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# Sustainability Issues and Strategies in the Outdoor Apparel Brand Industry

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**Abstract**
Going green has seeped into the nation's consumer consciousness. And while some industries have received more attention than others, research has shown that even for consumers with knowledge of environmental impacts resulting from apparel production and manufacture, purchasing green over conventional apparel has not historically been a concern for many consumers. This paper theorizes that the outdoor apparel industry, with their history of championing environmental conservation efforts can serve as an industry leader by implementing product sustainability efforts across their supply chain to influence other apparel brands and actors within the textile supply chain to employ greener practices. This paper explores that question by researching (1) the potential of whether the outdoor recreationalist, the main consumer of outdoor brands' products, will be receptive to purchasing green apparel and the potential for a higher price tag, (2) environmental impacts associated with apparel life cycle, (3) product sustainability best practices as advocated by industry trade associations, and (4) a benchmark of product sustainability practices implemented by several outdoor brands as identified by publicly available literature. A review of the environmental impacts associated with apparel across the entire product life cycle revealed that impacts from the production and processing and apparel consumer use stage dwarf those of transportation and product end-of-life. An additional comparison of environmental impacts from specific fiber types revealed that wool was the most sustainable fiber among those examined. Lastly, the review of apparel product sustainability practices found, at an approximate result of two to one, that the majority of outdoor brands did not exhibit or at least advertise their efforts for production of sustainable apparel and that only five (5) of the fourteen (14) brands reviewed publicly exhibited a comprehensive sustainability strategy. However, the study did reveal some brands that exhibited best practices for implementation of sustainable apparel measures and that these brands through their actions were already serving as advocates within the broader apparel industry for adoption of product sustainability measures.

**Disciplines**
Other Business | Other Environmental Sciences | Sales and Merchandising

# SUSTAINABILITY ISSUES AND STRATEGIES IN THE OUTDOOR APPAREL BRAND INDUSTRY

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ABSTRACT

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Going green has seeped into the nation's consumer consciousness. And while some industries have received more attention than others, research has shown that even for consumers with knowledge of environmental impacts resulting from apparel production and manufacture, purchasing green over conventional apparel has not historically been a concern for many consumers. This paper theorizes that the outdoor apparel industry, with their history of championing environmental conservation efforts can serve as an industry leader by implementing product sustainability efforts across their supply chain to influence other apparel brands and actors within the textile supply chain to employ greener practices. This paper explores that question by researching (1) the potential of whether the outdoor recreationalist, the main consumer of outdoor brands' products, will be receptive to purchasing green apparel and the potential for a higher price tag, (2) environmental impacts associated with apparel life cycle, (3) product sustainability best practices as advocated by industry trade associations, and (4) a benchmark of product sustainability practices implemented by several outdoor brands as identified by publicly available literature. A review of the environmental impacts associated with apparel across the entire product life cycle revealed that impacts from the production and processing and apparel consumer use stage dwarf those of transportation and product end-of-life. An additional comparison of environmental impacts from specific fiber types revealed that wool was the most sustainable fiber among those examined. Lastly, the review of apparel product sustainability practices found, at an approximate result of two to one, that the majority of outdoor brands did not exhibit or at least advertise their efforts for production of sustainable apparel and that only five (5) of the fourteen (14) brands reviewed publicly exhibited a comprehensive sustainability strategy. However, the study did reveal some brands that exhibited best practices for implementation of sustainable apparel measures and that these brands through their actions were already serving as advocates within the broader apparel industry for adoption of product sustainability measures.

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# I. Introduction

Mark Twain (1976) once stated, “Clothes make the man. Naked people have little or no influence on society.” Worldwide, the clothing and textile industry constitutes the second largest economic trade activity and is estimated to be worth $353 billion (UNEP, 2014). However, what many consumers do not grasp is that apparel manufacture and retail can cause significant environmental pollution. These impacts will vary depending on the type of fiber a garment is made from, but they will occur throughout a product’s life cycle and can include: significant energy use, natural resource depletion, greenhouse gas and other air emissions from processing fossil fuels into synthetic fibers (polyester or nylon); significant water use, toxicity from fertilizers, pesticide and herbicide use related to production of fiber crops (e.g., cotton); and water use, hazardous waste, and toxic effluents from the production stage of apparel that includes chemical usage for pre-treatment, dyes, and finishes; and from product end of use and transport (European Commission, 2013).

While there already exists a broader consumer market for sustainably sourced goods, as evidenced by the fact that an estimated 85 percent of U.S. consumers already purchase green products (Grail Research, 2009), the apparel industry has historically not received nearly as much attention as perhaps the food industry where concern has been voiced by consumers regarding herbicide/pesticide usage for grown crops, genetically modified food, and hormone/antibiotic over usage for livestock animals. There also has been a rise in popularity and proliferation of community farmer’s markets selling locally grown and organic produce. The lack of attention on the apparel industry however has begun to change. Recently, the non-governmental environmental activist group

Greenpeace initiated their “Detox” campaign to raise awareness to environmental pollution from apparel manufacture, specifically wastewater from dyeing processes and the use of certain chemicals within the apparel supply chain to pressure brands to sign a pledge (twenty of which have so far signed) that apparel manufacture should not cause environmental pollution (Greenpeace, 2014). Negative attention has also been given to fast fashion (low cost clothing that mimics current luxury fashion trends) and how it is predicated upon recent trends quickly running their course and then making way for the next trend (Joy, 2012), with garments usually disposed after being worn ten times or less (Birtwistle & Moore, 2007).

This attention and subsequent greater demand by consumers for more significant efforts to promote environmentally friendly practices across other industries have not gone unnoticed by the apparel industry. In response, industry groups such as the Sustainable Apparel Coalition (SAC) have been formed to promote, in their own words, “An apparel and footwear industry that produces no unnecessary environmental harm and has a positive impact on the people and communities associated with its activities.” (SAC, 2012).

For some clothing brands, particularly those in the specialized outdoor gear and apparel sector, supporting environmental causes and espousing environmental activism is not a new idea. In fact, some brands, such as The North Face (Tomlinson, 2011) and Patagonia (Stevenson, 2012) have founders who are noted for their environmental conservation and activist efforts. The North Face and Patagonia have also combined with REI and Kelty to create The Conservation Alliance, which is a non-profit organization dedicated to dispersing funds provided by member companies to “community-based

campaigns to protect threatened wild habitat, preferably where outdoor enthusiasts recreate." (The Conservation Alliance, 2014).

With this history of environmental support and activism established by a few brands combined with a consumer base made up mostly of outdoor recreationalists, who are presumably concerned with their impact on the environment, does this support for environmental conservation measures also translate into implementation of best practice sustainability measures across their apparel product's life cycle? If so, could outdoor apparel brands on behalf and because of their consumers strive towards production of more sustainable apparel and be an apparel industry leader in pioneering and innovating ideas that mainstream fashion brands could implement and utilize to produce and market more sustainable clothes for their consumers? This paper theorizes that because of the outdoor brands' main consumer base, the outdoor recreationalist, a benchmark of a company's product sustainability practices from publicly available literature will show that the majority of companies are engaged in sustainable product practices.

To examine this question of product sustainability practices amongst outdoor apparel brands, this Capstone paper will first examine influencers that may sway a consumer to purchase green apparel, the likelihood that the main group of consumers of outdoor apparel companies, the outdoor recreationalist, is amenable to purchasing "green" apparel and how the perception of company's sustainability practices, real or perceived, influences public opinion of that specific company and their products. Next examined will be environmental impacts associated throughout various apparel products' life cycles, from raw material generation to end of life.

The following section will examine product sustainable best practices as highlighted by industry trade associations or brands by performing a survey of publicly available literature. This review of industry best practices will be used to formulate a benchmarking tool of “Yes/No” questions to identify product sustainable practices. Results and trends from this benchmark survey will then be discussed and compared. The final section details results of the capstone and conclusions that can be drawn from this review of outdoor apparel brand sustainability practices. It is important to note that this review will be limited solely to apparel sustainability practices rather than other items (e.g., offsetting employee airline travel, reducing energy/water usage in an office building, etc.) or worker social issues (e.g., fair wage, labor rights, safety, etc.) in the industry.

## II. Literature Review

A literature review was performed across different topics to identify consumer preferences that may influence the implementation of sustainability practices for outdoor apparel brands. Topics reviewed include factors that influence consumers to purchase green apparel and whether the outdoor apparel brand's main consumer base, the outdoor recreationalist, is more likely to be concerned with the environment than the average consumer and how that may affect their preference when purchasing apparel. Lastly, it was explored whether a company or brand's commitment, real or perceived, to environmentally friendly practices or production of environmentally friendly products will help to sell more items.

### II.1. Green Apparel Consumers

Many choices confront a consumer when considering what and how it means to be a green apparel consumer. Environmentally friendly apparel purchases can vary and may include purchasing clothing expressly made with minimal impact to the environment; apparel made only from organic materials; or maybe a consumer only looks to purchase quality made products that will last longer than other garments (Chen & Burns, 2006).

However, what specifically drives a consumer to purchase green items? A study performed by Gilg, Barr, and Ford in 2005 identified three questions that are needed to identify green purchasers – who buys, what, when, and why? From those questions, three sets of variables were identified as being influential when classifying green consumers – environmental and social values, socio-demographic variables, and psychological factors. And while it was not a surprise, green consumers were found to be individuals who

tended to hold more pro-environmental and pro-social values. It was also found that green consumers were mostly liberal and would look to purchase sustainable goods if they perceived that those purchases would have a minimal environmental impact (Gilg, Barr, & Ford, 2005).

