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Some characteristics of the Cooperative Extension system are:

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- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
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- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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EXTENSION

Sustainable Landscapes: Creating a Hügelkultur for Gardening with Stormwater Management Benefits

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What is a Hügelkultur?

"Hügelkultur" (pronounced hyoo-gul-kulture) is a German word that means mound culture or hill culture. A hügelkultur is a sloped and raised planting bed filled with topsoil, wood and organic materials. German and European people have practiced it as a gardening method for hundreds of years. Figure 1 shows what a typical hügelkultur in the field looks like. A well-built hügelkultur is a self-watered, self-composting raised garden with few irrigation and fertilization needs. This

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garden bed is perfectly designed to capture rainwater runoff for sustainable stormwater management and can serve as a windbreak.

This fact sheet describes the benefits and construction of a hügelkultur. A hügelkultur case study built by landscape architecture faculty and students of the Sustainable Construction class demonstrates how to find the best spot for a hügelkultur on a property and what steps it takes to create one.

Benefits of Hügelkultur

1. **Hügelkultur conserves water.** It works as a self-irrigated garden and needs little supplemental water if constructed correctly in a location where it can capture surface runoff.

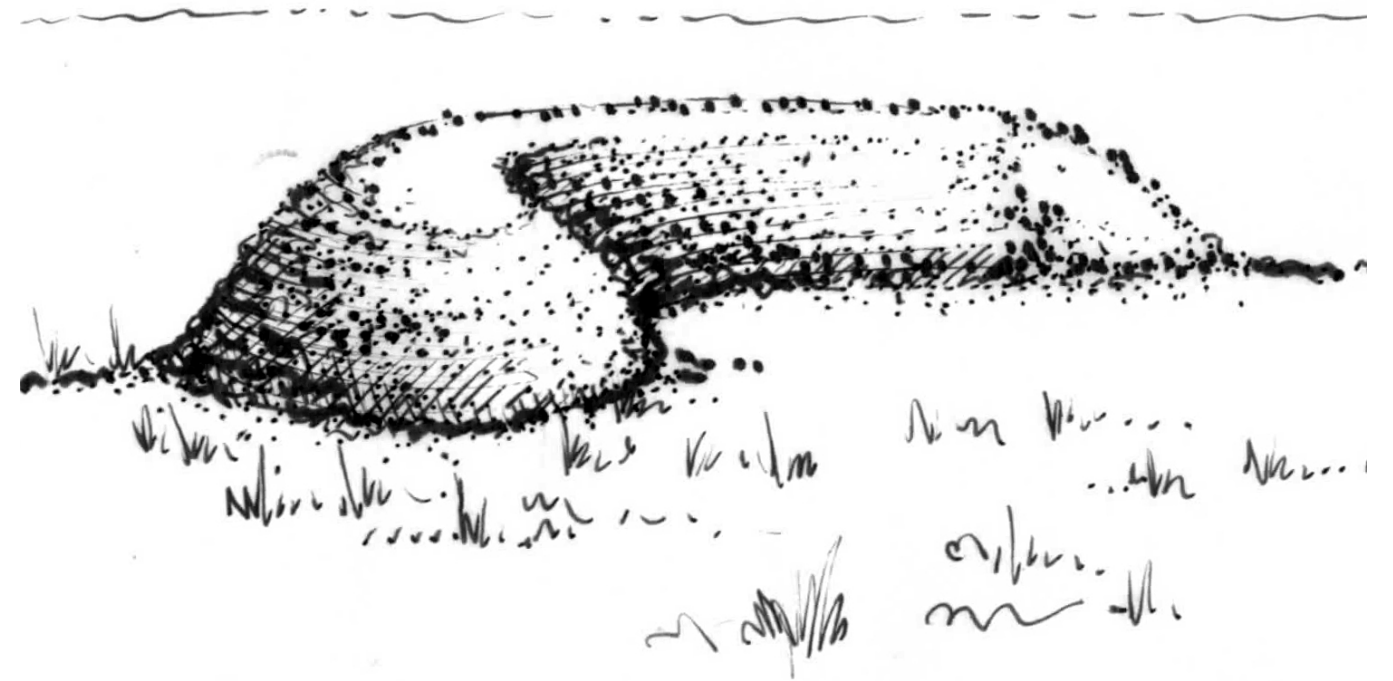


Figure 1. A typical hügelkultur.

