Design of

6100 SW Canby St
Portland, OR 97219

by

Kyle Williams
kyle@permiehomestead.com

for

Geoff Lawton's Online
Permaculture Design Course
Class of 2014

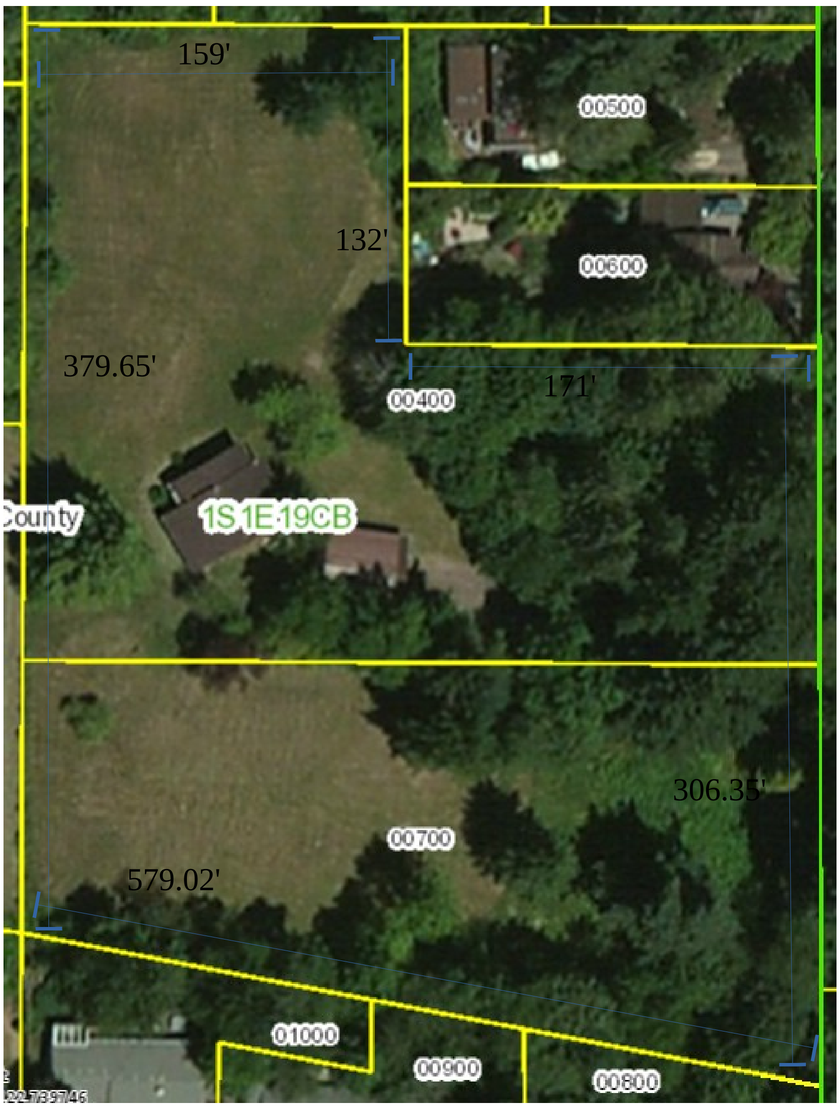
Background Documentation

I chose to design the site at 6100 SW Canby St because a friend of mine is in the process of purchasing it, and they asked if I would be willing to do their soon-to-be property for my final design exercise so they could implement what I designed. I happily obliged them, as it is a very interesting piece of property.

As mentioned, the property is located at:

6100 SW Canby St,
Portland, OR 97219
United States, North America

It is comprised of two tax lots, 00400 and 00700, as shown below:



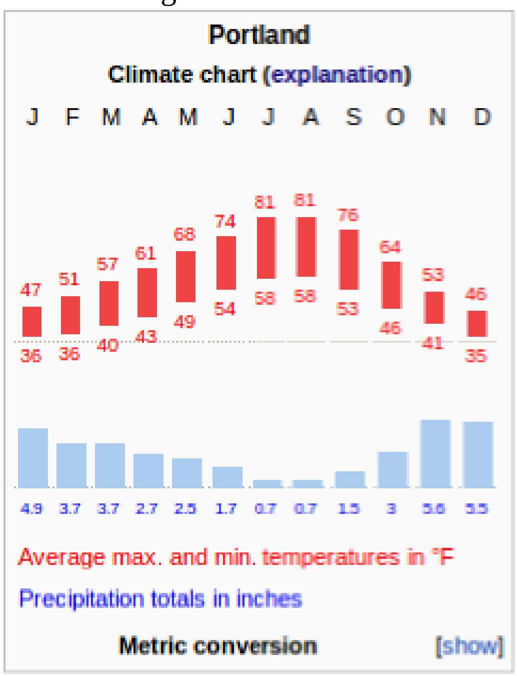
Total size of the property is 2.55 acres.

Geographical and Climate Information

Latitude/Longitude of the House: 45º 28' 6.5” N; 122º 44' 22.1” W
Distance from Pacific Ocean: ~60 mi/96.5 km
Elevation: 300ft/91.5m above sea level at the house

The climate of the area is typical of that in the Pacific Northwest of the USA. Portland is generally cool Mediterranean, with hot dry summers lasting from the beginning of July until the middle of September. From the middle of September until around New Years, it is rainy and cool to cold. After New Years and until late February it is cold and snows are possible but not common, and rain persists when it is not snowing. Spring seems to start in early March and last through June, with plenty of heavy rains and cool days. The Köppen climate classification for Portland is *Csb*.

The following climate data is from the Portland, OR wikipedia page:



From my own observations living in Portland, OR, I know that the winds are predominantly hot and come from the west during the summer, and the cold winter winds blow in from almost straight north. Fire danger on this property lies to the west-northwest, due to the direction of the hot summer winds and slope of the property. Rain also typically blows in from the west throughout the year, with snows coming in from the north when the cold winds are blowing. These observations are documented on the Sector Map further down in this document, following the zone map.

Property History

The property has been abandoned since at least 9/03/09, which is the earliest record I can find for it on the Multnomah County Assessor's website. The structure that is the house was originally built in 1914, and updated and expanded in 1971 to its current structural layout. The garage/shop building was built in 1982, and is in ill repair. The home itself is in need of updating, but is structurally sound. The land is well vegetated and does not appear to have been treated with insecticides or herbicides of any kind in the recent past. Water, power, and sewer to the property are all connected and appear to be in working order.

There are several fruit trees scattered throughout the property. These are indicated on the elements map by trees that are slightly transparent. Vegetation on the basemap that is covered by opaque elements, or other elements such as earthworks, will be modified or removed and used as fuelwood, building materials, or compost materials during the implementation of the design.

