for gravity irrigation. The pond is approximately 2000 ft sq. and 9 ft deep giving roughly 67,000 gallons of above ground water storage. The roof will capture about 44,000 gallons per year, which should be more than enough to keep the pond charged. The pond will be sealed using the Glee technique using leaves from the city, weeds from the lake, and pigs in it to compact and manure the pond. Also, the depth should prevent it from freezing through, which means fish can live in it year round such as perch, bluegill, bass, carp and catfish as well as some crawfish, clams, and frogs.



Cisterns: Two 1500 gallon cisterns will be used to store roof run off from the house and greenhouse, also in an elevated position as well as built on raised platforms to allow for gravity irrigation. They are protected from the suns damaging effect by the greenhouse and pine trees, and will eventually be covered with a trellis and climbing plants. (Thanks Penny!)

Drinking Water: Will come from a well, powered by an electric pump.

Access: The driveway enters from the west and connects with the existing two-track then connects up around neighboring house. Vehicle access is also maintained for the materials storage area. Foot paths radiate out from the house like spokes of a wheel, and connect together forming a flower petal pattern for efficient movement across the site.

Soil:

Current State: There's no way to get around it, the soil on site is in extremely poor shape. It's almost totally sand, with very little organic matter. A soil test has determined that it's acid with a PH of 4.8 with low P, K, Mg, and Ca. Digging a test hole has unearthed a hardpan layer of compaction about 2.5ft down. This is probably a self-cementing calcium-iron hardpan because it's orange in color. This means that if we try breaking it up mechanically with a subsoil plow, it will probably re-seal itself. So we will focus on building the top 2 ft of soil. The sand makes for soil that is very dry as the water and nutrients quickly leach down into the ground. Building organic matter content will be critical, as will raising the pH so more nutrients are available to the plants.



Animal Tractoring: The soil is beginning to be rebuilt through the use of movable pens for animals such as hens and pigs. The pigs root and turn over the soil through their natural behavior of looking for food. This behavior can be utilized to prep areas for cover crops by eliminating competing plants, and adding some fertilizer. I've already begun using this technique and have had great success out-competing the aggressive spotted knapweed.



Cover Cropping: I'll begin with a very diverse mix of cover crops to see what grows best here, including various pasture grasses, sunflower, chicory, orchard grass, festulolium, bird's foot trefoil, oats, peas, radish, squash, alfalfa, rye, vetch, beans, buckwheat, wildflowers, and clovers. In the garden areas I'll use buckwheat during the growing season and cut when it flowers so it doesn't go to seed. For a winter cover crop I'll use oats and field peas which will die before going to seed from the freeze. After broadcasting the seeds by hand, I rake them in with a high wheel cultivator, and then cover the area with straw. Sometimes I'll dig mini-swales to aid in moisture retention. I'm still experimenting with the best procedure for this process.

Lime: The acidity of the soil makes it inhospitable to most plant species we would like growing there, so raising the pH with applications of lime will be necessary. We'll start out with 2 tons/acre tilled in with a chisel plow. Over time, (every 10 yrs) the soil will start to go acid again due to the acid rain, so we'll top-dress the fields with a lighter application of lime until the food forest has begun self-managing the soil pH.

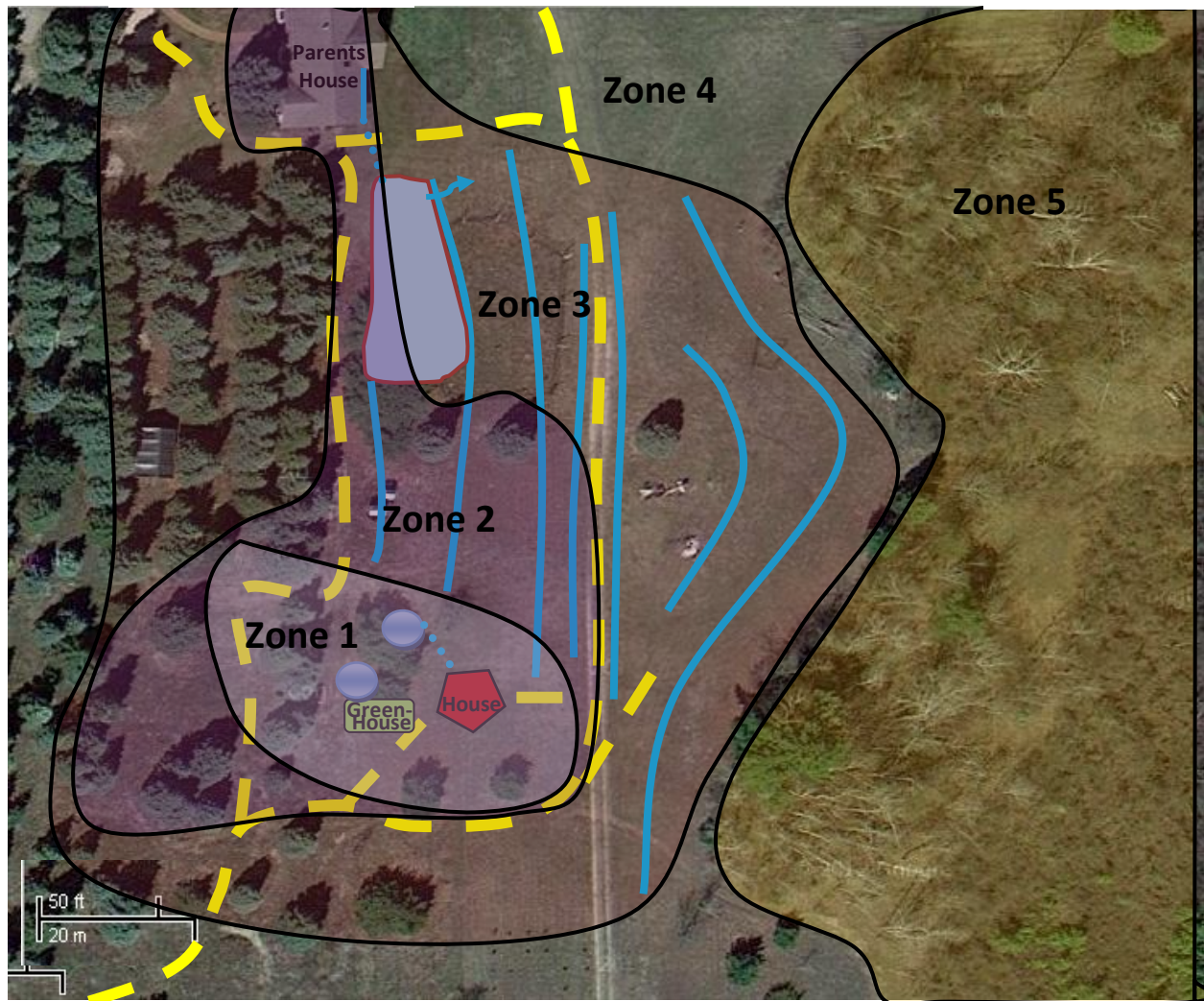
Pioneer Trees: In my food forest, I'll do a dense planting of Italian Alder, sea berry, and california false indigo which are fast growing nitrogen fixers which build nitrogen in the soil in order to fertilize the fruit and nut trees as they get established. Italian Alder is ideal because it doesn't spread through rhizomes like Black Locust, yet is fast growing, coppices, and makes a good fuel wood. Once my main crop trees

