

1     Supporting Information: Microfiber Masses Recovered From  
2     Conventional Machine Washing of New or Aged Garments

3     Niko L. Hartline, Nicholas J. Bruce, Stephanie N. Karba, Elizabeth O. Ruff, Shreya U. Sonar,  
4     Patricia A. Holden<sup>1</sup>

5  
6     <sup>1</sup>Bren School of Environmental Science and Management, University of California, Santa  
7     Barbara, California 93106, United States

8  
9     **Corresponding Author**

10    E-mail: holden@bren.ucsb.edu; tel: 805-893-3195; fax: 805-893-7612.

11  
12    **Author Contributions**

13    The manuscript was written through contributions of all authors. All authors have given approval  
14    to the final version of the manuscript.

15  
16    **Author E-mail Addresses**

17    Niko L. Hartline: nhartline@umail.ucsb.edu

18    Nicholas J. Bruce: nicholasjbruce@umail.ucsb.edu

19    Stephanie N. Karba: karba@umail.ucsb.edu

20    Elizabeth O. Ruff: eoruff@umail.ucsb.edu

21    Shreya U. Sonar: shreyasonar@umail.ucsb.edu

22    Patricia A. Holden: holden@bren.ucsb.edu

23 **Number of pages: 12**

24 **Number of figures: 5**

25 **Number of tables: 4**

26

27

28

29 **Table S1.** Description and composition of each jacket type tested.

Jacket	Body Fabric Composition	Description
Type A	100% nylon	Technical non-fleece synthetic jacket
Type B	85% recycled polyester, 15% polyester	Synthetic fleece pullover
Type C	63% recycled polyester, 33% polyester, 3% spandex	Synthetic fleece midlayer jacket
Type D	100% polyester	Synthetic sweater fleece jacket
Type E	100% polyester	Budget synthetic sweater fleece jacket

30

31

32 **Table S2.** Tap water quality metrics as reported by Ventura Water for 2012-2014.<sup>1</sup>

Constituent	2012	2013	2014
pH	7.4	7.3	7.3
Hardness (ppm)	619	671	645
Calcium (ppm)	162	182	169
Magnesium (ppm)	52	49	42
Manganese (ppb)	ND	0.41	0.41
Sodium (ppm)	134	140	129
Phosphate (ppm)	0.1	0.07	ND
Potassium (ppm)	4.8	4.97	4.74
Total Alkalinity (ppm)	269	265	266

33

34

35 **Table S3.** Average percent and standard deviation percent of jacket mass recovered per wash  
 36 across treatment types.

37

Filter Size Machine Type Age	20 $\mu\text{m}$				333 $\mu\text{m}$			
	Top-load		Front-load		Top-load		Front-load	
	New	Aged	New	Aged	New	Aged	New	Aged
Jacket A	0.086% (0.026%)	0.106% (0.045%)	0.018% (0.005%)	0.1% (0.157%)	0.296% (0.092%)	0.328% (0.171%)	0% (0%)	0.077% (0.03%)
Jacket B	0.099% (0.024%)	0.072% (0.033%)	0.005% (0.004%)	0.019% (0.001%)	0.278% (0.098%)	0.187% (0.099%)	0.011% (0.01%)	0.026% (0.004%)
Jacket C	0.107% (0.019%)	0.106% (0.032%)	0.008% (0.007%)	0.023% (0.005%)	0.341% (0.079%)	0.314% (0.125%)	0% (0%)	0.041% (0.002%)
Jacket D	0.077% (0.017%)	0.072% (0.016%)	0.021% (0.02%)	0.016% (0.004%)	0.191% (0.069%)	0.344% (0.098%)	0% (0%)	0.024% (0.007%)
Jacket E	0.126% (0.008%)	0.324% (0.042%)	0.036% (0.006%)	0.02% (0.003%)	0.262% (0.064%)	0.156% (0.09%)	0.042% (0.042%)	0.051% (0.006%)

38 **Table S4.** Regression model of wash order against recovered fiber mass (mg), with other  
 39 variables included as covariates. Wash order did not significantly predict fiber mass:  $t(131) = -$   
 40  $0.20, p = 0.84$ .