Family Needs/Wants

My friend is an able-bodied man at 35 years of age. He is a carpenter with many "handyman" skills, and an average to good gardener. He has limited permaculture knowledge, but has become interested in learning more about permaculture throughout the process of my designing his property. He is married to a 36 year old able-bodied woman who has good to excellent gardening skills, but otherwise no other "homesteading" skills. They both work part-time but well paying jobs, and can dedicate about 30-35 hours a week implementing the design I have come up with. They also believe they can afford to invest $10-15 thousand dollars into updating the house and implementing earthworks and structures suggested in the design in their first year at the property. After that, they believe that money will not be a problem when it comes to implementing more of the design.

They expressed an interest in having chickens on the homestead, but did not want any other forms of livestock included. They did, however, wish to have a sizable aquaponics system, which is designed into the northern area of Zone II. My friend enjoys fishing, and like the idea of being able to catch some fish after wading/swimming out to "The Island." They also informed me of the fruit and nuts they enjoy the most, which are reflected in the design.

They wish to heat the home using a wood stove rather than the electric heating that is already installed. This was taken into account when designing the Zone IV Farm Forestry area. Also reflected in the Zone IV design is my friend's carpentry and woodworking skills, which he will use to fashion the oak and hickory wood into furniture, tools, crafts, etc.

Existing Structures/Access

My friends wished to spend little to no money and effort on any major overhaul of existing access and structures. They enjoy the privacy that the current driveway offers them, and the house/garage would be too expensive for them to demolish and rebuild.

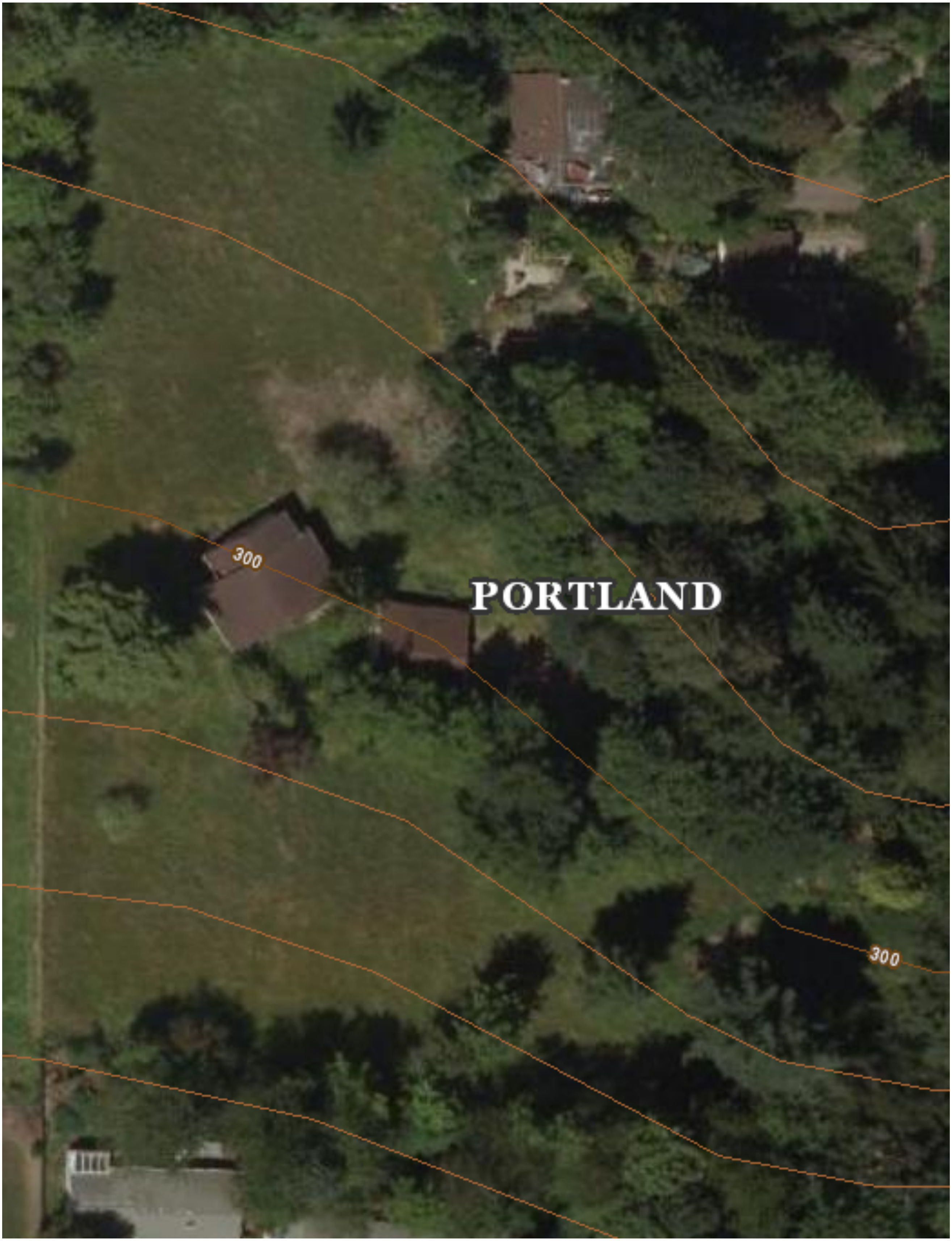
Site Specifics

Due to a lack of funds, I was unable to perform soil tests of the site. However, unofficial soil tests showed that most of the land was sandy-loam to loam for 6 inches to 2 feet depending on the area, with a good amount of clay when dug deeper.

The area as mentioned above is 2.55 acres. The site slopes north-northeast, with the house sitting directly on the 300' contour line. Contours on the map represent 10 ft of elevation difference between lines. The basemap of the property, the topo data used to create the contour lines, the topo data overlayed above the basemap, and the created contour lines used in the design are on the following pages.

Aerial view of property
as it looks today.

Topo data used to create contour lines in design.



Basemap with transparent topo overlay to demonstrate the accuracy of the created contour lines used during the design process.

Basemap with created contour lines.

Zones and Sectors

The zones were designed around existing vegetation and structures. Because there is a small chunk of native Portland, OR forest that is relatively untampered with, my friends chose to leave it as Zone V.