Studies have also been performed to specifically examine influencing factors for consumers when purchasing sustainable or green apparel. One study done in 1998 by Kim and Damhorst explored several themes related to apparel consumption and environmentalism that included exploring consumer's knowledge of environmental issues related to apparel products, concern for the environment, and behavior that may be brought about because of environmental concern. The study concluded that while there was no strong relation between environmental knowledge and concern for the environment and responsible apparel consumption, it did find that general environmental responsible behavior was more strongly related to environmentally responsible apparel consumption (Kim & Damhorst, 1998).

Another study performed in 2010 by Brosdahl and Carpenter, did also generally corroborate the above findings, that knowledge alone of environmental impacts from textile and apparel production did not necessarily encourage environmentally friendly consumption of apparel. However, in contrast, this study indicated that environmental concern did positively influence environmentally friendly apparel consumption behavior and that this concern could serve as a mediator between knowledge and behavior and ultimately influence and perhaps modify a consumer's purchasing behavior (Brosdahl & Carpenter, 2010).

Even though the above studies indicated that knowledge of environmental impacts of textile manufacturing did not generally influence purchase of environmentally friendly apparel, one common theme from the above reviewed studies was that when consumers were provided with knowledge of the environmental impacts of textile and apparel, this was found to influence their concern for the environment and potentially their consumption behavior. Brosdahl and Carpenter (2010) stated that whether consumers do not have or could use more information, that education of those consumers appeared to be the key to encouraging more environmentally friendly apparel purchasing. The Kim and Damhorst (1998) study also speculated that businesses could even serve to educate consumers further about the environmental benefits of some of their apparel products, and that when they learned about those benefits, some consumers may be more motivated to choose the green alternative.

The above studies have established that the more a person is environmentally conscious and exposed to knowledge regarding environmental impacts from apparel and textile, the more likely that consumer will purchase sustainable apparel. However, what type of consumer will generally favor purchasing environmentally friendly apparel? The reviewed studies again provided conflicting answers, with the Kim and Damhorst (1998) study asserting that some consumers would be willing to pay higher prices for the product if it meant improving environmental quality, while another study by Hustvedt (2006) found that consumer likelihood of purchasing an organic cotton t-shirt vs. a conventional cotton product decreased as price increased. Additionally, a study performed found that if an eco-friendly product is to be successful in the market, its environmental superiority could not be the only core value added, that it would be successful only if customers

perceived the product attributes as superior to other similar product offerings (Meyer, 2001).

Amidst these questions as to who might be a consumer that would purchase sustainable apparel, a case study performed in Hawaii was reviewed that attempted to profile consumers that would conceivably pay more to purchase organic cotton in place of conventional cotton products (Lin, 2010). The results of this case study showed that the profile of potential organic cotton consumer who might pay higher prices for organic cotton was one who displayed certain pro-environmental attitudes and behavior that included among others the importance of being environmentally responsible, considered environmental issues when making a purchase, and was involved in environmental organizations (Lin, 2010).

A review of the above studies indicates that while there did not appear to be a direct link between environmental knowledge and purchase of environmentally friendly apparel, it was found that if consumers were provided with education on environmental impacts from textile manufacturing that this could increase their environmental concern which could then influence a consumer towards purchasing environmentally friendly apparel. It was also noted in a profile of consumers who did purchase environmentally friendly apparel that some common attributes seemed to be an importance placed on being environmentally responsible and being involved in environmental organizations (Lin, 2010).

### II.2. Outdoor Recreationalists

This section will examine the outdoor recreationalist. Fortunately for outdoor apparel brands, there is a large potential consumer base for their apparel because

according to the Outdoor Foundation (2013), nearly half of the U.S. population (49.4 percent) participates in some form of outdoor recreation. And these participants combined to spend an estimated $646 billion dollars on outdoor recreation alone (The Outdoor Recreation Economy, 2012), with apparel sales making up approximately $3.7 billion of that figure (Big Rock Sports, 2013). Clearly these figures indicate there exists a robust market for outdoor apparel and a huge potential consumer base. However, does being an outdoor recreationalist also translate into concern for the environment and thus an individual who would be willing and interested in purchasing environmentally friendly apparel?

Several studies have been performed examining whether participation in outdoor recreation creates an awareness and concern for the environment. One of the earliest studies to explore this topic was performed in 1975 and found that the presumed link between participation in outdoor recreation and environmental concern or behavior to be weak, while other more specific questions regarding outdoor recreation and environmental concern received far stronger support (Dunlap & Heffernan, 1975). Those secondary questions that were supported explored whether individuals participating in "appreciative" recreation (activities that do not alter the environment) will exhibit greater environmental concern than "consumptive" recreation (activities where something is taken); and whether concern for the environment by the outdoor recreationalist will be greater when protecting aspects of the environment necessary for pursuit of their chosen activity (Dunlap & Heffernan, 1975).

Another study performed in 1977 by Geisler, Martinson and Wilkening would revisit the same questions, but go further and add a third outdoor recreation classification

for “abusive” activities that resulted in environmental degradation. The Geisler et al., study (1977) found that rather than instead of recreational pursuits, individual demographic characteristics may be better indicators of environmental concern. This study also stressed the point that a difficulty encountered while pursuing this study was distinguishing individuals into single activity classifications because many participated in more than one recreation activity classification (Geisler et al., 1977). The below table illustrates sample activities associated with each recreation classification (Berns & Simpson, 2009).

**Table 1 – Outdoor Recreation Activity Classification**

| Outdoor Recreation Type | Activity |
|---|---|
| Appreciative | Hiking, camping, visiting state parks and scenic areas, photography, canoeing, cross-country skiing, bird watching, scenic tours, visits to beaches, walking for pleasure, sightseeing |
| Consumptive | Fishing, hunting |
| Abusive | Snowmobiling, dune-buggying, motorcycling, trail-biking, all-terrain vehicles (ATVs) |

Adapted from “Outdoor Recreation Participation and Environmental Concern: A Research Summary,” by G. N. Berns and S. Simpson, 2009, *Journal of Experiential Education*, 32, p. 86.

Another study that revisited the original Dunlap and Heffernan questions found instead that contrary to their 1975 study, that they had identified reverse findings and there was in fact substantial support linking outdoor recreational participation to pro-environmental behavior and that secondarily there was little indication in differences of pro-environmental behavior between the different outdoor activity classifications (Theodori, Luloff, & Willits, 1998). The Theodori, et. al. (1998) study also noted that rather than use the term “environmental concern,” the term “pro-environmental behavior” was instead utilized because to the authors this term was a stronger measure of environmental attitude because it indicated actions taken rather than just “concern.” The other studies reviewed have used the terms environmental concern or pro-environmental

behavior interchangeably. One other important note about the Theodori, et. al. (1998) study was that it also re-classified outdoor activities back into two categories (appreciative to slight resource-utilization and moderate-to-intensive resource utilization) noting that purely appreciative activities almost always involved some sort of impact to the environment (e.g., cutting a trail for hiking); whereas sometimes traditional consumptive activities, such as fishing, could have minimal impact if the fisherman strictly practiced catch and release.

One final study was also reviewed that was differentiated from the prior studies in that the population of outdoor recreationalists that formed the study group was nationally based rather than regionally or state based (Teisl & O'Brien, 2003). Another aspect in which Teisl and O'Brien (2003) differed, was that it attempted to measure the overall relationship between outdoor recreation and environmental concern by a particular activity rather than classification type. Results from this study indicated that not only is outdoor recreation positively associated with environmental concern/behavior, but that the more likely someone was to participate in an "appreciative" forest-based type of recreation (e.g., wildlife watching, hiking), the more likely that individual would exhibit environmentally friendly traits, such as participating in an environmental organization and purchasing environmentally friendly products (Teisl & O'Brien, 2003).

The results certainly vary from the review of studies performed examining the relationship between environmental concern/behavior and participating in an outdoor recreation activity. However, there is enough of an indication from the various studies that a positive link does clearly exist between outdoor recreationalists and environmental

concern/behavior and that the level of that concern/behavior depends on the individual's chosen activity.

### II.3. Consumer Perception of Sustainability Practices

In 2011 Patagonia published an advertisement in the New York Times on Black Friday with the headline "Don't Buy This Jacket" (2014) that stated rather than purchasing this item that individuals should instead sign up for their Common Threads Initiative which asks people to buy only what they need, to repair what breaks, and reuse what is no longer needed and then to recycle everything else (Patagonia, Inc., 2014). This advertisement would later generate 30,000 signatures for this pledge (Wieners, 2012) and Patagonia would go on to see revenue increase from 2011 to 2012 by $158 million (Stock, 2013).

With such a response from this advertisement, does it benefit a company to undertake sustainability initiatives? Turns out that it does. As reported by Forbes, a study found that 60 percent of people's willingness to buy, recommend, work for, and invest in a company is driven by their perceptions of the company and that slightly less than half of that figure is dependent on the attributes related to a company's corporate social responsibility practices (Smith, 2012). A study done by Ruf, et.al. (2001) also showed that a positive association existed with short and long term sales when paired with change and improvement in a company's social and environmental performance. It was also noted that consumers appeared to provide greater support for companies that are socially and environmentally responsible (Sen & Bhattacharya, 2001). One last study that was examined went even further and suggested that there was a two-way causality with sustainability and financial performance where a virtuous cycle was created as

financially successful companies usually tend to spend more on sustainability efforts because they can afford to and these programs contribute to even greater financial success (Orlitzky, Schmidt, & Rynes, 2003).