mature, I'll either keep the Alder coppiced low to the ground, or cut it and suffocate the stump with some metal until the roots rot.

Importing OM: While it's labor and resource intensive to import organic matter (such as woodchips, spoiled hay, manure, leaves and compost) for the whole site, it does make sense to bring it in to kick start the zone 1 plantings such as the kitchen, herb, and main crop gardens. It also makes sense to import some clay which will help the soil retain more moisture as a sandy-loam instead of pure sand. I will be talking to local farmers with access to manure and spreader, and see if they can come spread some on my site. I've also been collecting spoiled bales of hay that have gotten too wet and aren't good for animal feed anymore. These can be broken apart and spread.

Hugelkulture: Burying wood in my garden beds and swale berms increases organic matter in the soil, thereby increasing its ability to retain water and nutrients.

Zones of Use:



Zone 1: [.2 acre] Diverse kitchen gardens (Picked every day, planted 4-6times/month, heavily mulched and fertilized), Herb garden/Spiral and Picking Greens, Root Cellar/Ice House, Patio, Dwarf fruit trees (multigraft, espalier), Mother plants, High value/difficult to grow plants, Trellis, Deciduous Vines and Trees, Nursery, Shade house, Greenhouse, Seed storage, parking, Feed store, Tool shed, Washing line, Cisterns, Garden Ponds, EDGE Z1: Compost, Poultry (chickens)

Zone 2: [.75 acre] Includes Parents House, Diverse Food Forest, Main Crop Garden (corn, potatoes, grain, pumpkins, melons, okra, squash, turnips, carbs, storage crops) Woodlot/Coppice firewood, Cut Forage. (Chop n Drop mulch and Groundcover)

Zone 3: [1.5 acres] (rough mulch, big wood sticks etc.) Grazing Pasture, Broad Food Forest blending out, Broad Main Crop (Mass), Farm Forestry Blending in

Zone 4: [5-10acres] Farm Forestry (timber, poles, bee forage, animal pasture, nuts, mushrooms)

Zone 5: Wilderness/Unmanaged, Forage, Hunt, Firewood, Timber

House Design:

*The house design is still up in the air, but here's a snapshot of one approach...

Main Design Considerations:

- Small enough to be easily heated by one wood stove
- Very affordably built; use salvaged materials
- Passively heated partly by the sun in winter, passive cooling in summer
- Very well insulated to hold in heat, and keep out cold during the winter
- A substantial volume of thermal mass within the insulation layer to help buffer the temperature
- Made of locally sourced natural materials
- House 2-4 people
- Include a sleeping loft, full bathroom, food storage, full kitchen, and eating/seating areas
- Have potable water on tap; cold year round, hot most of the time.
- Constant source of renewable, off-grid electricity
- Strong roof to withstand the snow load or steep pitch
- 3ft deep foundation to avoid frost heave, and splash up of rain
- Wind sheer anchors to prevent roof uplift
- Vapor barrier to prevent moisture build up inside house, and radon gas infiltration

Area – 269.7sq. ft

Shape - Pentagon

Side length (5 sides) - 12.5ft

Circumradius - 10.62ft

Inradius - 8.62ft

Height – 15ft

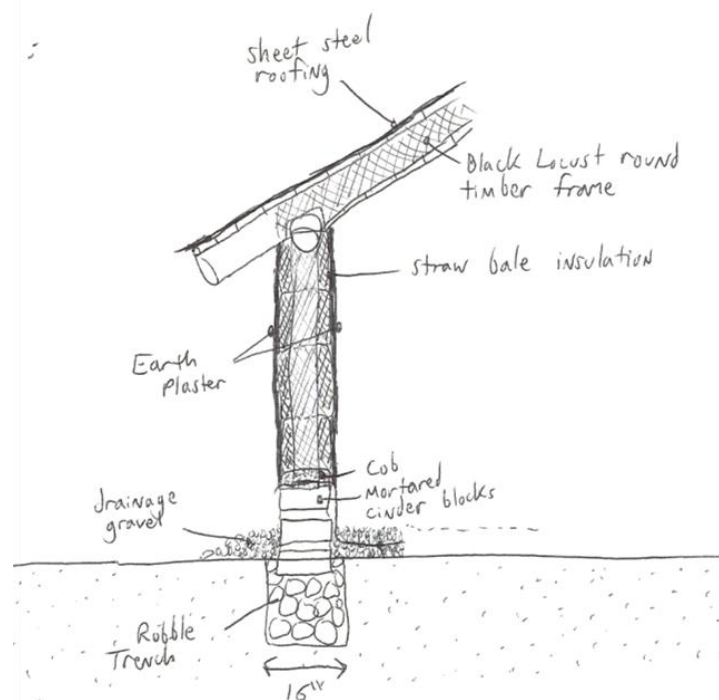
Frame - Timber, round 12ft black locust poles

Walls - Strawbale and covered on the inside with a mud plaster and the outside with limestone based plaster.