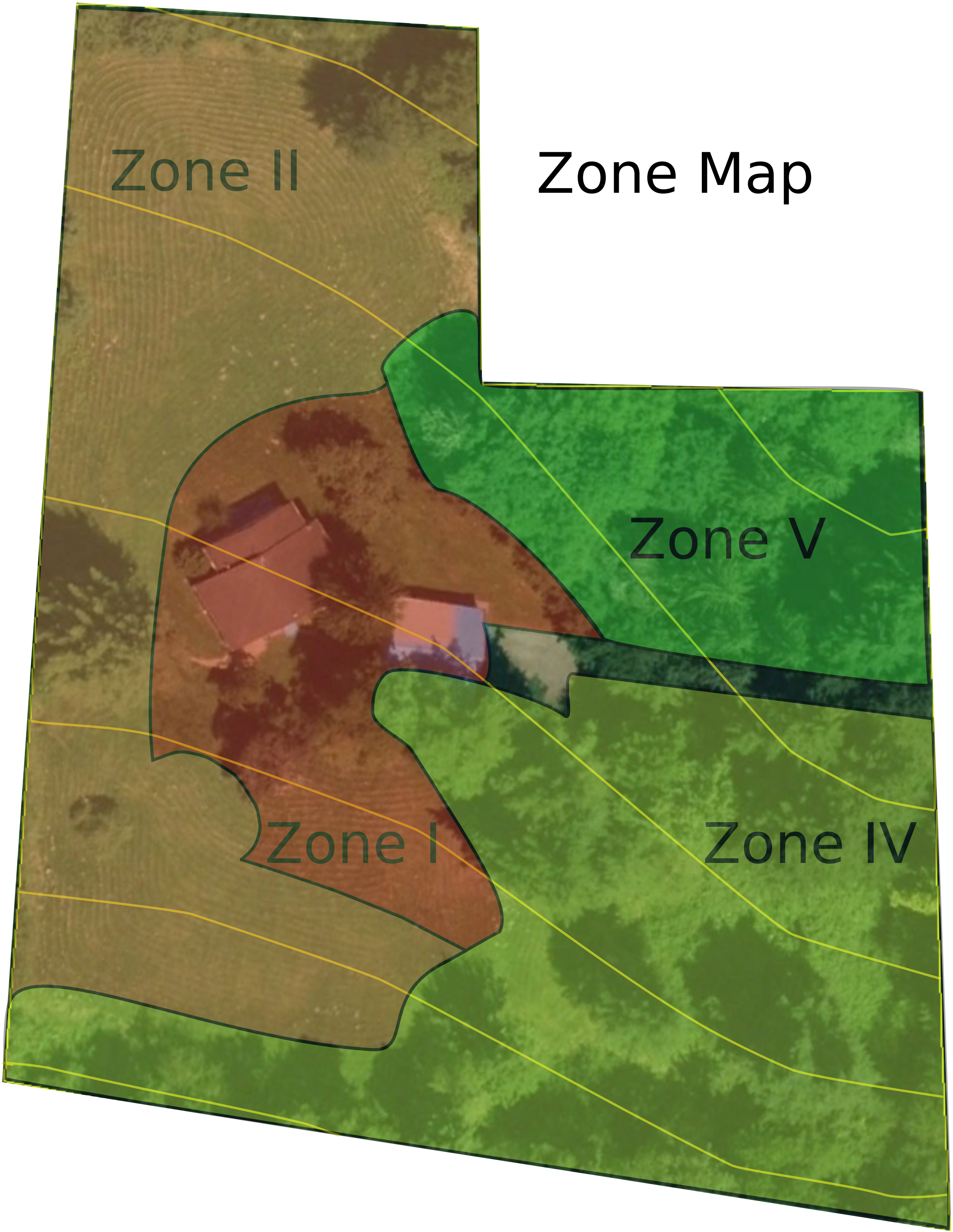
The vegetation along the southern and southwestern property boundaries is a mix of native trees, fruit trees, and grasses, with some Himalayan blackberry mixed in amongst the trees. We decided this would be a good place to design Zone IV and take advantage of some of the already existing red alders by coppicing them for firewood and planting the other trees for Zone IV around the coppiced stumps. Also, because many of the existing trees would be impacted by the implementation of the earthworks on the property, it didn't make sense to attempt to preserve any pockets of Zone V with such a sizable corner of it already in place.

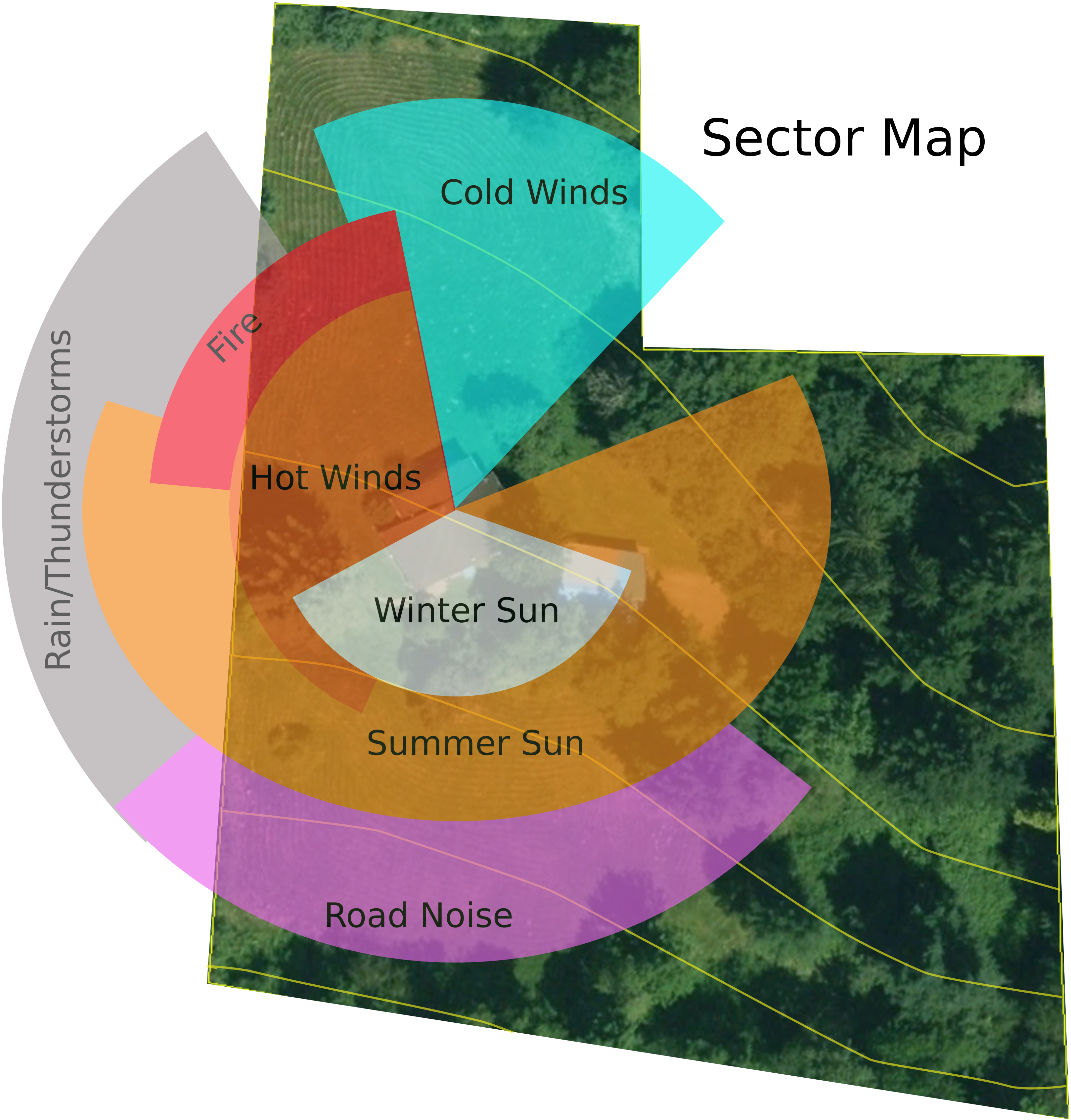
Zone I was designed around the existing house and shop/garage, as well as the area where the garden is, which made the most sense because of the location of the kitchen in the house (overlooking where the garden will be) and the back door that exits out to that area. (See the elements map for doors, garden, other Zone I elements, etc.)

