



Hügelkultur Garden Demonstration Project



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King Conservation District

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Event: KCD volunteer work party to install a 17' x 7' Hügel bed

Date: September 8th, 2016

Location: City Soil urban farm, King County WTD South Treatment Facility, Renton, WA

Hügelkultur: 'Hügel' mound + 'kultur' cultivation; Hügelkultur is the practice of mounding soil over materials which assist the soil in regenerating itself through increased water retention, the slow release of nutrients, habitat creation and complexity. The process in general involves building a mound of woody material (typically rotting wood of varying diameters) and covering with layers of organic material (often referred to as 'green manure'), compost, and top soil. While this practice has grown in popularity over recent years, it has been used in various forms by European cultures dating back many centuries. Today Hügelkultur is being used in drier regions to retain water for growing crops and also in challenging urban sites to regenerate soil and provide nutritious garden space for both perennial and annual food crops.

City Soil urban farm is a one-acre patch of land owned by King County Wastewater Treatment Division's South Plant treatment facility in Renton, Washington. The farm serves as a community-giving garden which demonstrates the use of recycled water on urban agriculture projects and provides community education opportunities to expand knowledge of soil, food, and agriculture. Recycled water is former wastewater that is treated to remove solids and impurities and is used in sustainable landscaping irrigation. In the spirit of the goals for the farm, King Conservation District, along with partners from King County, Seattle Tilth, and DIRT Corps, set out to demonstrate the Hügelkultur gardening technique as a demonstration project. The project is designed to showcase soil regeneration and efficient use of water through increased water retention and use of recycled water.

Late in the summer of 2016, a volunteer work party of 13 hard-working volunteers set out to install a 5-foot-tall Hügelkultur garden bed. The specific goals for installing such a feature were to:

- Learn Hügelkultur using a hands-on approach by building a mound using raw materials.
- Establish conditions to regenerate poor urban soil into productive soil rich in nutrients and organic material.
- Educate community members about how to build a Hügelkultur mound, the science of soil regeneration and nutrient cycles, and the associated benefits.
- Observe the dynamic features of the mound as time progresses, specifically noting changes in mound structure, soil quality, ability to retain water, and establishment of plants.

A recap of the project is presented below.

1. Preparation

The mound was to be built in a 20 feet by 6 feet area (length-wise aligned roughly north-south) within the northwestern quadrant of the farm. The aspect is a 5 to 10 % gentle slope to the east that ends in a rain garden. The area was not being used for much food production. The soil present was primarily clay with some patches of sandier soils. Drainage was poor with extremely slow water percolation. The hardpan was high and varied in depth from several inches to one foot. Plants originally present included several species of lavender, a rosemary plant, a celeriac plant, and a lemon balm plant. Surrounding these plants was a thick layer of grasses and weeds. The plants were transplanted to another area of the farm except for the celeriac plant which was left in place since it was not in the planned area for the mound. The grasses were stripped from the surface and staged nearby for use in creating the mound. The weeds were composted elsewhere on site. Before the project installation day, the soil was soaked with recycled water to make digging easier.

2. Materials

The following materials were staged for use in building the mound:

- Approximately one cord of wood of mixed deciduous species to include apple, pear, cherry, and maple. Wood logs varied in length from mostly one to two feet (a few longer logs) and average diameters from 2 to 6 inches (a few wider logs). This wood was donated by a resident of Kent.
- Gro-Co compost (King County WTD)
- Top soil (King County WTD)
- Organic material – twigs and clippings from the farm, including leaves and the grasses removed from the mound area.
- Organic compost material (straw, one standard bale) donated as excess by a landscaping project in West Seattle.
- Burlap coffee bean sacks

3. Building Process

a. Remove Himalayan blackberry (several days before event)



BEFORE



AFTER

Blackberry was removed by using loppers to clip brambles near the ground leaving behind about a foot of each cane remaining. The root balls were dug up using shovels. About 400 square feet of blackberry was removed.

b. Dig the trench



Wood staged nearby



Mound site before digging (transplants on right)