Variable	Estimate	Standard Error	t-value	p-value	R <sup>2</sup>
(Intercept)	-4.7	426	-0.011	0.99	0.55
Type: B	15	179	0.083	0.93	
Type: C	-0.1	130	-0.0010	1.0	
Type: D	67	130	0.51	0.61	
Type: E	279	239	1.2	0.25	
Age: New	-164	362	-0.45	0.65	
Load: Top	947	699	1.4	0.18	
Filtersize: 333	406	69	5.9	< 0.001	
Wash order	-4.0	20	-0.20	0.84	

41  
 42  
 43  
 44  
 45  
 46  
 47  
 48  
 49



50

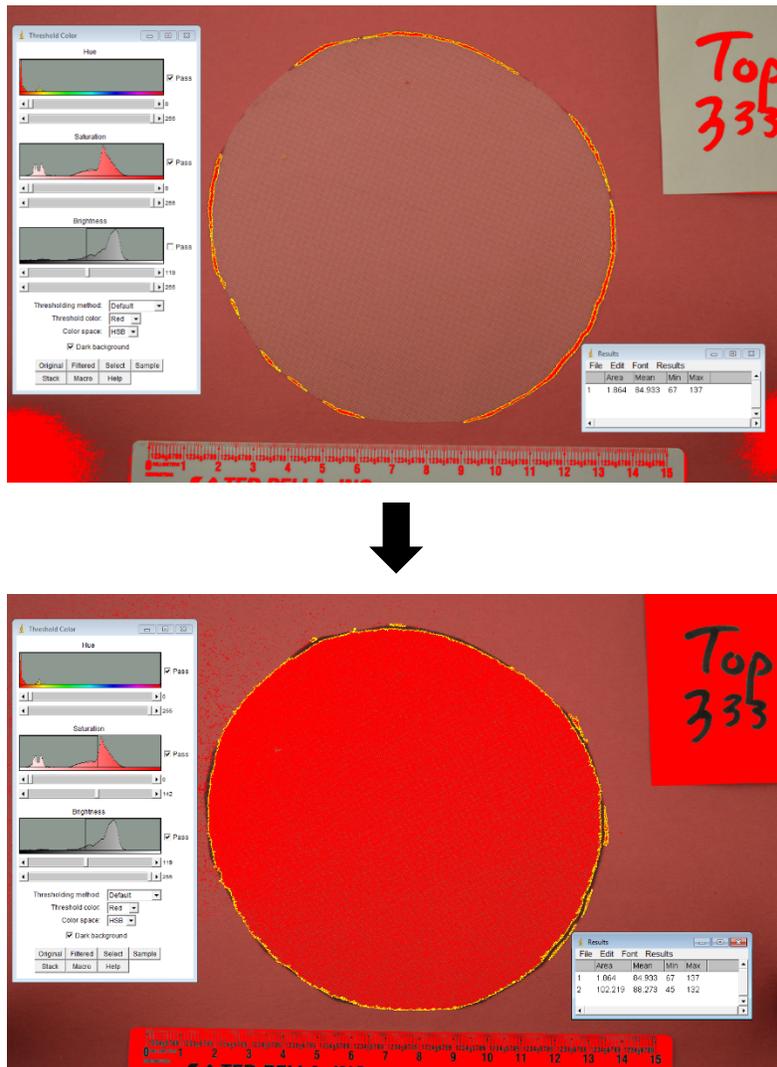
51

52 **Figure S1.** Filtration column with size specifications. Each filter housing contains a Nitex®  
53 nylon filter manufactured by Aquatic Research Instruments roughly cut to a circle about 11.5  
54 centimeters in diameter. The filtration column was constructed out of 10.16 cm diameter  
55 schedule 40 ABS piping. These were connected with schedule 80 PVC 10.16 cm diameter pipe  
56 compression union with Viton o-ring. The filters were secured between the halves of the unions.

57

58

59



60

61 **Figure S2.** ImageJ measurement of a top-load 333  $\mu\text{m}$  sample. The 15 mm ruler at the bottom of  
 62 each image is used to set the scale. For 333  $\mu\text{m}$  filters, areas were calculated in two parts to  
 63 isolate both the black marker lines (0 to 255 Hue, 0 to 255 Saturation, and 94-100 to 255  
 64 Brightness) and white filter (0 to 255 Hue, 0 to 130-138 Saturation, and 0 to 94-100 Brightness).  
 65 For 20  $\mu\text{m}$  filters, areas were calculated with one measurement (0 to 255 Hue, 0 to 130-135  
 66 Saturation, and 0 to 255 Brightness).



77 **Figure S3.** Image of aged top-load Jacket D 333  $\mu\text{m}$  filter showing the pilling effect of smaller  
78 fibers, causing them to catch on the larger filter.