Zone II was basically designed as what was left of the property after Zones I, IV, and V were designed. It was slightly expanded to include both the storage pond and the aquaponics pond, which were originally divided between Zones I and II. I thought the dam walls of the ponds made natural borders between zones, and slightly shrunk Zone I accordingly.

The following map shows the Zones designed into the property, and following that is the sector map:

Zone Map

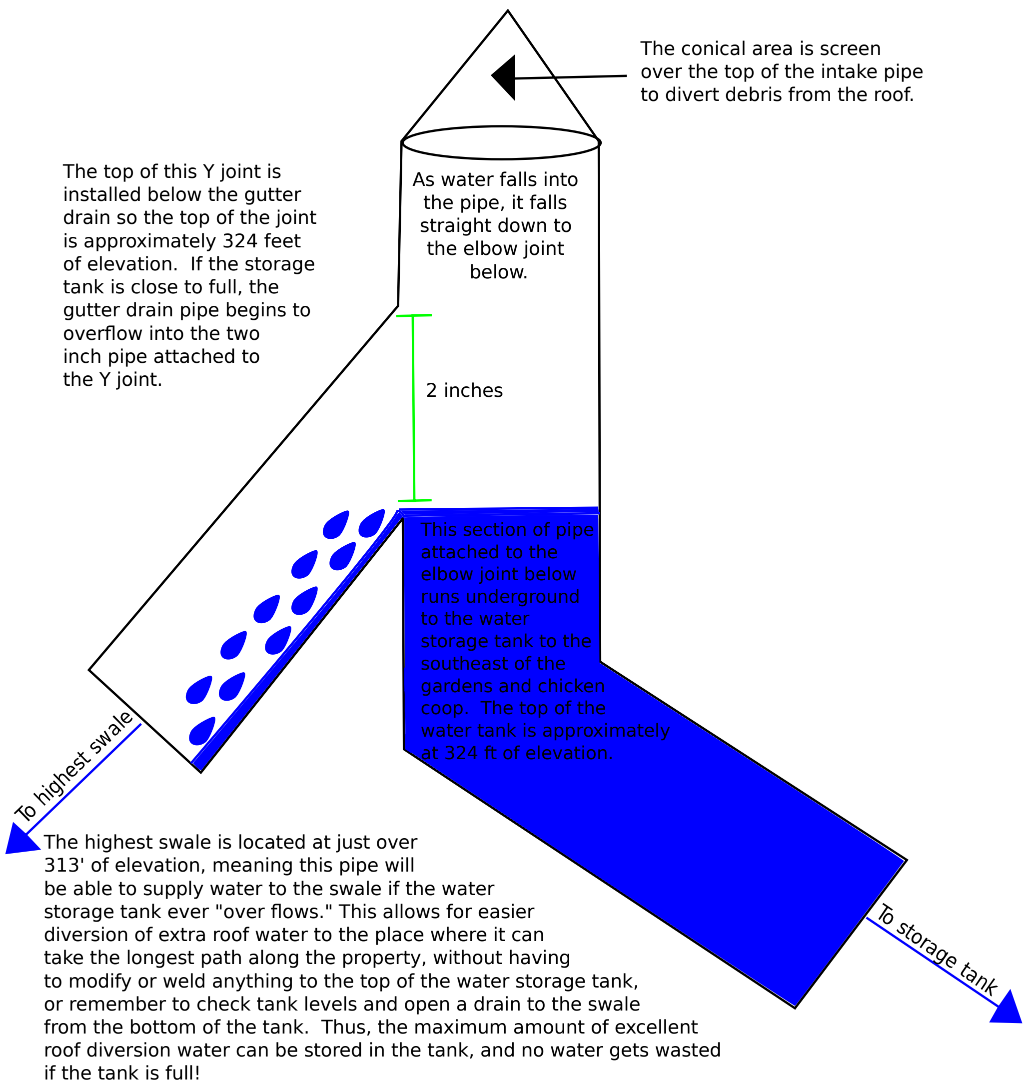



Sector Map
Cold Winds
Fire
Rain/Thunderstorms
Hot Winds
Winter Sun
Summer Sun
Road Noise

Earthworks

The earthworks for this property were designed from the top of the property down. The first swale, which includes a water storage pond near the western end, was lowered in elevation slightly from the "longest-highest" contour line on the property in order to add some length and catchment to the contour. This was done for the purpose of being able to include the storage pond on the highest swale of the property. Because the area above the highest swale may not be large enough to quickly fill the storage pond, an innovative design was imagined and added to the swale.

There is a water storage tank designed into Zone I of the property (see the elements map further along in this design) that is intended to irrigate the garden beds and provide water for the chickens, as well as watering the compost piles above the garden beds. As described in the explanations on the final map of this design, the water tank will be filled using runoff from the roof of the house. The bottom of the house sits at 300 feet of elevation and its gutter system will be about 25 feet off of the ground (it is a two story house). The bottom of the water tank will sit at about 315 feet of elevation, and the tank itself will be about 9 feet tall. This leaves about a foot of clearance for the gutter drain diagram shown below.



As mentioned in the diagram, the swale is just above 313 feet of elevation. The pipe coming off of the Y joint travels underground just like the pipe to the storage tank, and resurfaces to a few inches over the top of the swale on the backcut so water can immediately flow into the swale itself. The outlet will be located near the storage pond and the compost pile area, to minimize the amount of pipe that has to be laid underground. The top of the outlet pipe will also be screened to prevent debris from getting into and clogging the pipe, and will be surrounded with small river rocks in a decorative pattern to make it easily noticeable to prevent tripping over the pipe.