### II.4. Discussion

From the above review of the literature related to green consumers, outdoor recreationalists and consumer perception of companies' corporate social responsibility programs, it was observed that the studies reviewed provided sometimes contrasting results. Ultimately though, when reviewing attributes of green consumers, it was shown that the more a person is exposed to knowledge regarding environmental impacts from apparel and textiles and displays concern for the environment, the more likely that consumers will purchase sustainable apparel. It was also observed from a study profiling green apparel purchasers that these were individuals who usually displayed traits such as being environmentally responsible, considered environmental issues when making purchases, and were involved in environmental organizations (Lin, 2010).

In the review of outdoor recreationalists, it was noted that recreationalists were positively associated with environmental concern/behavior and that those participants in an "appreciative" forest-based type of recreation (e.g., wildlife watching, hiking) were more likely than other outdoor recreationalists to exhibit environmentally friendly traits, such as participating in an environmental organization and purchasing environmentally friendly products (Teisl & O'Brien, 2003). Additionally, in the last review it was noted that a company's financial performance generally benefitted in both the short and long term when positive changes ensued that were associated with a company's corporate

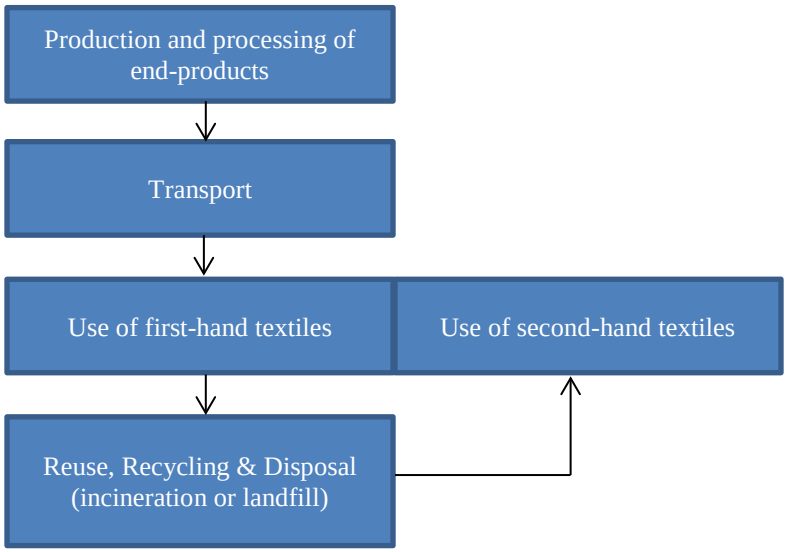
social responsibility performance in both environmental and social areas (Ruf, et. al., 2001).

These implications, that outdoor recreationalists exhibit environmental concern/behavior and that some specifically exhibit tendencies to purchase environmentally friendly goods, show that consumers can serve as an impetus for outdoor apparel brands to start or increase their efforts to implement sustainable practices regarding apparel manufacture and retail and that it would be well received by their clientele. And that, if done in a correct manner, may also possibly lead to increased financial performance over the short and long term.

## III. Environmental Performance of Apparel Throughout the Life Cycle

This section will explore the environmental performance of apparel products throughout their life cycle that are made from four major fibers (cotton, wool, polyester, and nylon) that constitute the bulk of an outdoor brand's apparel products (Chouinard & Brown, 1997). This evaluation will be used to further understand where implementation of sustainable practices will afford the greatest return for environmental improvement in the life cycle of any one specific apparel product. The below figure depicts the system boundaries used to examine the environmental impacts associated with the life cycle of these four fibers.

**Figure 1 – Apparel Life Cycle**




Adapted from "Environmental Improvement Potential of Textiles (IMPRO-Textiles)," by Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., ... Boufateh, I., European Commission Joint Research Centre, 2014, p. 30.

The first stage of the apparel life cycle begins with production and processing of end-products which includes the extraction of raw materials (cultivating/husbandry of fiber-producing crops/animals and production of synthetic materials), this is followed by processing of the fiber, then making the yarn and fabric, and lastly finishing the garment,

which can include cutting and sewing the final product (Beton, et al., 2014). The next phase of the apparel life cycle is distribution or transport which includes moving final products from manufacturer to the retail location (Beton, et al., 2014). The use phase then accounts for consumer use of the purchased apparel such as washing and drying and then choosing what to do with the product at its end-of-life (Beton, et al., 2014). End-of-life for the apparel products are then discussed which includes one of three options – reuse, recycle, or disposal. Reused apparel products are expected to have a 50 percent longer lifetime extension (Beton, et al., 2014).

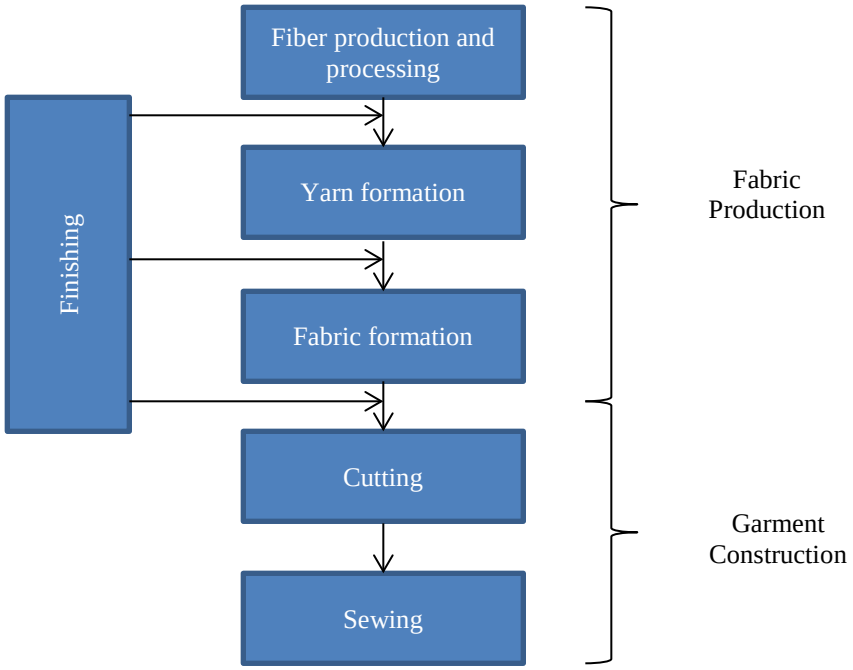
The below discussion on environmental impacts from the apparel life cycle is structured so that production and processing of each fiber will be discussed separately while parts of the life cycle common to each fiber type, (distribution, use, and end-of-life) will be included in a combined discussion. Suggested practices for implementation of greener practices surrounding fiber production are also included. The final part of this section will provide a summary of impacts for all fiber types combined across an apparel's life cycle including a discussion and ranking of the environmental impact from the production and processing stage only for each fiber type.

### III.1. Production and Processing

Production and processing of apparel can be divided into two separate steps, production of fabric and then construction of the garment. The exact fabric production and garment construction steps differ for each fiber type, whether natural (cotton and wool) or synthetic (polyester and nylon), but they are most disparate during the fiber production and processing stage since natural fibers are dependent on farming and harvesting or animal husbandry whereas synthetic fibers are mainly derived from

petroleum resources and must be produced via a chemical plant prior to fiber and fabric creation (Beton, et al., 2014). The below figure provides a general overview of the apparel product manufacturing steps for both natural and synthetic fibers.

**Figure 2 – Overview of Apparel Product Manufacturing Steps**




Adapted from "Environmental Improvement Potential of Textiles (IMPRO-Textiles)," by Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., ... Boufateh, I., European Commission Joint Research Centre, 2014, p. 34.

### III.1.1 Fabric Production

#### *Cotton*

Cotton in the U.S. accounts for 30 percent of the textile production and is a natural cellulosic fiber that comes from plants, is biodegradable and a renewable resource (Chen & Burns, 2006). Steps associated with cotton fabric production include cultivation, yarn formation, fabric formation, and then finishing/garment construction (Beton, et al., 2014). Cotton plants during cultivation are very susceptible to insects and fungi and as a result, conventional cotton requires heavy use of pesticides and fungicides

such that cotton cultivation accounts for 25 percent of the world's pesticides while it only uses an estimated 3 percent of the world's farmland with the majority of pesticides applied in the U.S. (Chen & Burns, 2006). Water usage is also very intensive for growing cotton, with 70 percent typically coming from irrigation and only 30 percent from rain (Defra (ERM), 2007).

Prior to harvest of the cotton, a defoliant is also used to cause the leaves to fall off the plant so as not to stain the cotton fibers. Before processing the outer layers of the cotton fibers must also be removed so that dyes can penetrate; and this step is mostly done using sodium hydroxide in a process named "scouring" (Chen & Burns, 2006). Formaldehyde is also sometimes used to improve the wrinkle recovery of the fabrics, despite its carcinogenic properties (Chen & Burns, 2006). Water usage is often extensive in the next stage when the fiber is rinsed prior to dyeing and then washed again after (Chen & Burns, 2006). Therefore, impacts to land utilized for cotton cultivation can occur from heavy pesticide and fungicide use and contaminated wastewater can result from the fiber dyeing processes if not treated properly.

Practices being pursued to mitigate environmental impacts include the organic cultivation of cotton, which rather than using pesticides and fungicides instead relies upon trap crops designed to lure potential pests, use of beneficial bugs, and cover crops that kept weeds down during early growth periods (Chouinard & Brown, 1997). Other efforts have also been made to improve cotton dyeing by improving the cotton's fiber affinity for dyes so that some of the rinse and after wash steps can be eliminated to reduce water usage (Chen & Burns, 2006). Citric acid is also being pursued as an

alternative to using formaldehyde for durable-pressed cotton fabrics (Chen & Burns, 2006).