Roof - 3:12 slope, made of black locust slab shingles, and insulated underneath with light straw-clay

Foundation – Rubble Trench, Cinder block, wind sheer anchors, vapor barrier

Floor – Earthen floor (for thermal mass)



Passive Solar Overhang Calculations (in feet):

GENERAL INPUTS

latitude ° North

window faces SOUTH

show values Sun %

overhang style Horizontal

OVERHANG DIMENSIONS

overhang depth

overhang spacing

window height

	MORNING												AFTERNOON								
	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00				
Jan					100%	93%	87%	84%	83%	84%	87%	93%	100%					Jan			
Feb				100%	87%	77%	72%	70%	69%	70%	72%	77%	87%	100%				Feb			
Mar				62%	53%	50%	49%	48%	48%	49%	50%	53%	61%					Mar			
Apr				0%	0%	0%	8%	12%	13%	12%	7%	0%	0%	0%				Apr			
May					0%	0%	0%	0%	0%	0%	0%	0%	0%					May			
Jun					0%	0%	0%	0%	0%	0%	0%	0%	0%					Jun			
Jul					0%	0%	0%	0%	0%	0%	0%	0%	0%					Jul			
Aug				0%	0%	0%	0%	0%	0%	0%	0%	0%	0%					Aug			
Sep				4%	25%	31%	33%	34%	35%	34%	31%	26%	7%					Sep			
Oct				95%	75%	68%	64%	62%	61%	62%	64%	68%	76%	95%				Oct			
Nov					100%	89%	83%	80%	79%	80%	83%	89%	100%					Nov			
Dec					100%	97%	90%	87%	86%	87%	90%	97%	100%					Dec			
	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00				
	MORNING												AFTERNOON								

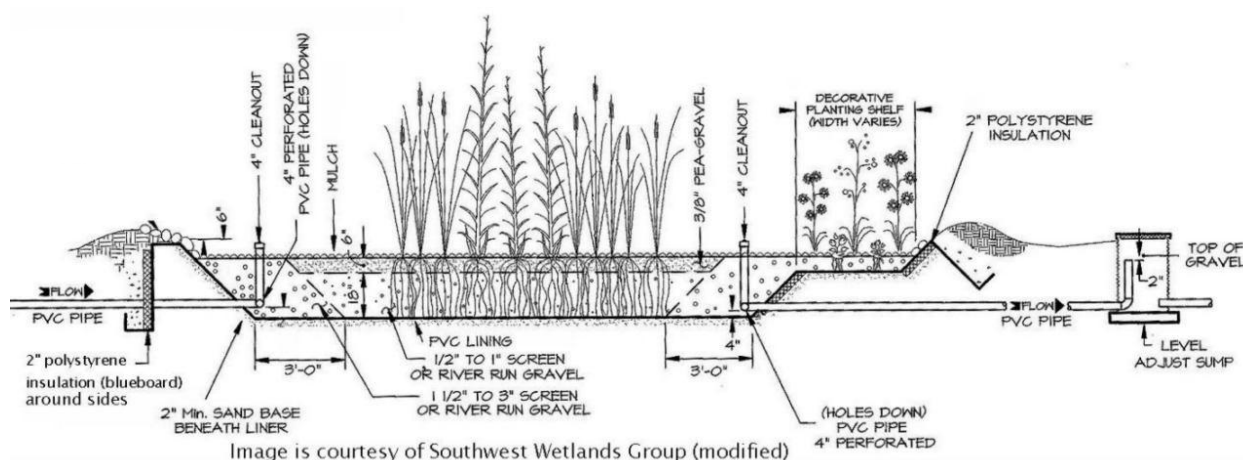
[source: http://www.susdesign.com/overhang_annual/index.php]

Energy and Waste Systems:

Electricity: Off-grid Solar PV system with Battery Backup. 2x 250watt panels, 2.5kW Inverter, 8x 6volt deep cycle batteries, charge controller, PV wires, Mounting. Yearly Production: 560kWh Total: \$4244.67

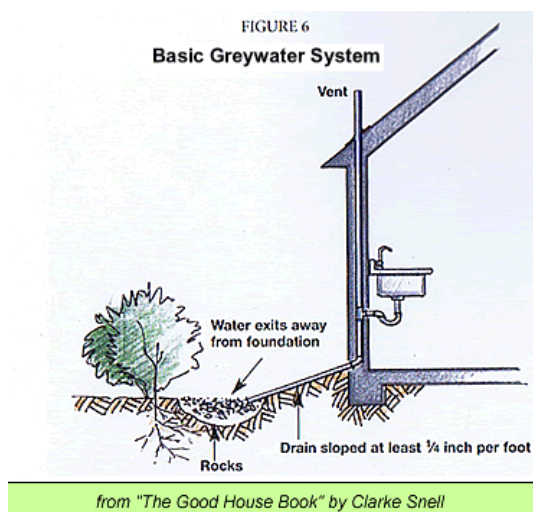
Refrigerator: Converting a chest freezer into a fridge will create a super-insulated, extremely efficient fridge that only consumes .15-.18kW per day! [source: <http://www.aselfsufficientlife.com/chest-freezer-to-fridge-conversion-the-most-energy-efficient-fridge-ever.html>]

Blackwater Constructed Wetland: This will be constructed slightly down slope from the house so that the blackwater can flow by gravity into it. It will be filled with wetland plants such as cattails, sagittaria, rushes, reeds, scurpis, and bulrush. When the system gets full of biomass, it will be harvested out and composted and returned to the garden to complete the nutrient cycle.