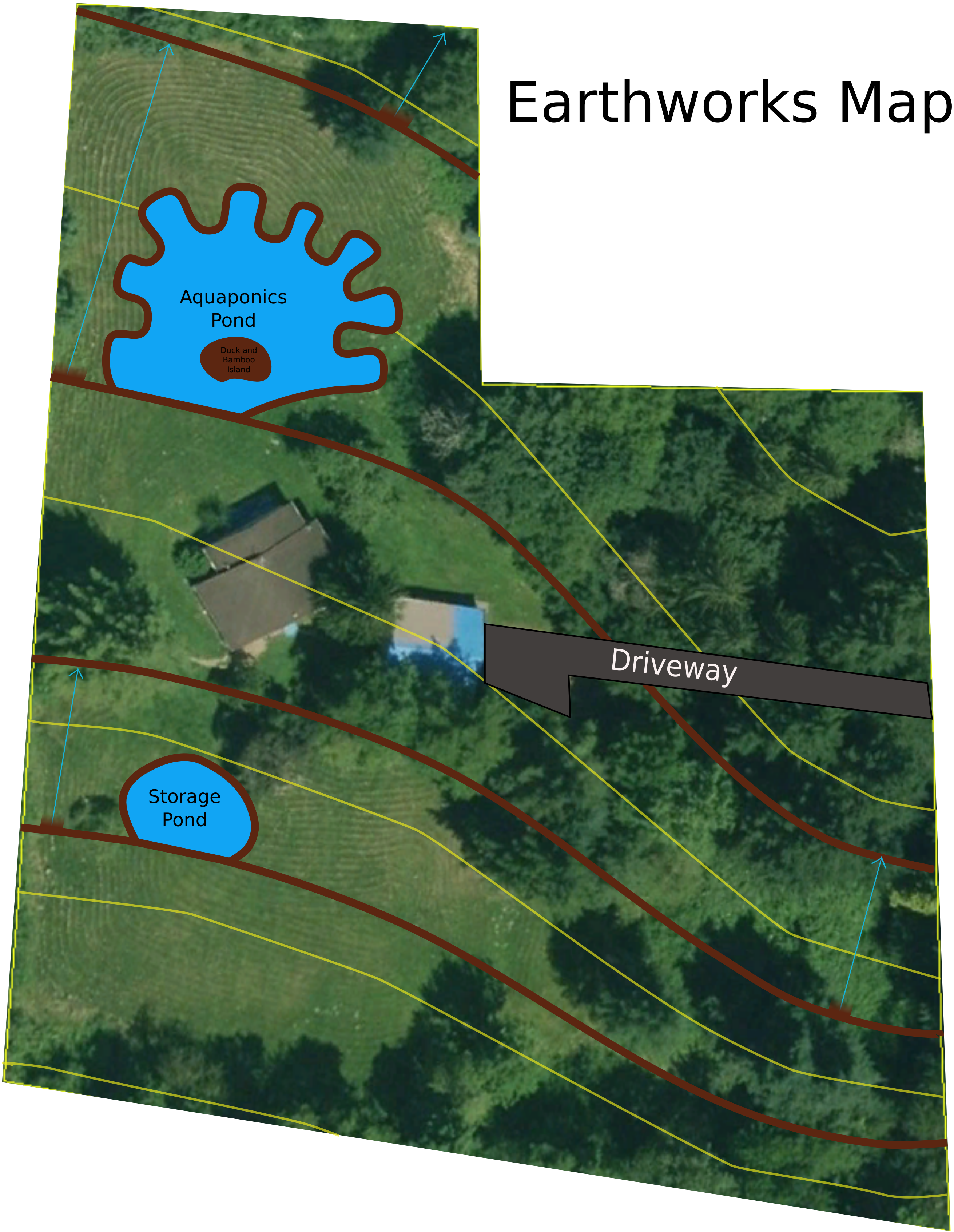
This swale (as diagrammed on the following page and mentioned above) is also attached to a storage pond. This pond will have a pipe extending out of the northernmost tip of its dam wall, which can be used to water the garden or provide water to the house in event of a drought. It can also be used to wet down the area surrounding the house and the house itself in the event of a fire. (A small electric pump will probably be needed, but is not drawn into the design diagram.) To the west of the storage pond is a level sill that allows drainage under the firebreak trees to the next swale down, thus keeping the firebreak area moist and watering said trees.

The next swale down spends most of its length in Zone IV, helping to saturate the ground in the Farm Forestry area. A small but properly sized level sill will be installed near the far eastern side of the property to assist with major rain events when the storage pond is releasing a lot of water quickly and the ground is already saturated from the rain. This swale overflows to the 3rd swale down, which is an interestingly connected swale.

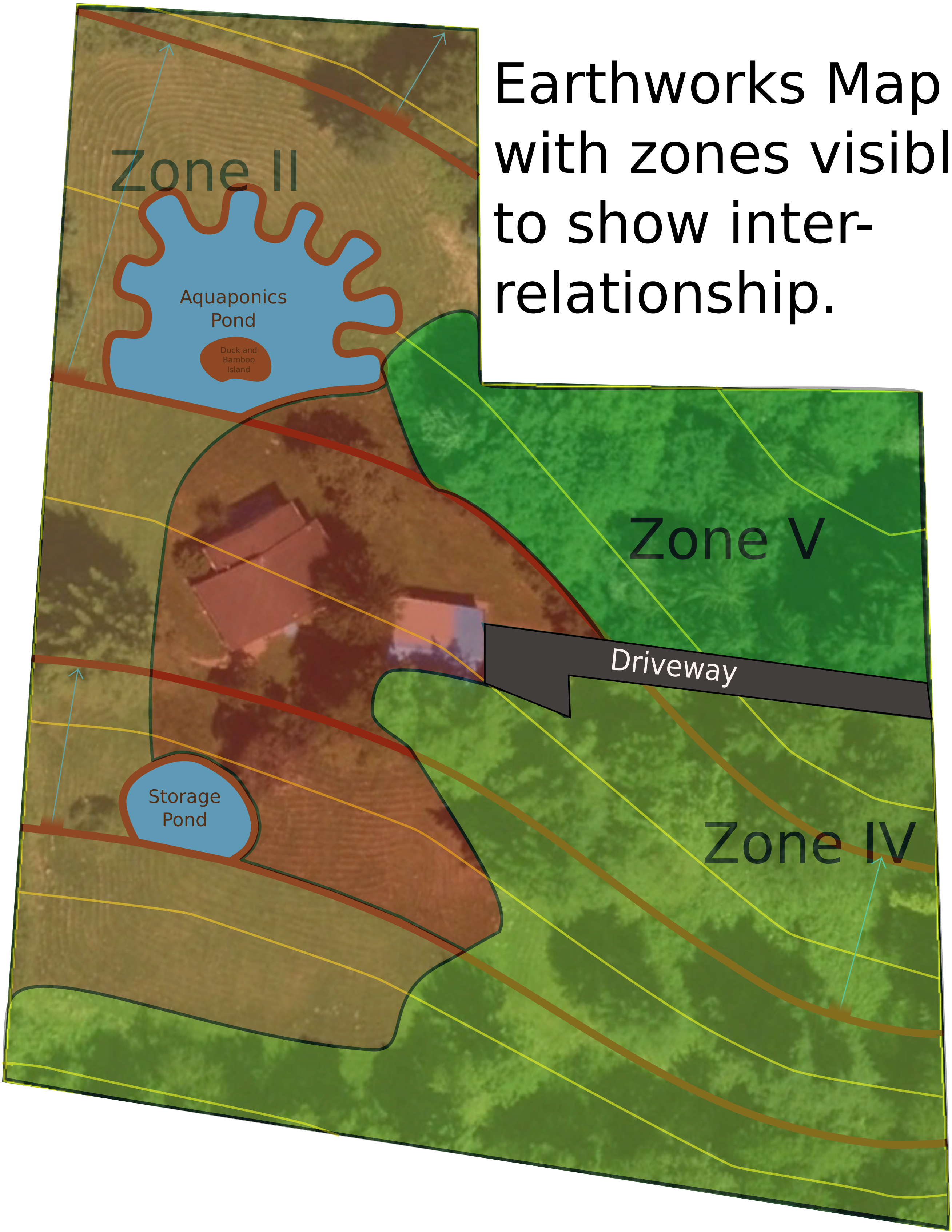
The 3rd swale down spends about half of its length in Zone IV before passing under the driveway and becoming the border between Zone I and Zone V. Right angle to the swale should help provide plenty of water downhill to the plants in Zone V, helping this natural area thrive. The swale then passes just uphill of an existing apple tree in Zone I (this section will likely have to be dug by hand to prevent too much root damage) providing it with plenty of water as well. The swale then continues westward to form the southern boundary of and supply water to the Aquaponics pond. The southeastern most stretch of the Aquaponics pond's dam wall forms the border there between Zone I and Zone II. At the far western side of this swale, there is the widest level sill on the property to account for the volume of water that would be in the earthworks system at this point in the event of a major rain event. This water flows down through the northwestern most portion of Zone II and helps water the Food Forest at the northern part of the property, while also helping to water 2 blueberries tucked into the swoops of the dam wall at 9 o'clock and 11 o'clock (pretending the pond itself is a clock face with 12 o'clock at the northern end of the pond). Small drain pipes coming out of the pond at the other swoops do the same for the blueberries planted from 12 o'clock to 3 o'clock on the Aquaponics pond (5 small pipes in all).

