LIQUID DESERT // Designed for the demanding needs of riding through Bears Ears.

LIQUID DESERT
HYDRATION

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fall 2020

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DES 3520-001 Product Studio // Tsoutsounakis

in partnership with Bureau of Land Management

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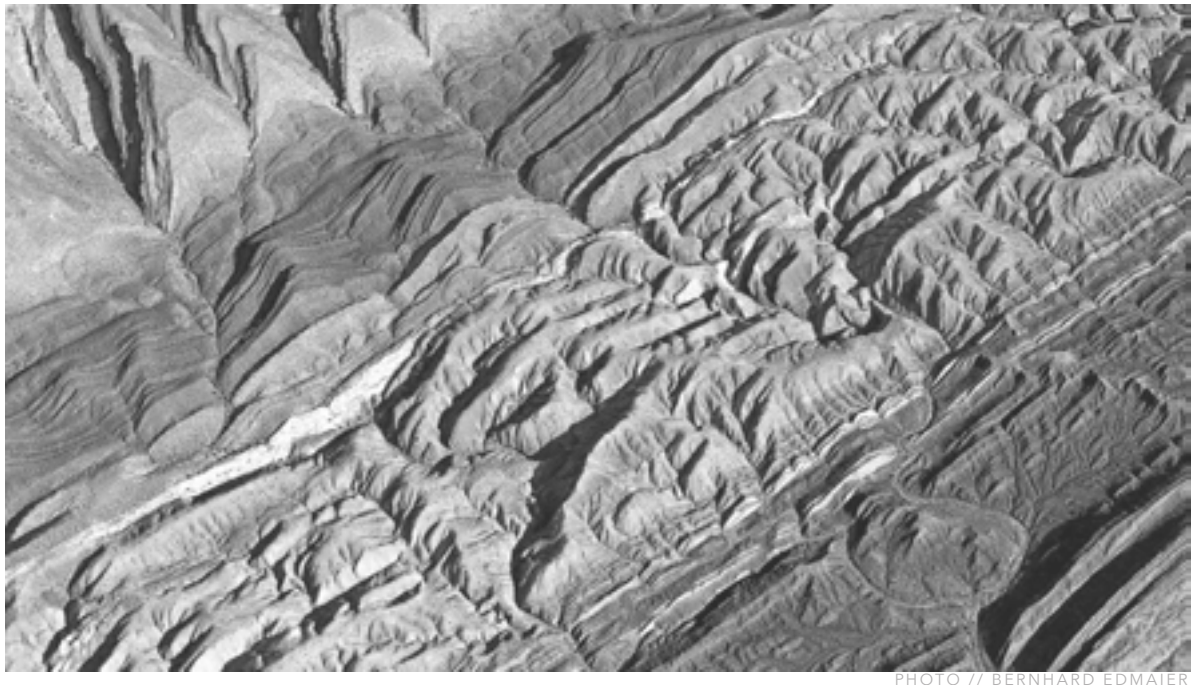

PHOTO // BERNHARD EDMAIER

OBSERVATION
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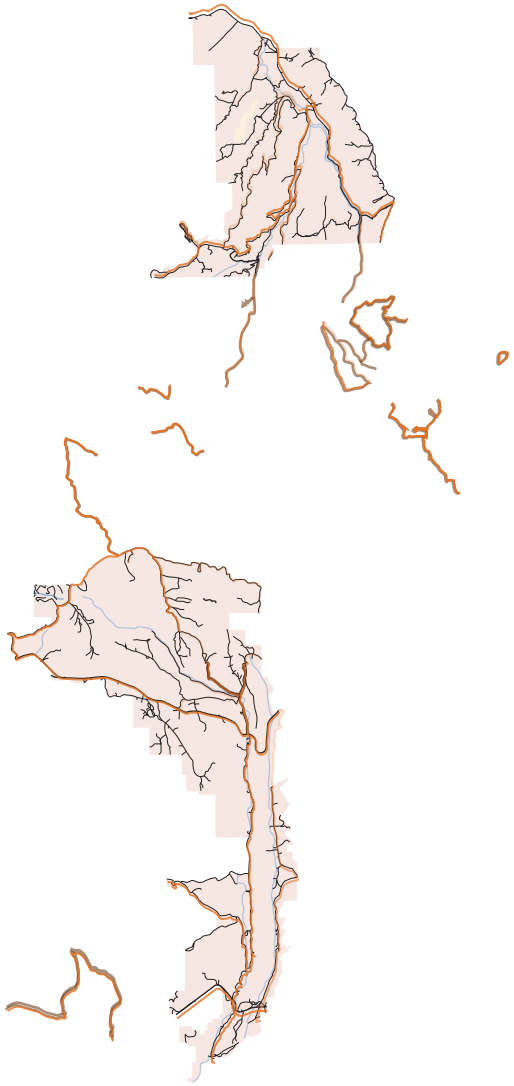
OBSERVATION
_BEARS EARS

