Microfiber Snapshot:

Patagonia's involvement in microfiber research

2018 Recycling Council of Alberta

Steph Karba

stephanie.karba@patagonia.com

Material Innovation and Development Department

patagonia

- **Environmental Researcher** in the Materials Innovation and Development Department
  - Microplastics point person
  - Quantify environmental impact of our materials
  - Materials science research
- BS in Hydrology from UCSB
- Masters in Environmental Science & Management from the UCSB Bren School

UCSB
UNIVERSITY OF CALIFORNIA
SANTA BARBARA

BREN SCHOOL · UCSB

patagonia

25 Years of Recycled Polyester

Leading the apparel industry's use of recycled plastics since 1993. This year alone, we reused 12,548,300 plastic bottles to make your favorite garments.

How is your clothing made?

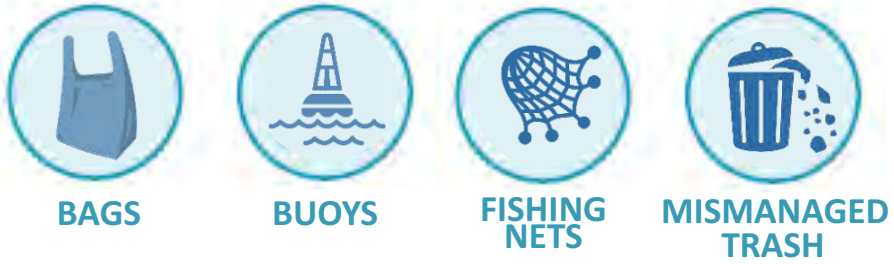
patagonia®

Terms & Focus of the Day

Macroplastics

Plastic particles larger than 2.5 cm (GESAMP)

Includes everything plastic -- plastic bags, food packaging, fishing nets and gear, buoys, balloons



Microplastics

Plastic particles smaller than 5 mm in their longest dimension (Thompson et al. 2009; Masura et al. 2015)

Includes fragments, pellets, films, foams, and fibers

patagonia

Inside the lonely fight against the biggest environmental problem you've never heard of

In 2011, an ecologist released an alarming study showing that tiny clothing fibers could be the biggest source of plastic in our oceans. The bigger problem? No one wanted to hear it

npr KUNC news arts & life music programs shop

the salt WHAT'S ON YOUR PLATE

FOOD FOR THOUGHT

Are We Eating Our Fleece Jackets? Microfibers Are Migrating Into Field And Food

February 6, 2017 · 1:21 PM ET

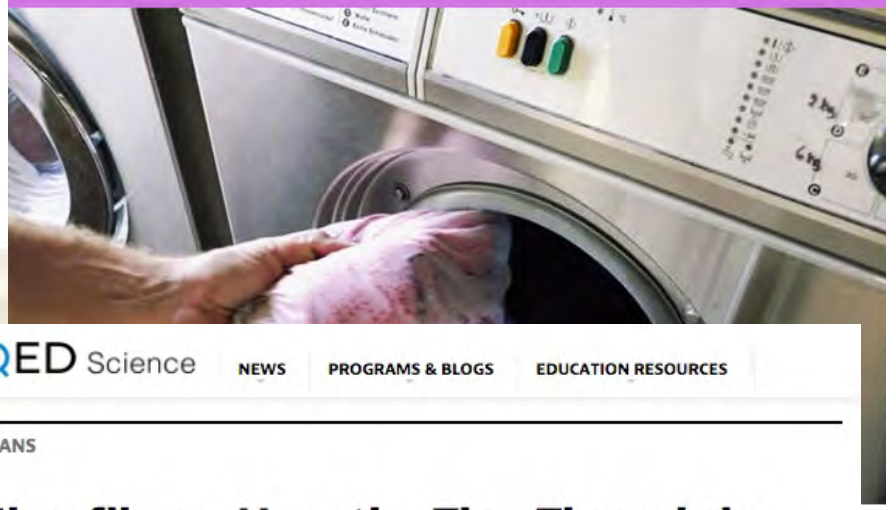
JESSICA BODDY

ckets could be ending up in rivers, fields and our diet.

ges

Your Fleece Jacket Is Polluting The Ocean: This Laundry Bag Can Help

The Guppy Friend keeps the microfibers from synthetic clothes from ending up in the ocean—and inside sea life.