Finally, there is a small 4th swale tucked into the Food Forest in the very north-eastern part of Zone II. This swale has a small level sill that helps direct water into an existing drain pipe that leads runoff from this property and the properties east of it to a small creek that is just outside of the property boundaries to the north. At this point, water that has fallen onto the property has exited its boundaries.

Earthworks Map



Earthworks Map with zones visible to show inter-relationship.



Elements

Next we will discuss the elements designed into the property, starting with Zone I and working our way outwards.

Zone I

Zone I is of course largely dominated by house, shop/garage, garden beds, and chicken coop. The rain runoff from the roof of the house has already been documented, so it won't be discussed further in this section.

To the northeast of the house my friends requested to leave a small patch of lawn that already exists on the property. The don't have kids yet, but are planning to soon, and they would like to have a small lawn area for relaxation and recreation with lawn games. This also makes for level and easy travel to and from the house to the cars parked in the garage or the driveway parking area. To the north of the lawn and north-northeast of the house is an existing apple tree that produces abundantly and will provide a nice summer snack as well.

On the southwestern side of the house, where the back door is located, a smallish glasshouse will be attached to the house. The glasshouse will feature roll-down shutters that can be lowered during the summer to prevent it from getting too hot, and vents into the house that can be opened during the winter to help passively warm the house. The glasshouse will also have a door that opens up right to a large-sized herb spiral, making access to herbs from the kitchen very easy. (See diagram with explanation bubbles for an arrow showing where the kitchen and kitchen window are located in the house.) My friends having a good amount of gardening experience did not feel they needed my assistance designing which plants would go where on the herb spiral, and it would not easily have been included in the design due to the size of the plants, so I did not include which plants went where in the design. Needless to say, it will follow a pretty traditional pattern for an herb spiral in the pacific northwest.

Southeast from the herb spiral the garden can be reached by crossing the 2nd swale and walking under an existing plum tree. The garden beds will be 4 foot wide double reach garden beds on contour, totaling about 120 linear feet when added together, making for 480 square feet of gardening space. My friends believe that with their expertise with gardening a garden this size will be a large enough space to provide for them as their family grows. Again, because of their gardening experience and the limits of the scale of my diagram, I did not include what plants to plant where in this design.

Uphill from the highest garden bed will the chicken coop, a chicken compost yard, and the composting area. After my friends do their morning care of the gardens, they can toss garden scraps into the chicken compost yard, then let the chickens out so they can eat and scratch up scraps and leave rich manure filled pre-compost in the compost yard. This material can then be spread directly onto the garden, or shoveled over to the composting area for further processing.

Just downhill from the chicken coop will be a small tool shed that will house garden tools, a small assortment of tools needed for repairs on the chicken coop, irrigation parts for the water tank and the garden, and a shovel and pitchfork for compost management. There will also be a limited supply of woodcutting tools for working in Zone IV, though most of those tools will be housed in the shop/garage which also has easy access to Zone IV.

Zone II

Zone II is best described starting from the chicken coop. The coop will have another door that opens up to a small chicken pathway that has a gate close to the coop that opens to the first paddock attached to it. Chickens can be let out to “free-range” in this paddock, which will be a small managed pasture for the most part. The paddock will also have a hedge of shrubs along the southern and eastern borders that will provide plenty of rich fodder for the chickens during some parts of the year, and a mulberry tree to really boost their fodder (See diagram and plant species list for which shrubs will comprise the hedge). There are two small gates in the northwestern corner of this paddock, one leading to the composting area and water storage pond, and the other leading into the next paddock over.

The small chicken pathway works its way around the outside of the chicken paddock to the east and then the south, where there is another small gate that opens up to the second paddock. If my friends want to let the first paddock rest, they can open the second gate around the pathway and let them into the second paddock instead (and so on with the third and fourth paddocks further north along the small chicken pathway). This second paddock is also planted with hedge shrubs around its southern and western border, and it has a gate in the northwestern corner that opens up to the third paddock allowing easy travel between paddocks for my friends or their chickens.

The third chicken paddock is not bordered by shrubs, but has several firebreak deciduous fruit trees just beyond the pathway to the west, as well as an apple tree that already exists on the property. This paddock is the smallest and should be used for shorter amounts of time, allowing it to have a faster recovery time and letting the chickens come back sooner. This paddock also has gates, one nearby the herb spiral allowing easy access through to the chicken pathway and the firebreak trees beyond, and one that opens up to the fourth and final paddock.

The fourth and final paddock also doesn't have a hedge of shrubs, but could along the northern edge if my friends decided they wanted one. This paddock has the least extra forage for the chickens, but is slightly larger than the third paddock and so the chickens can stay in for a little longer. Finally, this paddock has a gate that opens out to the northernmost portion of Zone II where the Food Forest is located.

Along the western side of the third and fourth paddocks will be a line of firebreak trees planted to protect the house. Some of these are deciduous fruit trees that will supplement human and chicken feed, but a few are and will be broadleaf maple, a flagship tree of the pacific northwest. One broadleaf maple is already growing there, and my friend very much looks forward to sitting under it and reading.