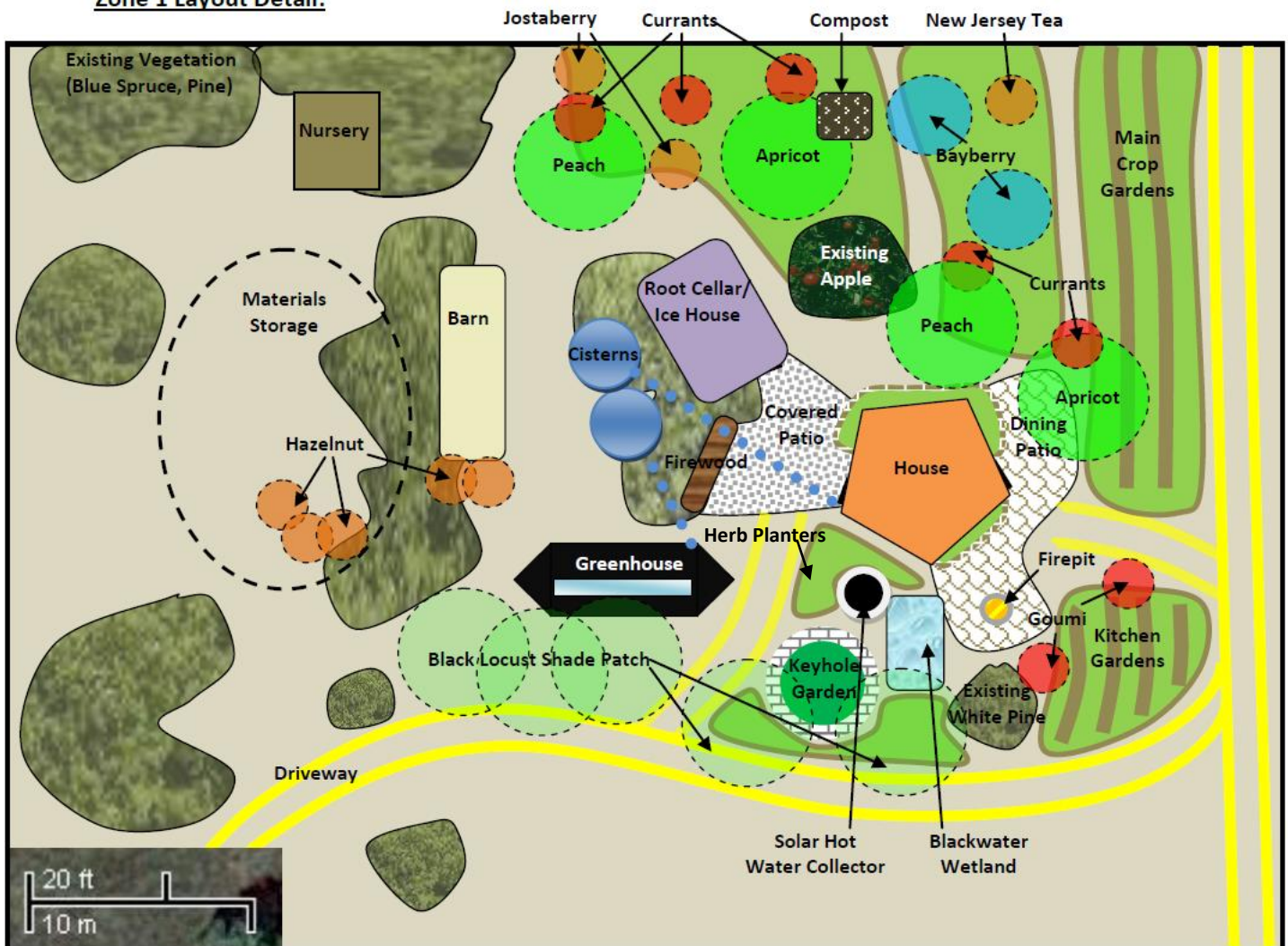


Greywater: Water from the sinks, shower, and washing machine will gravity flow through planter troughs inside the house, near the windows. This feeds the soil, and filters the water. It will then go into the toilet basin for flushing into the blackwater cell. The washing machine water will flow out into a mulch basin. The pipe will be HDPE and buried so that it can still function in the winter.

Hot Water: Hot water will be provided by a hybrid DIY solar/wood system. The hot water will be stored elevated in a typical 40 gallon electric water heater, set to a low setting. Then the cold input will be pre-heated through a coil of 1inch HDPE tubing in a sunny position, and can optionally be piped through a copper tube wrapped around the stove pipe of the wood stove.



Zone 1 Layout Detail:



House: The house itself is the center of energy, and serves as the place we sleep, cook and generally celebrate and contemplate life. It's like the nucleus of the cell, and we, the land-stewards, move around the site keeping all the systems running smoothly like little protein molecules, serving our purpose for the greater organism.

Herb Planters: There will be cooking herbs and greens within and alongside the house for quick and easy harvesting. Shade tolerant plants such as claytonia will go on the north side of the house, and the more Mediterranean herbs to the south.

Covered Patio: The west patio will be covered by a solid roof to provide an outdoor gathering space during rainy days. The covering will also keep snow clear from the paths to the firewood and root cellar during the winter. The patio may also be used as a covered parking space in the winter.

Dining Patio: This patio (made of broken chunks of sidewalk from the city) will serve as an outdoor dining and food processing area during the summer. It will have a nice view of the forest, and gardens and be covered with a natural round timber trellis, with Hardy Kiwi and Grapes growing up it. There's also an embedded firepit for those late night storytimes.

Root Cellar/Ice House: In the future we would like to build an ice house and root cellar to store our food through winter, and have a freezer space during the summer. This will include two super-insulated rooms connected by a door. The back room would contain ice blocks stored in sawdust that were frozen in buckets during the winter. The front room would be kept around 40 degrees Fahrenheit for cool crop storage, by leaving the door to the ice room open the correct amount. It's located near the house because it will be accessed almost daily. Alternatively, the root cellar may be incorporated into the main house design.

