REDUCING MICROFIBER POLLUTION:

An Industry Playbook

Design Solutions

5 GYRES
SCIENCE TO SOLUTIONS

The Nature Conservancy

www.5gyres.org/MicrofiberPlaybook

REDUCING MICROFIBER POLLUTION:

Design Solutions

Introduction

Microfibers are released into the environment throughout a garment's lifecycle: from manufacturing to wear, washing, and disposal. By making intentional choices in material selection, construction, and finishing, designers can drastically reduce garment shedding and support brands committed to reducing their microfiber emissions footprint.

This guide equips designers with general and accessible interventions to balance technical, aesthetic, and commercial demands while mitigating microfiber pollution. The emphasis is on "easy wins"—high-confidence strategies that are low effort but high-impact for reduced microfiber shedding.

These design solutions can lead to enhanced material performance and increase the durability and lifespan of clothing, ensuring that we are designing better clothes that last longer.

Note: *This guide does not establish shedding reduction targets. Rather, it points to examples and strategic design choices that brands can explore and test.*

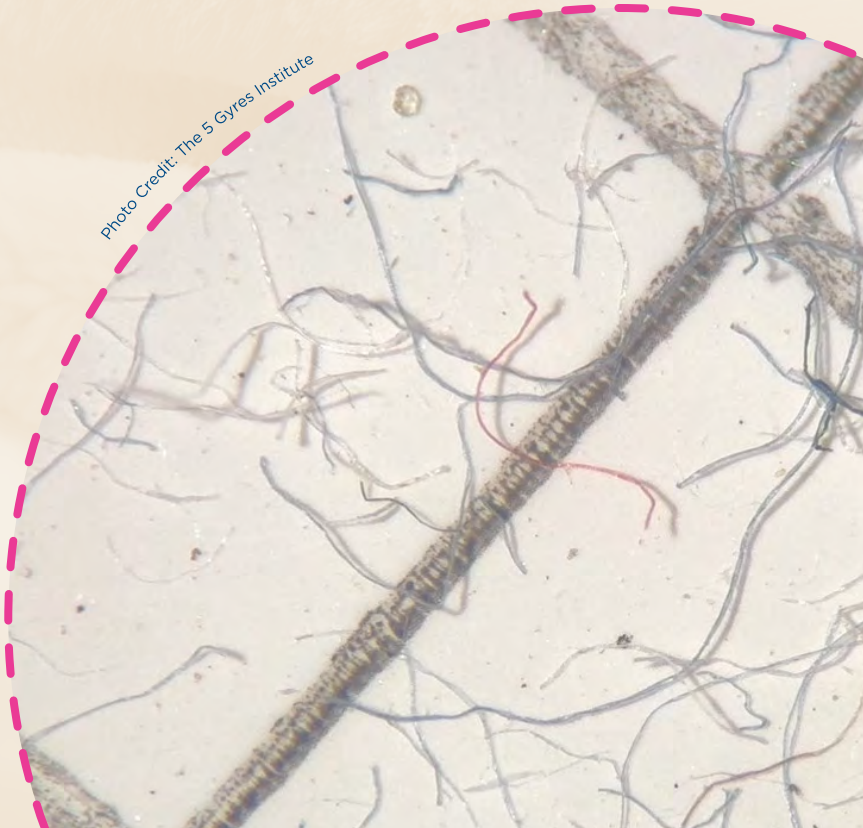
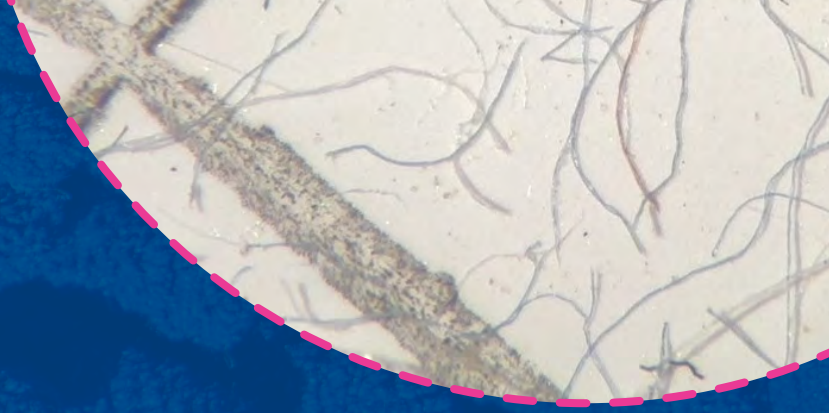
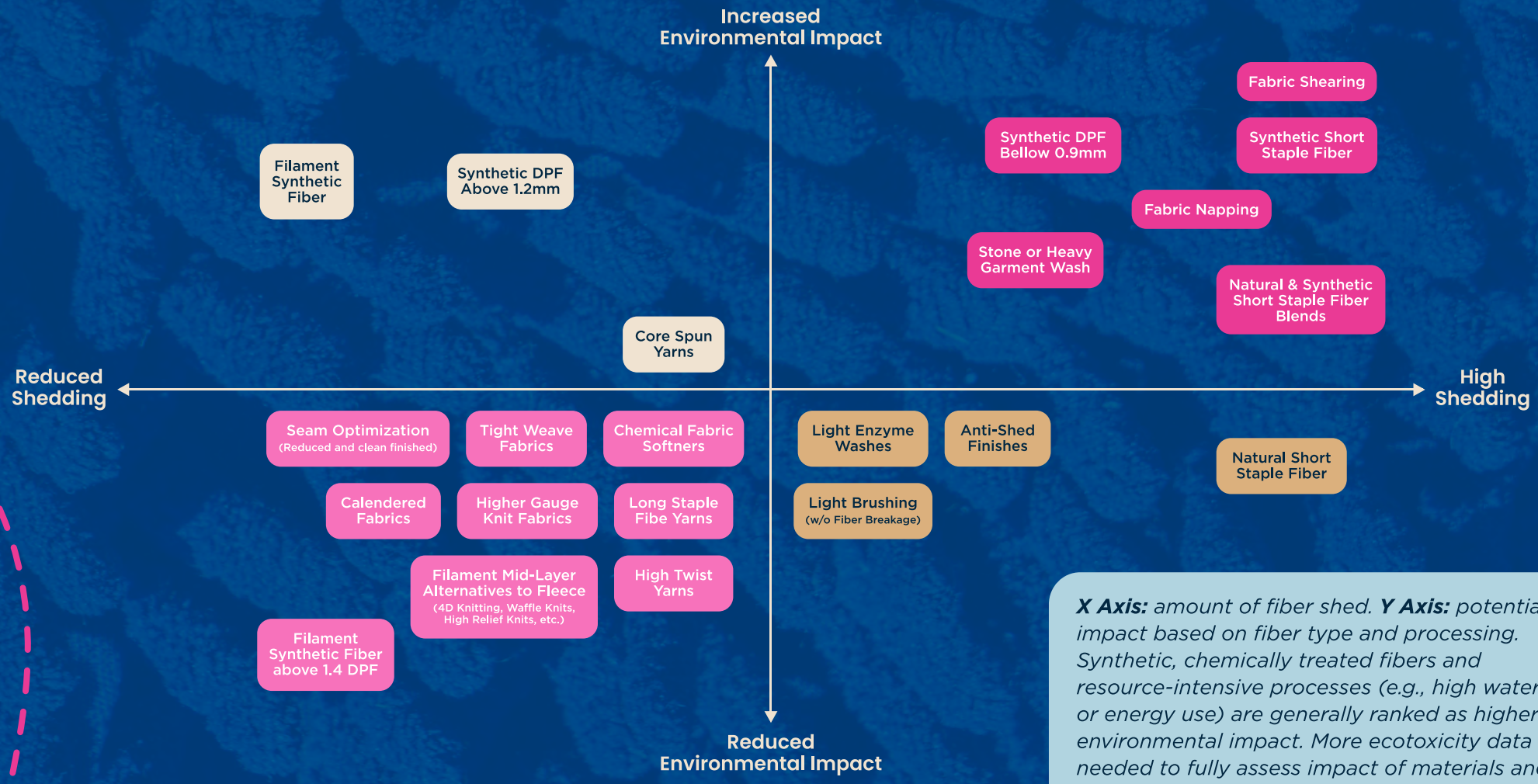


Photo Credit: The 5 Gyres Institute

WHAT HAS THE GREATEST IMPACT ON MICROFIBER SHEDDING?