The northern portion of Zone II does not have to be accessed by the chicken paddock, but can also be entered by skirting the dam wall and Zone V, or by traversing along the swale connected to the Aquaponics pond. The Aquaponics pond dominates this portion of Zone II, with the Food Forest getting not quite but nearly equal area. The Aquaponics pond, as mentioned in the explanation bubble on the very last diagram, will be planted with reeds, cattails, aquatic surface plants, etc. around its edges. Cranberries might also be attempted if a suitable structure for them can be designed into the earthworks for the dam wall. I could not represent these plants on the diagram without overly complicating it, but know that they will be included. (In future designs that I do for clients, I will figure out a way to adjust the scale of my diagram such that these types of small plants can be included, but by the time I got to including the elements in my design it was too late to adjust and start over again. I hope this does not preclude me from becoming certified.) The pond will also be stocked with bass, bluegill, and triploid rainbow trout. Crappies, freshwater shrimp, crayfish, and native slugs/snails are also under consideration by my friends depending on the regulations set forth by the Oregon

Department of Fish and Wildlife.

Finally in Zone II, the Food Forest. Represented on the diagram are the large- and medium-sized nut- and fruit-trees, as well as some shrub layer berries. Additionally, this area will be planted with hand-broadcast annual vegetables that will be allowed to fend for themselves, perennial vegetables like asparagus, russian red kale, horseradish, garlic, chives, onions, sunchokes, *oxalis tuberosa*, sorrel, ground cherries, strawberries, *physalis pruinosa*, leeks, turnips, sweet potatoes, rhubarb, wintergreen, twisted stalk (*streptopus amplexifolius*), Gambel oak, and dwarf chinkapin oak, and many others that my friends might come up with over time. Vines will include hops, grapes, native blackberry, superhardy kiwifruit (*actinidia kolomikta*), and maypop. This approximately ¼ acre food forest should produce *quite* a lot of food!

Zone III

Because the property is only 2.55 acres/1.03 hectares, and because my friends do not currently want any livestock other than chickens (and wild ducks if they decide to populate the ponds), I did not include a Zone III in this design.

Zone IV

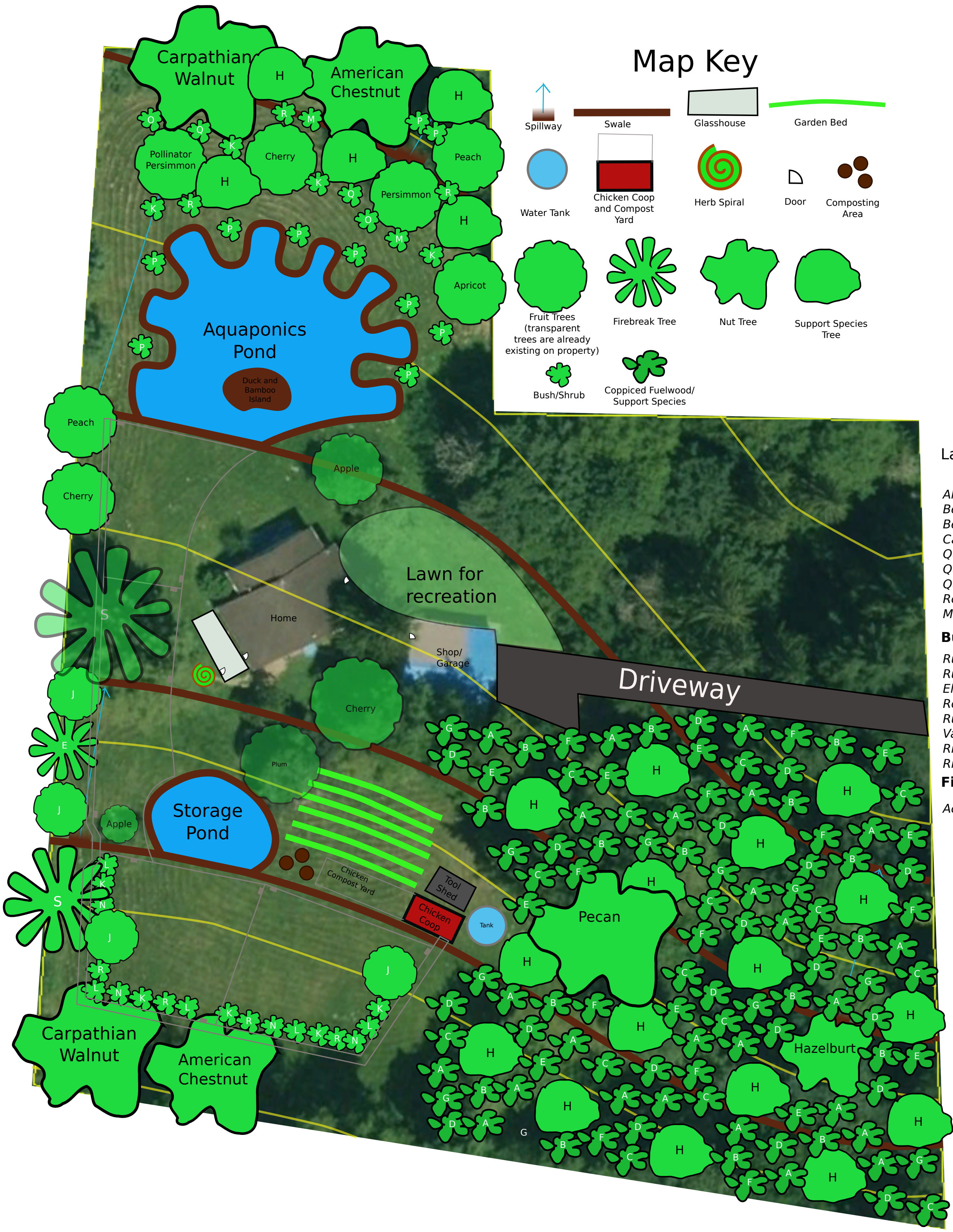
Zone IV will be somewhat extensive for this property, and also somewhat densely planted with trees that will be coppiced to allow for plenty of fuel wood and woodworking material. The major species I selected for this area are listed in the Plants Species Key on the following diagram. Shrubs and herbaceous plants may be scattered throughout as well, to provide more food for both my friends and their chickens. The shrub and herbaceous plants will largely be the same as those included in the Zone II Food Forest, but far more sparsely planted, and not as well looked after. Coppice and prunings from the smaller trees in this area can be dropped to create forest mulch for the soil, and some of it can be brought over to the composting area to bulk up garden compost if needed.

One unique feature of this Farm Forestry area is the density of oaks included. My friends want to allow for the possibility of having a few pigs in the future, and oak mast can provide a rich diet for those pigs. In the event they do get pigs, I recommend to them that they do not coppice a few selected oaks, so those can be allowed to mature and provide abundant mast production. The pecan and hazelburt should supplement both my friends and the pigs as well. The dominant support species included in the Farm Forestry Zone IV is Black Locust, not only for its nitrogen fixing properties, but also for the excellent timber it produces, and the edible flowers in the summertime. Some chickens have also been known to eat black locust seeds, though they are not edible for humans. The fast growing Red Alder is included quite frequently because of its excellent use as fuelwood. The yellow birch is included for its excellence in furniture and fuelwood, as well as distillation to charcoal. Paper birch is included as a fuelwood. Bitternut hickory is included as a fuelwood and a meat-smoking wood, as well as its usefulness for tool handles, dowels, ladders, stakes, posts, etc.

