



Life Support

Humboldt State University, ENGR 215, Fall 2013

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http://www.appropedia.org/WETLAND_Humboldt_LifeSupport

Background

In the summer of 2014, an island-based ecosystem and mobile habitat, also known as WetLand, will be launched on the Delaware River in Philadelphia. WetLand will promote art, community, sustainable living, and environmental technology. The Wetland barge will provide a short-term home for artists and a venue for educational events. One of the goals of WetLand is to showcase a model for interdependent living and self-sufficiency. This will be achieved by growing food on the barge; using solar power; and gathering, purifying, and storing water on site.

Objective

The objective of Team Food on Deck is to design an edible railing for WetLand. The purpose of the railing is to provide a safe perimeter for the barge that also provides a place to grow food. It must be sturdy, weather-resistant, and act as a self-sustainable food source model.



Criteria

In order of importance:

Safety

Durability

Produce Production

Ease of Replication

Cost

Environmental Justice

Plant Locality

Ease of Maintenance

Level of Water Conservation

Educational Value

Aesthetically Pleasing

Results

The edible railing, named Life Support and depicted in the Figure, is a self-supporting structure that functions as protection for the side of the barge, as well as a source of food. Several plant species are recommended for the different sizes of containers. The predicted crop yield per plant, for one summer growing season is as follows: 6-10 carrots, 6-12 radishes, 1/2-1 pound spinach, 1/2-1 pound lettuce, 1 1/2 pounds potatoes, 3/4-2 pounds tomatoes, 1/2 pounds peppers, 1/3-1/2 pounds beans, 1/3-1/2 pounds peas, 10-15 cucumbers, and 1/2-1 pound strawberries.



A: The base railing is constructed from square 1-inch steel conduit. There are 140 linear feet of the base railing along the perimeter of the barge.

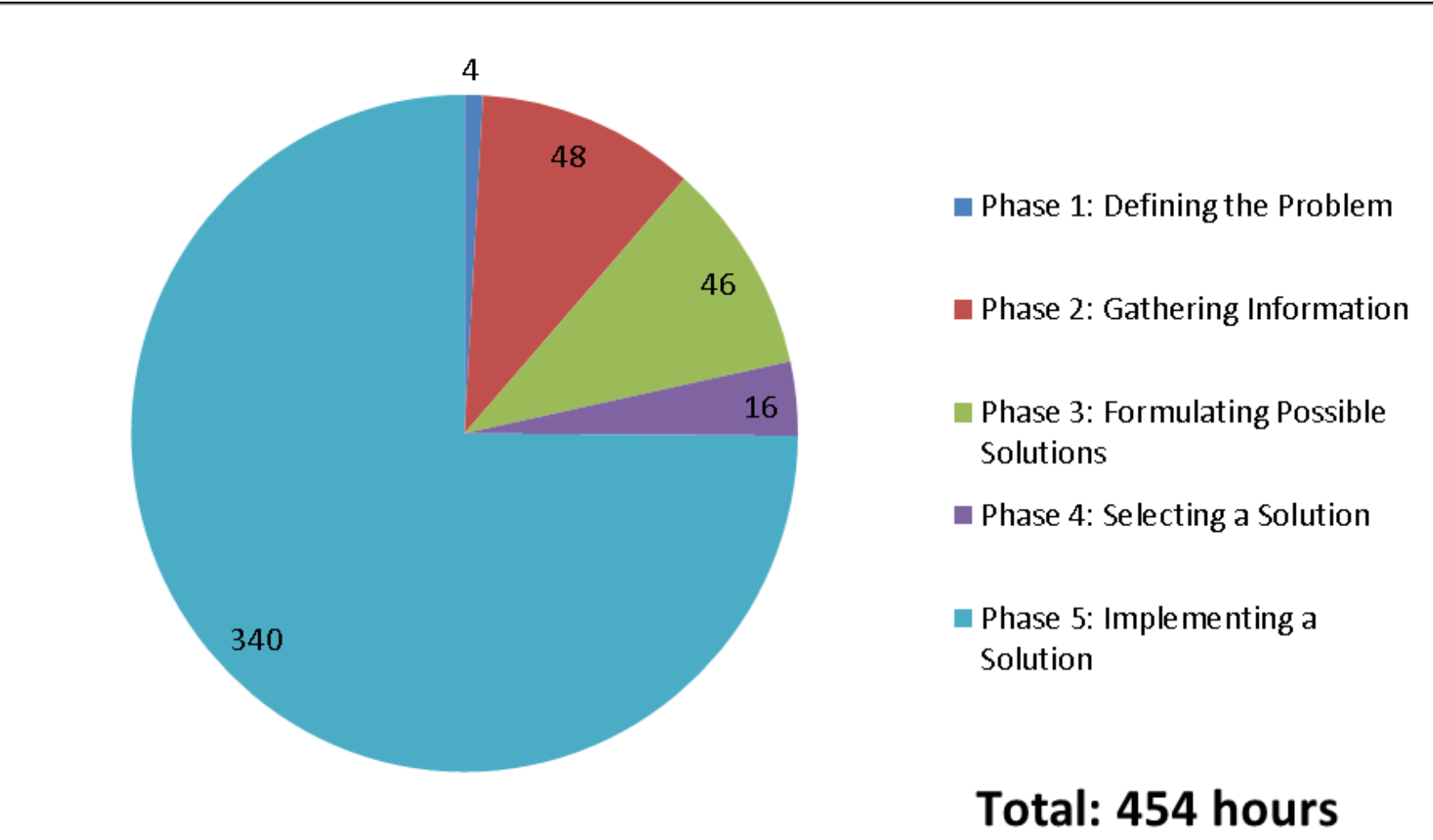
B: The planters are recycled plant nutrient solution containers. Four holes are drilled in the back of each container to attach the containers to the railing with zip ties. Each container contains a weed mat on the bottom, followed by 1 inch of volcanic rock, and finally a mixture of Fox Farm’s Ocean Forest Potting Mix and coconut fiber. Two drainage holes are drilled in the bottom of each container.

C: The trellis structure is made from old fencing, attached to the railing by zip ties.

D: The gravity fed irrigation system starts with a raised reservoir tank held in a steel conduit cage. A large ball valve allows each 8-foot section to be turned on and off. Three small ball valves allow each row to be turned on and off. Irrigation tubing extends to each container, where a “T” connector allows water to drip to each plant.

Cost

The design cost measured in hours, shown in the Figure below displays the hours spent on each step of the design process. The estimated time to replicate one 8-foot section of Life Support is 8 hours for 4 people.



The table below lists the costs, measure in dollars, to replicate the major components of Life Support. The total cost does not include the cost to make the base railing.

Section	Price per 8-Foot Section	Price for Whole Railing
Planters	\$20.00	\$165.00
Irrigation System	\$26.20	\$392.96
Soil System	\$15.00	\$225.00
Total	\$61.20	\$782.96