How Plastics In Your Clothes Are Polluting The Environment

By REBECCA THIELE • NOV 28, 2016

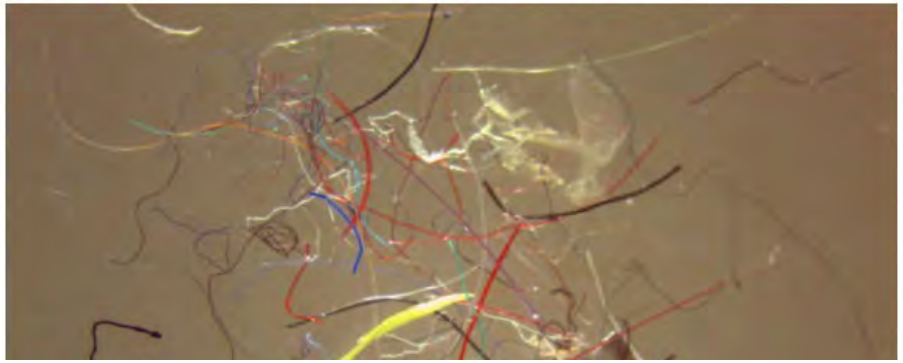
Tweet
Share
Google+
Email

patagonia

KQED Science NEWS PROGRAMS & BLOGS EDUCATION RESOURCES

OCEANS

Microfibers: How the Tiny Threads in Our Clothes Are Polluting the Bay



Patagonia's Engagement

Fund Research	Test Method Working Group	Product Innovations	Support NGOs	Customer Education
BREN SCHOOL · UCSB	AATCC®	bureo	SFEI SAN FRANCISCO ESTUARY INSTITUTE	the Cleanest Line

patagonia

Fund Research

2015 - 2016

2017 - 2019

2017 & 2018

patagonia

Fund Research

Microfiber Pollution & the Apparel Industry

Nicholas Bruce | Niko Hartline | Steph Karba | Bess Ruff | Shreya Sonar
Faculty Advisor: Dr. Patricia Holden

"Microfiber Masses Recovered from Conventional Machine Washing of New or Aged Garments"
September 30, 2016

- **All Garments Shed**
- **Washing Machines Matter:** Top load machine use results in **~7x** more fibers recovered than from front load machines
- **Quality and Age of Garment Matters:** Aging results in **25%** more fibers recovered; A lower quality product resulted in **41%** more fibers recovered

patagonia

Fund Research

Salt

Yang et al. (2015)
Karami et al. (2017)

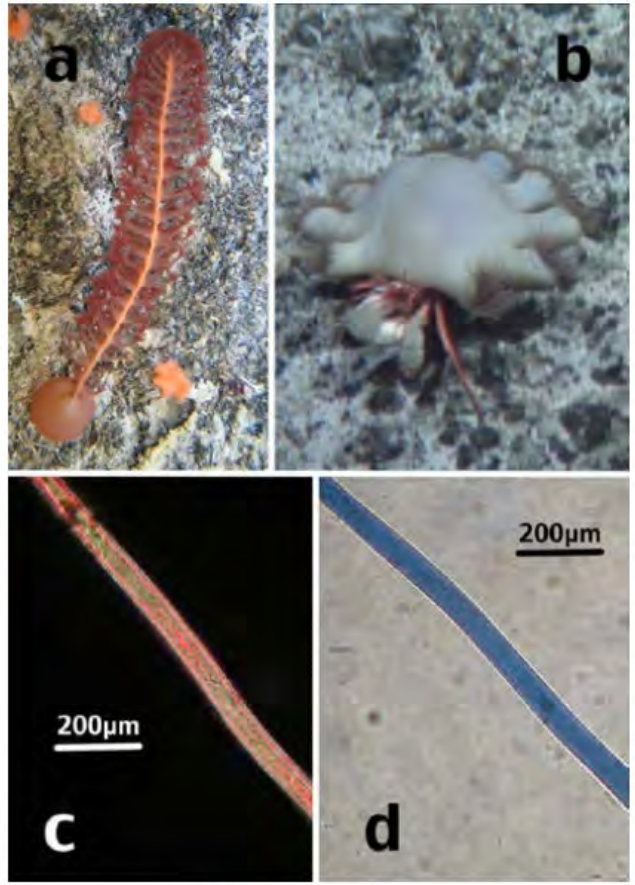
Sewage Sludge

Mahon et al. (2017)

Browne et al. (2011); Miller et al. (2017); Baldwin et al. (2016)

Arctic Ice

Obbard et al. (2014)



Inside Organisms

Taylor et al. (2015)

patagonia

Fund Research

- **Fiber Release:** Quantify fiber shedding from 39 fabric samples provided by 4 outdoor brands - Patagonia, MEC, REI and Arcteryx
- **Materials Weathering Study:** 1 year of fabric exposure to the ambient air and marine environment and chemical composition characterization matching using high resolution FT-IR spectroscopy.
- **Wastewater Treatment Research:** Evaluate microplastic and microfiber capture at Metro Vancouver WWT facilities.

