ADVENTURE WAGON

Client Project Recommendations

Mule Bag 2.0

Collaborative Product Design
MCAD MASD Fall 2023
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Content

WHAT IS SUSTAINABILITY?

Sustainability Defined

What Sustainability is Not:

1. A marketing ploy (greenwashing)
2. Reduction in quality
    a. (Longevity is core to sustainable practices)
3. More costly for business

What Sustainability is:

Operating a business, by **doing right by people** and by **using less resources** = efficiency = more profits

(That's just good business 101!)

Focus on the three pillars AKA

The Triple Bottom Line:

Planet (environmental protection)

People (social equity)

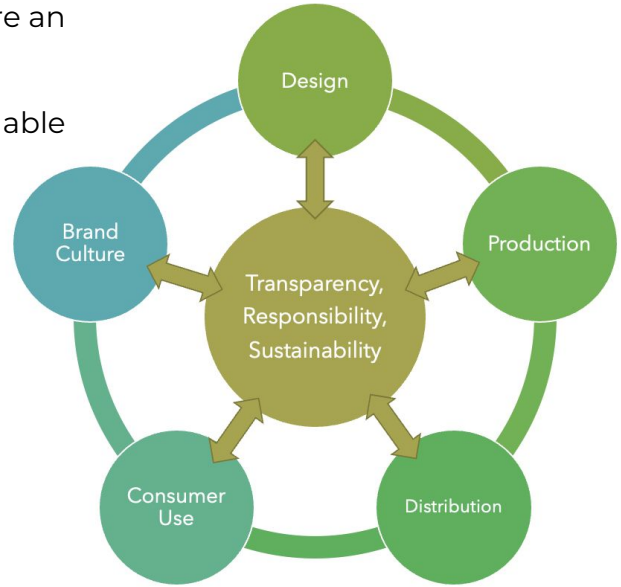
Profit (economic viability)

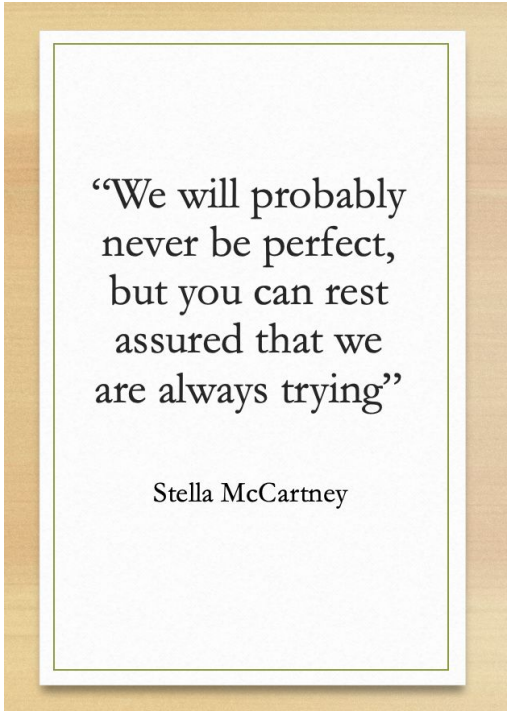
"Development that meets the needs of the present, **without compromising the needs of tomorrow**".

Big Hairy Audacious Goals (BHAG)

Like climbing **Mount Everest** or a **Moon Mission**, the following recommendations are BIG goals with a modern business mindset. These are an aim, or a **lighthouse**, in new ideas to allow Adventure Wagon to be a part of a sustainable future.

What elements of the business are the priorities for the BIG Goals?

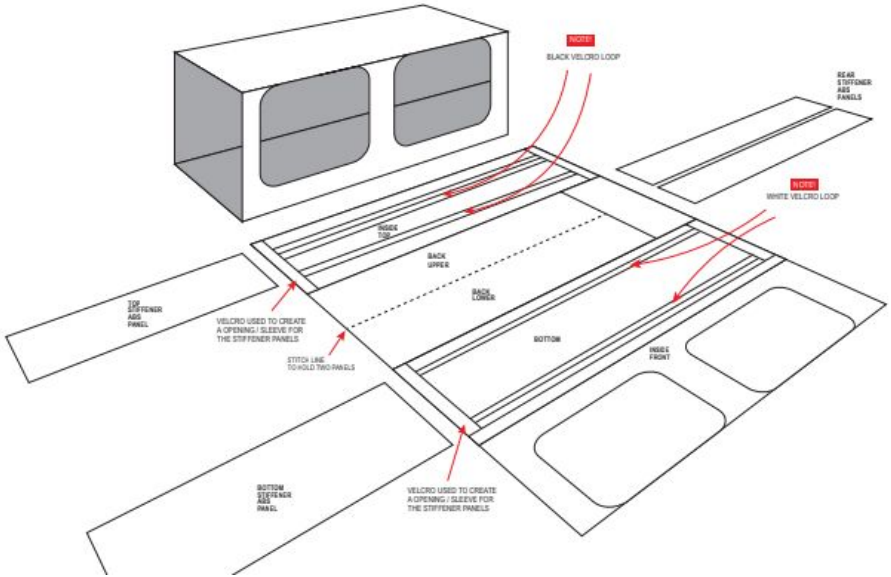




CURRENT DESIGN

A LOOK AT ADVENTURE WAGON & THE MULE BAG 2.0

SCOPE
SYSTEM VIEW



The Current Mule Bag 2.0 Design

Scope (Mule Bag layout (hardware excluded)

Life Cycle Analysis (LCA) of the Mule Bag 2.0

- Material extraction
- Manufacturing
- Material Manufacturing
- Assembly
- End-of-Life

Functional Units

Mule's Bag use capabilities: Weight (kilos) and volume (liters)