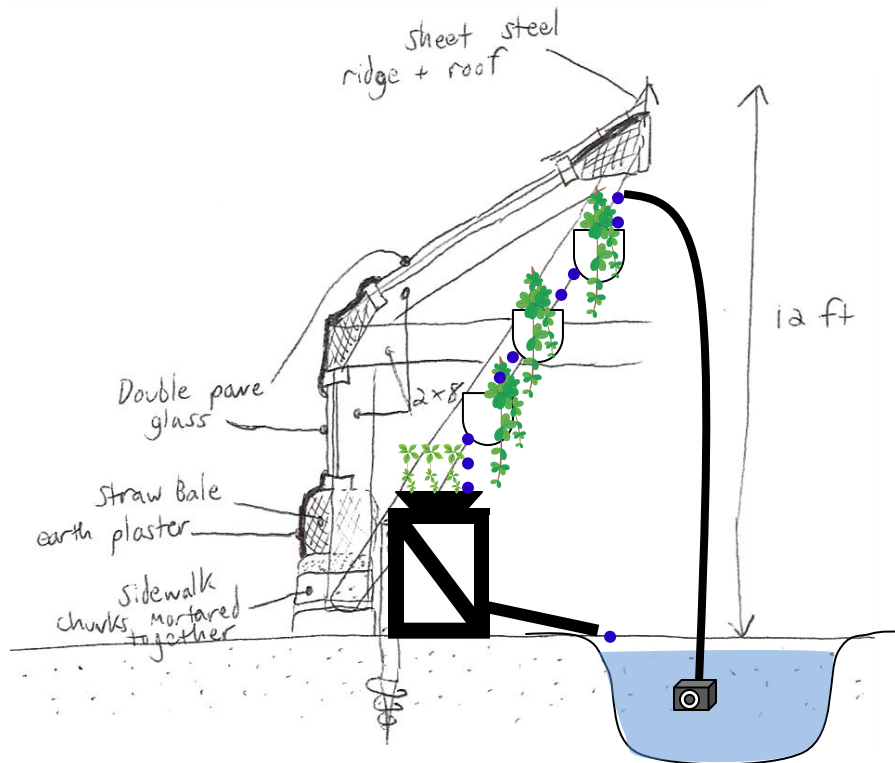
Keyhole Garden: This is a raised bed hugelkulture garden that serves as an aesthetic focal point of the site, so it will be decked out with some colorful flowers and medicinal plants. It has gotten very dry, so I mixed some hydroton into the soil from my aquaponics system to help it hold moisture, as well as keeping it heavily mulched. There is a basket in the center for compost which returns nutrients to the soil.



Barn: There is an old camper trailer on site, which I gutted out and use as a barn for storing tools, feed, and seed out of the weather. It's not the most slightly thing, so I'll paint it up with a mural but also keep it tucked back behind the greenhouse and pines, but still close enough to be easily accessible.

Greenhouse: The greenhouse has a wood frame, ribbed steel roof, strawbale construction with double pane glass on the south wall and roof. The glass will be covered with a glazing to diffuse the light across the full interior space. Inside will be a small pond dug into the ground to keep it from freezing. This will be used to irrigate and fertilize a vertical growing aquaponic system that will grow food crops through the winter, and feed new seed starts and transplants in the spring. Some space will also be dedicated to growing pruned-espaliered tropical climate "luxury" plants such as coffee, black pepper, avocado, banana, mango, pineapple, and fig. The greenhouse will have a sleeping loft, wood stove, and sink and can serve as alternate sleeping and office quarters.





Other Close Elements: Also situated near the house will be the solar hot water collector, the blackwater wetland, the firewood pile, and the cisterns for collecting the roof runoff from both the greenhouse and the house.

Black Locust Shade Patch: While working on the greenhouse we quickly noticed how intense the sun is in this area, so I planted a number of black locust seeds as an adjustable shade barrier and windbreak. Since Black Locust can coppice, we can keep selectively cutting them until we get exactly the right light amount. Black Locust leaves out very late in the spring so I'll have all my transplants out of the greenhouse by the time the shade is coming in to keep it cool.

Kitchen Gardens: The rest of the spaces that aren't dedicated to elements, patio, or paths will then become kitchen gardens for growing a high diversity of food producing plants and herbs. This is where we'll get most of our greens and it will be kept heavily mulched, fertilized, and watered. These gardens get the most attention. I will apply companion planting, and crop rotation principles as well as planting a number of support species to help deter pests (onions, chives), attract pollinators (asters, marigold), and accumulate nutrients in the soil (comfrey, yarrow, white dutch clover).



Diverse Food Forest: This area serves as an area to experiment with different polycultures of multifunctional plants, as well as being a genetic bank of many of the perennial edible and useful plants that can be grown in this region. Close in to the house we focus on small dwarfing or semi-dwarfing fruit trees, berry bushes, and a high diversity of herbaceous and groundcover species. The ground is kept covered through low spreading/creeping plants, and chop-and-drop mulch. We're aiming to have some

plants always in bloom, and some always in fruit through the growing season by selecting early, mid and late ripening varieties of each plant. We will also have a moving compost pile within the food forest to build nutrient rich soil wherever it collects.

Main Crop Garden: The main crop garden is downslope of the food forest so that any nutrient rich runoff from the food forest is absorbed by the garden beds. It's constructed as two long hugelkulture mounds on contour. This will be used to produce the bulk of our staple crops such as corn, sweet potatoes, amaranth, sunflower, pumpkins, melons, squash, beans, turnips, carrots, and other storage crops.