Wastewater Management – Research

- 4 peer reviewed papers on effectiveness of WWTPs – showed removal rates of 65-98%
- Results of study with MetroVancouver were just published in Science Direct (Gies et al., 2018)
- A subset of fibers was analyzed - approximately **32.4%** of suspected microplastics were plastic polymers.
- Approximately 99% of all microplastics are retained in WWTP biosolids
  - However, biosolids are applied to agricultural land
- Population of 1.3 million - estimate that **1.76 ± 0.31 trillion MPs enter the WWTP annually.**

patagonia

Fund Research

College of Textiles – Senior Design Project

- **2017 Group:** First iteration of microfiber release test method for accelerated laundrometer
- **2018 Group:** Accelerated laundrometer test method refined and shared with AATCC RA100 working group; Began to identify fabric, yarn, and fiber characteristics that likely lead to increased or decreased shedding

patagonia

Opportunities to Fund Research

1. **Material Flow and Hotspot Analysis for Synthetic Microfibers**
   - $100,000
2. **Understanding Environmental Effects of Microfibers**
   - $150,000

1. **Polymer Design**
   - $150,000
2. **Sensing Technology**
   - $150,000
3. **Modeling of Microplastic Transport**
   - $150,000

patagonia

Fabric Shedding Test Method Development

AATCC is leading the charge with regards to testing for the presence of microfibers in laundering wastewater. AATCC Committee RA 100, Global Sustainability Technology, is developing a new test method, Fiber Release During Laundering: Accelerated.

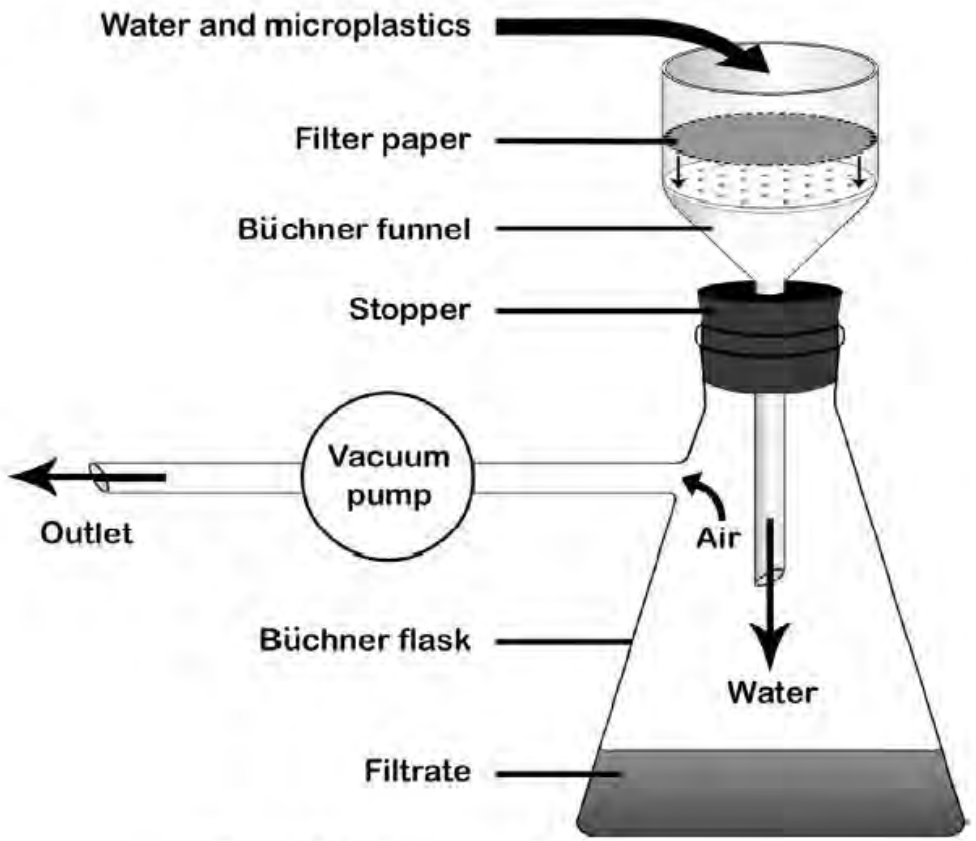


Figure 9.1 A vacuum filtration system.