X Axis: *amount of fiber shed.* ***Y Axis:*** *potential impact based on fiber type and processing. Synthetic, chemically treated fibers and resource-intensive processes (e.g., high water or energy use) are generally ranked as higher environmental impact. More ecotoxicity data is needed to fully assess impact of materials and chemical mixtures.*

KEY DESIGN LEVERS

1. Swap short staple fibers

Why:
Staple fibers have exposed ends that shed easily, and staple yarns are often not twisted tightly, allowing fibers to be released. Filament fibers (long, continuous strands) are more stable and shed less. For cotton, long staple cotton sheds less compared to short staple. Extruded cellulosics (e.g., rayon, viscose) shed more in staple form vs. filament.

Action:
Replace synthetic staple yarns with filament yarns wherever possible.

Benefits:
Higher durability, faster dry times, longer garment lifespan.

2. Increase denier per filament

Why:
Low denier per filament (DPF, i.e., thin filaments) are more prone to breaking. Higher denier per filament increases fiber robustness.

Action:
Specify synthetic fibers above 1.4 DPF wherever possible and avoid fiber below 0.9 DPF. Smart use of higher DPF filament fibers, in the proper texture, can improve performance.

Benefits:
Improved performance, increased durability, reduced need for post-processing.

3. Minimize brushing; use alternatives

Why:
Light brushing raises fibers to the fabric surface, while heavy brushing breaks fibers, allowing them to come loose from fabrics during wear and care. Shearing of napped fabrics (e.g., fleeces) ensures that fibers are broken/cut and increases shedding dramatically.

Action:
Reduce brushing and favor unbrushed alternatives. Use light brushing in tight weaves and knits to soften them without breaking fibers, avoid heavy brushing and sanding, and design fabrics that are functional without requiring these treatments.

Benefits:
Lower cost, better durability, higher performance, more comfortable against the skin.

4. Optimize seam and hem construction

Why:
Fraying at seams is a major contributor to shedding during washing and wear.

Action:
Use clean finishing of seams, including turned-in seam allowances, overlocking, binding, or heat-sealed seams. Reinforce high-stress areas (cuffs, buttons, pockets, etc.).

Benefits:
Enhanced garment durability, fewer customer complaints, higher perceived quality.

5. Use tighter weaves or knits

Why:
Loose structures allow fibers to escape easily and are more prone to physical abrasion.

Action:
Choose dense weaves or tight-knit structures for synthetic or blended fabrics, avoiding loose-knit patterns.

Benefits:
Higher fabric integrity, longer wear life.

6. Use blends mindfully

Why:
Some blends shed more due to uneven wear or processing compatibility. Short-staple blends used in low-twist yarns are particularly prone to fiber loss.

Action:
Select blends with similar fiber lengths and properties, and avoid unstable or poorly bonded combinations. Higher staple lengths, where lengths are similar in each fiber type, and with higher twist will reduce fiber loss.

Benefits:
More durable fabrics, better pilling resistance, improved comfort, higher perceived quality.

PRACTICAL SWAPS

Instead of...	*Try this...*
Brushed fleece with staple fibers	Smooth, filament-based material with minimal or no brushing
Loose woven poly-cotton blend	Tightly woven monomaterial construction
Low-twist yarns	High-twist or core-spun yarns
Open-knit synthetics	Dense-knit structures