### *Wool*

Wool is a fiber derived from animals and is typically sourced from sheep (Chen & Burns, 2006). The first step in wool fabric production is wool cultivation, which relies on farm equipment, animal husbandry for the sheep, provision and application of agrochemicals to the sheep ("sheep dip") to prevent parasitic infestation, animal feed production, and water for the sheep (Beton, et al., 2014). Other steps after collection of the wool fabric include washing and bleaching when preparing the wool for yarn formation and dyeing, and then weaving/knitting the yarn for fabric formation, prior to garment construction (Beton, et al., 2014).

Environmental impacts that can occur from wool production include overgrazing and soil erosion of areas where sheep herds are kept and excess manure which can create runoff contamination if it makes its way into waterways (Chen & Burns, 2006). Water and ground pollution can also result from sheep dip, which typically consists of organophosphorus compounds (Defra (ERM), 2007). After the fiber collection from the sheep, the fibers are then washed with an alkaline solution to remove grease and other impurities such that the fiber loses an estimated 45 percent of its weight (Beton, et al., 2014). Chemicals are then applied to the fibers to prevent shrinkage, to ensure machine washability, and to provide resistance to moths and stains (Chen & Burns, 2006). The fiber is then made into yarn and then fabric where it will undergo dyeing and garment finishing.

Mitigation of environmental impacts from wool production typically focuses on preventing sheep from overgrazing any specific area through herd movement to prevent desertification of overgrazed areas and contaminated water runoff from sheep manure (Patagonia, Inc., 2014). Other impacts from wool production include greenhouse gas emissions (methane) from sheep themselves while grazing and then possibly wastewater impacts from dyeing operations (Defra (ERM), 2007).

***Polyester***

Polyester is perhaps the single most used synthetic fiber and is produced from a polymer solution sourced from the by-product of petroleum resources (Chen & Burns, 2006). Once polyester is made, the raw material is melted and then extruded through a spinneret from which the filaments solidify and cool in the air from which yarn is formed (Chen & Burns, 2006). Chemicals are often added at this step to change the physical and chemical properties of the filaments in order to hold the dyes before the fiber is formed (Beton, et al., 2014). The yarn can then be used without washing or cleaning, but it needs to be sized and knitted for fabric formation (Beton, et al., 2014). Once formed, polyester does not require any finishing processes like natural fibers. Polyester and other synthetic fibers also utilize more water during fabric formation than natural fibers (Defra (ERM), 2007).

Environmental impacts from production of polyester largely result from depletion of fossil fuels, energy and water use to make the fibers, emissions to air (greenhouse gases, nitrogen oxides), and effluent and waste (hazardous and non-hazardous) (Defra (ERM), 2007). Polyester however is extensively recycled with an estimated 2.4 billion bottles kept out of landfills in the U.S. each year (Chen & Burns, 2006). Air emissions

are estimated to be reduced by 85 percent when material is sourced from recycled polyester compared to new raw materials (Chen & Burns, 2006).

### *Nylon*

Nylon or polyamides are produced in largely the same manner as polyester with raw materials sourced from the by-product of petroleum reserves and it is then produced by extrusion through a spinneret with the resulting filaments air cooled (Chen & Burns, 2006). Once formed, yarn is produced from the fiber followed by knitting and weaving to make the fabric for garment construction (Beton, et al., 2014). Similar to polyester, chemicals can be added to the yarn formation step to change the physical and chemical properties of the filaments to hold any dyes (Beton, et al., 2014). Environmental impacts are also similar to polyester which can include depletion of fossil fuels, energy and water use, emissions to air (greenhouse gases, nitrogen oxides), and effluent and waste (hazardous and non-hazardous) (Defra (ERM), 2007). Nylon can be recycled, but it does not usually achieve as high recycling rates as polyester (Chen & Burns, 2006).

## III.1.2 Garment Construction

Once the fabric is made, the next step is that of actual garment construction or confection which largely consists of cutting and sewing each garment into the final product. Energy usage accounts for most of the environmental impacts during this stage, however waste textiles are also generated as each garment has its own shape and size and must be cut to those specifications. The waste fabric is either disposed or re-used for other applications (Beton, et al., 2014).

Additional materials to the fabric may be added during the finishing and garment construction steps which are not considered fabric but can form an essential part of the

garment, especially for outdoor brands, and can include polyurethane, polyvinyl chloride (PVC), and down (feathers) (Beton, et al., 2014). Polyurethane is usually added to swimwear, while PVC is the main coating material to waterproof products such as ski jackets, rain coats, overcoats, and ski suits (Beton, et al., 2014). Down is usually added to insulating products such as coats or sleeping bags (Beton, et al., 2014). The finished garment is then packaged for distribution using materials that can include plastic, metal, and cardboard with each having impacts associated with their production including resource use, water effluent, and waste generation (Defra (ERM), 2007).

### III.2. Transport

The next phase in a product's life cycle is transport or distribution, which can be transport of finished product from manufacturer to retail and any other time during the production and processing stage as one country may be make the fabric while another would perform the garment finishing (Beton, et al., 2014). Transportation options utilized in this phase can include all of the above (land, sea, and air), however most apparel or fabrics shipped internationally usually occur in large bulk shipments via ocean freighter rather than air, usually at a rate of ocean shipping vs. air being 92 percent to 8 percent respectively (Beton, et al., 2014). When a shipment reaches port, inland shipping occurs almost always by truck transport (Beton, et al., 2014). Environmental impacts from this stage are mostly air emissions (greenhouse gas and other), with emissions from ship transport generally much lower than air or truck transport via truck (Business for Social Responsibility, 2009).

### III.3. Use

The use phase of apparel can include washing, drying, dry cleaning and ironing which may result in energy, water, chemical use for dry cleaning, and effluent from detergent use. The extent of energy and water use really depends on the washing method (temperature, capacity of load, mixtures of clothing type), washing and drying equipment used, and clothing lifetimes (Allwood, Laursen, de Rodriguez, & Bocken, 2006). The environmental impact from this stage of the apparel's life cycle is wholly dependent on the consumer, who determines how often a garment is washed, ironed, and the wash temperature used (Beton, et al., 2014).

The use phase, particularly for natural fibers, is where the highest energy use can occur across that fiber's life cycle, which results from washing and drying clothes especially if hot water is used due the energy needed to heat the water (Allwood et al., 2006). Cold water washing of clothes can decrease the amount of energy used during this phase in the apparel's life cycle (Allwood et al., 2006). During washing, use of detergents and other washing substances can also generate effluents with phosphate concentrations (Defra (ERM), 2007). Dry cleaning can also cause environmental impacts because it is often done using the toxic chemical perchloroethylene which causes the generation of volatile organic compounds (VOCs) and solvent waste (Defra (ERM), 2007).

### III.4. End-of-Life

Garments at their end-of-life can either be disposed, reused, or recycled. Textile waste produced each year is not insignificant. The U.S. EPA (2014) estimates that 14.3 million tons of textile materials were generated for disposal, reuse, or recycling of the

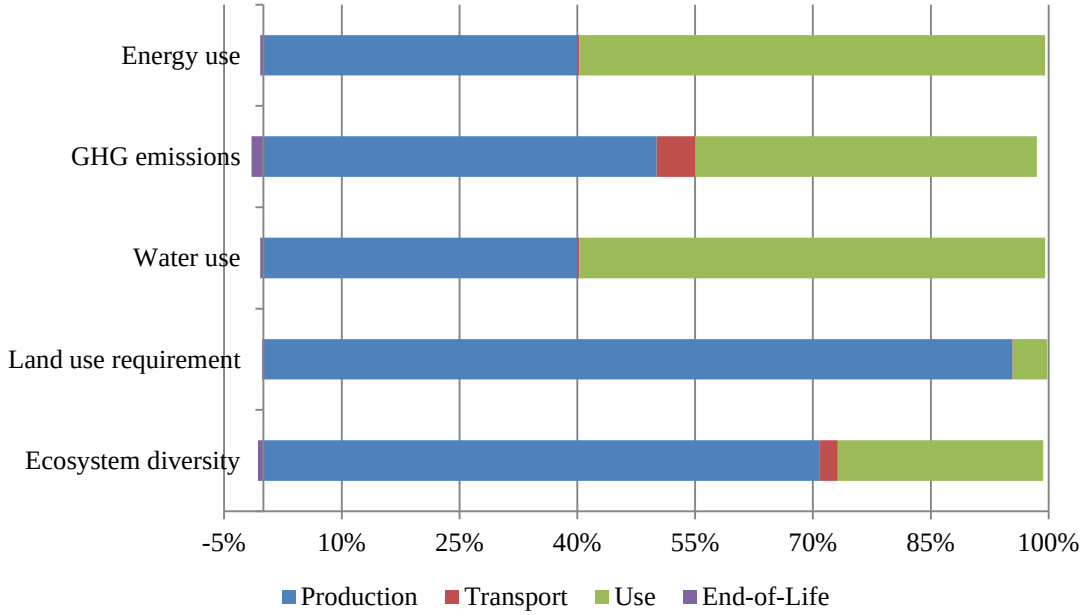
roughly 19.4 billion garments Americans purchased in 2012 (AAFA, 2012). The U.S. EPA (2014) also estimates that 5.7 percent of all municipal solid waste disposed each year is made up of garments and other textiles.