As the surrounding surface water runs into the mound, the organic material in the hügelkultur acts as a sponge to absorb the water and wick it up to the roots of the plants.

2. **Hügelkulture is low maintenance.** It requires minimal maintenance due to the drought-resistant nature. As with any garden, it will still need weeding.
3. **Hügelkultur is a sustainable stormwater management practice.** It works as a “raised rain garden” with the mound providing a water retention function. Thus, it is a sustainable stormwater management practice as the mound slows down the water runoff and allows a place for water to infiltrate back into the ground.
4. **Hügelkultur produces food.** Growing crops in the beds is a highly regarded self-sufficient farming practice. Wider use of hügelkultur in gardening and agriculture can be an efficient way to increase crop yields and reduce hunger.
5. **Hügelkultur improves the soil.** The organic matters in soil conduct a dynamic self-composting process over time inside the mound. It also is a tool for carbon sequestration and makes use of landscape debris that might otherwise be burned or sent to a landfill.
6. **Hügelkultur is permaculture.** It is a productive practice for gardeners, farmers, children and homeowners.
7. **Hügelkultur is easy and affordable.** It is in general inexpensive and easily adaptable to different environmental/site situations and materials.

Designing a Hügelkultur

A hügelkultur should be designed with the location in mind, therefore the final garden can take many forms to fit the site. A simple hügelkultur will resemble a long, straight mound, as was built by the Sustainable Construction class demonstrated and shown later in this fact sheet. A hügelkultur also can have many other design characteristics. The mound system can have a curved shape or be grouped together to create a destination in a garden for people to enjoy. Figure 2 shows examples of different hügelkultur forms.

Types of Hügelkultur

Anatomy of a Typical Hugelkultur

A typical hügelkultur has multiple layers of materials: large logs, branches, small twigs, grass clippings, manure and topsoil. Figure 3 shows the anatomy of a typical mound.

Sizes and Slopes

A hügelkultur can be built at any scale. The length and height of the garden should be based on the site and available materials. The sides of a hügelkultur can be steeper or more gently sloped, depending on the needs. Keep in mind that the steeper the sides are, the more difficult it may be to plant seeds without them washing away.

may need additional nitrogen fertilizer, as this nutrient can sometimes be inadequate for strong plant growth during the decomposition process. To fix nitrogen to the soil without adding fertilizer, plant legumes for the first couple of seasons. Legumes like peas can be a harvested crop or used as a cover crop.

Vegetables planted in this hügelkultur example included pumpkin, multiple squash varieties, asparagus, horseradish and tomato.

Pay attention to these things when planting on a hügelkultur:

- Just as with composting, the best practice is to build the mound in fall for spring planting as it will benefit from curing time before planting.
- Hügelkultur beds also can be planted immediately. The example was planted right after the bed was raised.
- Both seedings or transplants will work, depending on what plants are used.
- Water the plants at their establishment stage with a simple hose. As the materials continue to decompose, the water retention in the hügelkultur will improve and plants will require less watering.
- Plant selection should still be based on amount of sun exposure the hügelkultur receives. Most vegetables require six to eight hours of sunlight. Therefore, if you have a hügelkultur in the shade, it may not be an appropriate location for vegetables.
- A special note should be made that hügelkultur is a dynamic process where the wood and organic materials are biodegrading and sinking over time. In terms of maintenance, compost will need to be added before each planting season.

An example plant list:

Cover Crops	Vegetables/Fruits	Ornamentals
Clover*	Tomatoes	Viburnum
Winterpeas*	Peppers	Salvia
Vetch*	Squash	Amsonia
Wheatgrass*	Melons	Agastache
Buckwheat	Blackberry	Helleborus
Cowpeas	Okra	Ornamental grasses

*Cool season crops.