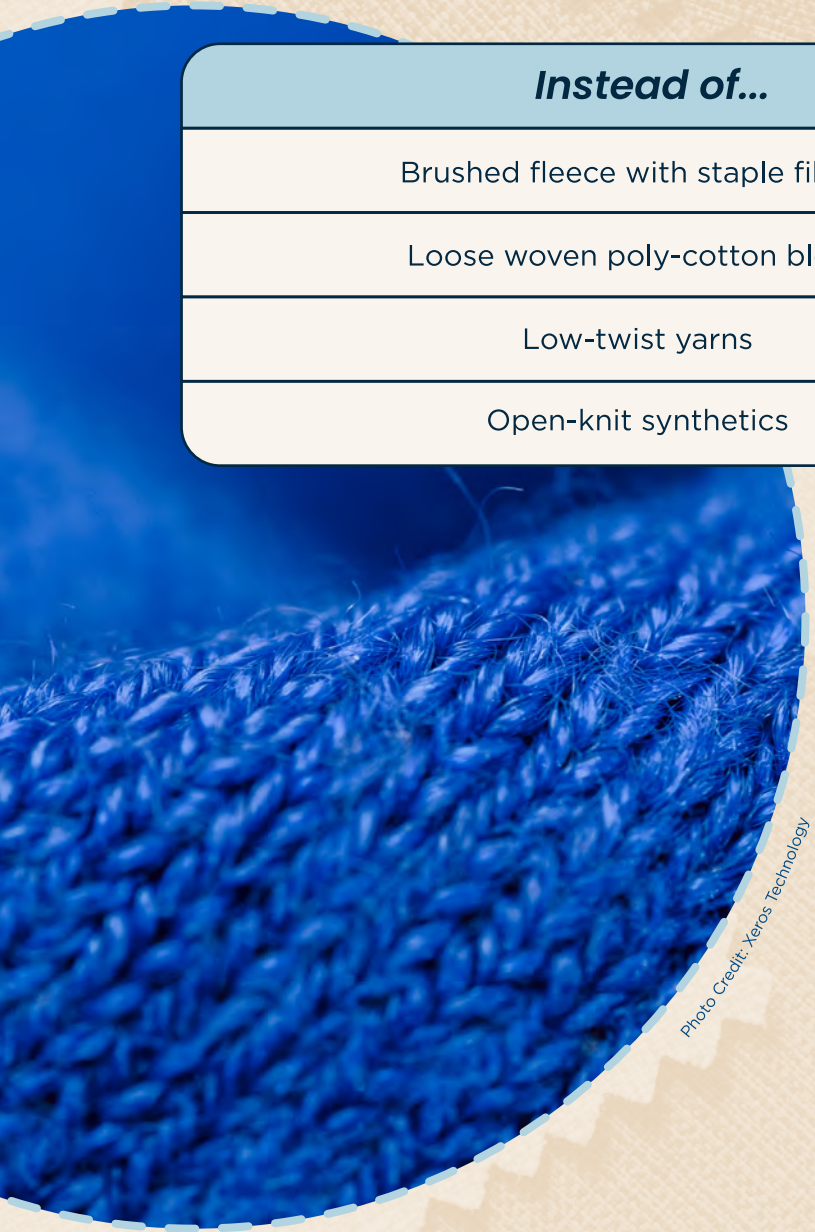


Photo Credit: Xeros Technology

Case Studies

• **Polartec:** Uses alternative constructions to fleece optimized for low shedding. Known as "4D Knitting," these warp knits feature filament insertion yarns within the two faces, providing varying insulation levels.

• **Patagonia:** Reduced brushing on fleece and piloted low-shed alternatives.

• **Under Armour:** Developed a simplified fiber-shed test method, now globally recognized under DIN specification, to improve access and integration across its supply chain. Under Armour is using the method to identify and redesign high-shedding materials. Their approach emphasizes early intervention and ease of use to adopt testing and reduction strategies. Method and measurement kits are available to the broader industry.

ADDRESSING COMMON CHALLENGES

Challenge	Strategy
Preference for soft handfeel	Use enzyme/chemical softening instead of brushing
Perceived lack of ROI	Link design choices to reputational benefits, ESG, and potential incoming regulations
Limited supplier buy-in	Provide data to sourcing teams to support decisions

CALL TO ACTION

• **Start with the easy wins.** Pilot one or two interventions in your next design cycle. Partner with suppliers to test outcomes and track shedding rates. Share findings internally to create momentum for change.

• **Microfiber reduction is not just an environmental issue —** it's a product innovation opportunity. The best solutions offer higher performance, lower cost, and longer wear. Use these interventions to future-proof product lines while improving quality and consumer trust.

Photo Credit: The 5 Gyres Institute