Digging the trench (celeriac stayed)



Trench dug

The final dimensions of the mound area after digging the trench was about 17 feet by 7 feet. We dug down at varying depths between 1 to 1 ½ feet below the surface. It took approximately 2 hours with 7 people.

c. Build the wood base



Laying down logs (largest first, then smaller)



Stacking process (includes twigs & leaves)



Fill gaps with smaller material (leaves, twigs, and dug-up soil)

d. Add the organic material layer



Sticks and leaves from around the farm



Adding straw provides for more organic material

e. Finish structure with layer of compost (Gro-Co) and top soil



About 6 inches to a foot of each, compost and top soil, were layered on top of the green layer (leaves, twigs, and straw). It was important to keep the sides of the mound as steep as possible. The woody material provides the main structure, so it is equally important to build to both sound structure and height.

f. Cover with burlap sacks and let the structure settle



g. After a few weeks of gravity and weather, install some plants and mulch



The planting plan is attached as a separate appendix at the end of this report. Some huckleberry bushes are planted on the top with some large-leafed lupine and red columbine plants on the far side as pictured. Great Camas and Harvest Brodiaea bulbs along with seeds for two species of Sisyrinchium are sown on the near side as picture (long slope facing east). The narrow end slope on the left as pictured (facing south) is sewn with Nodding Onion seeds.

4. Finished Product

- With 13 volunteers the entire mound was built and covered within 6 hours.
- Final dimensions were 17 feet by 7 feet and 5 feet in total depth (3 to 4 feet above ground level).
- The mound was covered with burlap sacks to protect the bare soil from exposure to the elements.
- Allow several weeks for gravity and rain to settle the structure. Continue to protect bare soil with burlap or mulch.
- For our project we covered the mound with burlap sacks for several weeks before removing them to plant. Immediately after planting, mulch was applied to cover the entire mound and minimize erosion from wind and rain.

5. Lessons Learned

- Overestimate the amount of materials needed by about 10 to 20% volume. We ran short on wood and needed to scout the farm for extra wood. We found enough wood, but took extra time to gather more. We could have also used more straw.
- It is very important to fill in gaps in the wood as much as possible with materials on-hand, otherwise the outer layers will sink into the wood based and cause difficulty when trying to establish the planting medium.
- If available, plan for using enough compost and topsoil to cover a layer of at least 2 feet. The structure will settle and this width will provide ample space for future planting. We had to add more soil to the top of the mound after it settled and before planting.

6. Recommendations

- Stage materials and do as much site preparation as possible prior to the date of building the mound.
- A trench was dug in order to be able to make the total height of the mound longer than the actual height above ground, which lowers the harvesting level for the top of the mound. This makes it easier to harvest without disturbing the structure. The mound can be built directly from ground surface without digging a trench if desired.
- Don't expend too much extra effort trying to dig deeper when the hardpan is reached. Soils in urban areas often have hard clay layers only a few inches below the ground. It's not worth the effort to dig deeper.
- The base of the mound, below the wood layer, should be capable of retaining water. If the layer is primarily clay, then that should suffice without adding any base materials. However, considering adding a clay soil to keep water near the wood above.
- A mound can be built into a slope as we did to help with infiltration of water as it flows off site, allowing for greater concentration of soil nutrients. As water flows down the slope, it slows within the mound, depositing minerals and nutrients that can be soaked up with the water into the decaying wood and organic matter. These minerals and nutrients can then be taken up through the roots of plants on top of the mound. However, building a mound on flat soil is just as beneficial for regenerating soil and providing a nutritious planting space. Extra benefits of collection of nutrients and water infiltration come with designing a mound on a slope or above and near a swale.
- Stack wood length-wise across the mound and also diagonally and width-wise to create an interwoven and stable structure. The bottom should cover the most surface area.
- Place largest diameter logs on the bottom with smaller diameter logs and twigs placed on higher layers. Use soil that was dug up to make the trench to fill in gaps that are created when stacking the wood. If soil is not available, plug gaps with any organic material available (twigs, leaves, sod, or grass clippings are good examples).
- Keep the soil dug up from the trench close-by to fill in gaps in the wooded structure.
- Keep grass clippings and dug-up sod close-by to use on top of the wood layer.
- Compost weeds somewhere else and do not use on the mound. Be careful that any weeds with seed heads do not scatter seeds onto the mound at any point; otherwise weed seeds may sprout later on the mound.
- Water the mound to the point of soaking and saturation throughout the entire process until ready to add the cover. This will get the decomposition process started.
- When complete, cover the mound with mulch or burlap sacks to prevent rain from aggressively eroding the top layer of soil, especially if the mound has steep slopes on the sides.
- If the main goal is soil regeneration, consider planting only perennial plants on the mound to minimize disruption of the soil structure. Avoid using root crops. The best crops produce fruits or vegetables above ground so the harvester does not have to disturb the soil. If food production is the main goal, then consider the most productive crop varieties given conditions throughout the mound, which may include a variety of annual crops.
- The highest concentration of nutrients will be at the base of the mound on the downslope side. Consider the area just off the mound as a great place to plant annual crops that are demanding of a lot of nutrients.
- Have plenty of wheel barrows, metal rakes, and shovels on hand!