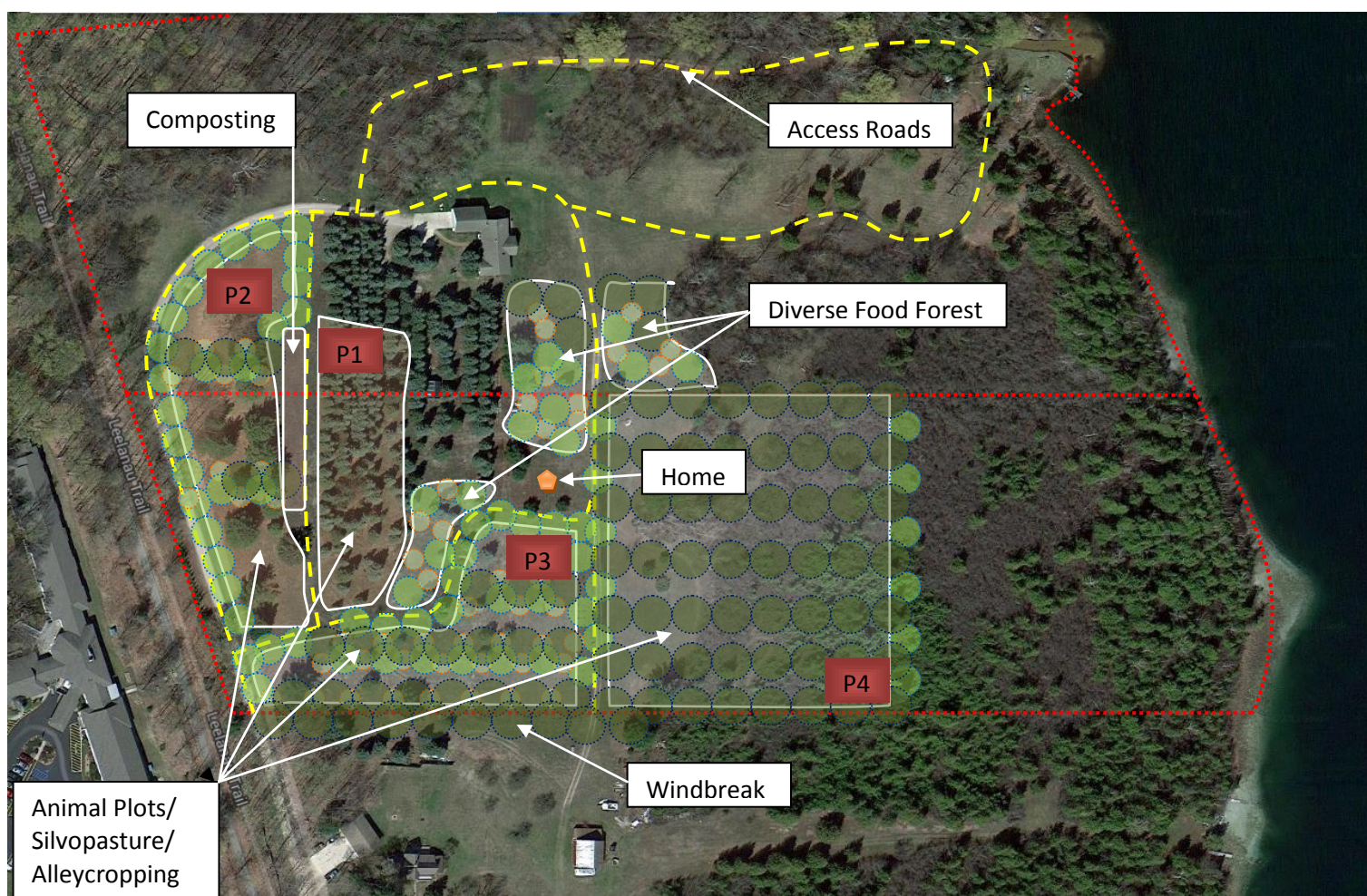
Existing Vegetation: Blue Spruce and Pines are mostly left as is, but some are limbed up to fit in elements such as the cisterns, the barn, nursery, and the root cellar. The limbs and trees that are pruned out will be used to build hugelkulture garden beds on contour in the kitchen, and main crop gardens. I've also been using the sharp spruce branches to build a protective barrier around my new plantings.

Nursery: The nursery is protected by a tall fence and includes plants waiting to be planted, as well as new seeded perennials just growing from seed. This will expand out as we prepare to plant full site.

Materials Storage: This area is used to store building and planting materials that don't have an immediate use. It should be accessible by vehicle and somewhat hidden from view by the existing trees as well as planted hazelnuts and serviceberries. This will also be a spot for a Parkour playground for kids and adults.



Zone 2-4 Layout Detail:



Diverse Food Forest: Near the house are patches of diverse food forest that is more heavily managed, and serves as the mother colony of beneficial species. This will also make for good chicken forage area, as well as some annual crop production mixed in. These areas tend to major in small fruit trees.

Canopy Pattern: When designing the canopy, I tried to keep it 40-60% open to allow light in for the undergrowth plants. During establishment, I plant the trees and shrubs closer than desired. This allows for a larger harvest during the young years. As they mature and start to crowd in, I'll thin some out, removed those that don't produce as well. I'm selecting for disease resistance, size of crop, and earliest year of crop production.

Animal Plots: The animal fodder system is based off Mark Shepard's work in Restoration Agriculture, and silvopasture agroforestry systems. Each of the four main plots (P1-P4) will be surrounded by perimeter fence, then smaller paddocks will be created within these using moveable electric fencing. We always try to keep the animals moving onto new ground. (Cows-smaller pens daily, Pigs-larger pens weekly) This is known as mob-grazing, or a paddock-shift system. This allows the pasture to rest and recover leading to increased pasture and soil health. By combining the tree crops with the animals pasture, we provide shelter from the sun and wind, reducing animal stress. The trees reduce erosion while

increasing yield in the space since the sky above the pasture wouldn't otherwise be used. It also helps supplement the need for imported feed, especially for pigs, who eat the fallen fruit and nuts.

In addition to this, I will cover-crop behind the pigs until a good mix of fodder crops are growing on the pasture as well (alfalfa, rye, squash, pumpkins, sugar beets, clover, amaranth, sunflower, sunchokes, radishes, peas, beans, chickweed, dandelion, plantain and more). The pasture will benefit from the fertilizing and soil building edge effect of the perennials. Some of these alleys between the trees can also be used for hay or annual crop production on rotation.

Composting: We've developed a partnership with 'Bay Area Recycling for Charities' who collect all the food waste in the city and compost it. They have begun composting at Realeyes Homestead which helps us build the organic matter in our soil. We also use the expired organic produce from the local food co-op, Oryana, as the main feed supply for our pigs. We do supplement them with some non-GMO grain feed. The chickens also enjoy the bounty of crawling critters in the compost piles.