Additional plant information sources

Oklahoma Proven at www.oklahomaproven.org
 HLA 6436, Cover Crops – Healthy Garden Soils at <https://extension.okstate.edu/fact-sheets/healthy-garden-soils.html>
 HLA 6439, Shrubs – Selecting Shrubs for the Landscape at <https://extension.okstate.edu/fact-sheets/selecting-shrubs-for-the-landscape.html>

Summary

Overall, a hügelkultur is a simple and practical method for gardening and urban farming. Yet it brings environmental, social, educational and economical benefits together. It is a true sustainable practice that should be widely advocated and practiced.

Additional resources

Videos:

Making a Hugelkultur <https://youtu.be/VD4n5cv28kQ>
 Hugelkultur Cover Crops <https://youtu.be/79xUvhl-H44>
 Mound Garden Update <https://youtu.be/t62Lz6GO3Bo>
 A Hugelkultur Built in Oklahoma <https://youtu.be/7vj7e2khn7k>

Figures were drawn by Carmen Wright, Landscape Architecture student at Oklahoma State University.

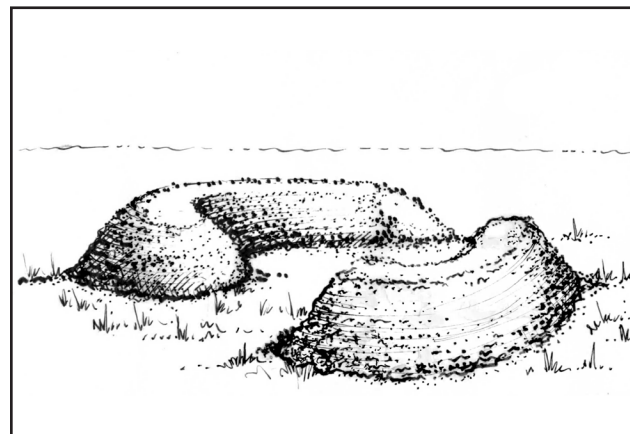
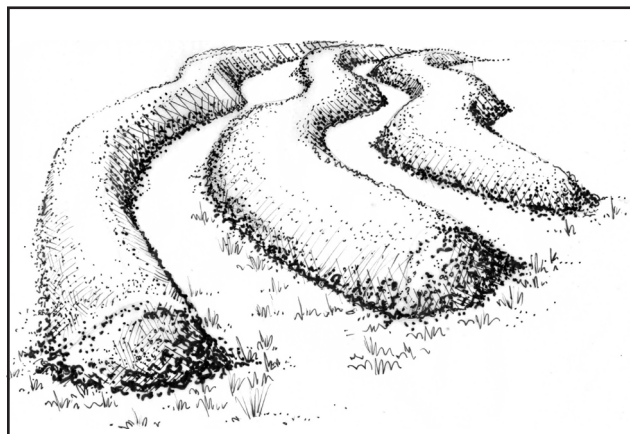
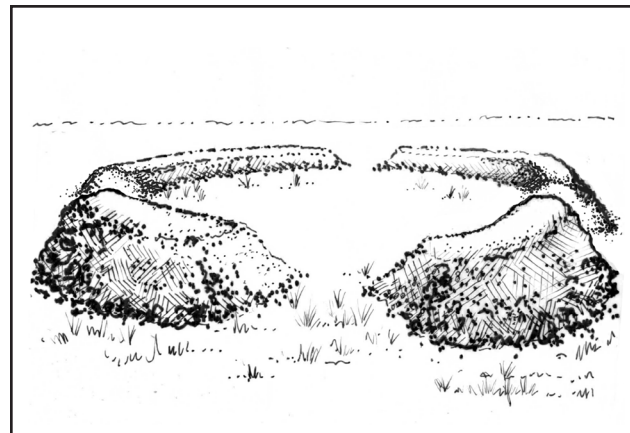
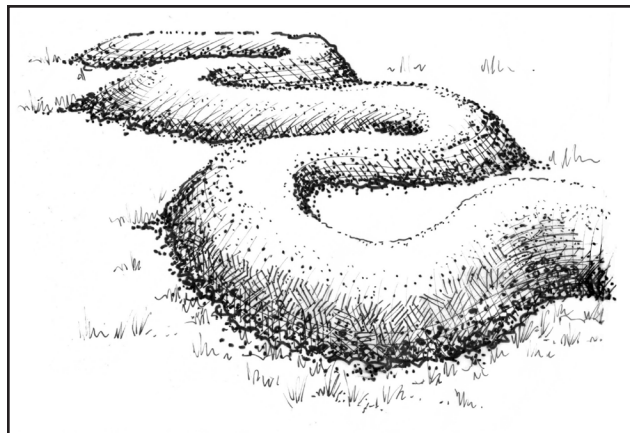