CYCLING AVAILABILITY



/ 1 BOUNDARY

The Bears Ears Boundary line was recently reduced by 85% of its original boundary lines. This was done just one year after it was established a national monument (CRRAMP)

/ 2 MTB TRAILS

MTB Project, an app for locating mountain bike trails, was recommended by the Bureau of Land Managements website. The app shows a total of 14 trails in the Bears Ears are. (MTB Project)

/ 3 OHV

OHV trails are any roads that motorized vehicles are permitted on. This includes Highways, gravel roads, and 4x4 roads. (CRRAMP)

/ 4 HEATMAPS

Strava Heatmaps is a tool used through the Strava Fitness app. The tool allows users to filter how trafficked areas are from users gps uploaded rides. (Strava Heatmaps)

With the Bears Ears area only having 14 mountain bike trails, the cycling scene may look relatively scarce. Most people look to Moab or Virgin when planning a cycling trip to Utah.

Looking deeper into where bicycles are permitted within the monument one can find all OHV trails to be fair game. And these roads and trails are getting use from the cycling community. By overlaying Strava Heatmaps with OHV maps it is clear that the majority of the riding being done is not on the mountain bike trails. But rather on the Highways, gravel, and 4x4 roads typically looked at for OHV use.

BIKEPACKING

"The roads are our biography. Written by those who come before us and passed on by us to those that follow. Our responsibilities don't lie in the route of travel, for that we have no control, but instead in how we travel them."

Gus Morton

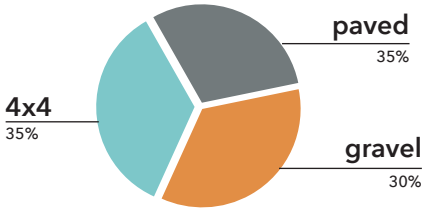
PHOTO// GUS MORTON

Bikepacking is a fast growing niche within the cycling world. Consisting of the same dynamics of backpacking but being transported via bicycle.

The riding can be done on a wide variety of terrain, with riding on gravel and 4x4 roads being the most common. The Bears Ears National Monument has an abundance of these types of roads and paired with the history and landscape makes it a popular destination for avid cyclists alike.

BEARS EARS LOOPS

Bikepacking Roots is a non-profit organization that creates bikepacking routes while advocating for land conservation. Their *Bears Ears Loops* was used as a case study when developing the hydration system. (Boyle)



DISTANCE

Section B of the loop is 291 miles of the Bears Ears Loops, this is the portion that crosses through the monument. The map to the right shows it cutting through Indian creek and following along the Shasta Ja unit. Before the monument got reduced the route went through much more of what was considered the monument.

5-7 days

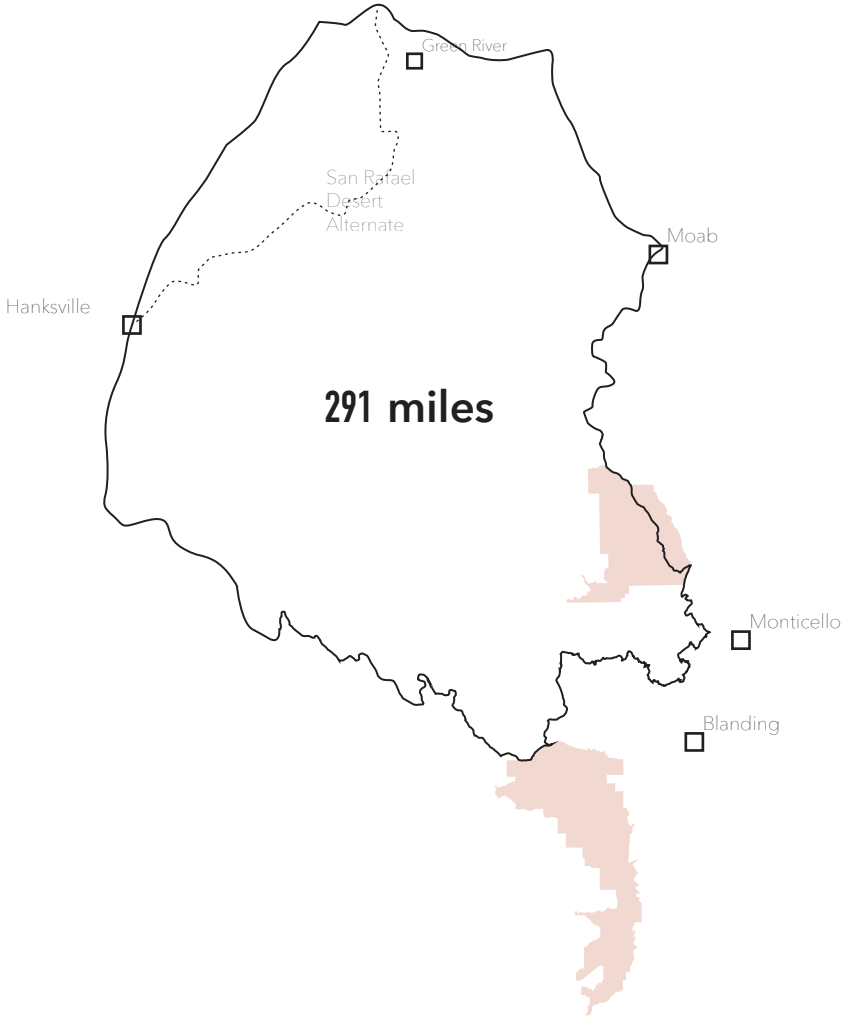
DURATION

On average Section B takes 5-7 days to complete. This results in an average of 40-50 miles a day of riding.