Aside from disposal options, garments that are recovered for reuse are usually exported overseas for sale to developing countries (Beton, et al., 2014). Those reused clothes typically have a 50 percent longer lifetime when compared to non-reused clothes (Beton, et al., 2014). Garments that are recycled are made into lower value products (e.g., mattresses, wipes, carpet underlay, automotive mats, etc.) (Defra (ERM), 2007). However, if the garment is made out of a fiber blend it generally cannot be recycled because the material usually cannot be separated into individual fibers needed to make other textile products (Beton, et al., 2014). A growing trend to prevent true disposal of apparel is by not only designing a garment with the consumer in mind, but also for end-of-life, which enables products to be taken apart and recycled more easily (Defra (ERM), 2007).

### III.5. Summary

This section will review the results from a life cycle analysis that averaged environmental impacts from all fibers from each life cycle phase. This will be followed by a review of and ranking of environmental impacts from each fiber strictly from the production and processing stage of each fiber's life cycle. The results of the averaged environmental impacts from each life cycle phase for all fibers across varying environmental impacts (expressed as a percent) is found below.

**Figure 3 – Percent Contributions of Each Product Phase to Environmental Impacts**




Adapted from "Environmental Improvement Potential of Textiles (IMPRO-Textiles)," by Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., ... Boufateh, I., European Commission Joint Research Centre, 2014, p. 166.

This figure shows that of an apparel's life cycle for any fiber type, the production and use phases were by far the main contributors for all environmental impact categories (Beton, et al., 2014). The transport and end-of-life impact categories were found to cause less impacts with the end-of-life category being negative for some categories examined because end-of-life only included recycling and disposal activities, whereas clothing reuse was captured in the production category (Beton, et al., 2014).

When looking at individual categories, it is clear that the production phase dominates with regard to agricultural land use which can be attributed to the large amounts of land needed to grow cotton and for sheep grazing for wool production (Beton, et al., 2014). Otherwise the use phase mostly dominates at approximately 60 percent with respect to energy use and water use mainly because of consumer washing and drying

clothes, which can vary from heavy (tops, bottoms, etc.) or light depending on article of clothing (jackets, suits, etc.) (Beton, et al., 2014).

Greenhouse gas emissions are mostly split between the production phase at slightly more than 50 percent and the use and transport phase. The high amount of greenhouse gas emissions from the production phase can be attributed to synthetic materials being produced using an energy intensive process as they are sourced from petroleum resources (Beton, et al., 2014). Greenhouse gas emissions from the transport category are produced during ship, air, or truck transit. The use phase also produces greenhouse gas emissions from the electricity that is needed to run the washer and dryer for cleaning clothes (Beton, et al., 2014). Impacts to ecosystem diversity occur mostly from the production phase due to potential water impacts from pesticide use for growing cotton, sheep dip runoff, and toxic wastewater effluent from finishing operations (Beton, et al., 2014).

A more detailed look at the production and processing stage for each fiber was also reviewed in order to understand the specific impacts that apparel brands are able to influence and control as compared to only offering suggestions and guidance to consumers post-purchase. The below table provides that analysis (Defra, 2010).

**Table 2 – Summary of Environmental Impacts of Fiber Production**

| Fiber | Relative impacts between fibers (+ = relatively low impact, ++++ = relatively high impact) | | | | | |
|---|---|---|---|---|---|---|
| | **Energy Use** | **Water Use** | **GHG Emissions** | **Wastewater Production** | **Chemical Use in Finishing** | **Land Requirement** |
| Cotton | ++ | ++++ | ++ | ++ | +++ | +++ |
| Wool | + | + | + | ++++ | ++ - +++ | ++++ |
| Polyester | ++ | + | +++ | + | + - ++ | N/A |
| Nylon | +++ | +++ | ++++ | + | + - ++ | N/A |

Adapted from "The role and business case for existing and emerging fibres in sustainable clothing," Department for Environment, Food and Rural Affairs (Defra), London, 2010, p. 7.

As observed from the above table, cotton is the fiber that has the highest environmental impact because it is not only the most dominant fiber type used in clothing and other applications, but the impacts per fiber are also higher for cotton than the other fibers examined (Beton, et al., 2014). The main impacts from cotton during this stage are the high amounts of fertilizers and pesticides used during production. The fibers that have the next biggest impact are the two synthetic fibers, polyester and nylon, because of the large amounts of energy required to produce which releases more greenhouse gas emissions than natural fibers (Beton, et al., 2014). Polyester is thought to have more impact than nylon because polyester is the most consumed fabric type after cotton (Beton, et al., 2014).

Wool is thought to have the least environmental impact of all the fibers examined because it is not associated with large amounts of pesticide/herbicide use or greenhouse gases during production (Defra, 2010). However, wool production can still impact the environment with land use impacts from sheep overgrazing, agrochemicals used in sheep dip, and a large amount of wastewater generated from multiple washes used to clean the raw fibers following harvesting from the sheep (Defra, 2010). The below table also

provides a listing of fibers ranked by key environmental impact during the finishing stage from most to least (Defra, 2010).

**Table 3 – Fibers Ranked by Environmental Impacts During Production and Processing**

Decreasing impact ↓

| Energy Use | Water Use | GHG | Wastewater | Land Requirement |
|---|---|---|---|---|
| Nylon | Cotton | Nylon | Wool | Wool |
| Polyester | Nylon | Polyester | Cotton | Cotton |
| Cotton | Wool | Cotton | Nylon | Nylon/ |
| Wool | Polyester | Wool | Polyester | Polyester |

Adapted from "The role and business case for existing and emerging fibres in sustainable clothing," Department for Environment, Food and Rural Affairs (Defra), London, 2010, p. 6.

This above review of environmental impacts during an apparel's life cycle was performed to understand where impacts could occur and the phases during the life cycle that outdoor apparel brands would have influence over for implementation of greener practices. From this review, it was observed that while environmental impacts from certain categories (energy and water use) showed the greatest impact during the use phase rather than the production and processing phase, significant environmental impacts also can occur during the production and processing stage. Therefore, while outdoor brands may not have direct control over approximately half of the impacts that can occur from use of their product that may result from the use phase, brands can still influence and have an effect on greening their supply chain with respect to apparel process and production practices.

# IV. Outdoor Brand Apparel Sustainability Best Practices

To better understand sustainability measures that outdoor brands may implement to improve environmental impacts from their products, this section will highlight product sustainability measures that are being advocated by industry groups specific to the outdoor and the greater apparel industry. This review will also be used to help form the basis for criteria to benchmark sustainability efforts for several outdoor apparel brands from publicly available literature. Initiatives from four organizations were reviewed including the American Apparel and Footwear Association (AAFA), Outdoor Industry Association (OIA), and the Sustainable Apparel Coalition (SAC). It is important to note that in addition to providing practices aimed at improving environmental performance these groups also provided measures for enhancement of social and labor practices, however only those measures regarding environmental performance improvement were profiled.

## IV.1. American Apparel and Footwear Association

The AAFA lists several sustainability resources available to member companies on their website which are offered by their Environmental Committee. The resources available through this committee include a restricted substances list, guidance on helping companies comply with individual U.S. state chemical regulations, a tool to manage voluntary product environmental profiles, suggested supplier environmental standards and best practices for retail brands, and textile wastewater effluent limit guidelines from manufacturing operations (AAFA, 2014).

The restricted substance list (RSL) is described by the AAFA as a list that is updated every six (6) months which covers chemicals and other substances whose

presence in a product is restricted through a government regulation or law. It also lists the most restrictive version of that particular regulation worldwide (AAFA, 2014). The Environmental Committee offers guidance programs to help companies navigate individual U.S. state regulations regarding the disclosure of certain high concern chemicals within products particularly with respect to children (AAFA, 2014).

Following this, the AAFA (2014) offers suggested textile manufacturer effluent guidelines for wastewater from manufacturing operations and environmental standards and best practices for companies to use that covers such topics as: industrial wastewater; storm water; air emissions; energy management and conservation; hazardous materials, storage, and transportation; and solid and hazardous waste. The last item listed by the AAFA is the Voluntary Product Environmental Profiles tool that allows for material suppliers to self-author and publish product declaration forms that can be made available that contain information on that material related to information on the chemical makeup of products and environmental properties relative to global standards and regulations (VPEPxchange, 2014).

### IV.2. Outdoor Industry Association

Perhaps no group better represents the outdoor industry in its entirety in the U.S. than the OIA. The OIA (2014) claims to be the leading trade association for the outdoor recreation industry serving more than 4,000 manufacturers, distributors, suppliers, sales representatives, and retail brands. According to its website, the OIA (2014) has a Sustainability Working Group that was formed in 2007 to explore issues of corporate environmental responsibility in the outdoor industry which focuses on the following

areas: development of sustainability indexes; responsible chemicals management; and advocating and developing mechanisms for materials traceability within the supply chain.

The OIA (2014) states that in the past they had developed a stand-alone eco-index tool, but were now working in an ongoing collaboration with the SAC to continue development of sustainability indexes for apparel, footwear, and equipment. This effort will be further described in the SAC section. The OIA (2014) also works in the area of chemicals management and is focused on helping to ensure that chemicals used within the outdoor industry are produced using sustainable chemistry, the promotion and use of inherently safer chemicals, and reducing or eliminating hazardous chemicals from products. The key projects that are being pursued to promote this focus area include development of an inventory of existing tools for chemicals management and a description of what each tool does and an examination of the chemistry used for durable water repellents and research into potential alternatives to the traditional perflourinated chemistry treatments (OIA, 2014).

The last product sustainability focus area to be discussed regarding the OIA (2014) is their materials traceability working group that seeks to establish systems and standards for traceability within raw material supply chains. This initiative works with the Textile Exchange, a non-profit organization, to develop standards for materials that will allow stakeholders determine the veracity of claims regarding raw material sourcing (OIA, 2014). Materials that currently have traceability standards developed or being developed include, down (feathers), wool, organic and recycled content (OIA, 2014). Following these material traceability standards will show that the content claims for that

material has been backed up by third-party verification audits and supply chain tools (OIA, 2014).