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Resources

For more information on Hügélkultur, please visit these websites:

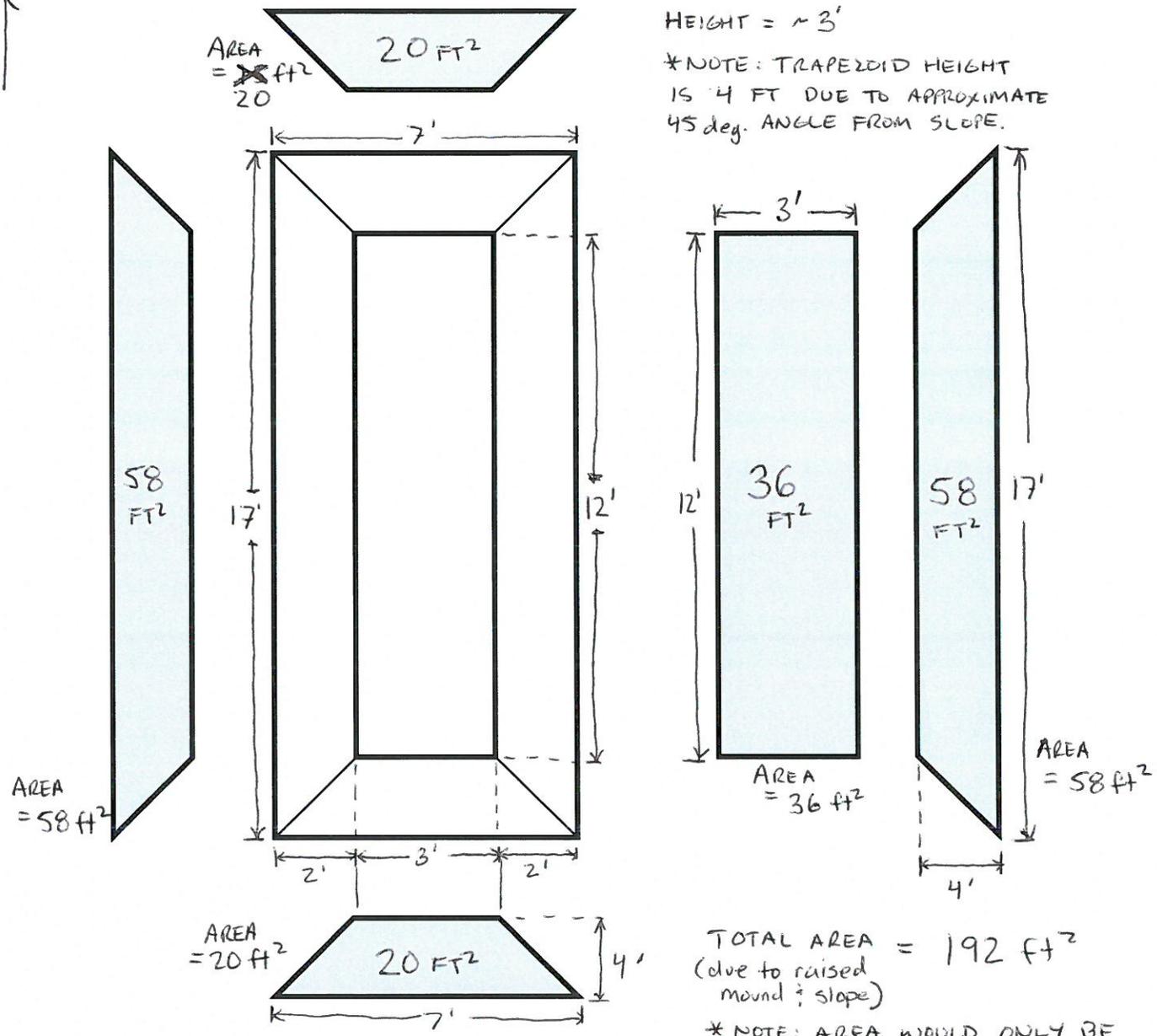
<https://www.niftyhomestead.com/blog/hugelkultur/>