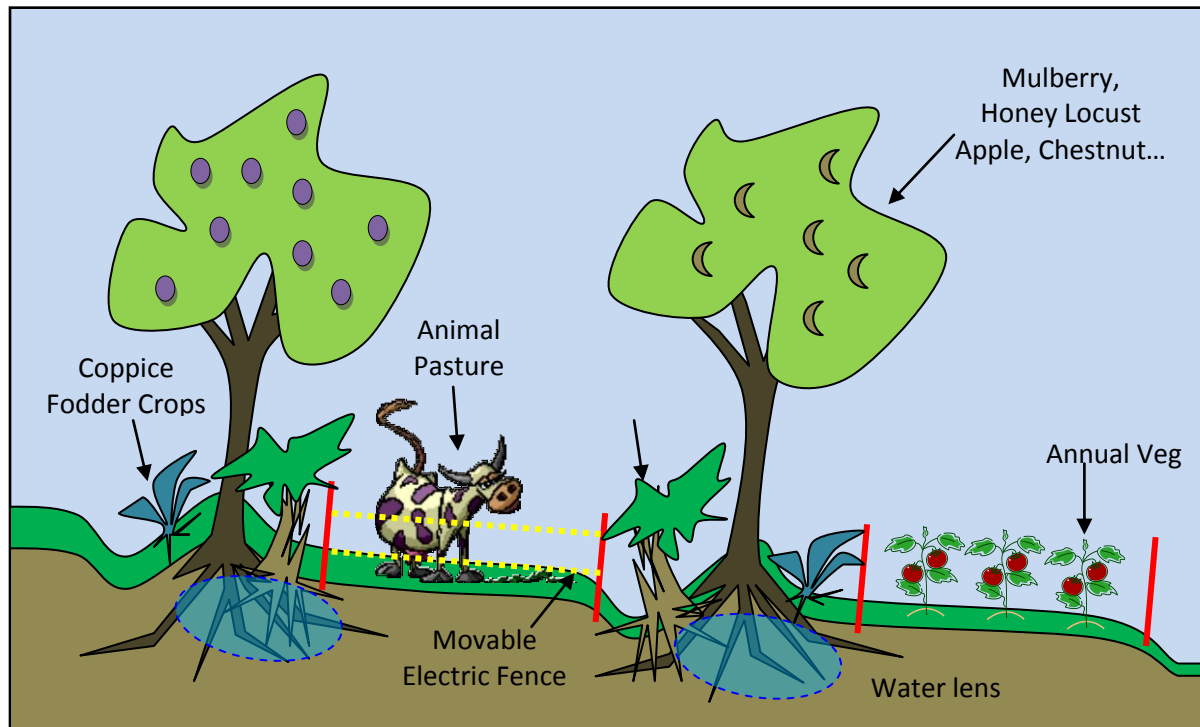
Windbreak: Strong winds tend to blow across the field from the south on this property, so we can block this with a dense windbreak along the southern boundary. Korean nut pine would make a great option here because it's an evergreen so it would be an effective windbreak year-round; while also producing a crop of pine nuts.

P1: (.6 acre) This area is already densely populated with blue spruce trees. It makes a good pen for overwintering the pigs because it provides shelter from the cold and wind, and can't be used for much else due to the deep shade. Once the pigs move into new paddocks this spring we will try to establish a groundcover of Wintergreen, Solomon's seal, and Pink Purslane, all of which are adapted to an acid, shaded habitat and are edible for pigs and humans.

P2: (1acre) This area has an established patch of oaks which indicates that chestnuts will also probably do well here. We plan to move the pigs into this section during the fall when the acorns are dropping which will be like manna from heaven to them.

P3: (1acre) This plot will provide additional pasture for the animals, as well as alley-crop production. It's very dry and exposed, so we will select perennial species which fit this habitat. It will also benefit greatly from some pioneer trees like Italian Alder, and a windbreak to the south.

P4: (3acres) This area is mostly covered in a thicket of grey dogwood. We would like to use a combination of pigs and goats or sheep to clear out the dogwood, leaving the mature cedars. We will then plant in alleys of multifunctional polycultures, like the other plots. The soil here, however, is much more moist with higher organic matter so we will select species adapted to this habitat including elderberry, highbush cranberry, hazelnut, pawpaw etc. The tree's are planted in east-west orientation because this allows the trees to get the most even sun exposure. We would usually plant the rows on swale-berms on contour, but decided this wouldn't be necessary due to the minimal slope, high water table, and fast drainage of the sandy soil.



Desired Species List:Trees:

Persimmon (fruit)
 Italian Alder (Nitrogen Fixing, timber)
 Black Locust (N-fixing, Lumber, Firewood)
 Osage Orange (Timber, Firewood, Fence)
 Thornless Honey Locust (Honey flavored pods, wood)
 Hybrid Poplar (fast growing, firewood)
 Chinese Chestnut (Nut production)
 Korean (Siberian) Nut Pine
 Hickory (nut, timber)
 Pawpaw (Fruit)
 Hardy Pecan
 Black Walnut
 Willow (Rooting Hormone, Fodder)
 Apple
 Pear
 Peach
 Apricot
 Plum
 Cherry
 Mulberry (animal fodder)

Shrubs:

Hazelnut
 Currant (shade tolerant berry)
 Goumi (berry, N-fixer)
 Gooseberry
 Aroniaberry
 Lingonberry
 Service Berry (Saskatoon)
 Siberian Pea Shrub (N-fixing, Animal fodder)
 Spicebush (Spice, tea)
 Elderberry (native)
 New Jersey Tea (Soap from leaves, N-fixer, tea)
 Northern Bayberry (wax for candles)
 Jostaberry
 Honeyberry
 Rugosa Rosa (edible rose hips, vigorous)
 Cornelian Cherry (edible fruit, vigorous)
 Highbush Cranberry
 Bladdernut
 Autumn Olive (berry, vigorous, N-fixer)
 Serviceberry (saskatoon)
 Raspberry, Blackberry, Blueberry etc.