6-8 L water
3 days of food

SUPPLY

To complete this ride food and water is stored on the bike along with all the other gear required to be self sufficient. With the arid climate it is required that a rider carries 6-8 liters of water at a minimum. This equates to about two days worth of water along with being able to carry 3 days worth of food.



OPPORTUNITY
OPPORTUNITY
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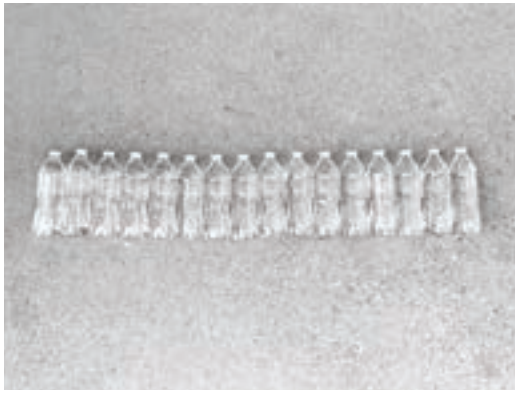
OPPORTUNITY
_HYDRATION

8 liters of water to be stored on the bike.

TWO DAYS OF WATER

8
liters
17.5
pounds



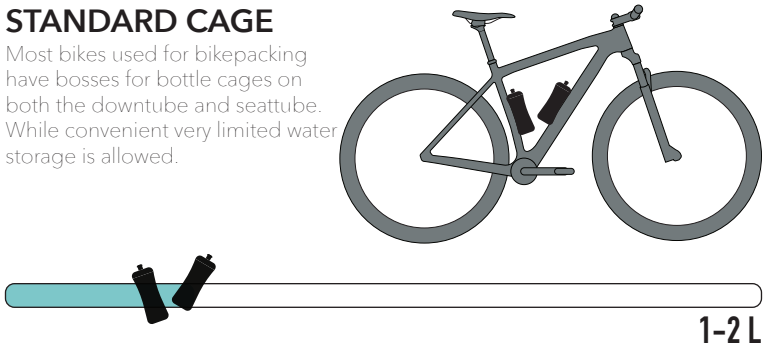
HOW MUCH?

First wanting to wrap around the idea of how much 8 liters actually is. One liter of water weights 2.2 pounds. Resulting in 17.5 pounds of water that needs to be carried in addition to all of the other gear necessary. This is equal to 16 disposable water bottles, each at 16.9oz. Or two one gallon jugs and one disposable water bottle.

EXISTING WATER STORAGE

STANDARD CAGE

Most bikes used for bikepacking have bosses for bottle cages on both the downtube and seattube. While convenient very limited water storage is allowed.

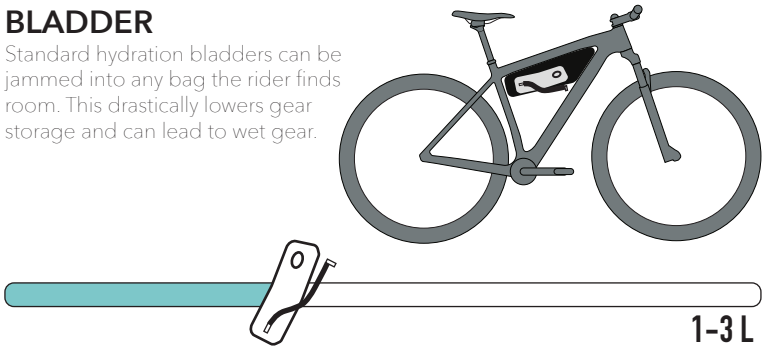


STEM BAG

Stem bags can be attached to the stem. This allows for easy access but is limiting on the amount of water that can be carried. Weight is also positioned high and unstable.

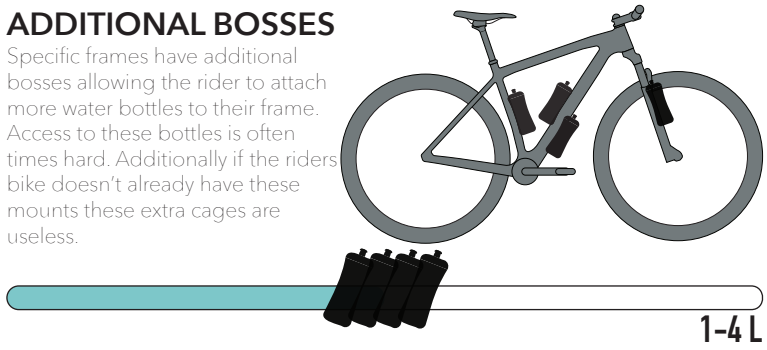
BLADDER

Standard hydration bladders can be jammed into any bag the rider finds room. This drastically lowers gear storage and can lead to wet gear.