<http://richsoil.com/hugelkultur/>

<https://www.permaculture.co.uk/articles/many-benefits-hugelkultur>

https://www.youtube.com/watch?v=mibKS_Bdolg

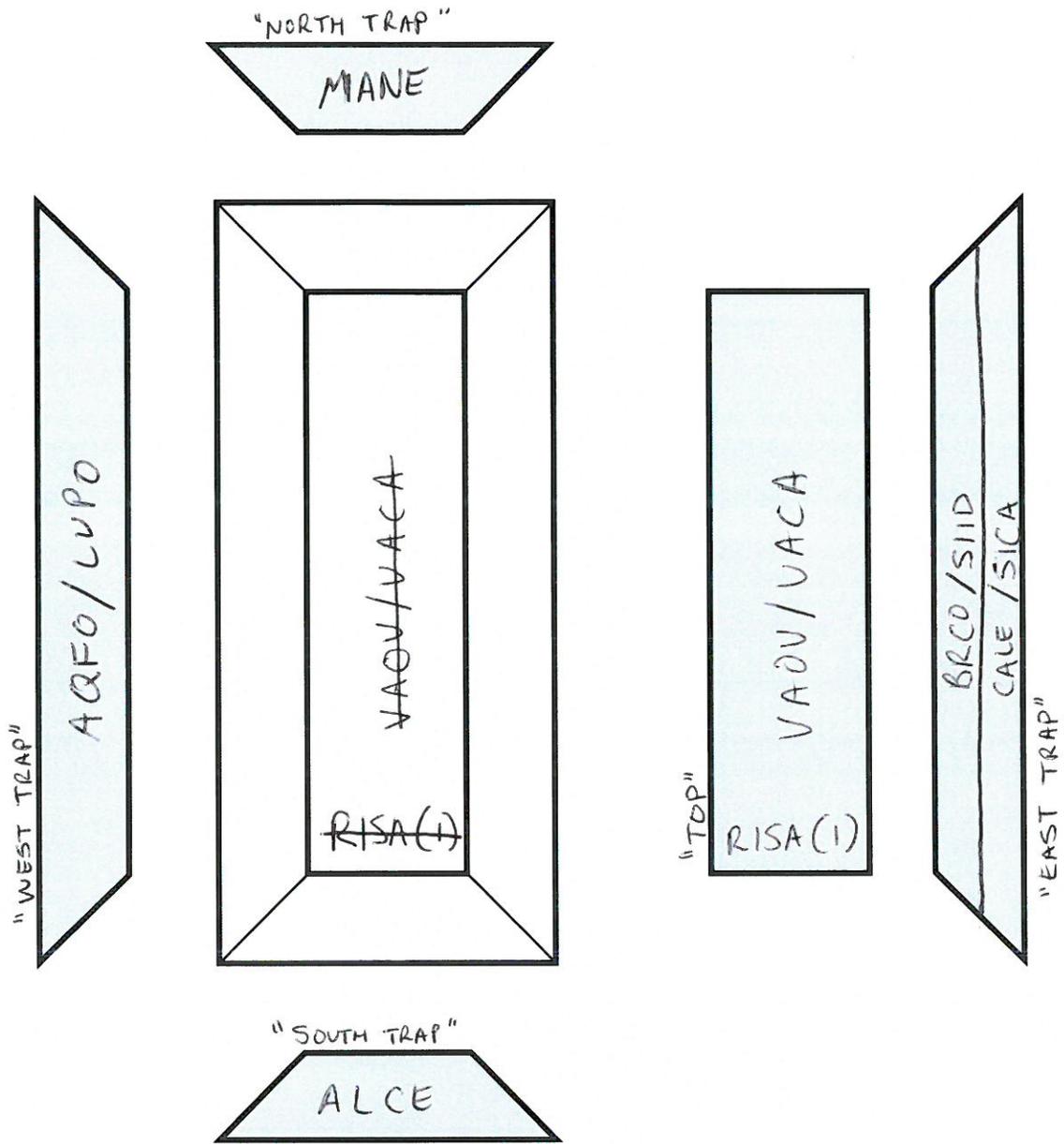
<https://www.youtube.com/watch?v=LpZsErPloel>