patagonia

Test Method Progress

		Sample 1	Sample 2	Sample 3	Sample 4	TOTAL
Old Method: Full Garment, Standard Washing Machine	**Water**	120 L + 120L blank	120 L + 120L blank	120 L + 120L blank	120 L + 120L blank	960 Liters
	Time	45 min + 45 min blank	45 min + 45 min blank	45 min + 45 min blank	45 min + 45 min blank	6 Hours

patagonia

Test Method Progress

		Sample 1	Sample 2	Sample 3	Sample 4	TOTAL	
Old Method: Full Garment, Standard Washing Machine	**Water**	120 L + 120L blank	120 L + 120L blank	120 L + 120L blank	120 L + 120L blank	960 Liters	
	Time	45 min + 45 min blank	45 min + 45 min blank	45 min + 45 min blank	45 min + 45 min blank	6 Hours	
New Method: Fabric Swatch, Accelerated Laundrometer	**Water**	150 mL + 600 mL for filtering	150 mL + 600 mL for filtering	150 mL + 600 mL for filtering	150 mL + 600 mL for filtering	3 Liters	**-99%!**
	Time	45 Minutes				45 Minutes	**-87%!**

patagonia

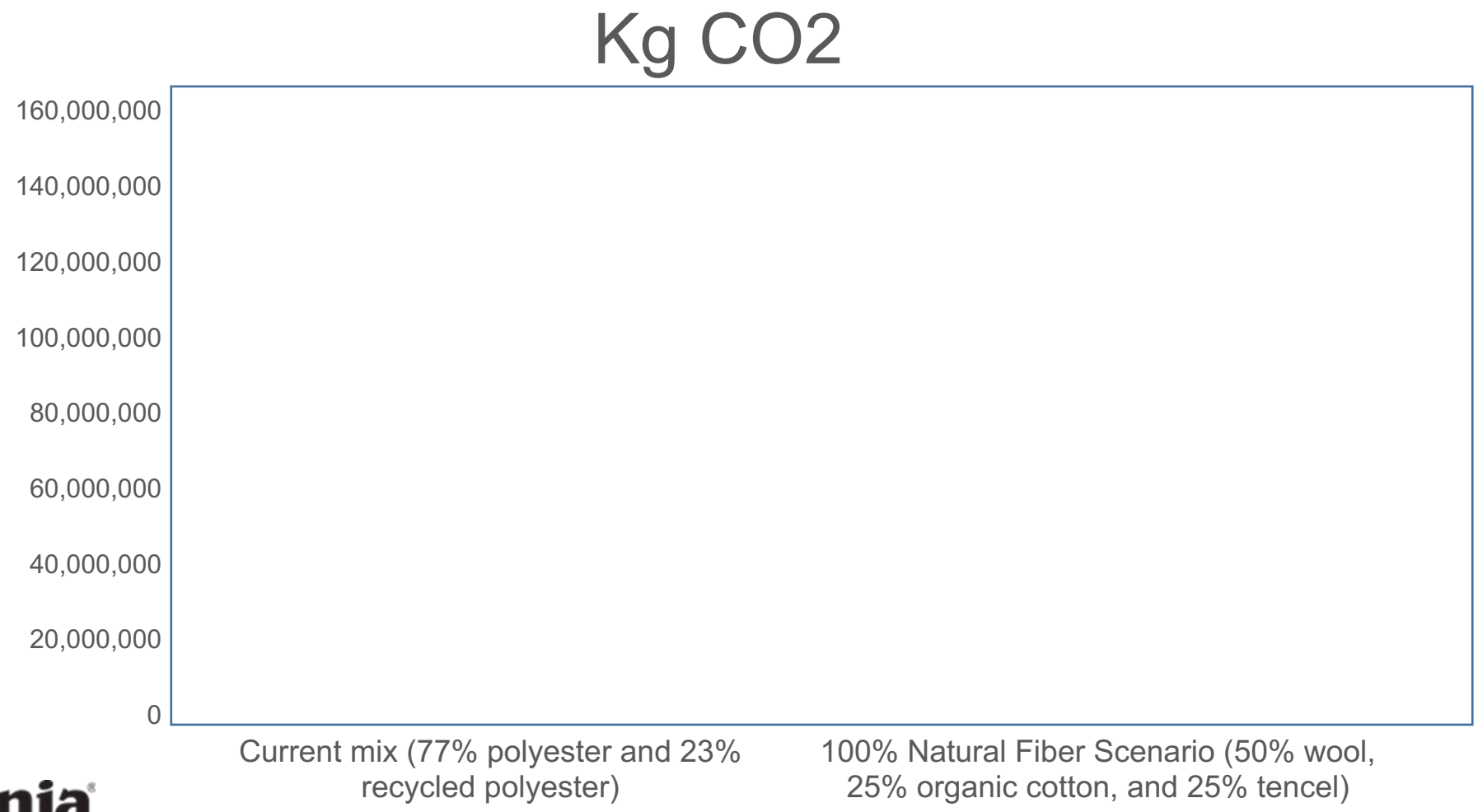
Material Innovation Opportunities

- **Yarn:** Type, Twist
- **Production:** Pre-Washing, Cutting
- **Chemical Finishes:** Additives
- **Mechanical Finishes:** Brushing, Napping, Tumbling