### IV.3. Sustainable Apparel Coalition

The SAC (2014) depicts itself as a trade organization comprised of brands, retailers, manufacturers, government and non-governmental organizations and academia which represents more than one-third of the global apparel and footwear market and works to reduce the environmental and social impact of apparel and footwear products from around the world. The SAC was also formed as a collaboration between Patagonia and Walmart (Chouinard & Stanley, 2012). As discussed above from the efforts of the OIA, the SAC's only goal is to build and offer an eco-index tool for sustainability assessment. This tool, the Higg Index, was based on the eco-index tool originally developed by the OIA (2014) and Nike's Environmental Design Tool (2014), and has since had two versions released, the most updated being the Higg Index 2.0 released on December 11, 2013 (SAC, 2014). The index is described as an assessment tool for apparel and footwear products to help organizations standardize how they measure and evaluate environmental performance of apparel products across the supply chain at the brand, product, and facility levels (SAC, 2014).

The specific indexes available from the SAC (2014) are separated into modules to assess environment and social/labor performances of both facilities and brands. Three (3) modules are available to assess environmental practices: one at the facility level for apparel/footwear specifically to examine material, packaging, and manufacturing facilities and then two (2) separate brand modules for apparel and footwear which can be used to assess apparel and/or footwear specific environmental practices at the brand level

(SAC, 2014). Two (2) additional modules were also built to assess the social/labor performances of facilities and brands (SAC, 2014). Other tools that were also listed by the SAC included a Rapid Design Module to help designers make environmentally friendly choices during product design and a Materials Sustainability Index (MSI) that is used in the Rapid Design Module to help designers understand and select environmentally better materials by providing scores in four usage areas – energy, chemistry, water, and waste (SAC, 2014).

### IV.4. Summary

The above review of the sustainability practices of three organizations offers a view of advocated sustainability practices by organizations within the apparel and outdoor industry. Some of the practices are similar and are even the result of collaboration between two entities, such as the OIA and SAC working to develop the apparel eco-index tool, The Higg Index (SAC, 2014). Other similarities are seen in promoting environmental declarations for raw materials as evidenced by the development of the OIA's (2014) common content standards and the AAFA's Voluntary Product Environmental Profiles that allow material suppliers to self-publish material and information related to their material (VPEPxchange, 2014). Other important environmental measures advocated by these groups include recommended supplier environmental standards and best practices by the AAFA and tools for chemicals management within the supply chain, such as the RSL by the AAFA (2014); which if used will help ensure that brands or manufacturers are not using chemicals prohibited by law or regulation and the OIA's (2014) chemicals management inventory tool that can be used by a member company to identify proven best management practices for chemicals.

# V. Benchmarking of Outdoor Brand Apparel Sustainability Practices

## V.1. Brand Selection

The first step in benchmarking product sustainability practices was to select the outdoor brands to evaluate, which was done by reviewing membership lists from the SAC (2014) and voting members of the OIA Sustainability Working Group (SWG) (2014). This allowed for identification of brands with interest and presumed activity in sustainability topics as well as those specific to the outdoor industry that target consumers in active outdoor recreation activities (ski, snowboard, mountaineering, surfing, climbing, etc.). Other criteria included only evaluating brands that also have a good size apparel line rather than mostly footwear. Large brands such as Nike or Adidas, who are both members of either the OIA SWG or SAC, were deliberately not profiled due to their already large market penetration for general recreation apparel and mainstream sporting goods. The selection of brands was also limited to those based within the North American continent. Brands selected for the benchmarking evaluation are listed in the table below.

**Table 4 – Outdoor Brands to Evaluate for Product Sustainability Benchmarking**

| # | Brand | Organization | Headquarters Location |
|---|---|---|---|
| 1. | Black Diamond | OIA SWG | Salt Lake City, UT |
| 2. | Burton | OIA SWG | Burlington, VT |
| 3. | Columbia | OIA SWG, SAC | Portland, OR |
| 4. | EMS (Eastern Mountain Sports) | OIA SWG | Peterborough, NH |
| 5. | LL Bean | SAC | Portland, ME |
| 6. | Marmot | OIA SWG, SAC | Santa Rosa, CA |
| 7. | MEC (Mountain Equipment Co-op) | OIA SWG, SAC | Vancouver, BC |
| 8. | Mountain Hardwear | Member through parent company (Columbia) | Redmond, CA |
| 9. | Outdoor Research | OIA SWG | Seattle, WA |
| 10. | Patagonia | OIA SWG, SAC | Ventura, CA |
| 11. | prAna | OIA SWG | Carlsbad, CA |
| 12. | Quiksilver | OIA SWG | Huntington Beach, CA |
| 13. | REI (Recreational Equipment, Inc.) | OIA SWG, SAC | Seattle, WA |
| 14. | The North Face | OIA SWG, SAC | San Leandro, CA |

Note: OIA SWG – Outdoor Industry Association Sustainability Working Group; SAC – Sustainable Apparel Coalition

Following selection of the brands, it was determined to try and obtain primary information from each brand regarding product sustainability practices by conducting interviews with brand employees with responsibility or were part of that brand's efforts to implement product sustainability measures. All brands were contacted via electronic mail and about half responded with positive overtures about being willing and able to provide information regarding their brand's apparel sustainability measures. However, despite that initial overture, interviews were only conducted with two (2) brands, and due to the small sample size of responses, it was determined to not include this information in this study and to continue only with publicly available literature from each brand's website or parent company's website. The OIA and SAC were also contacted to provide information, however either no response was received or they were unable to provide information regarding outdoor brands' apparel sustainability measures. It should also be noted that some of the above brands are also retailers of other brand's apparel and that product sustainability measures were only evaluated for their in-house product lines.

### V.2. Brand Benchmarking Tool

The tool used to benchmark product sustainability for the above outdoor apparel brands is found in Appendix A. The tool was created by reviewing best practices as identified from industry trade groups in Section IV. It was created mainly from review of the Higg Index Apparel Brand Module for the Environment due to its look at the entire life cycle of apparel (see Figure 1) – production and processing, transportation, use, and product end-of-life, which includes recycling, reuse, or disposal (SAC, 2014). It was important to have a tool that evaluated product sustainability measures for each brand across the product's entire life cycle because, as noted in Section III.3., environmental impacts from any one specific apparel is split roughly in half between impacts caused during material sourcing and production and from the use phase due to consumer appliance use for apparel washing and drying. Individual brand scoring from the Higg Index is not currently available for specific apparel products.

Specific questions sourced from the Higg Index were mainly those asking if certain information or reporting were made available to the public. In addition to questions specifically targeting impacts from throughout the apparel's life cycle that were sourced from the Higg Index, additional general questions were included asking whether a brand had a mission statement to show their commitment to reducing environmental impacts, whether any brands included literature on their website regarding environmental impacts from apparel manufacture, and if the apparel produced by the brands met sustainable criteria as determined by a third-party certifier.

Questions from the benchmark tool Numbers 1 to 3 were asked to identify general sustainability information from the brand, such as if the brands were aware of the

environmental impact that could be caused by apparel production and processing, were committed to reducing that impact, and also making consumers aware of that impact by asking if they had publicized information via a product life cycle analysis or published a corporate social responsibility (CSR) report. In particular, question Number 2, regarding whether information surrounding environmental impacts from apparel production and processing was included on the brand's website was asked as a result of the literature review performed in Section II which identified that if consumers were provided with education regarding impacts from apparel production and processing that they would be more likely to purchase green apparel.

The next five (5) questions, Numbers 4 to 8, were asked to identify whether particular environmental information from apparel production and processing was made available to the consumer. Specific questions that were asked included: if a life cycle analysis had been conducted on any one product; if the brand had sought third-party verification to certify their products as sustainably produced; if the brand required their apparel manufacturer's follow a code of conduct mandating that applicable environmental laws and regulations are met; if data from the brand is made available regarding environmental impacts from apparel process and production; and whether the brand used and published a chemical restricted substance list. Other ancillary questions were also asked to determine if certain published data were verified by a third-party organization and if audits were conducted and publicized to determine manufacturer compliance with the company's environmental code of conduct.

The next questions, Numbers 9 and 10, deal with the transportation stage of the life cycle specifically asking whether recycled materials are used for packaging materials,

and the brand has a packaging restricted substance list since packaging materials can come with their own set of environmental impacts, and if product transportation emissions are published. The last three questions, Numbers 11 to 13, deal with product care, product repair, and end-of-life, respectively. These questions are asked to determine whether each brand provides information to consumers to help with reducing the impact of their products once purchased through recommendations for enhanced product care during the use phase, whether a service for product repair from normal wear and tear that would not be covered as part of a warranty, and if the brand offered a direct take back program for their products at end of life. The below table outlines the question number from the benchmark tool and the part of the product life cycle that is associated with that question.

**Table 5 – Benchmark Took and Corresponding Section of the Apparel Life Cycle**

| Benchmark Tool Question Number | Apparel Life Cycle Section |
|---|---|
| Questions 1 to 3 | General Sustainability Information |
| Questions 4 to 8 | Production and Processing |
| Questions 9 to 10 | Transport |
| Questions 11 to 12 | Use |
| Question 13 | End-of-Life |

## V.3. Results

Results from the survey of outdoor brands using the benchmarking tool (Appendix A) and publicly available literature is provided in the table below. Note that each question asked is weighted the same to determine overall score. Questions were asked in a "Yes/No" format to determine if data for that particular question were available from each brand. Questions 3 to 6 also include additional questions if those questions were answered in a positive fashion. Answers were primarily determined from each brand's sustainability web page with some information coming from the parent company's sustainability website where applicable.