Figure 2. Four types of curved hügelkultur with different designs and spatial uses.

- Fill in spaces between the logs and branches with leaves, manure, grass clippings and/or kitchen waste (Photo 4).



Photo 4.

- When the mound is approximately 3 to 5 feet tall above ground, add 1 to 2 inches of topsoil (Photo 5). Keep in mind that the height of the hügelkultur will continue to shrink as the materials break down over time (Photo 6).



Photo 5.



Photo 6.

Special note: Water each layer thoroughly before adding the next layer. Use a tamper to compact the pile after each layer is added to improve decomposition and reduce voids that can cause safety concerns. This hügelkultur was built at 20-foot x 8-foot x 4-foot tall, since the site was very large. A scaled down version of 6-foot x 3-foot x 3-foot would be a more appropriate size for a typical residential yard. Photo 6 shows its completion before planting.

- Plant the hügelkultur. After the final layer of topsoil is added to cover the hügelkultur, vegetables or other plants can be installed on the top and slopes of the mound (Photo 7). Depending on the ratio of carbon to nitrogen materials incorporated in the hügelkultur, new plants



Photo 7.

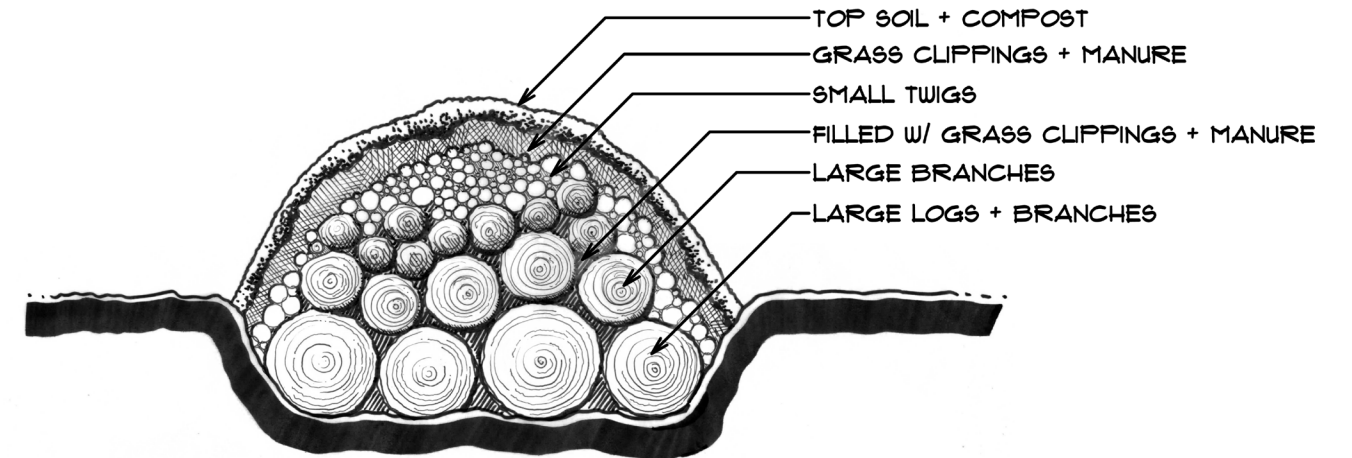


Figure 3. Typical cross-section of a hügelkultur.