ADDITIONAL BOSSES

Specific frames have additional bosses allowing the rider to attach more water bottles to their frame. Access to these bottles is often times hard. Additionally if the riders bike doesn't already have these mounts these extra cages are useless.

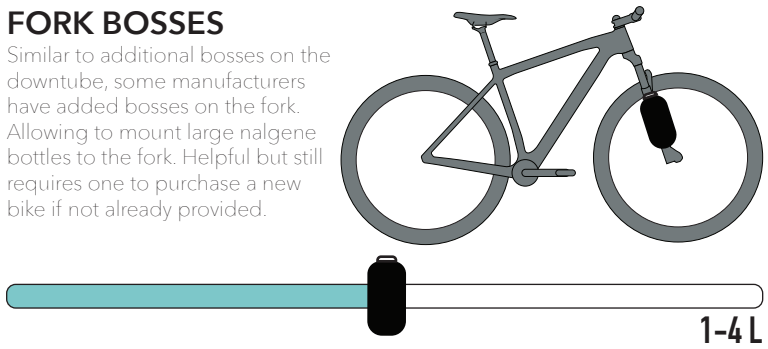


EXISTING PRODUCTS

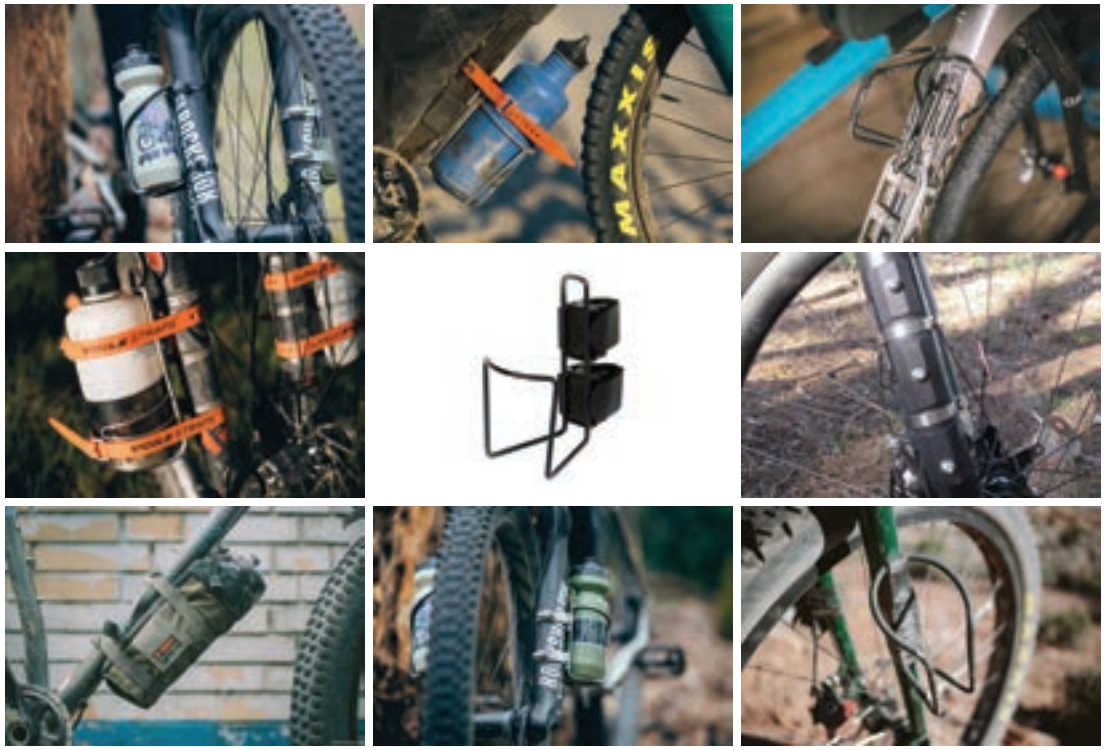
The existing options for water storage do not allow 8 liters of water on a large range of bikes. Some require a new bike while others inhibit crucial space to carry other gear.

FORK BOSSES

Similar to additional bosses on the downtube, some manufacturers have added bosses on the fork. Allowing to mount large nalgene bottles to the fork. Helpful but still requires one to purchase a new bike if not already provided.



ADDITIONAL MOUNTS



CAGE PRECEDENT

A large portion of the water storage market consists of ways to attach more water bottle cages. This address the issue of needing more water but only adds more water bottles to the bike. (Watts)

By only attaching more standard water bottles this would result in needing to carry 10 bottles to get to the 8 liters of water needed for Bears Ears Loops.