Estimated Energy Use: N/A

Estimated Lifetime: +50 years

Estimated Usage: 5-10 years

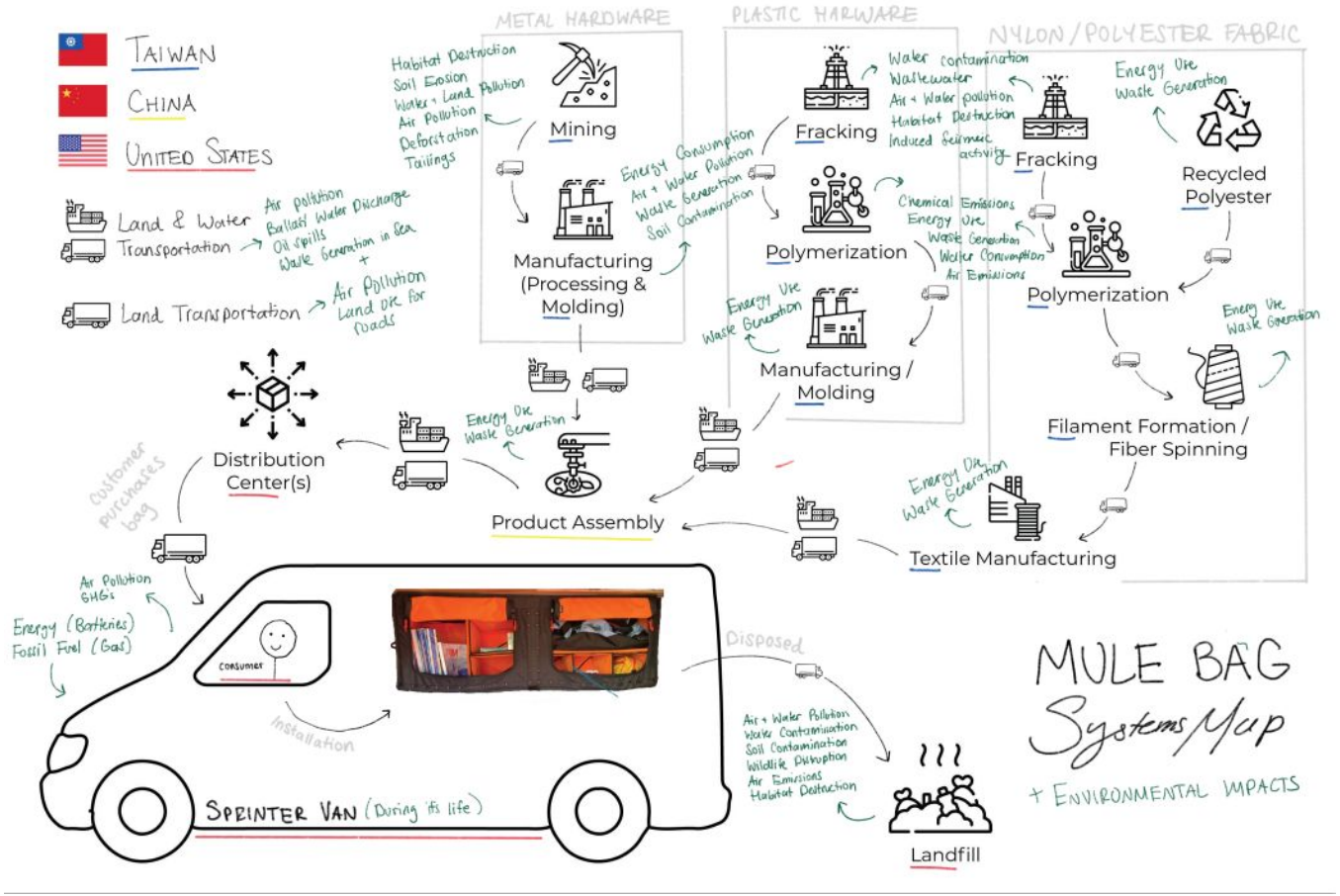
In-use aspect will be omitted because the Mule Bag doesn't take any energy to function, but the Mule Bag is designed to be used in a sprinter van and the environmental implications of van life go beyond our scope.

Impacts to consider:

- Energy / Fossil Fuels
- Greenhouse gas emissions
- Pollution: water, land, and air
- Resource depletion
- Human health

MULE BAG 2.0 SYSTEM MAP

Embarking on a comprehensive exploration, our Whole System Map of Adventure Wagon's Mule Bag illuminates its intricate workings—from material production, product assembly, and distribution to its end-of-life stage.



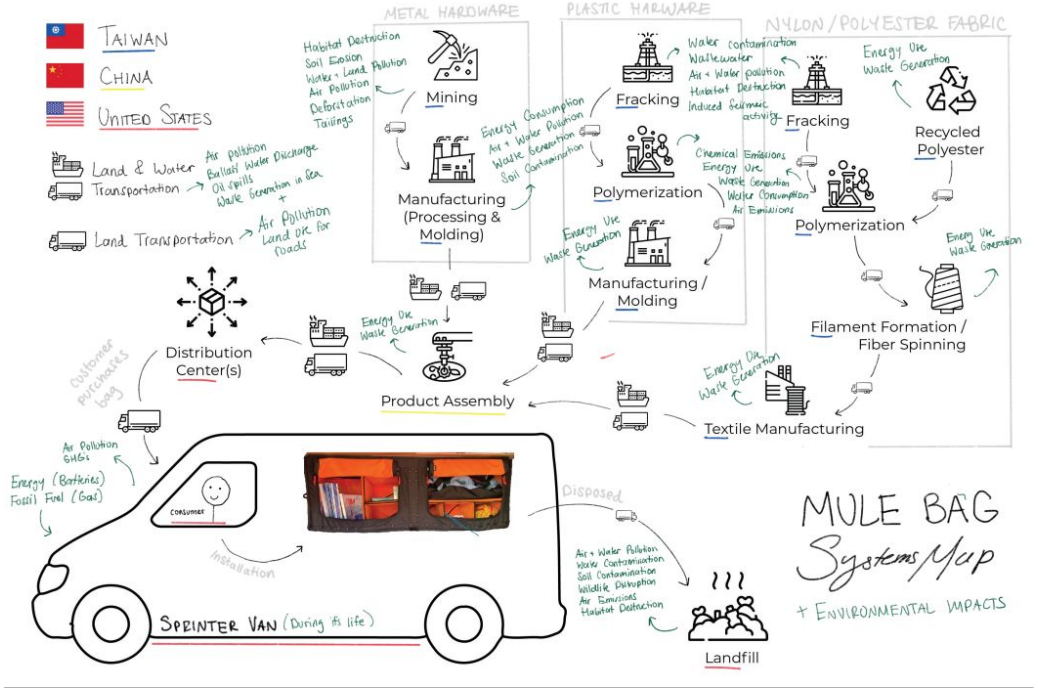
INSIGHTS

MULE BAG 2.0 SYSTEM MAP

Adventure Wagon's Mule Bag, was assessed through looking at each of the components weight and estimating material composition and manufacturing processes that was used in order to prepare Life Cycle Assessments (LCAs). We collectively determined the boundary, functional units, and System Bill Of Materials (BOM).

An LCA was prepared for the Mule Bag 2.0 and used as a base concept for the LCA. As a group we identified 3 scenarios for sensitivity that we believed had the potential to to enhance the LCA of the Mule Bag.

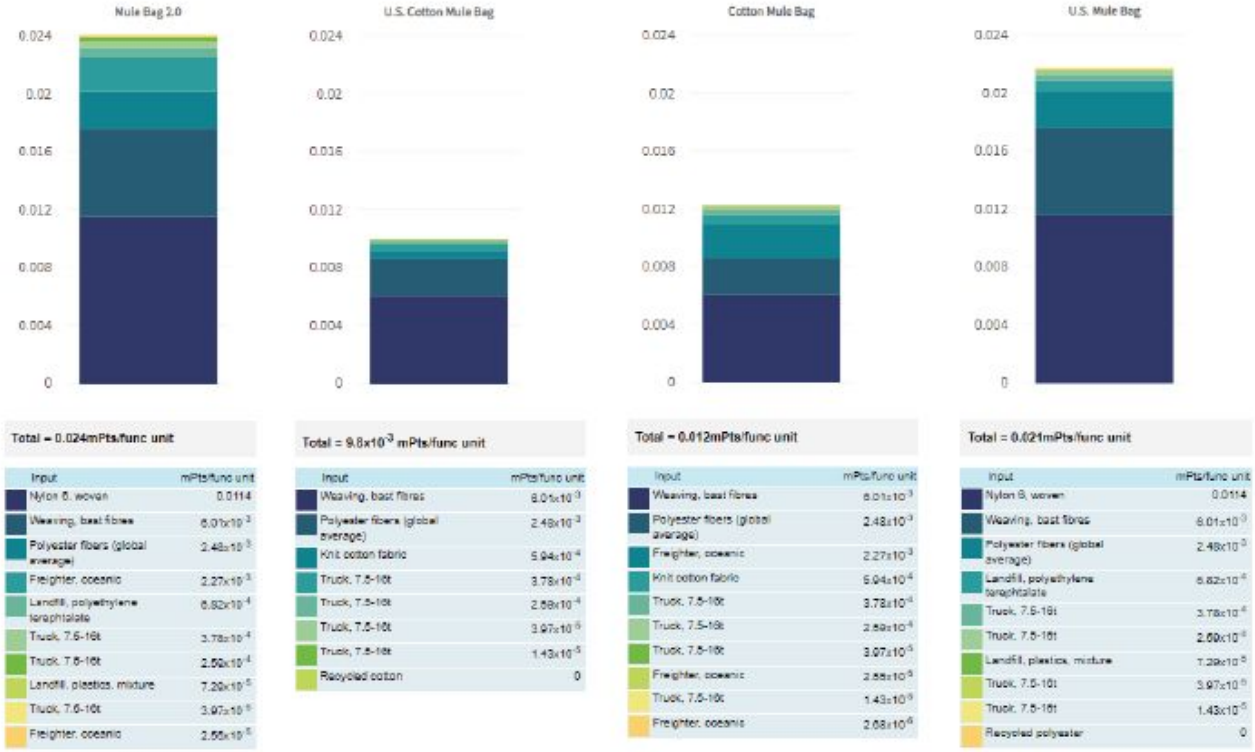
It is important to note that with the software we used (Sustainable Mind) we are unable to with 100% certainty guarantee that the LCA are correct and reliable as the data the software use is more generic and based on this the true LCA of the Mule bag can either be better or worse. Therefore this is only to be used as a guideline.