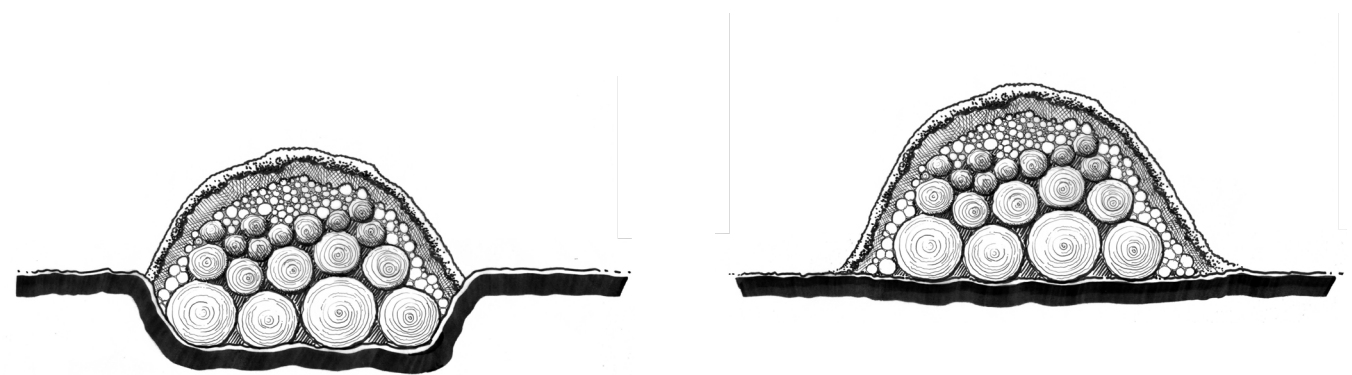


Figure 4. An in-ground hügelkultur (left) and an above-ground hügelkultur (right).

Depth & Borders

Hügelkultur can be built in-ground or above ground (Figure 4). Digging into the ground can help capture more runoff, but may require more materials to create the desired height. Also, depending on the depth and soil, digging may require additional tools/machinery. A mound also can have base borders or be without borders (Figures 5 and 6). A border at the foot of the mound can stabilize the shape and prevent the top layer from washing away. The border materials can be wood, brick or stone. The photographs on pages 4 through 6 show an in-ground type hügelkultur without a base border.

Construction Process

Hügelkultur utilizes a lasagna gardening or sheet composting process, meaning one layer of material is stacked on top of another, alternating carbon and nitrogen sources of organic material that will decompose with time.

Basic Material List

- Tree logs, branches and leaves. Hardwoods are the best, including alder, aspen, birch, cottonwood, maple, oak, poplar and willow. Avoid using the following: tree species that may have allelopathic qualities (e.g. black walnut), trees that resist decay (e.g. cedars), cut green trees that sprout easily (e.g. willows) or wood with antifungal and antimicrobial properties (e.g. railroad ties and painted lumber).
- Manure, kitchen waste and grass clippings can be used for composting. These are nitrogen-rich materials, which help to maintain a proper carbon-to-nitrogen ratio in the decomposing process.
- Topsoil and mulch to cover the planting surface at the top of the mound 1 to 2 inches deep. If the hügelkultur is built slightly into the ground, the excavated topsoil can be used.

