

- The purpose of this report
 - This report is to evaluate the REI nature-inspired cold food storage system.
- The name and a short description of the design
 - The REI nature-inspired cold food storage system.
 - PRODUCT GOALS
 - Designed and manufactured in a sustainable manner with materials that are not harmful to the earth, to the consumer or to society.
 - Derive design inspiration from nature.
 - Align the product with Life's Principles.
 - Generate sales for REI's first nature-inspired product line.
 - Establish REI as a strong market leader and influence in sustainable outdoor products.
 - Provide consumers with a high-quality product that allows them to keep their food safe during their adventures and travels.
 - Give back to the earth as much as possible
 - WHAT DOES THE PRODUCT DO?
 - Keep food cold for extended periods of time away from on-grid refrigeration
 - Maintain a food safe internal temperature between 36° F and 40° F
 - Protect food from warm temperatures
 - Keep food from being damaged during transit (car or backpack)
 - Keep food safe for consumption
 - Prevent animals and wildlife from accessing food
 - Prevent bacteria and microorganisms from contaminating food due to unsafe temperatures
 - Provide a lightweight and space-efficient method for transporting personal food
 - Adapt to different needs and situations (backpacking vs camping; one person vs multiple people)
 - Prevent accidental solid/liquid messes from spilling
- The one-page illustration of your design (from last week's report)

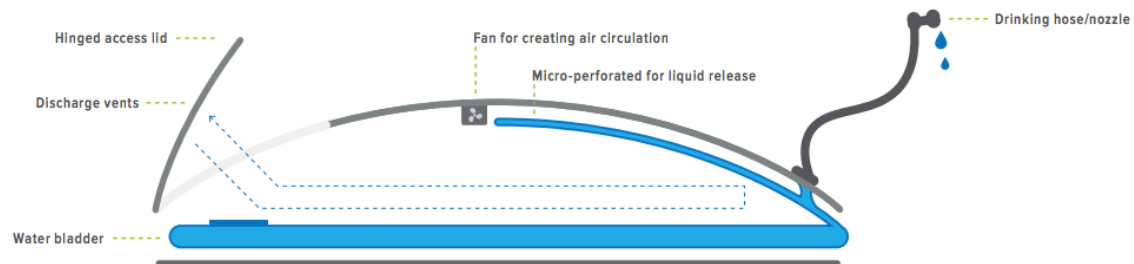
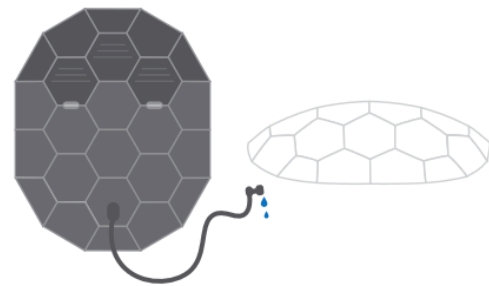
PROPOSED DESIGN

In this design, the unit works as both the cooler and food containment system, as well as the user's water source for drinking. The water bladder fits inside of a protective case inspired by the interlocking shapes of a tortoise shell. Due to the shapes' relationships, no internal frame structure is required.

The subtly-curved shape allows for food items to be stored within the same hollow space as the water bladder, without taking up too much space within the user's pack. The integration of the water bladder allows for small amounts of water to be fanned out through the air vents for keeping the internal temperature of the cooler low for food storage.

Functions: protect food from warm temperatures, keep food from being damaged during transit while backpacking, keep food safe for consumption, prevent animals and wildlife from accessing food, provide a lightweight and space-efficient method for transporting personal food, and provide a source of hydration for the user.

Biological inspirations: honeybee water collection and fanning for evaporative cooling, and tortoise shell shape structure.



-
- Descriptions of how the design does and does not reflect each Life's Principles

Does the design adapt and evolve?

Is the design locally attuned and responsive?

- *Does it leverage feedback loops?*
 - Yes. The product cools water using the backpacker's drinking supply. Because of this, the backpacker can take a sip of their water to determine if their cooling compartment needs new or fresh water.
- *When it uses materials, are the materials locally available and abundant?*
 - Yes. Alyssa proposed that the system cools using locally available water, which can be refreshed constantly. The structural materials are also proposed to be readily available and renewable (recycled ABS and bamboo, which grows rapidly in many environments)
- *Recommendations:*
 - Perhaps allow the water bladder to fill more space when the cooling compartment is empty. That way, if the backpacker is carrying only a little food, the water will fill the rest of the compartment. This would mean that 1) the food is more secure, 2) there would be more water to keep the food cool, and 3) there would be more water to drink.