While ideal to carry the water on the bike rather than the bike. carrying 10 water bottle cages is not the answer.

DESIGN PROCESS
DESIGN PROCESS
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DESIGN PROCESS
_PROTOTYPE

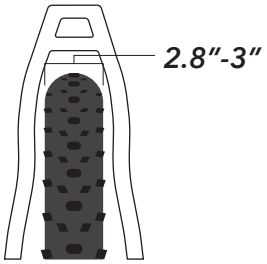
THE RIGS

TYPE OF BIKES

Characterized by bikes that the geometry is designed around a relaxed riding position allowing the rider to not experience excess muscle fatigue while riding day after day.

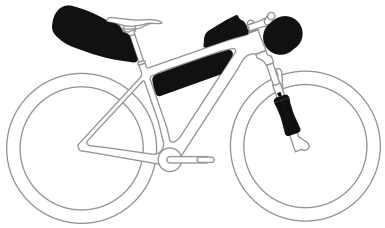
While technically any bike could be made two work for some sort of bikepacking there are a few key characteristics looked for when deciding on a bike for bikepacking.

Hardtails are the most common allowing for maximum storage capacity and pedal efficiency.



TIRE CLEARANCE

To counter balance the lack of rear suspension manufactures have incorporated a wider tire clearance among many bikes of this category. The wider tire allows for compliance and grip resulting in a smoother and less fatiguing ride.



HARDTAIL

A hardtail is a bike that lacks rear suspension. This frees up space within the front triangle for more storage. Hardtails also are more efficient because of less pedal bob. Rear suspension is not needed for the Bears Ears Loops because of the lack of technical descent.

SANTA CRUZ
Chameleon

SURLY
ecr

TREK
1120

SALSA
Fargo

BOMBTRACK
Beyon+adv

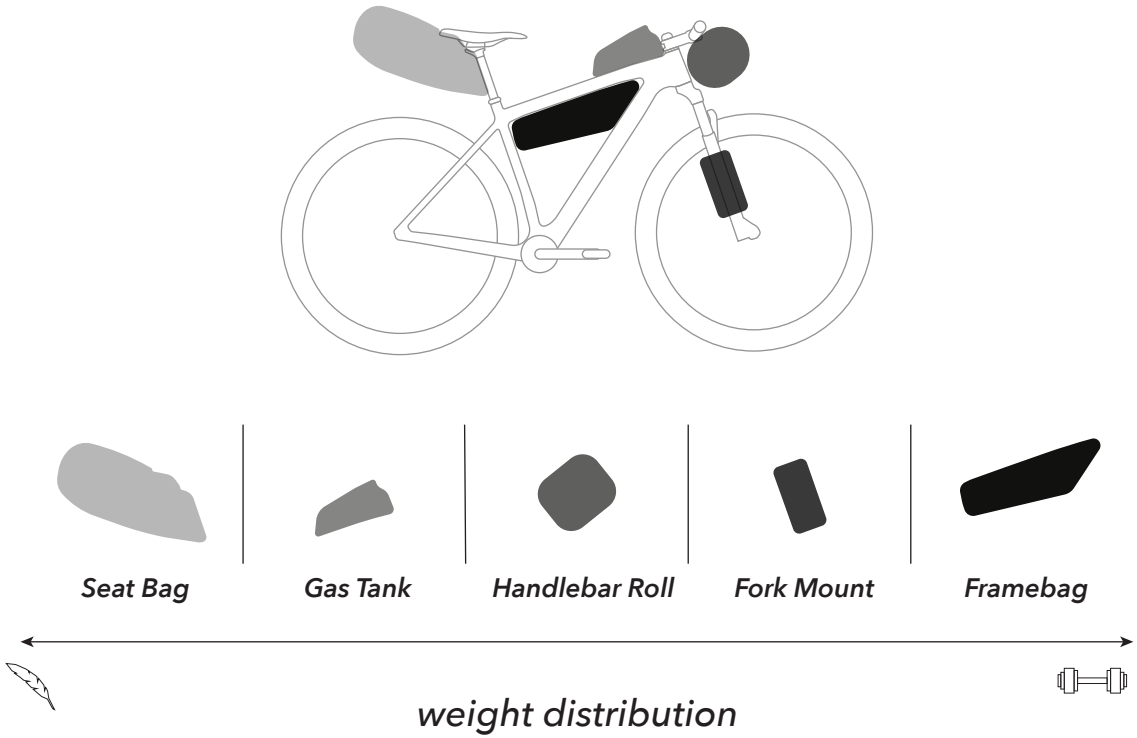
KONA
Honzo

WEIGHT DISTRIBUTION

Placement

Since the 8 liters of water is so heavy, 17.5 pounds, it is important to be aware of where on the bike it is stored.

Space being limited water is packed wherever there is room. But it is ideal to keep the water centered to maintain good handling. (Beltchenko) The diagram below displays the most common way of packing up a bike for a week bikepacking.



SEAT BAG

Large amount of storage. Usually light items are kept here.