GOAL? → Set a maximum allowable shedding threshold for materials

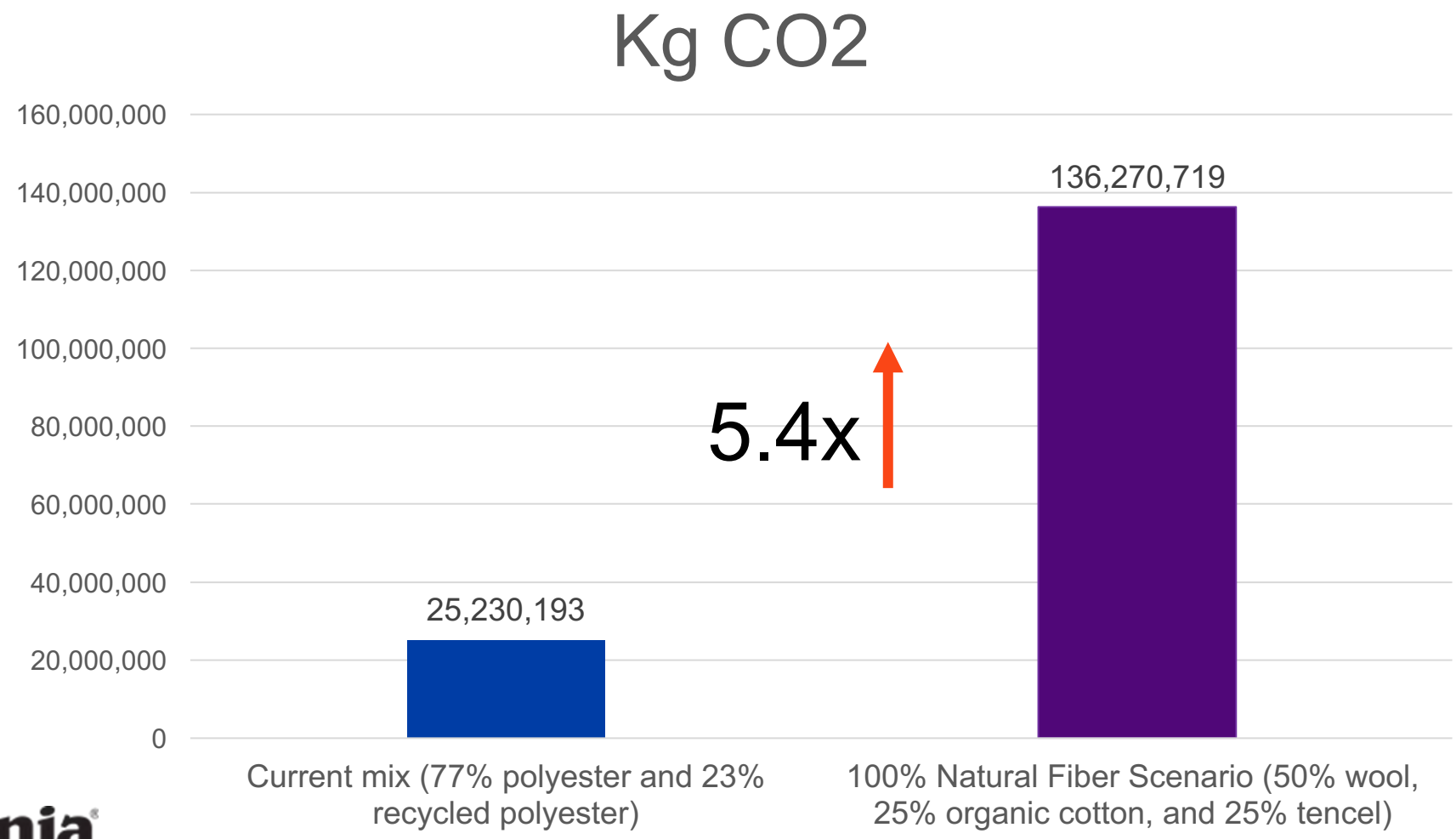
patagonia

The Case for Synthetics



patagonia

The Case for Synthetics



patagonia

Product Innovation Opportunities

adidas | PARLEY

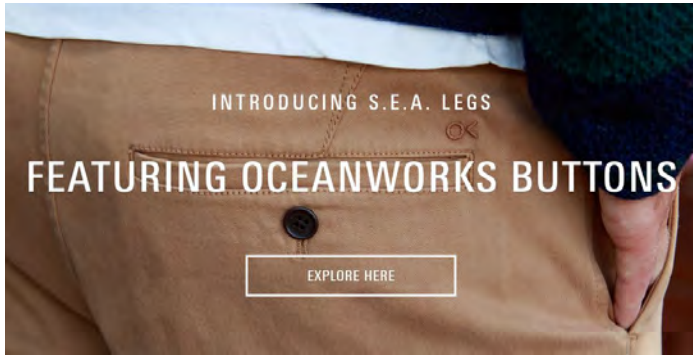
OCEANWORKS

OUTERKNOWN

thread

Timberland

bureo | patagonia | COSTA



patagonia

The Unicorn Material

Biobased + Biodegradable + Durable + Recyclable

patagonia

Support NGOs

- **San Francisco Estuary Institute** – quantifying microplastic and microfiber pollution in the SF Bay and adjacent National Marine Sanctuaries.
- **Surfrider Foundation** – collaborative work with Heal the Bay to reduce plastic from entering the ocean
- **Heal the Bay** - collaborative work with Surfrider Foundation to reduce plastic from entering the ocean
- Since 2010 Patagonia has given over $200,000 in grants to NGOs working on plastic pollution

patagonia

SFEI | AQUATIC SCIENCE CENTER
SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

SURFRIDER FOUNDATION

Customer Education

"Addressing the shedding of microfibers from synthetic garments continues to be a top priority for us at Patagonia."

patagonia

Customer Education - Action

- **When you buy, buy high-quality products**
- **Learn what your clothes are made of**
- **Wash less often**
- **Invest in a front-load washer**
- **Fiber filters help**
  - GuppyFriend Washing Bag