**Table 6 – Brand Product Sustainability Benchmark Results**

| Abbreviated Question | Black Diamond | Burton | Columbia | EMS | LL Bean | Marmot | MEC |
|---|---|---|---|---|---|---|---|
| **1.** Is there a publicly available env. mission statement? | Yes | Yes | Yes | No | Yes | Yes | Yes |
| **2.** Offer information describing the env. impacts of apparel manufacture? | No | No | No | No | No | No | Yes |
| **3.** Publish a CSR report? | No | No | No | No | No | No | Yes |
| *Data verified by a 3rd party?* | -- | -- | -- | -- | -- | -- | No |
| **4.** Publish a LCA? | No | No | No | No | No | No | No |
| *Data verified by a 3rd party?* | -- | -- | -- | -- | -- | -- | -- |
| **5.** Offer sustainable apparel verified by a 3rd party? | Yes | Yes | No | No | No | Yes | Yes |
| *What 3rd party organization?* | bluesign | bluesign | -- | -- | -- | Organic cotton-GOTS | bluesign |
| *How many or what % of apparel?* | NL | NL | -- | -- | -- | NL | 71% |
| **6.** List code of conduct requiring compliance with env. laws? | Yes | Yes | Yes | No | No | Yes | Yes |
| *Audits performed to determine compliance with code of conduct?* | No | No | No | No | No | No | Yes |
| **7.** Make available env. impact data from apparel manufacture? | No | No | No | No | No | No | No |
| **8.** RSL publicly available? | Yes-BSSL | Yes-BSSL | No-Not viewable | No | Yes-AAFA | Yes-BSSL | No |
| **9.** Have a packing RSL or use recycled materials for packaging? | No | No | No | No | Yes-Recycled | No | No |
| **10.** Report emissions from product transportation? | No | No | No | No | No | No | Yes |
| **11.** Low-impact care instructions for product available on website? | No | No | No | No | No | Yes | Yes |
| **12. P**roduct repair information available on website? | No-Warranty only | No-Warranty only | No-Warranty only | Yes | Yes | Yes | No-Warranty only |
| **13.** Advertise apparel take back programs or recycle worn products? | No | No | No | No | No | No | Yes-online gear swap |

**Notes:** bluesign – 3rd party verification for sustainable textile production; GOTS – Global Organic Textile Standard, 3rd party verification for organic cotton; NOP – USDA National Organic Program , regulatory verification for organic cotton; CCP – Common Content Standard, 3rd party verification for organic cotton from the OIA and Textile Exchange; BSSL (bluesign system substances list) – 3rd party RSL published by bluesign; AAFA – 3rd party RSL; "Yes-VF" – The North Face relies upon its parent company (VF Corp.) for this action; Common Threads – Patagonia's apparel repair and take back program.

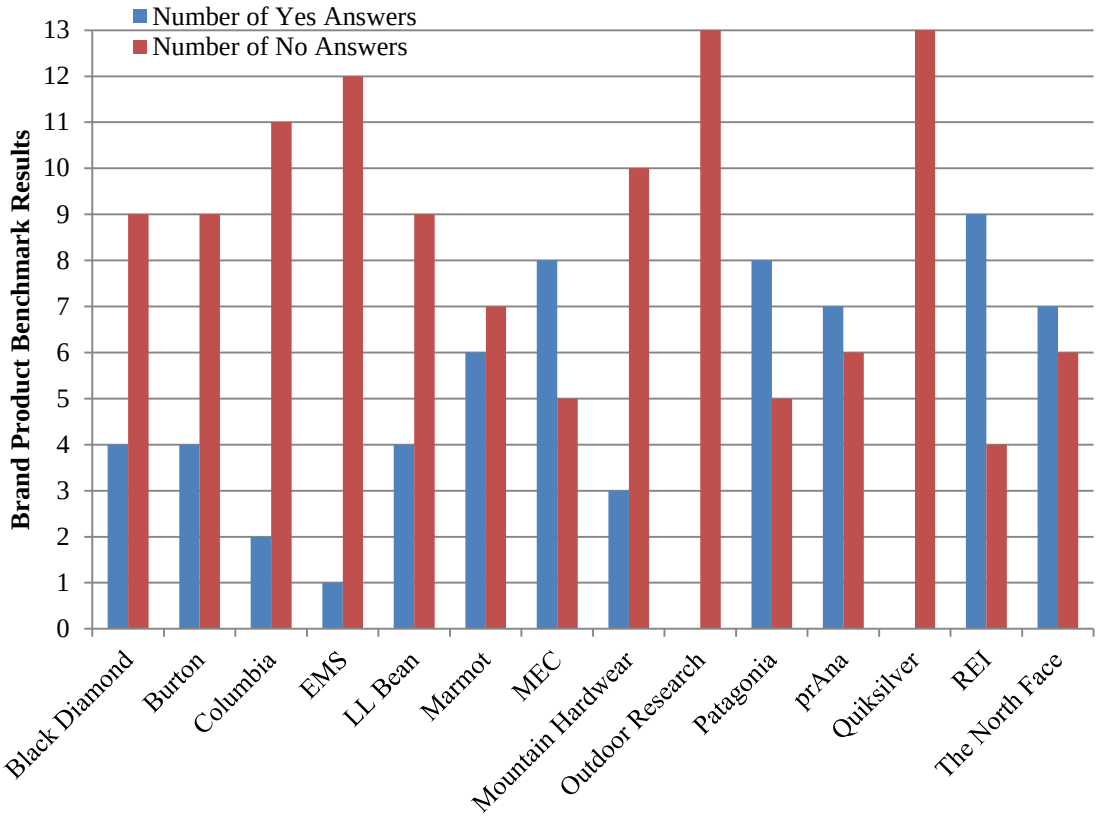
**Table 6 – Brand Product Sustainability Benchmark Results (continued)**

| Abbreviated Question | Mountain Hardwear | Outdoor Research | Patagonia | prAna | Quiksilver | REI | The North Face |
|---|---|---|---|---|---|---|---|
| **1.** Is there a publicly available env. mission statement? | Yes | No | Yes | Yes | No | Yes | Yes |
| **2.** Offer information describing the env. impacts of apparel manufacture? | No | No | Yes | Yes | No | Yes | No |
| **3.** Publish a CSR report? | No | No | No | No | No | Yes | Yes |
| *Data verified by a 3rd party?* | -- | -- | -- | -- | -- | No | No |
| **4.** Publish a LCA? | No | No | No | No | No | No | No |
| *Data verified by a 3rd party?* | -- | -- | -- | -- | -- | -- | -- |
| **5.** Offer sustainable apparel verified by a 3rd party? | No | No | Yes | Yes | No | Yes | Yes |
| *What 3rd party organization?* | -- | -- | bluesign, organic cotton-NOP | bluesign, organic cotton-CCP | -- | bluesign | bluesign |
| *How many or what % of apparel?* | -- | -- | 21% | NL | -- | 25% | 36% |
| **6.** List code of conduct requiring compliance with env. laws? | Yes | No | Yes | Yes | No | Yes | Yes-VF |
| *Audits performed to determine compliance with code of conduct?* | No | No | Yes | No | No | Yes | Yes-VF |
| **7.** Make available env. impact data from apparel manufacture? | No | No | No | No | No | No | No |
| **8.** RSL publicly available? | No | No | Yes-BSSL | Yes-BSSL | No | Yes-BSSL | Yes-VF |
| **9.** Have a packing RSL or use recycled materials for packaging? | No | No | No | Yes-Recycled | No | No | No |
| **10.** Report emissions from product transportation? | No | No | No | No | No | Yes | No |
| **11.** Low-impact care instructions for product available on website? | Yes | No | Yes | Yes | No | Yes | Yes |
| **12. P**roduct repair information available on website? | No-Warranty only | No-Warranty only | Yes-Common Threads | No-Warranty only | No | Yes | Yes |
| **13.** Advertise apparel take back programs or recycle worn products? | No | No | Yes-Common Threads | No | No | No | No |

**Notes:** bluesign – 3rd party verification for sustainable textile production; GOTS – Global Organic Textile Standard, 3rd party verification for organic cotton; NOP – USDA National Organic Program , regulatory verification for organic cotton; CCP – Common Content Standard, 3rd party verification for organic cotton from the OIA and Textile Exchange; BSSL (bluesign system substances list) – 3rd party RSL published by bluesign; AAFA – 3rd party RSL; "Yes-VF" – The North Face relies upon its parent company (VF Corp.) for this action; Common Threads – Patagonia's apparel repair and take back program.