TOTAL AREA = 192 ft²
(due to raised mound & slope)

*NOTE: AREA WOULD ONLY BE 119 ft² IF ON FLAT GROUND. 72 EXTRA FT² SINCE RAISED MOUND!

City Soil - Hügelkultur Mound "Dimensional Layout"



City Soil - Hügelkultur Mound
"Plant Layout"

Scientific Name	Common Name	Abbreviation	Sun Conditions	Soil Preferences	Moisture Preferences	Height	Planting Width	Use	Source
Allium cernuum	Nodding Onion	ALCE	Full Sun/Light Shade	Neutral/Slightly Acid	Sandy, well-drained	4 - 20 inches	6 - 12 inches	Pollinator attractant	Seed
Brodiaea coronaria	Harvest Brodiaea	BRCO	Full Sun/Light Shade	Unknown	Dry	12 inches	6 inches	Edible	Bulb
Camassia leichtlinii	Great Camas	CALE	Full Sun/Light Shade	Acidic	Moist (dry tolerant)	3 - 4 feet	6 inches		Bulb
Sisyrinchium californicum	Golden-eyed Grass	SICA	Full Sun/Light Shade	Neutral	Moist (dry tolerant)	16 inches	6 inches	Pollinator attractant	Seed
Sisyrinchium idahoense	Blue-eyed Grass	SIID	Full Sun/Light Shade	Neutral	Moist (dry tolerant)	16 inches	6 inches	Pollinator attractant	Seed
Mahonia nervosa	Low Oregon Grape	MANE	Sun/Shade tolerant	Acidic to slightly alkaline	Moderately dry	24 inches	12 to 24 inches	Edible	Potted
Lupinus polyphyllus	Large Leaf Lupine	LUPO	Sun/Partial Shade	Neutral/Acidic	Dry or Moist	4 feet	15 to 18 inches	Dynamic Accumulator	Potted
Aquilegia formosa	Red Columbine	AQFO	Shade tolerant	Neutral/Acidic	Dry or Moist	24 inches	10 to 18 inches	Medicinal/Infusions	Potted
Ribes sanguineum	Flowering Red Currant	RISA	Full Sun/Part Shade	Acidic	Moist (dry tolerant)	6 - 10 feet	2 - 4 feet	Edible	Potted
Vaccinium caespitosum	Dwarf Bilberry	VACA	Full Sun/Part Shade	Acidic	Moist (dry tolerant)	2 feet	1 - 2 feet	Edible	Potted
Vaccinium ovalifolium	Oval Leaf Blueberry	VAOV	Full Sun/Part Shade	Acidic	Moist (dry tolerant)	6 - 10 feet	2 - 4 feet	Edible	Potted