LCA

Impacts by SBOM Inputs: Total [mPts/func unit)

Reference

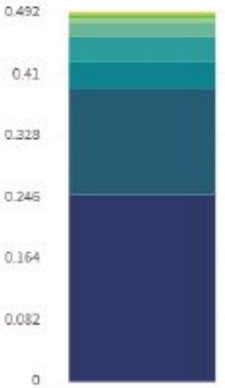


LCA's

Impacts by SBOM Inputs: Carbon footprint [CO2 eq. kg/func unit]

Reference

Mule Bag 2.0



Total = 0.49 CO_2 eq. kg/func unit

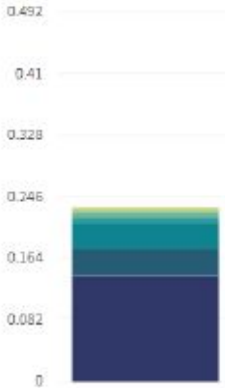
Input	CO_2 eq. kg/func unit
Nylon 6, woven	0.248
Weaving, bast fibres	0.142
Polyester fibers (global average)	0.0353
Freighter, oceanic	0.0325
Landfill, polyethylene terephtalate	0.0200
Truck, 7.5-16t	8.07×10^{-3}
Truck, 7.5-16t	4.16×10^{-3}
Landfill, plastics, mixture	2.34×10^{-3}
Truck, 7.5-16t	8.38×10^{-4}
Freighter, oceanic	3.65×10^{-4}

U.S. Cotton Mule Bag

Total = 0.20 CO_2 eq. kg/func unit

Input	CO_2 eq. kg/func unit
Weaving, bast fibres	0.142
Polyester fibers (global average)	0.0353
Knit cotton fabric	9.31×10^{-3}
Truck, 7.5-16t	8.07×10^{-3}
Truck, 7.5-16t	4.16×10^{-3}
Truck, 7.5-16t	8.38×10^{-4}
Truck, 7.5-16t	2.28×10^{-4}
Recycled cotton	0

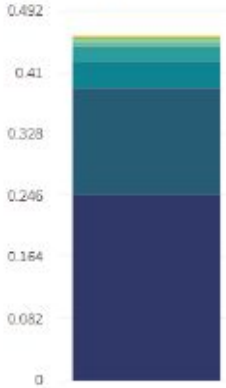
Cotton Mule Bag



Total = 0.23 CO_2 eq. kg/func unit

Input	CO_2 eq. kg/func unit
Weaving, bast fibres	0.142
Polyester fibers (global average)	0.0353
Freighter, oceanic	0.0325
Knit cotton fabric	9.31×10^{-3}
Truck, 7.5-16t	8.07×10^{-3}
Truck, 7.5-16t	4.16×10^{-3}
Truck, 7.5-16t	8.38×10^{-4}
Freighter, oceanic	3.65×10^{-4}
Truck, 7.5-16t	2.28×10^{-4}
Freighter, oceanic	3.83×10^{-5}

U.S. Mule Bag

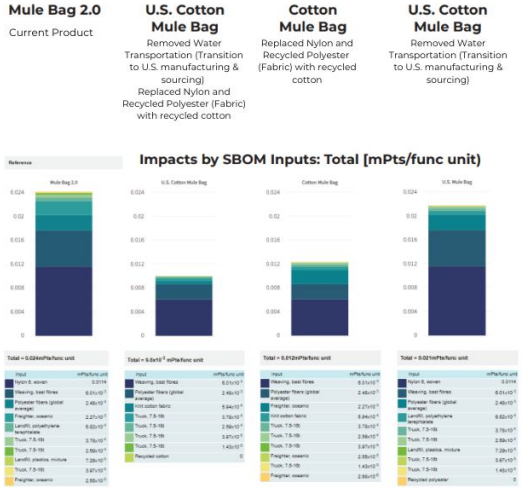


Total = 0.46 CO_2 eq. kg/func unit

Input	CO_2 eq. kg/func unit
Nylon 6, woven	0.248
Weaving, bast fibres	0.142
Polyester fibers (global average)	0.0353
Landfill, polyethylene terephtalate	0.0200
Truck, 7.5-16t	8.07×10^{-3}
Truck, 7.5-16t	4.16×10^{-3}
Landfill, plastics, mixture	2.34×10^{-3}
Truck, 7.5-16t	8.38×10^{-4}
Truck, 7.5-16t	2.28×10^{-4}
Recycled polyester	0

LCA REVIEW

MULE BAG 2.0 SYSTEM MAP



The Life Cycle Assessments (LCAs) for the Mule Bag focused on the main fabric and webbings, excluding hardware and containers due to their minimal contribution to the product's overall environmental impact. The decision to omit the in-use aspect was made as the Mule Bag requires no energy for functionality.

The priorities for sustainable design, involve using plant-based materials (50-90%), sourcing materials from other companies (50-80%), implementing take-back programs, expanding the brand to different demographic groups, local material sourcing in the U.S., and local manufacturing in the U.S. The focus is on reducing the carbon footprint during manufacturing and promoting sustainability through various initiatives.

It is also important to note that Adventure Wagon is already using a recycled polyester for the majority of the Mule Bag's materials and although it is better than virgin materials, it is crucial to explore alternatives as well as ways to keep the existing materials from the Mule bag in circulation for as long as possible.

INSIGHTS

IDENTIFIED REDESIGN PRIORITIES

Priority 1: Plant-Based Materials
Metric: 50–90% of the Mule Bag is made of plant- based materials
Per the LCA results, we found that the recycled polyester and nylon creates the greatest carbon footprint during the manufacturing stage.

Priority 2: Material Sourcing from other Companies
Metric: 50-80% of the Mule Bag is made of materials sourced from the liability materials of other companies (deadstock/waste/etc.)
Per the LCA results, we found that the recycled polyester and nylon creates the greatest carbon footprint during the manufacturing stage. The idea is to collaborate with another company to receive their material/fabric waste, reducing the need for new material and decreasing the other company's footprint as well.