GAS TANK

Snacks, chargers, and emergency items are stored here for easy access

HANDLEBAR ROLL

Large amount of storage that is fairly accessible. The weight up front can slow down steering but will offer more traction and stability.

FORK MOUNT

Large and heavy items are stored with lots of room. Keeps weight low and centered for stability.

FRAME

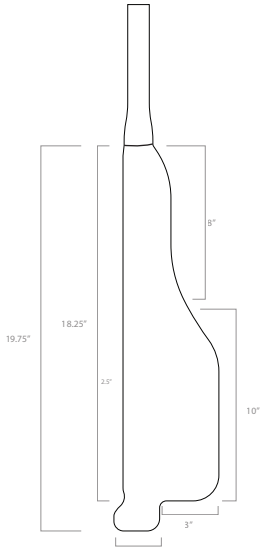
Some bikes come with mounts on the forks offering added storage for water or other needs.

INTERNAL STORAGE

At first looking at how water storage can be integrated within the bike design itself. One being within the fork and the other within the downtube of the frame. Leaving full range of storage throughout the bike.

Although effective, these designs require the user to purchase new fork or a new frame altogether. This is both expensive and will lower the amount of people looking at this as an upgrade they can purchase.

Manufacturing costs for the molds alone start at $10,000 and up to $100,000. Resulting in both high manufacture and consumer costs.



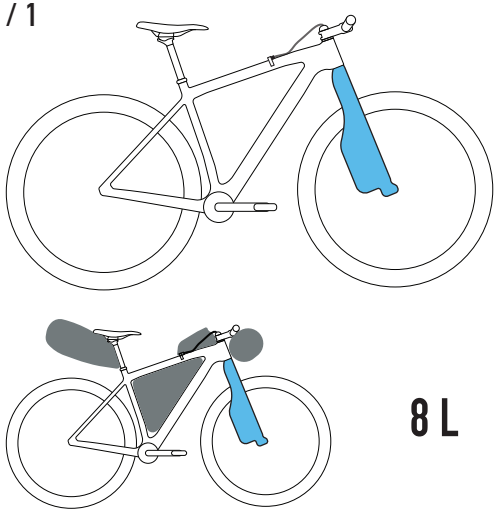
/ 1 FORK

Water is stored within both legs of the fork. Four liters within each leg, equaling 8 liters as a whole system. The fork would be the only part that would have to be purchased, allowing for a wide range of bikes to be fitted to. Water would be accessed through a hose and mouth piece, similar to a camelbak

/ 2 FRAME

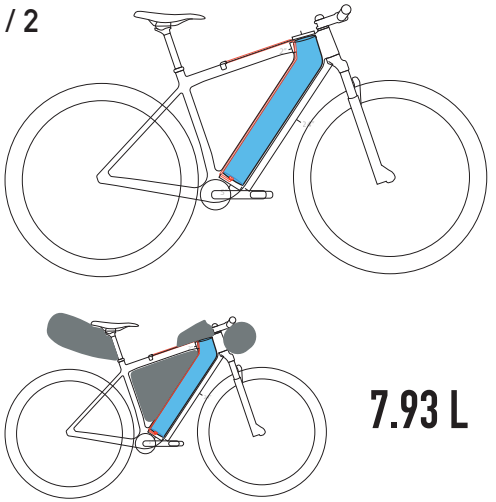
Storage within the downtube of the frame allows the weight to stay centered and low. While still allowing for full use of the rest of the bike for gear storage. Water would be accessed through a hose and mouth piece, similar to a camelbak.

/ 1



8 L

/ 2



7.93 L

GAS BAG

Researching how motorcyclists carry extra fuel during overland races I came accross the Giant Loops Moto Gas Bag. The Gian Loops bag is a stand alone fuel bladder that can be mounted onto the motorcycle allowing for the fuel to take shape of the motorcycle and take up less space.

Working with fabrics allows the water to be stored within the contours of the frame. Allowing to maximize water storage while being able to collapse down and take up less space.

PROTOTYPES

Images shown to the right are prototypes working with the frame geometry and looking at how to attach the stand alone bladder to the frame.

/1

/ 2

/ 1 Able to store 4 liters of water, allowing the rider to carry two for Bears Ears while carrying one for shorter rides.

/ 2 Storing up to 6 liters of water, but reduces storage for gear. Still keeps weight low but reduces gear storage. No longer allowing room for a frame bag.

MATERIALITY

MATERIAL

When researching materials that are safe to store drinking water TPU was high on the list. Made out of Nylon Cordura with a TPU (thermoplastic polyurethane) heat seal-able laminate, the material is ready to stand up to the abuse of the Utah Desert.

NYLON

Nylon is a synthetic material that shares many characteristics with Polyester such as stretch and shrink resistance. But is a much stronger material.

TPU

Thermoplastic Polyurethane (TPU) is a plastic that is commonly used in the medical industry. With high abrasion resistance, BPA Free, and waterproofing TPU makes a perfect material for containing water while on the bike. (Erez)

OXFORD WEAVE

The system uses an Oxford weave. This is a small checker patterned weave. Most common in fabrics that are heavier than 200 denier (200D). Cordura, packcloth, and ballistic nylon all use an Oxford weave.