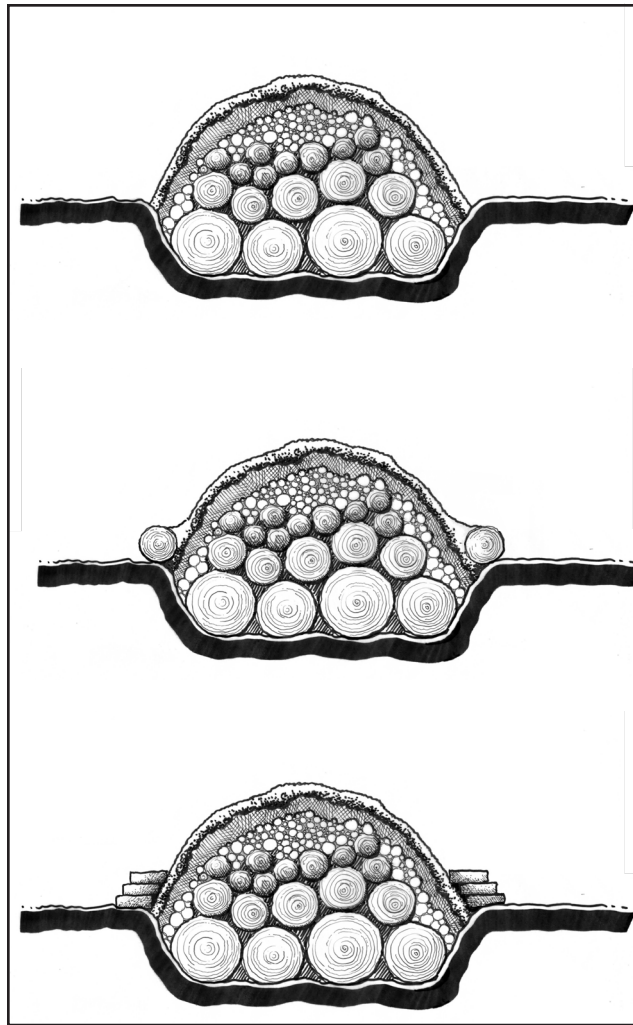


Figure 5. In-ground hügelkultur without border (top), with wood borders (middle) and with stone borders (bottom).

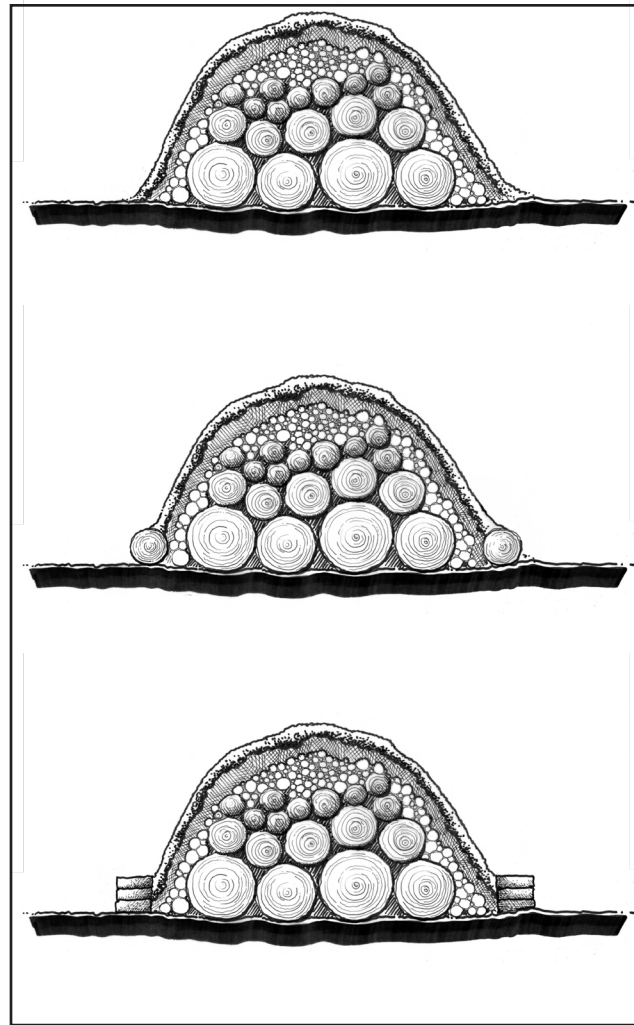


Figure 6. Above-ground hügelkultur without border (top), with wood borders (middle) and with stone borders (bottom).

Construction Steps

1. Locate a relatively lower elevation spot on the property where the mound can capture surface runoff. Ideally, this location receives six to eight hours of sun for greater planting options. Observe topography and construct a hügelkultur bed parallel with site contours or perpendicular to the downhill flow of water. Water runoff will be captured in the hügelkultur and encourage decomposition (Figure 7). Do not place the hügelkultur at a parallel position with the water runoff direction, as it will not be able to capture the runoff effectively (Figure 8).
2. Dig a trench 1 to 2 feet deep and to the desired length and width (this may depend on the amount of material collected). For a residential yard, a proper size can be a rectangle shape at size of 3 feet x 6 feet. For a larger site, dimensions can be scaled up. Photo 1 shows a trench much larger as it is built on a fairly large property. Remember to call Okie to locate utility lines before starting construction.