Does the design integrate cyclical processes?

- *Are processes cyclical?*
 - Yes. Once the water has been consumed, or it is no longer cool enough to keep the food at a proper temperature, the backpacker can

replenish their supply. Additionally, the product can be properly processed at end-of-life scenarios

- *Does it integrate local feedback loops?*
 - Yes, as the backpacker is able to test the water supply and keep it fresh.
- *Recommendations:*
 - Maybe you could consider a compartment for ice. This would not only help to cool the food and the water, but it would also melt into a fresh water supply, which could then evaporate to continue keeping food cool.

Is the design resilient?

- *Can it withstand disturbance while maintaining function?*
 - Perhaps. The product is designed to withstand structural duress, but it is not certain if it can sustain the damage while maintaining function.
- *Does it heal after disturbance?*
 - No. It does not appear that the product can heal after disturbance—at least, it cannot self-heal.
- *Are there opportunities for cross-pollination and mutation?*
 - It does not appear that the product can cross-pollinate or mutate.
- *Recommendations*
 - Perhaps the hexagonal structural components could be easily swapped for repairing or expansion. This would allow for both healing as well as cross-pollination and mutation. Maybe some hexagons provide greater structural support, but at greater weight, while other hexagons provide a lighter load, but at reduced structural support, and backpackers could choose how strong/light they wanted their individual containers to be.

Does the design create conditions conducive to life?

Does the design optimize rather than maximize?

- *Does it integrate multiple functions?*
 - Absolutely. This is one of the key features of the design. It stores the backpacker's water supply, and it stores a food supply, but it also cools the stored foods with the water supply.
- *Does it recycle materials? Is it recyclable?*
 - Yes. Alyssa made sure to note that the structural materials are recyclable, and the consumed materials (water) are readily available.
- *Does it perform functions with minimal material and energy?*
 - Partially. It utilizes electrical components to power a fan to evaporate the water and cool the compartment, and the fan is solar powered, but there could be opportunity for simplification or component reduction

that would circulate or evaporate the water without electrical components.

- *Recommendations:*
 - Since the cold storage is dome shaped, there are some spaces around the edges that could be considered “wasted space.” If this storage compartment is going to fit into a backpack, you might want to consider adding some dry storage compartments around the edges of the dome, thus “filling out” the space. Since these compartments don’t need to be cooled, they don’t need to be adjacent to the water bladder, and they can provide additional structural support to the compartment. Additionally, consider evaporation techniques that could operate passively.

Does the design use benign manufacturing?

- *Is it made from life-friendly materials?*
 - Yes. The structural components of the compartment are made from bamboo, which is readily available and very life-friendly
- *Is chemistry done in water?*
 - Yes. Water is the primary element of the product process, and the primary material (bamboo) grows naturally. The reused ABS alone is worth closer consideration, as it is not processed in water.
- *Are processes done at ambient/local temperatures and pressures?*
 - Again, the water and bamboo allow for benign processes, but the ABS is not manufactured at an ambient temperature, though it operates to keep other components at a proper temperature.
- *Recommendations:*
 - Reconsider the use of ABS for a more life-friendly alternative.

Does the design leverage its interdependence in the system?

- *Does it foster symbiotic, cooperative, community-based relationships?*
 - Yes. This product encourages backpackers to enjoy and explore nature. Within the product function itself, the water and food and backpack all operate within a symbiotic relationship of each other—the backpacker drinks the water and eats the food, and the water also cools the food.
- *Does it foster emergent relationships?*
 - Perhaps. The water works together with the fan to cool the food, and the water also keeps the backpacker hydrated, so together the cooling compartment provides a comprehensive food and water solution for the backpacker. It is not certain if any relationships emerge at higher levels.
- *Recommendations:*
 - Include a water collecting/filtering feature that allows the backpacker to collect water from any source—perhaps even from the air.

Recommendation Summary:

Alyssa has done a fantastic job of proposing a biomimetic solution for keeping food cool. At this point, the product appears to function well as a food-storage device. I think some next-stage development could address collecting water as well as optimizing storage of both food and water.

As for water collection, the pack could include a removable water collection feature that would supply water to the bladder. This could also filter the water to allow the backpacker to collect water from a wide variety of sources.

Additionally, the pack could utilize the spaces around the cold storage to make the container more box-like to maximize the space used within the backpack. These compartments could be used as dry food storage, or as the aforementioned water collecting/filtering feature.

Water filtration/resupply