Priority 3: Take-Back Programs
Metric: Take back program available (yes/no)
Take-Back Program is a convenient and eco-conscious initiative, allowing Mule Bag owners to return their old bags for recycling,responsible waste management, and the potential to earn rewards while supporting sustainability.

Priority 4: Expanding the Brand
Metric: Additional demographic groups purchasing the product (yes/no)
Ensuring that the story of sustainability is being told to expand consumer interest and the demographic groups buying the product. Increased profit can increase the dedication to sustainability.

Priority 5: Local Material Sourcing
Metric: Sourcing material in the U.S. (yes/no)
The Mule Bag is manufactured in China and shipped to the States. Supporting manufacturing in the states decreases transportation and supports the economy in the U.S. It also reduces transportation- related emissions and ensures the sustainability and quality of materials used in the product.

Priority 6: Local Manufacturing
Metric: Manufacturing in the U.S. (yes/no)
The Mule Bag is manufactured in China and shipped to the States. Supporting manufacturing in the states decreases transportation and supports the economy in the U.S..

MATERIAL EFFECTIVENESS

THOUGHTFUL DESIGN APPROACH

BACKGROUND

MATERIAL EFFECTIVENESS

In order to further analyse the Mule bag it was important to explore possible ways to reduce material and also to brainstorm different ideas to lightweight the product as well as ways to use the product as a service, aligning with the Design Brief criteria.

The winning design was illustrated, and a presentation was crafted, detailing the top ideas, the winning design, and its advantages. The presentation emphasizes material reduction comparisons and outlines how the chosen design benefits users and boosts company profitability compared to the current product.

Top Ideas

Lightweighting

- **Make one of the zipper pulls the bottle opener:** reducing one component.
- **Use naturally colored materials**: there are cottons that are naturally colored brown or green. No need for dyes.
- **Remove/replace all hardware:** Could the hardware be replaced with current fabrics? Could the hardware be minimal?

Product Service

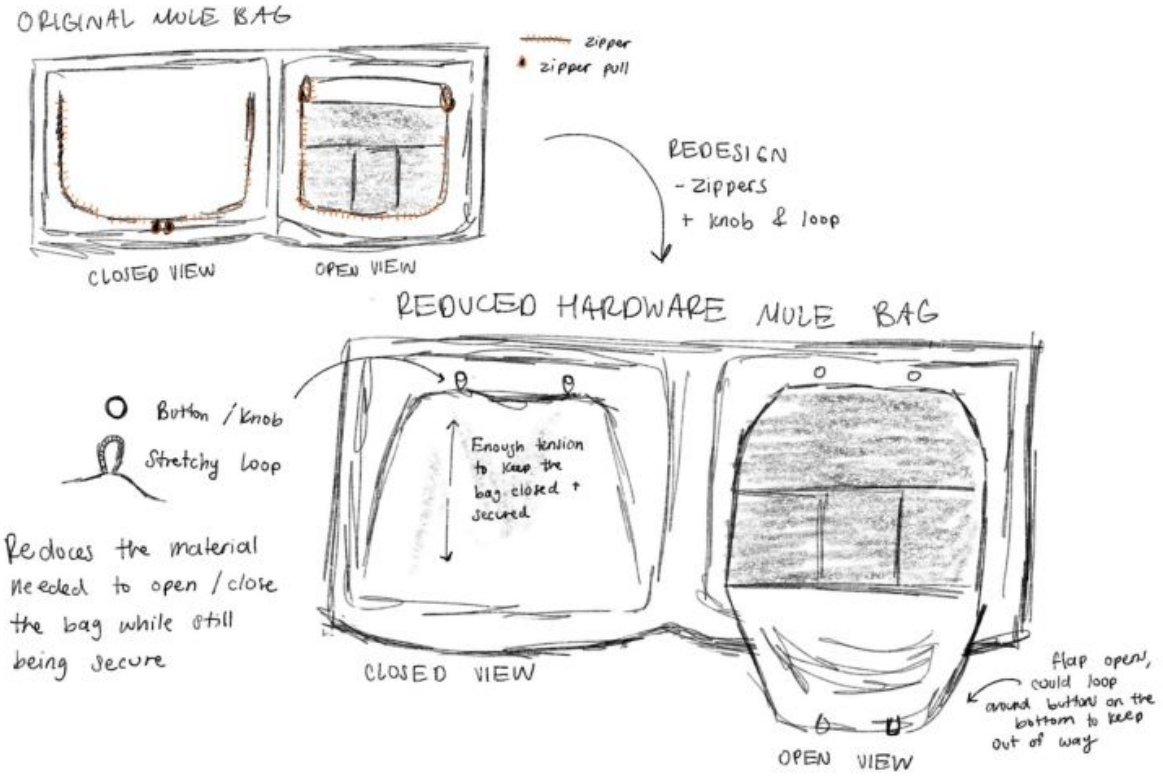
- **Mule Bag take back**: can exchange for a new color. Older version parts can be converted into new parts
- **Mule Bag recycling containers**. collect the Mule Bag, drop off at any recycling center, and receive a fresh one.
- **Mule Bag conversion:** once the bag is at its end, the bag could be returned and redesigned for another product (tote bag, hat, etc.)