Photo 1.

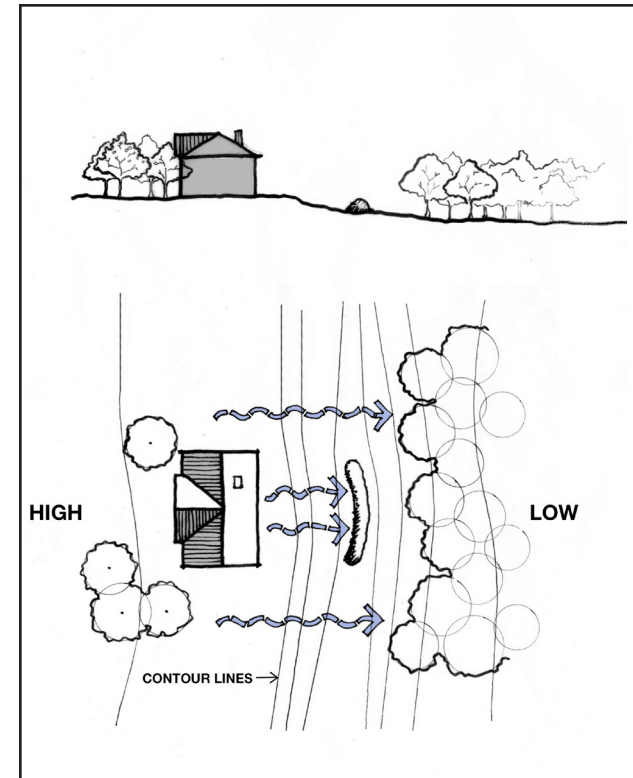


Figure 7. Correct. Place hügelkultur at a position of perpendicular to runoff direction.

3. Lay down the largest logs at the bottom of the pit as the base layer (Photo 2).



Photo 2.

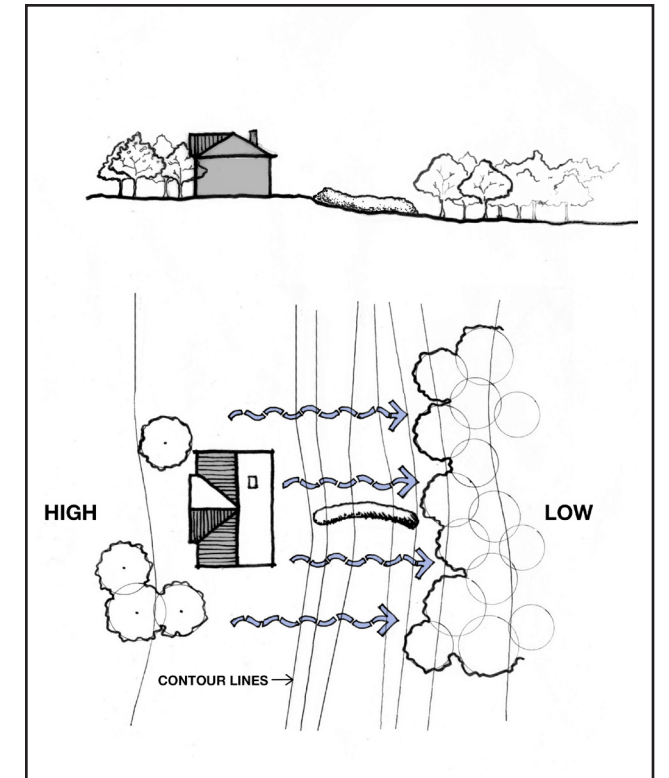


Figure 8. Incorrect. Do not place hügelkultur at a position of parallel to runoff direction.

4. Add a layer of branches, then smaller twigs (Photo 3).



Photo 3.