Herbs:

Comfrey (Nutrient Builder, Medicinal +more)
 Stinging Nettle (Nutrient Builder, Medicinal +more)
 Bird's Foot Trefoil (N-fixer, Insectary)
 Turkish Rocket
 Wild Leeks (Nutrient Builder, Edible Roots and Leaves, Native)
 Jerusalem Artichoke (edible roots/tubers, windbreak, vigorous!)
 Wintergreen (Evergreen groundcover, berries, nutrient builder, native)
 Yarrow (multifunction)
 Lovage
 Bergamot
 Echinacea
 Anise Hyssop (multifunction)
 Aster (multifunction)
 Milk Vetch (nutrient builder (selenium!))
 Sea Kale (edible green)
 Bee (Lemon) Balm (multifunction)
 Catmint
 Garden (wild, alpine) Strawberry
 Mints (difficult to control)
 Wild Ginger (multifunction, groundcover)
 Amaranth (winter storage chicken feed)
 Good King Henry (perennial spinach)
 Asparagus
 Rhubarb
 Fennel
 Skirret
 Lupin (erosion control, nutrient builder)
 False Indigo
 White Dutch Clover (groundcover, N-fixer)
 Daikon Radish (cover crop, break thru hardpan)
 Chives (pest repellent)
 Daffodils (pest repellent)
 Everbearing strawberry

Vines:

Grape
 Hardy Kiwifruit
 Groundnut (edible tuber, Nutrient Builder, Native, Groundcover)
 Hog Peanut (edible tuber, N-fixer, Native, Groundcover)
 Hops (leaves, tea, beer)

Business Prospects/Products:

Approach:

We've been exploring a number of potential products to fund this project. Some of the considerations are as follows;

- No pollution! Keep it legal, and safe for humans and all biology.
- Something of real value; don't screw people or sell snake-oil
- Quality and perseverance equate to success
- Low infrastructure/start-up costs
- Transparency; instead of investing in costly certifications, we'll open our farm and practices fully to our customers
- Local; Source materials locally and sell to mostly local markets
- Minimal maintenance/management demands
- Fit's in to larger process of site development
- Home-based; Allows us to be home to work on site most of the time

Pastured non-GMO Pork: [This year 2014] Based on Joel Salatin's numbers, we should be able to support 40 pigs rotating on paddocks on our site. To cut down on feed costs, we'll supplement as much as possible with organic food waste from the city delivered by Bay Area Recycling for Charity. Because keeping pigs through the winter is costly, for now we'll focus on raising them through spring-summer-fall and slaughter in early winter. Then we'll do a combination of selling half- and whole hogs direct to customers through a meat processor. And we'd also like to try taking some and selling it individually at the farmers market in Traverse City. The pigs also fit with our largest restoration work as they till and fertilize the soil, preparing it to be seeded with beneficial species; increasing the diversity and pasture health. Fallen fruits and nuts can harbor pests and disease, so the pigs eliminate this vector of infection by eating up all the fallen food.

Yearly Expenses: (not including infrastructure, which is around \$5-6000 mostly fencing)

- 40 feeder pigs - \$100 each = \$4000
- Non-GMO feed (no supplemental, for worst case scenario) - \$180 each=\$7200
- Freezer storage rental 6 months @ \$16/mo = \$96
- Processing \$1.50/lb smoked, sausage,bacon 4,800lbs meat = \$7200
- Farmers Market Stand fee \$12/wk for 6months = \$312
- Labor - Mine, Free! = \$0

Income:

- 4,800lbs of processed meat at Farmers Market prices \$8/lb avg = \$38,400
- Minus expenses \$18,808
- Net: \$19,592

Permaculture Plant Nursery: [Next year 2015] Since we'll be propagating many of these plants anyways, selling them can serve as supplemental income. We could sell them at the farmers market with our pork, or sell them to a local plant nursery.

Mushrooms: [3 years, 2016-17] I wasn't successful with my first batch of mushroom logs, but I'm determined to make them work because they're such a great product. I'll mostly focus on inoculating oyster and shitake logs from the wood on site.

Ginseng/Goldenseal: [7+ years] While it takes seven years to mature, ginseng has great income potential as it sells for \$260/lb or more. It can be grown wild in the woods, like we have to the north with little management. According to [this USDA/NRCS document on Agroforestry Farming](#), some sources cite a net income of \$15,300-\$16,500 per half acre of ginseng.

[http://nac.unl.edu/documents/morepublications/profitable_farms.pdf]

Chestnuts, Apples, Persimmons, Berries etc etc: [10+ years] Once the major tree crops mature there will be an abundance to harvest from.

Money? - It's an unfortunate fact of our current society that in order to own land and work it, you must be making a considerable paper currency income for land taxes, health insurance, etc. However we seek a simple life of modest means; providing a service or product of lasting value to others. Any surplus will be returned back into developing the land, and the community around us. Hopefully we're all blessed with THAT problem. :)

We would like to share a special **thank you** to our many teachers and mentors, as well as all those friends who've helped out on the farm here. Although not an exhaustive list... Mom and Dad, Brenda Baran, Penny Krebiehl, Bryan Mets, The Baker family, Brenda and Bruce Baran, Stuart Kunkle, Thomas Hirsch, Scott Ciaglaski, Michelle Ferrarese, Dave Jacke, Geoff Lawton, Bill Mollison, Toby Hemenway, Mark Shepard, , Trevor Newman, Mark Angelini, Teri VanHall, Fred Meyer, Brad Kik, Peter Bane, Keith Johnson, Samantha and Christopher Graves, Cliff Davis, Kirk Waterstripe, Bruce Holland-Moritz, Matthew Bertrand, Jesse Tack, Nathan Ayers, Flint Horton, Kerry Alspaugh, Jill Donberg, Nick Bathum, Mike Curiel, Blasé Masserant, Lance Masserant, Alyk Fuller, Matt Heimbürger, Ben Cichowski, Joey Breithaupt, Deanne Bednar, Ryan and Jake Fiebing, Ann Richarson, Sammy Padget, Spencer Boyles, Mara Penfil, Mateo, Johnathan Aylward, Geoff and Susan Kegerreis, Travis Noble Graves, Mark Toorock, Mike Zernow, Paul Darnell, Luci Romberg, Victor Lopez...and many more awesome friends who've been a big inspiration!

Brenda ☺ & Levi