Winning Design - Lightweighting

Remove/Replace all Hardware
20% material reduction

Naturally Colored Materials
10% material reduction

Zipper Bottle Opener
1% material reduction



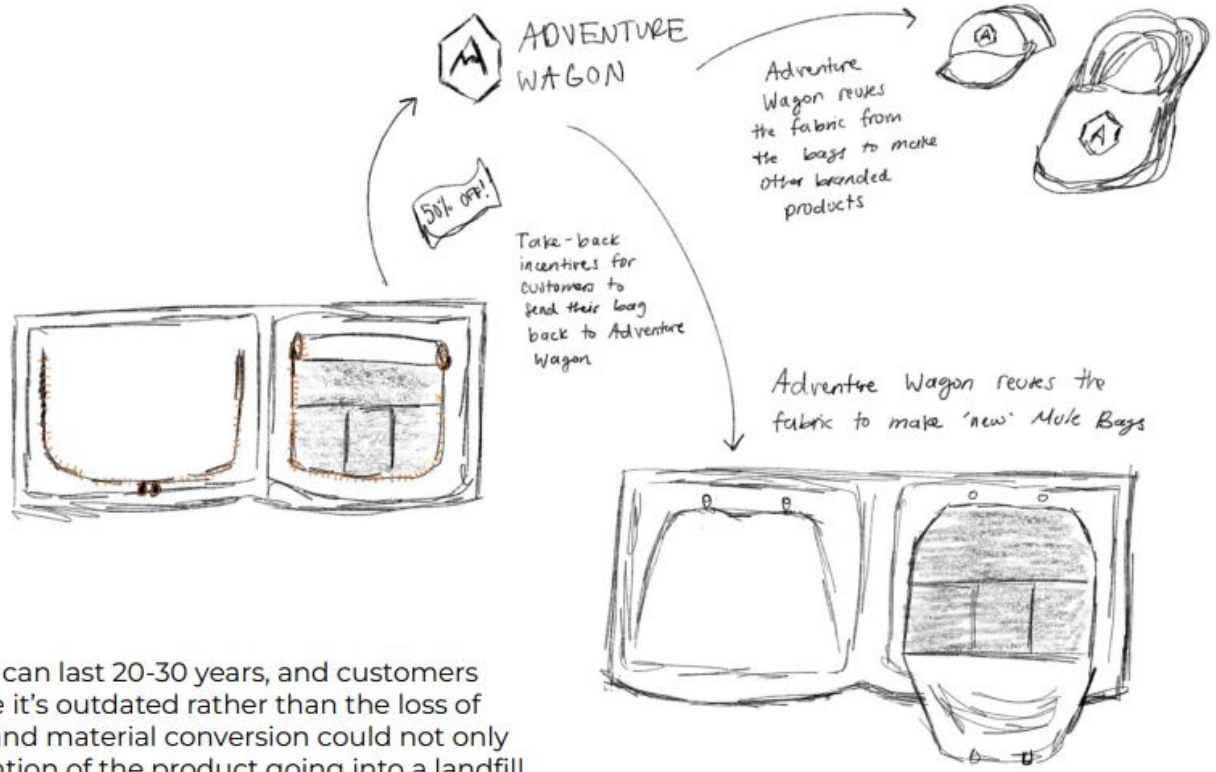
Winning Design - Service

Mule Bag Take Back

Mule Bag Recycling

Mule Bag Conversion

A take back program that includes coupons and discounts for customers could incentivize customers to return their old bag for a newer one, and/or the purchasing other of other products, further increasing profit, expansion of product line, and brand engagement.



James mentioned that the material can last 20-30 years, and customers typically get rid of their bag because it's outdated rather than the loss of functionality. A take back program and material conversion could not only support additional profit, but prevention of the product going into a landfill.

GOOD MATERIALS

THOUGHTFUL, SUSTAINABLE MATERIALS

MULE BAG 2.0 MATERIALS

SBOM SIMPLIFIED

MULE BAG 2.0 MATERIALS

MAIN MATERIALS

- Polyester Fabrics (main & lining)
- Nylon Mesh

TRIMS

- Polyester Webbing
- Nylon hook & loop

HARDWARE

- **Metal**
  - Zippers
  - Nuts, bolts
  - Bottle Opener
- **Plastics**
  - Knobs
  - Stifferners
  - Dividers
  - Zipper pulls

Majority of the materials used in the Mule Bag 2.0 is recycled polyester and nylon spandex textile.

What textile could replace recycled polyester and nylon spandex to increase sustainability for the Mule Bag? What materials could replace plastics? In the exploration of new materials, the following qualities are considered:

- Durability
- Life-time
- Manufacturing & end-of-life
- Elongation / sag over time
- Fire resistance
- Exposure to extreme heat/cold
- Area of manufacturing / raw materials

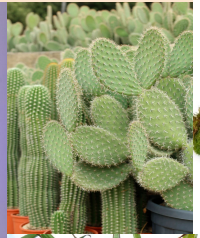
MATERIALS EXPLORED

Replace: Polyester Fabrics & Nylon Mesh

Fruit Leather Rotterdam

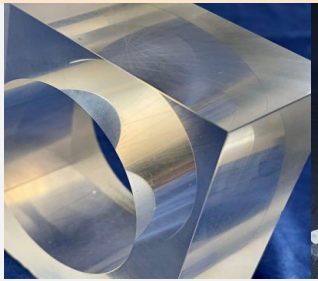
Qmonos Spiber

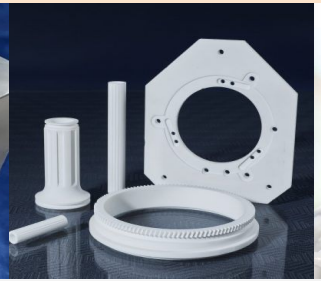
Werewool



Plant Based Leather Alternatives:
Piñatex, Desserto, Vegea

Mylo





Corning Glass ULE®

Trinseo

Replace: Hardware

BRAINSTORM MATERIAL REPLACEMENTS

FURTHER MATERIAL EXPLORATION

FABRICS/TRIMS:

- Cactus Leather
- Mylo (Mushroom Leather)
- Werewool (Mircobes)
- Pineapple Leather Piñatex, Desserto, Vegea
- Billboard canvas to be repurposed for bags
- Leftover textile fabric
- Worn out camping gear
- Denim (repurposed)
- QMONOS by Spiber
- Hemp
- Fruit Leather by Rotterdam

METALS:

- Glass Ceramics
- Corning Glass
- Sapphire
- Fused Quartz
- Boron Carbide
- Biosilicate Glass
- Recycled Metal
- Scrap Metal Accessories
- Smashed/Recycled Bottle cans

PLASTICS/ABS:

- Bio-resin
- Ceramics
- Metals
- Glass
- 3D filament / PLA
- Hemp
- Fishing line plastics

WINNING MATERIALS

TEXTILE REPLACEMENT:

Plant based leathers

- Fruit Leather Rotterdam
- Mylo
- Piñatex, Desserto, Vegea

WHY?

- Abundant, regnerative material
- Possibility of using food waste
- Can be grown locally
- Supports local manufacturing
- Long life span
- Variety of textile aesthetic

HARDWARE REPLACEMENT:

Corning Glass ULE

WHY?

- Easy to recycle
- Nearly zero thermal expansion
- Redesign of the Mule Bag has limited hardware

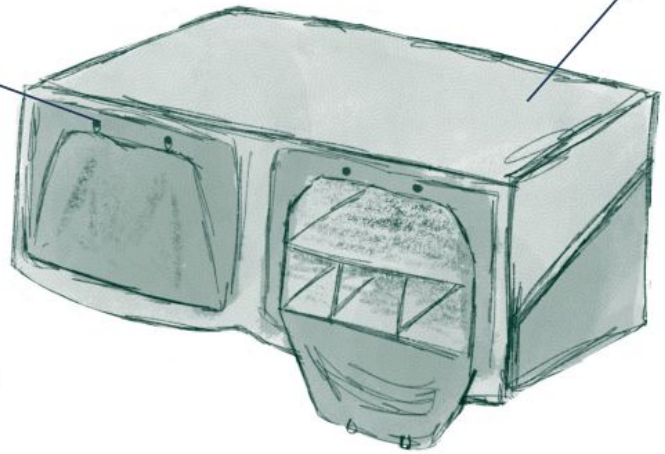
REDESIGN IDEAS

PLANT-BASED MULE BAG

Fruit Leather Rotterdam
Mylo
Piñatex, Desserto, Vegea

- Abundant, regnerative material
- Possibility of using food waste
- Can be grown locally
- Supports local manufacturing
- Long life span
- Variety of textile aesthetic

HARDWARE (BUTTONS)

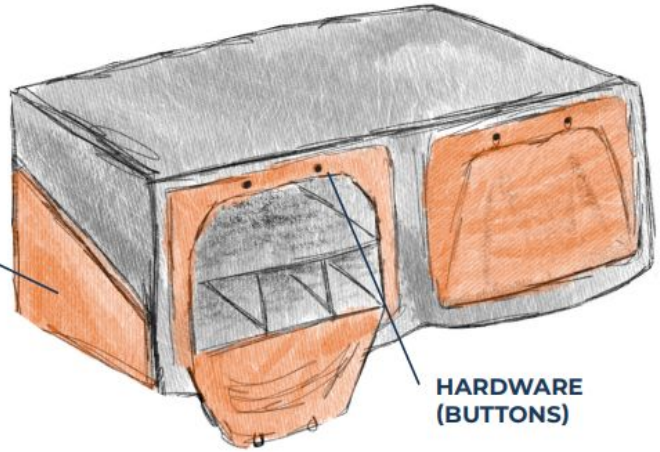


Scrap metal, wasted soda cans, etc. can be used for stiffeners - replaces plastic and utilizes waste