Zone V

Obviously, Zone V will mostly be left to itself. The only modification that will be done that will affect Zone V is the swale that forms part of its border, but this should help to bolster its resilience. Hard surface runoff from the driveway also helps water Zone V, and I have alerted my friends to be cautious about their cars developing leaks so as to prevent contaminating this zone. If need be, the swale should provide enough ground saturation, and the hard surface runoff from the driveway can be diverted elsewhere, but my friends don't think this will be a problem as they maintain their cars very well.

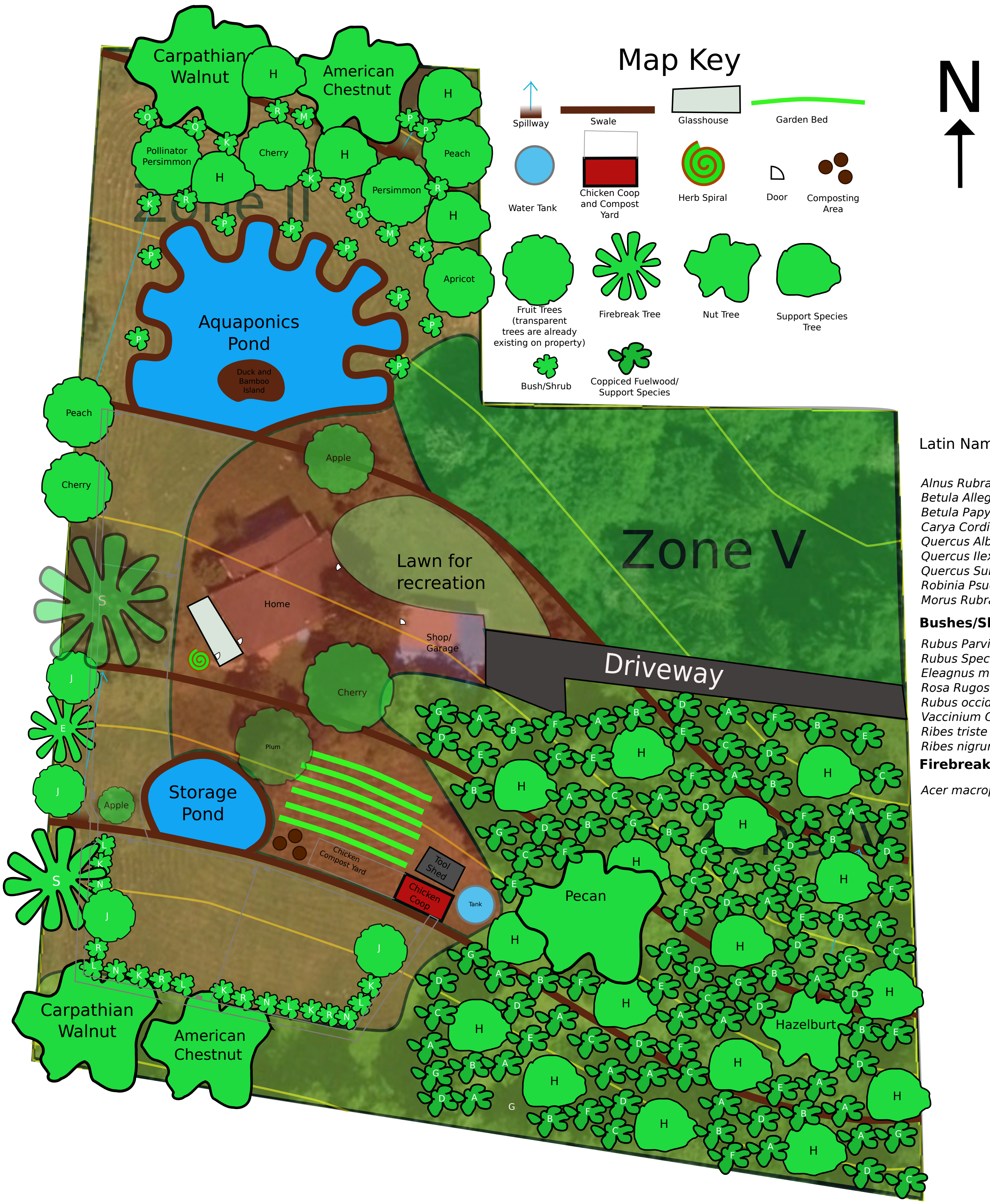
Map with only elements and earthworks showing, for better contrast of the elements over the basemap as it is now.



Plants Species Key

Latin Name ---	Common Name ---	Letter Code
Alnus Rubra	Red Alder	A
Betula Alleghaniensis	Yellow Birch	B
Betula Papyrifera	Paper Birch	C
Carya Cordiformis	Bitternut Hickory	D
Quercus Alba	White Oak	E
Quercus Ilex	Holm Oak	F
Quercus Suber	Cork Oak	G
Robinia Psuedoacacia	Black Locust	H
Morus Rubra	Red Mulberry	J
Bushes/Shrubs		
Rubus Parviflorus	Thimbleberry	K
Rubus Spectabilis	Salmonberry	L
Eleagnus multiflora	Goumi	M
Rosa Rugosa	Rugosa Rose	N
Rubus occidentalis	Black Raspberry	O
Vaccinium Corymbosum	Highbush Blueberry	P
Ribes triste	American Red Currant	Q
Ribes nigrum	Black Currant	R
Firebreak/Other		
Acer macrophyllum	Bigleaf Maple	S

Map of Elements overlayed above the zone map, to demonstrate inter-relationship therof.



Plants Species Key

Latin Name ---	Common Name ---	Letter Code
Alnus Rubra	Red Alder	A
Betula Alleghaniensis	Yellow Birch	B
Betula Papyrifera	Paper Birch	C
Carya Cordiformis	Bitternut Hickory	D
Quercus Alba	White Oak	E
Quercus Ilex	Holm Oak	F
Quercus Suber	Cork Oak	G
Robinia Psuedoacacia	Black Locust	H
Morus Rubra	Red Mulberry	J
Bushes/Shrubs		
Rubus Parviflorus	Thimbleberry	K
Rubus Spectabilis	Salmonberry	L
Eleagnus multiflora	Goumi	M
Rosa Rugosa	Rugosa Rose	N
Rubus occidentalis	Black Raspberry	O
Vaccinium Corymbosum	Highbush Blueberry	P
Ribes triste	American Red Currant	Q
Ribes nigrum	Black Currant	R
Firebreak/Other		
Acer macrophyllum	Bigleaf Maple	S

Map of Elements overlayed above the zone map, with explanations calling out certain elements.