79

80

81

82

83

84

85

86

87

88

89

90

91

92

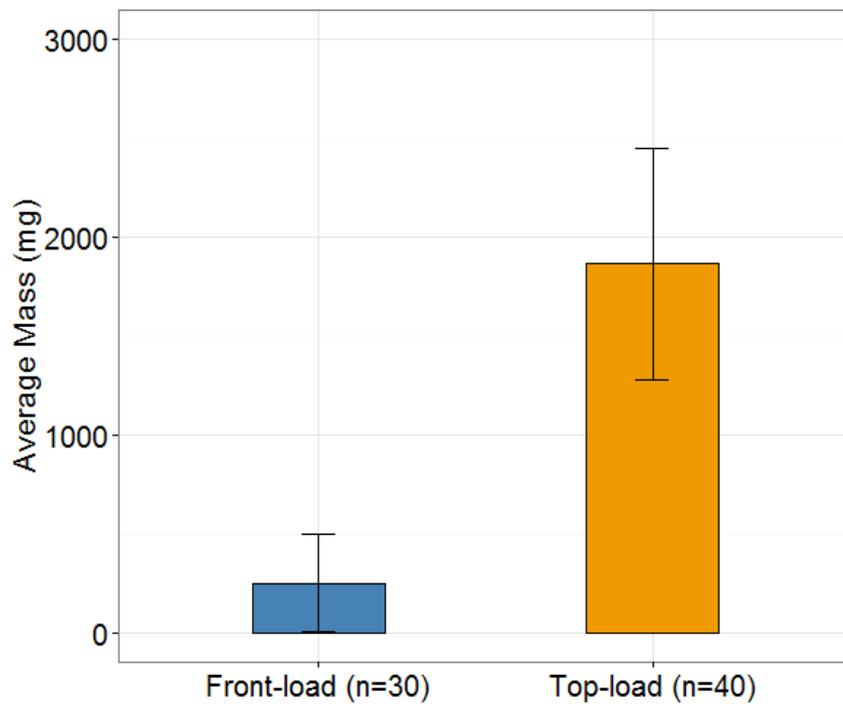
93

94

95

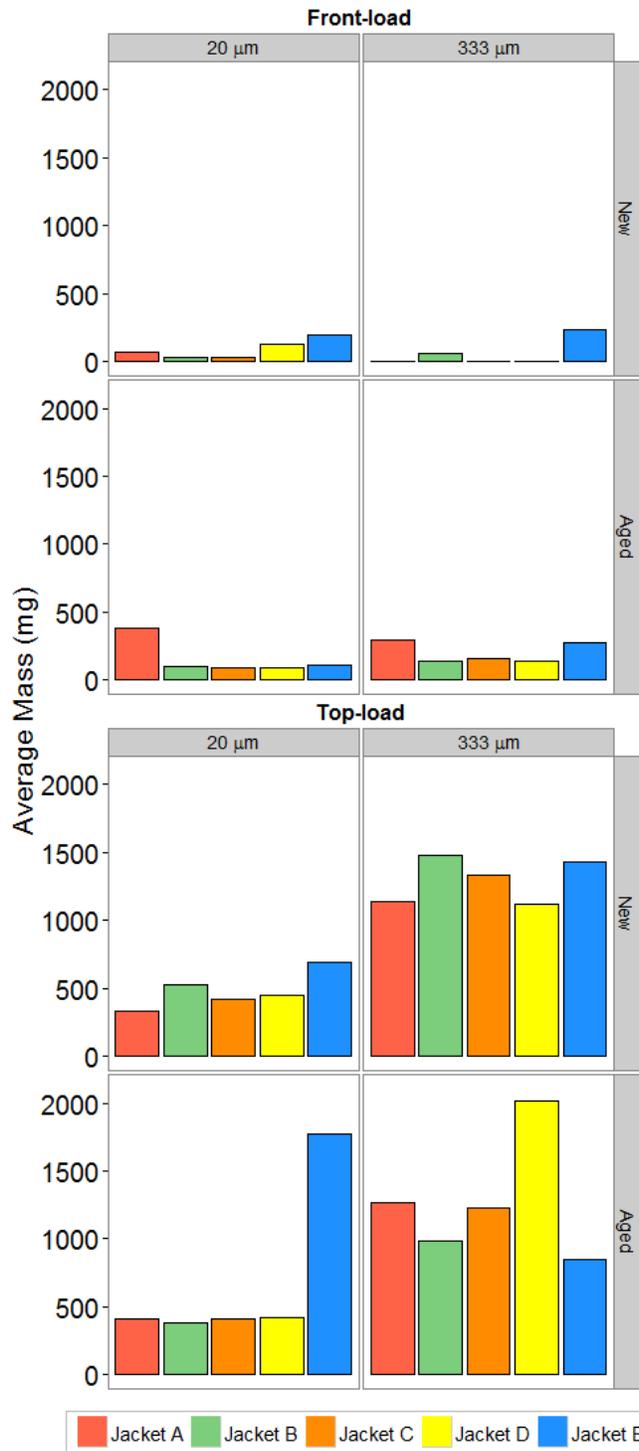
96

97



98 **Figure S4.** Average total ( $20\mu\text{m} + 333\mu\text{m}$ ) fiber mass recovered in Front-load and Top-load  
99 washing machine effluent. Error bars are  $\pm$  one standard deviation.

100



101

102 **Figure S5.** Average fiber mass recovered across all measured variables: age, washing machine

103 load type, filter sizes, and jacket types.

104 **REFERENCE**

105 1. Ventura Water, Drinking Water Consumer Confidence Reports. City of Ventura:  
106 Ventura, CA, 2016.

107

108

109

110

111