1000 DENIER

Based on a natural reference, one denier approximately equal to one strand of silk. Measured by the mass in grams per 9000 meters of fiber. When looking at fabric denier determines the thickness of the fibers used for the fabric.

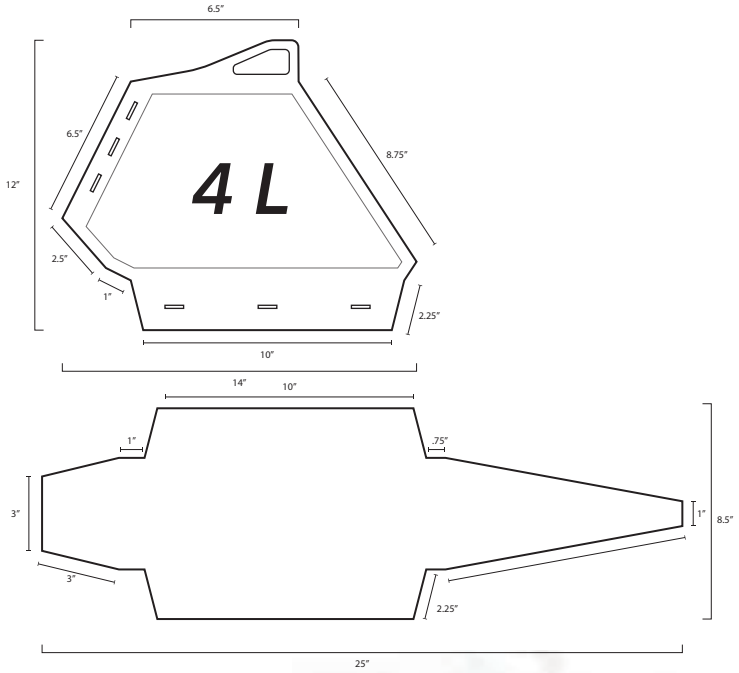
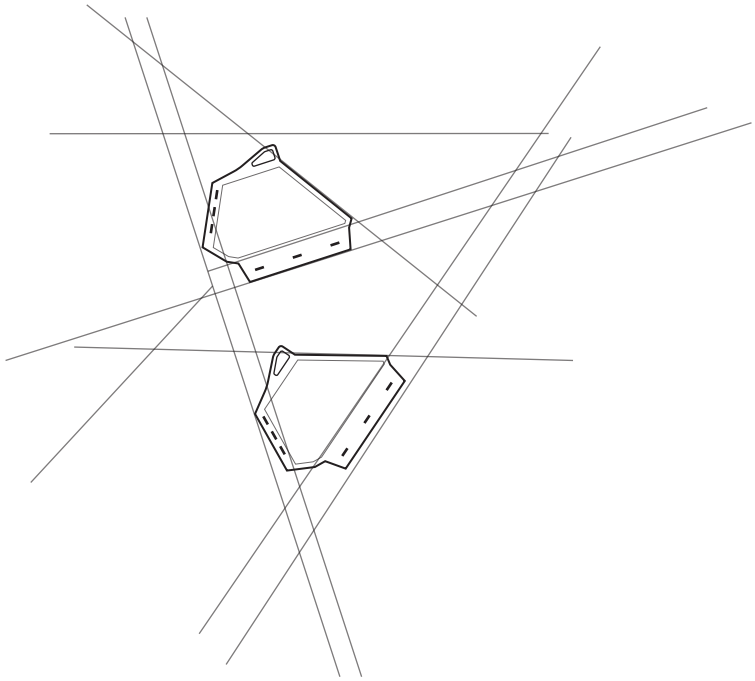


PHOTO // DIY PACKRAFT

GEOMETRY



FORM

The form is created by overlaying multiple frames and finding similar geometry. The angles shown above are average angles represent that geometry and creates a template for a form that can be attached to a wide range of bikes.

The bikes shown to the right are common bikes used for bikepacking, particularly for the terrain that is found in Bears Ears National Monument.

COMPATIBILITY

The geometry found lead to being able to attach two frame bags. One in the main triangle and the second tucked between the seatpost and toptube.

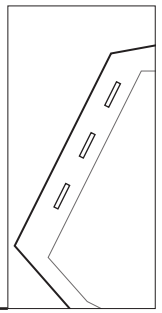
WEIGHT CENTERED

By designing around keeping the weight centered over the bike both the bladders are centered over the bottom bracket. This is where frame manufactures intend the most weight to be distributed.

ATTACHMENT

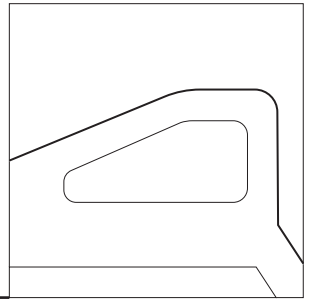
HEAT SEAL

The TPU is heat seal-able and because of this the system has zero stitching. This leads to slight overlap at the edges to create the seals. Once the seal is made the bond is actually stronger that the TPU alone.