RECYCLED MULE BAG

Billboard canvases
Leftover bulk textile
Worn out camping gear

- Utilizes waste
- Cheap
- Can be local
- Durable

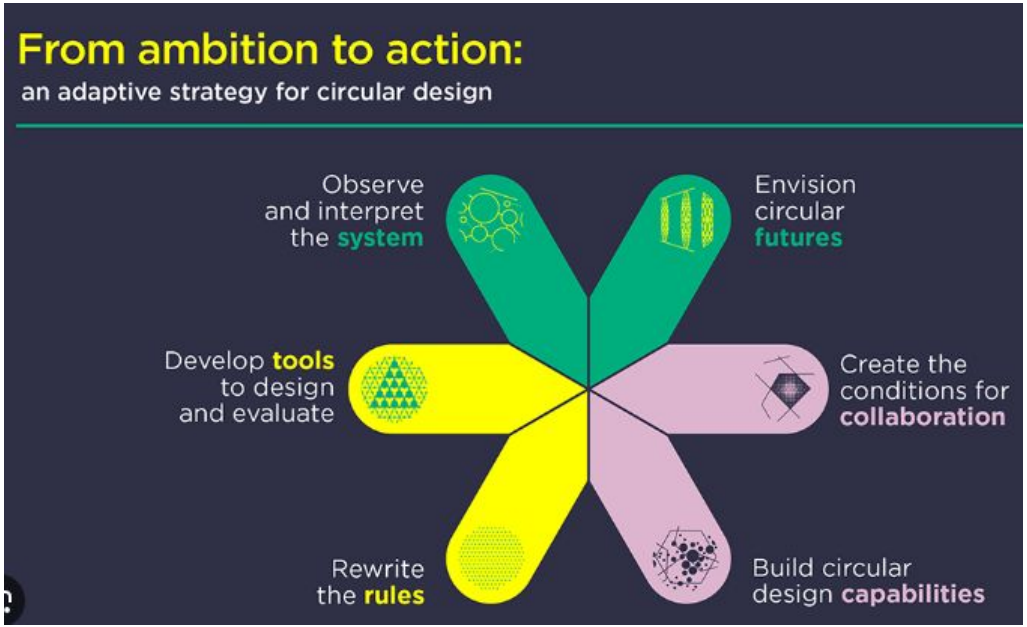


HARDWARE (BUTTONS)

HARDWARE

Corning Glass ULE

- Easy to recycle
- Nearly zero thermal expansion



CIRCULAR DESIGN

ADAPTIVE STRATEGY

INTRODUCTION

CIRCULAR DESIGN APPLICATIONS & CONSIDERATIONS

DESIGN PHASE

- Circularity
- Design Principles
- Durability
- Modularity
- Material Selection

MANUFACTURING PHASE

- Closed-Loop Manufacturing
- Use of Recycled Materials
- Minimal Waste Generation
- Collaboration with Suppliers

PRODUCT DISTRIBUTION

- Distribution Networks
- Collaboration with Retailer

CONTINUOUS IMPROVEMENT

- Feedback Mechanisms
- Research and Development
- Innovation

USE PHASE

- Product-as-a-Service
- Maintenance & Repair
- Customer Feedback Loop
- End-of-Life Decisions

END-OF-LIFE

- Take-Back Programs
- Refurbishment
- Recycling
- Material Recovery
- Waste Minimization

REGULATORY COMPLIANCE

- Environmental Regulations
- Industry Standards
- Consumer Regulations

STAKEHOLDER COLLABORATION

- Suppliers
- Manufacturers
- Retailers
- Customers
- Regulatory Bodies

COMMUNICATION & TRANSPARENCY

- Product Information
- Road and Safety
- Circular Initiatives
- Customer Engagement

MARKETING

PRODUCT, PEOPLE, PLACE, POSITIONING, PRESENTATION, & PACKAGING

MARKETING SUSTAINABILITY

What improved sustainable practices might most appeal to the company's core audience?

- Enhanced Eco-friendly Materials
- Circular Design and Product Longevity
- Carbon Footprint Reduction
- Packaging Innovation
- End-of-Life Solutions
- Education and Transparency
- Community Engagement

PRODUCT

Adventure Wagon delivers value through the following:

Adaptability
Adventure Wagon embodies a dynamic lifestyle, offering a versatile rig designed to adapt seamlessly to evolving adventures and interests, providing the freedom to embrace different seasons and activities, ensuring a journey perfectly suited to your changing needs, day after day, year after year. This can also align with sustainability values as you can reuse the same items in different configurations.

Functionality and Utility
The Mule Bag is designed to be highly functional, offering ample storage space, compartments, and features that cater specifically to the needs of adventure travelers. Its design allows for efficient organization and easy access to gear, making it a practical choice for outdoor enthusiasts.

Durability and Quality
Customers value products that last, especially in adventurous and rugged settings. The Mule Bag is made from durable, high-quality materials with the majority of the materials utilizing recycled materials, ensuring it can withstand the wear and tear of outdoor activities and travel, thus providing longevity and reliability.

PEOPLE

Consumer Demographics

Age

- Young to middle-aged adults (25-45 years old) who are actively pursuing outdoor adventures and seeking adaptable gear for various activities. (Includes Millennials 1982-1994)
- Older individuals (Retirees and empty nesters) who have money and time to spare who are seeking comfortable adventures.

Gender

While adventure enthusiasts come from diverse backgrounds, there might be a slightly higher focus on males or a relatively equal split between genders, considering the outdoor adventure market's historical gender skew.

Socioeconomics

Their audience could encompass a range of socioeconomic backgrounds, but predominantly those with middle to upper-middle incomes due to the investment often associated with quality adventure gear.

Education

Their target audience might comprise individuals with higher education levels, as this demographic often values sustainability, innovation, and the outdoors.

Psychographics (hobbies, interests, beliefs, values)

(Going through their social media and not evaluating the actual insights of the marketing data)

Marketing Data sheet (purpose of the assignment swap out for internal data)

Interest in Outdoor Sports

- Hiking
- Biking/Mountain biking
- Snowboarding
- Rock Climbing

General interest and fascination with Nature.

High value to be outside and travel

PLACE

The below details were retrieved from Sprout Social to provide insight to the different media channels

Facebook demographics and usage

- Number of monthly active users: **2.963 billion**
- Largest age group: **25-34 (29.9%)**
- Gender: 44% female, 56% male (no data on other genders)
- Time spent per day: **30 minutes**

YouTube demographics and usage

- Number of monthly active users: **2.1 billion worldwide**
- Largest age group: **15-35 (highest reach)**
- Gender: **51.4% female, 48.6% male** (no data on other genders)
- Time spent per day: **45.6 minutes**

Instagram demographics and usage

- Number of monthly active users: **2 billion** (self-reported), other reports cite **1.35 billion**
- Largest age group: **18-24 (30.8%)**
- Gender: **48.2% female, 51.8% male** (no data on other genders)
- Time spent per day: **30.1 minutes**

Twitter demographics and usage

- Number of daily active users: **237.8 million**
- Largest age group: **18-29 (42%)**
- Gender: **34.1% female, 61.29% male** (no data on other genders)
- Time spent per day: 34.8 minutes

LinkedIn demographics and usage

- Number of members: **930 million**
- Largest age group: **30-39 (31%)**
- Gender: **43% female, 57% male** (no data on other genders)
- 63% of **LinkedIn users access** the network weekly, 22% daily (in 2020)

Pinterest demographics and usage

- Number of monthly active users: **450 million**
- Largest age group: **25-34 (28.5%)**
- Gender: **76.2% female, 17% male, 6.6% unspecified**
- Time spent per day: **14.2 minutes**

POSITIONING

SWOT (as it relates to sustainability)

Strengths, weaknesses, opportunities, threats

Strengths Versatility and Modularity Innovative Brand Identity	**Weaknesses** Price Point Limited market awareness Product availability Supply chain issues Small business
Opportunities Market Expansion Partnerships & collaborations Sustainability expansion Product expansion	**Threats** Economic Factors Regulatory Changes Competitive Market Gas Prices Sprinter Van Ownership

Why do these people engage with the company?