  - Wexco Filtrol 160 / Lint LUV-R
  - Cora Ball

patagonia

Filters

Guppy Friend

Wexco Filtrol

Cora Ball

patagonia

Lint Filters in Japan!!

- 2 types : “Screen Mesh” type and “Box-Type”

- “Screen Mesh” type has been the mainstream in the past.
- Newly released washing machines tend to have “box-type” lint filter rather than “screen mesh” filter to avoid being easily tore.

patagonia

Microfiber Legislation

California Bill → AB 2379
Did not pass

CALIFORNIA LEGISLATURE—2017–18 REGULAR SESSION

ASSEMBLY BILL **No. 2379**

Introduced by Assembly Member Bloom
(Coauthors: Assembly Members Gonzalez Fletcher and Mark Stone)

February 14, 2018

(1) For clothing for which machine washing or hand washing is recommended or required: "This garment sheds plastic microfibers when washed. Hand washing recommended to reduce shedding."

patagonia

Connecticut Bill → CTSB 341
Passed

General Assembly **Raised Bill No. 341**

February Session, 2018 LCO No. **1411**

01411_____ENV

Referred to Committee on ENVIRONMENT

Introduced by:

(ENV)

AN ACT CONCERNING CLOTHING FIBER POLLUTION.

Thank you!

Steph Karba

stephanie.karba@patagonia.com

"We banned leaded gasoline. We managed to tackle ozone depletion. Humankind has a long history of creating environmental problems, but we're also starting to have a track record for solving environmental problems."

Roland Geyer, Professor of Industrial Ecology at the UCSB Bren School

patagonia