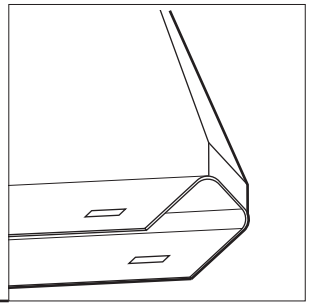
SEATTUBE

A single seal extended to one inch allows for three slots for frame attachment.



HANDLE

Extending the seal two inches allows for a handle to be cut out of the seal. This makes for easier handling and pouring when the bladder is being used off bike.



DOWNTUBE WRAP

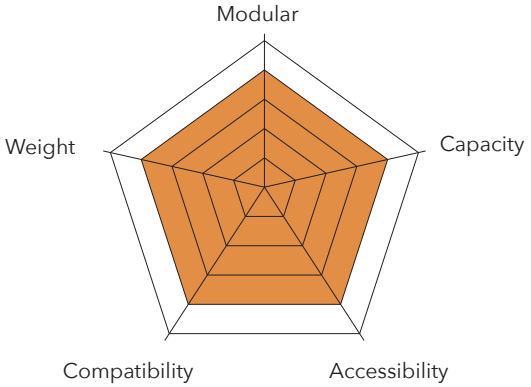
Two bottom seals are extended two inches to allow the material to wrap around the frame resulting in a system that will not sway back and forth. The extension also allows for a wide range of downtube diameters. Ranging with downtube diameters from 1.5" and up.

CAPACITY

4 - 8 LITERS

Attaching two hydration systems to your bike results in 8 liters of water total.

A single system holds 4 liters which keeps the size down allowing use on shorter weekend rides without being over watered. Grab a second for the longer multi day bikepacking adventures.



PRODUCT IMPACT
PRODUCT IMPACT
PRODUCT IMPACT
PRODUCT IMPACT
PRODUCT IMPACT
PRODUCT IMPACT
_OUTCOMES

OUTCOME

APPLICATION

The bladder can be used as a single or multiple unit system. Leaving both units in place the user has the ability to use a single detachable hose for both bladders.

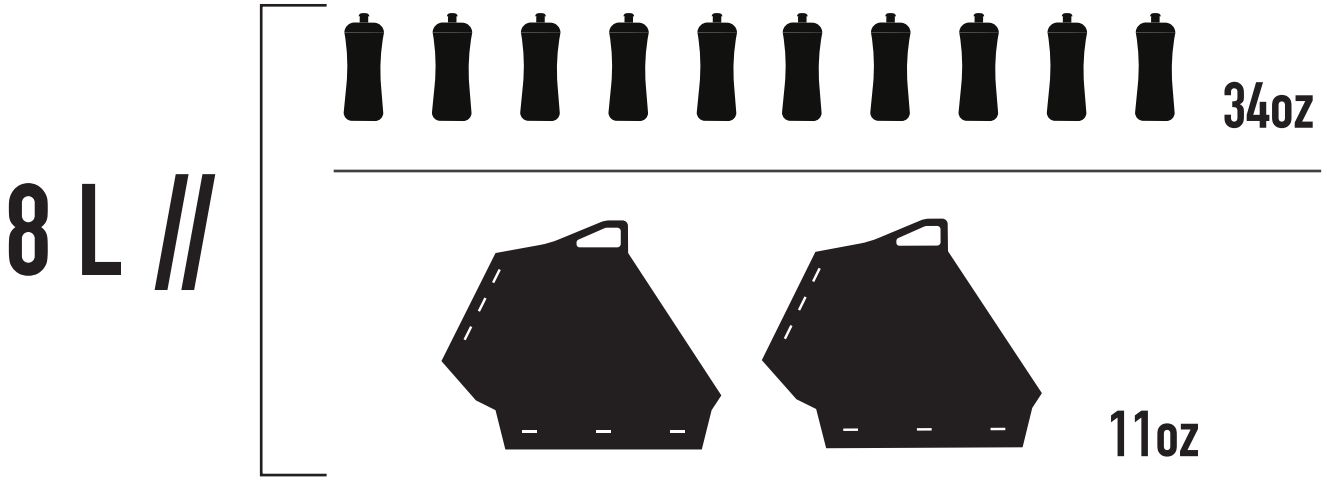
Once the top bladder is empty the user can detach the hose from the rear of the bladder and reatach to the lower bladder.

This allows for easy access to water without having to fumble with water bottles. Or having to stop every time when wanting to grab a drink.

WEIGHT

A system of two hydration bladders is the equivalent of ten standard water bottles. While at only 1/3 the total weight.

Weighing in at 11oz for two bladders and one detachable hose the Liquid Desert Hydration System is a the only stand alone hydration bladder designed specifically for the average bikepackers needs.



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PHOTO// GUS MORTON

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