Customer reviews on various forums and Adventure Wagon's website indicate that consumers engage with the company due to the quality, versatility, adaptability, and ease of installation of its products. The Moderately Adventurous Blog has praised Adventure Wagon's offerings as "Functional as they are beautiful".

The company's website facilitates the creation of a tailored adventure van, providing cost calculations and offering full-service options with accredited installers to convert vans within 2-3 weeks for upcoming adventures. While there is also a self-installation option available, it appears to be less preferred, with most consumers favoring the convenience of the full installation service, allowing them to simply relish their adventures.

BRAINSTORM

PROMOTION

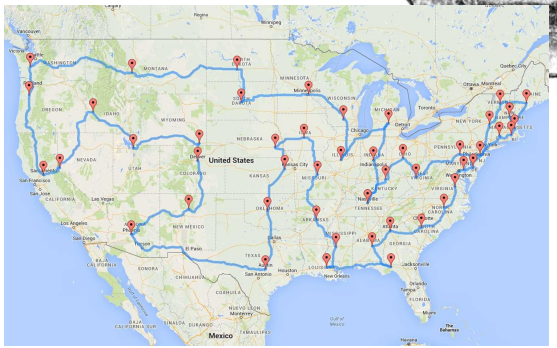
Michelle's fav
Vern's fav
Mariska's fav

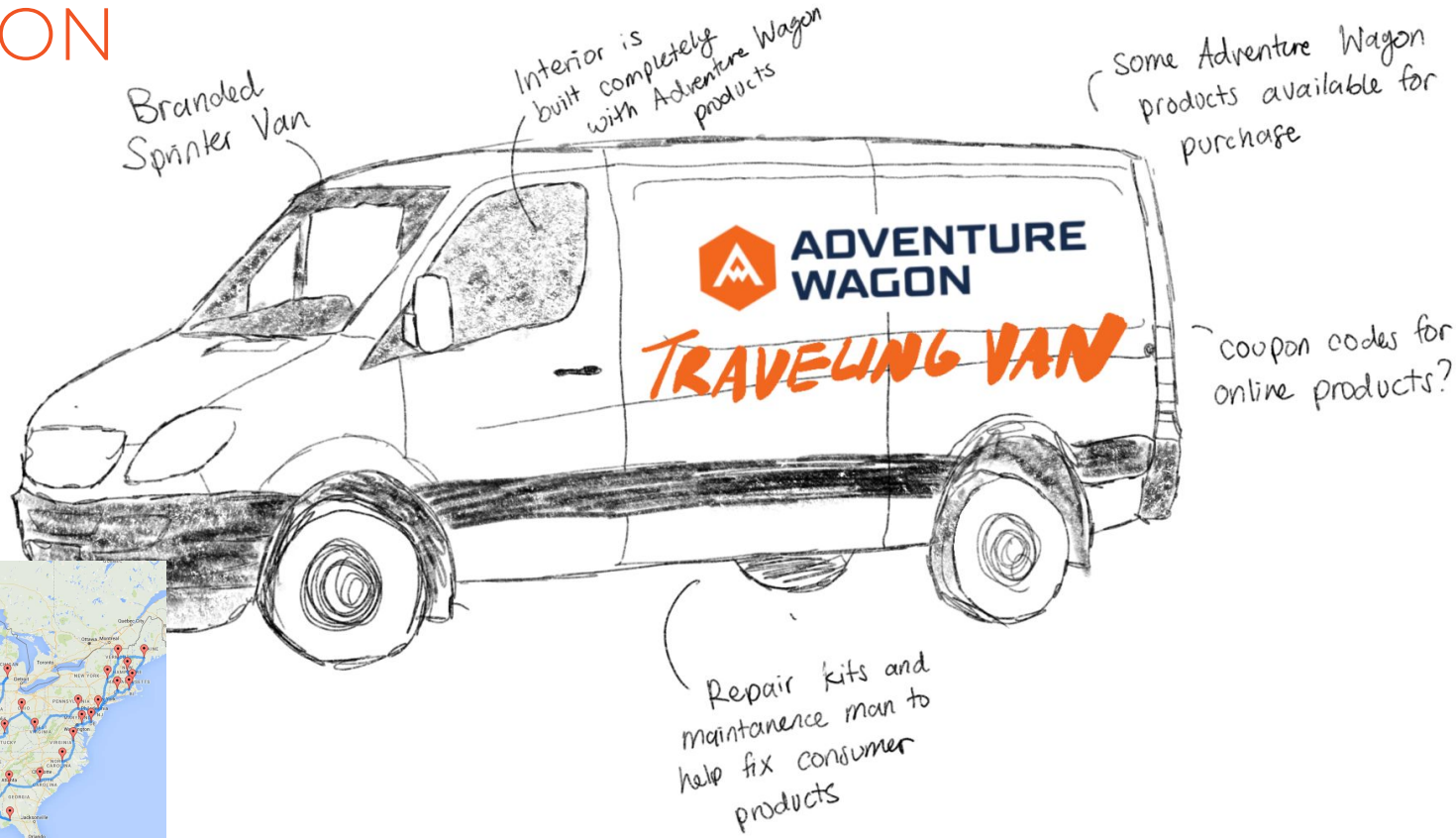
1. Collaborative Limited Editions (Patagonia, tent companies for special mule bags or products using repurposed materials.
2. Webinars or workshops
3. Interactive Product showcases (Virtual or in person), showcasing products and
4. Partnerships
5. Interactive Educational Apps or Tools: (Best ways to use you Mule Bags)
6. Virtual Adventures : Showcase what configurations for what adventures
7. Sustainability Podcast Series: Discussing sustainability, adventure, and outdoor practices. Invite guests from environmental and adventure fields to share insights, stories, and tips, creating engaging content for environmentally conscious adventurers.
8. Trade show booths that have the Van set up - OR (Outdoor Retail), GrassRoots, Etc (Envision their adventure)
9. Have a Van that travels around promoting the product. Can make stops at popular destinations for for Van-lifers. National Parks, Rest Stops, etc.. Could be the Van in Patagonia's repair van.
10. Create data pamphlets, that show the smaller footprint of a van life. Or how it could potentially be a cost savings for a user (such as not paying a rent expense).
11. Addressing the WHY for the brand- really create a compelling story to resonate with the consumer.
12. Also talk about what they are doing welling in the arena of sustainability. Don't green-hush themselves in the fear of green-washing

DESIGN IDEA

PROMOTION

Traveling Van to promote Adventure Wagon and their products and services. Stops at popular destinations for van-lifers: national parks, campsites, rest stops, cities, etc..





BRAINSTORM

PACKAGING

Michelle's fav
Vern's fav
Mariska's fav

1. Sustainable Materials (Recyclable or biodegradable and reducing the use of harmful materials like styrofoam)

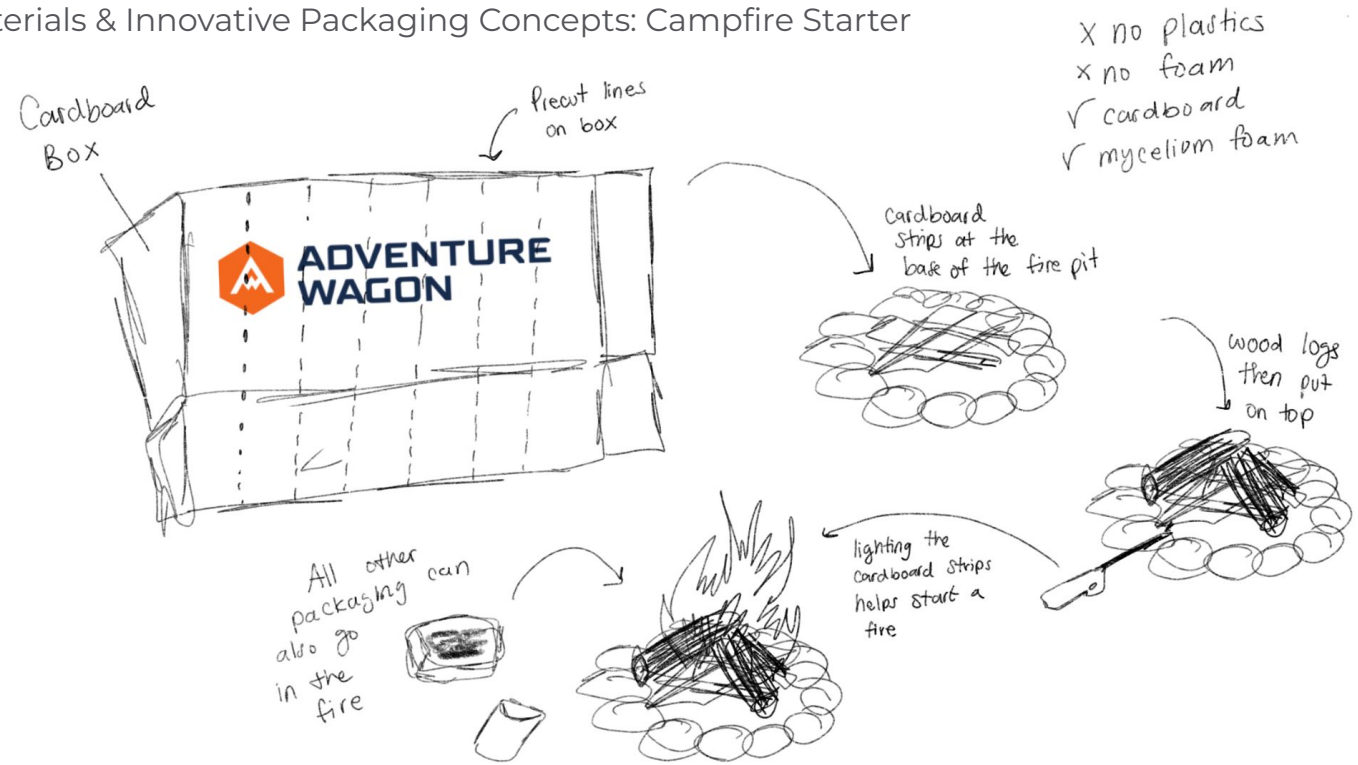
2. Explore innovative packaging concepts: transform packaging into multipurpose utilities for consumers—like using a cardboard box as a campfire starter—and consider interactive packaging that serves as practical tools for future adventures or engages users in activities such as board games.

3. Storytelling through their packaging (Who gives a crap is a great example of this) (visuals, infographics, or QR codes linking to videos)

DESIGN IDEA

PACKAGING

Sustainable Materials & Innovative Packaging Concepts: Campfire Starter



DESIGN DECISION MATRIX

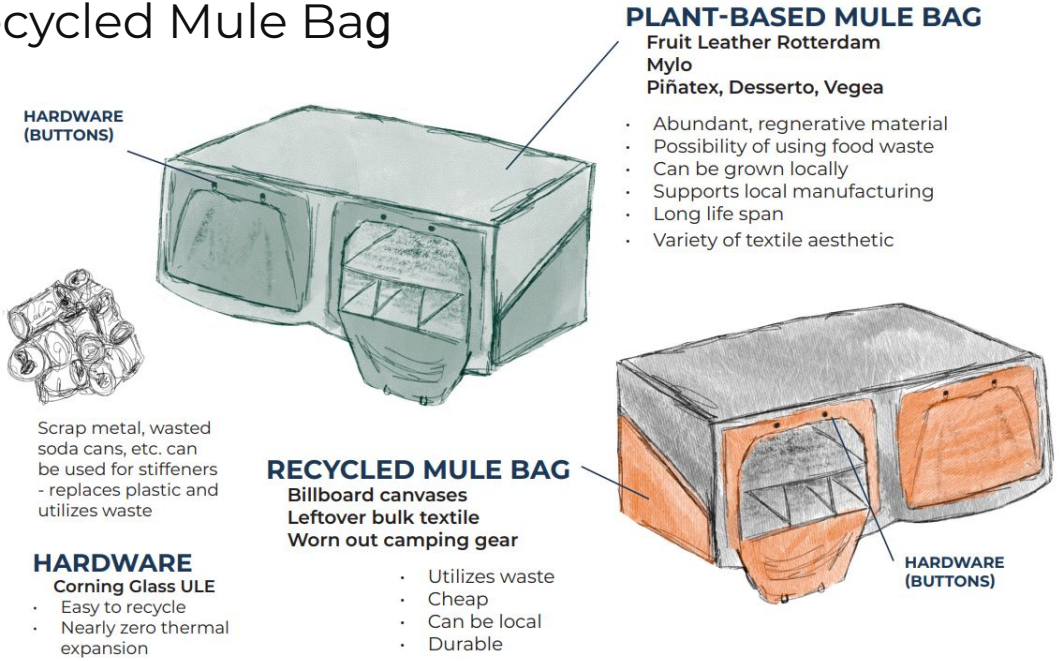
In our quest to optimize the design process, we're employing a design matrix, allowing us to systematically evaluate and prioritize various elements against our design brief priorities, crucial to enhancing Adventure Wagon's Mule Bag.

	Design #1 Lightweighting	Design #2 Plantbased	Design #3 Circular Design
Plant-Based	2	5	2
Material from Waste	2	2	5
Take-Back Programs	4	3	5
Expanding the Brand	1	5	5
Local Material Sourcing	1	4	5
Local Manufacturing	1	4	5
Benefits	Reduces material and energy consumption	Reduces energy, utilises regenerative sources. Using abundant and renewable materials.	Reduces waste, utilising existing “waste”. Create products and return a profit without more material demand.
Total Score	**13**	**21**	**27**

CONCLUSION

REVIEW OF THE NEW DESIGN

Plant Based Mule Bag & Recycled Mule Bag



Utilizing the Design Decision Matrix and aligning the scores against our design priorities, it became evident that Circular Design (the **Recycled Mule Bag**) emerged as the winner through waste reduction, enabling further product creation, and profitability without further material demand.

The **Plant-Based Mule Bag** came in second through the reduction of energy, typically through regenerative sources, and utilizes abundant and renewable options for the main material.