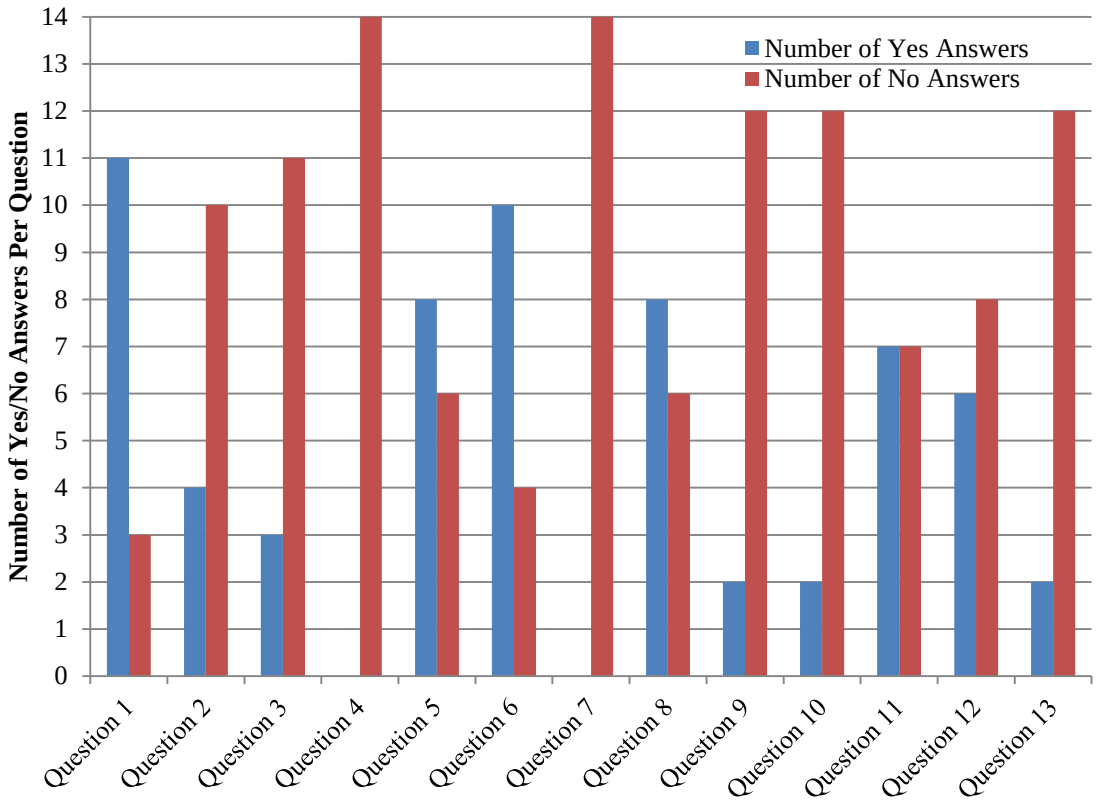
A graphical representation of the benchmark tool results of the "Yes" and "No" answers for each brand is also provided in the figure below. As identified from the figure, nine (9) of the brands reviewed received a majority "No" score from the benchmark tool, while only five (5) brands received a majority "Yes" score. Additionally, two brands, Outdoor Research (2014) and Quiksilver (2014), received a "No" score for all thirteen (13) questions and did not have any public literature available for product sustainability measures on their respective websites. Of the five (5) brands (MEC, Patagonia, prAna, REI, & The North Face), that scored a majority "Yes" score on the questionnaire, REI scored the most number of questions answered "Yes" with nine (9). MEC and Patagonia followed with eight (8) and prAna and The North Face with seven (7) questions answered "Yes."

**Figure 4 – Brand Product Sustainability Benchmark Results**



Results from the benchmark tool were also broken down according to the number of "Yes" and "No" answers per question in the figure below.

**Figure 5 – Total Number of Yes/No Answers Per Individual Benchmark Tool Question**




As evidenced by the figure, only four (4) questions, Numbers 1, 5, 6, and 8, received a majority of "Yes" answers while the remainder of the questions, except for Number 11 which was a tie, received a majority "No" answer. The questions that received a majority of "Yes" answers were: question Number 1 – if the company had a publicly available mission statement for environmental protection from apparel production and processing; Number 5 – whether the brand offered sustainable apparel verified by a third-party organization, Number 6 – if the brand had a code of conduct requiring compliance with local environmental laws and regulations for product manufacturing operations; and Number 8 – if the brands had made the content of their chemical restricted substance list

public. The question that resulted in a tie between "Yes" and "No" answers (Number 11) for the brands reviewed was whether the brand had made available alternative low-impact instructions regarding product care on its website in order to mitigate impacts from the apparel use phase, which is significant because the use phase can account for approximately half of the environmental impact from that product (see Figure 3).

Two questions, Number 4 and 7, also received "No" answers from all fourteen (14) of the brands reviewed. These questions were whether the brand had performed and publicized the results from a product life cycle analysis and if the brand had made data available regarding the environmental impacts (to air, water, and waste) from the production and finishing of its apparel products at its contracted manufacturing facilities. Three questions also had twelve (12) brands answer "No." These questions were Numbers 9, 10, and 13 and dealt with whether the brand used recycled materials or had a restricted packaging material list, if the brand reporting air emissions from transport of its products, and if the brand offered a take back service or advertised information for how to properly recycle or dispose of apparel at its end-of-life.

The supplemental questions asking if certain reporting performed by the brands were also verified by a third-party organization if they had answered "Yes" to questions Numbers 3 to 6 were also reviewed. Of these questions, Number 4, whether a life cycle analysis had been performed, received all "No" answers and will not be evaluated further. The three (3) brands, REI, The North Face, and MEC, that had answered "Yes" to question Number 4, whether they produced a CSR report all did not have their report done to a standard such as the Global Reporting Initiative (GRI) G4 standards (GRI, 2014).

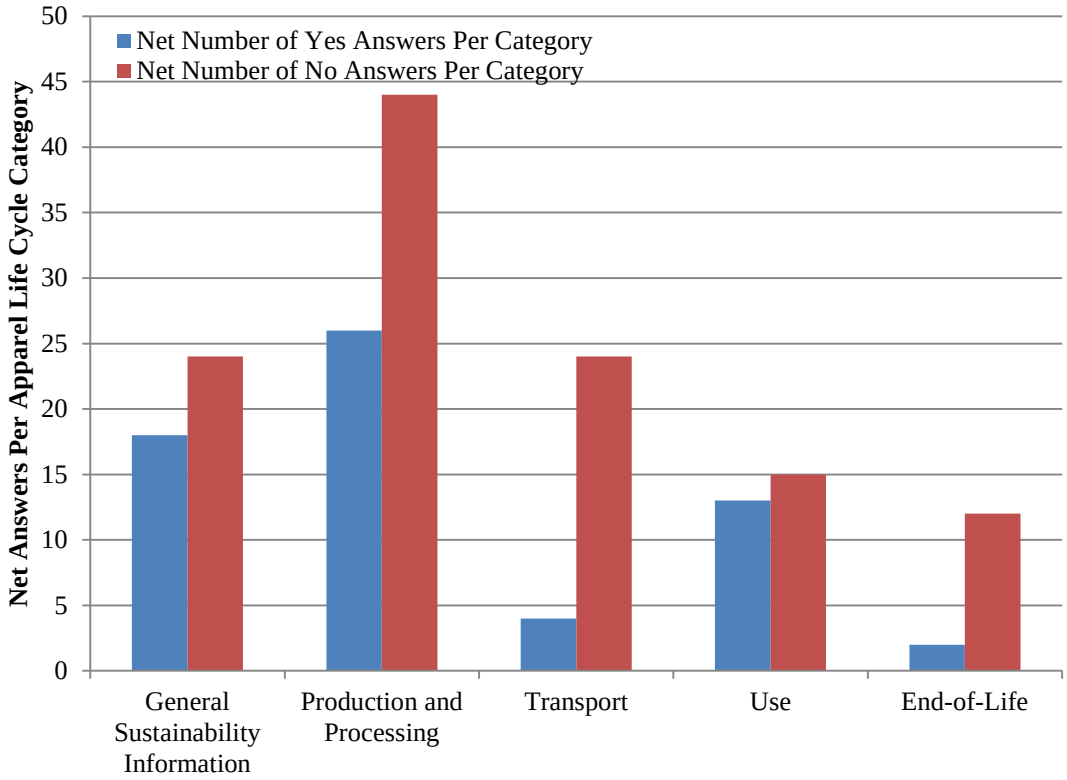
In contrast though, for question Number 5, whether a brand reported having apparel that met a third-party sustainable criteria did receive a majority with eight (8) brands answering "Yes." The third-party identified for providing and certifying the apparel as sustainable was a mixture of organizations identified in Table 6 for organic cotton and bluesign®, which is an independent organization based in Switzerland that provides independent auditing of textile mills which examines textile manufacturing processes from raw materials to water and air emission outputs and suggests ways to improve environmental impacts from its operations (Business Ethics, 2012). bluesign® then ranks its audit findings in order of concern and suggests ways to reduce consumption while recommending alternatives to certain harmful chemicals or processes for those textile mills ensuring that those fabrics are produced in a sustainable manner (Business Ethics, 2012). Of the brands that answered "Yes" to this question, four (4) of these brands (MEC, Patagonia, REI, The North Face) also provided how much of their current apparel product line was sourced from manufacturers that were bluesign® certified. Three (3) of the four (4) brands (MEC, Patagonia, REI) also stated that they would be moving to using 100 percent bluesign® certified fabrics in the future (MEC, 2014; Patagonia, 2014; REI, 2014). It should also be noted that Patagonia has used 100 percent organic cotton in its product line for over 10 years (Chouinard & Brown, 1997).

The last supplemental question examined, Number 6, asked if there was a published code of conduct for manufacturers that required compliance with local environmental laws and regulations and if answered "Yes," whether audits were performed against this standard. Similar to the number of brands providing what percentage of the product lines were bluesign® certified, the answer to this question is

much the same. Of the brands answering "Yes" to Question 6, only four (4) brands indicated that audits were performed (MEC, Patagonia, REI, The North Face), though the results of facility audits for The North Face are published by their parent company (MEC, 2014; REI, 2014; Patagonia, 2014; VF Corp., 2011).

Two (2) summary tabulations were also evaluated. The following graphical summary shows the net number of answers for each stage of the apparel life cycle per question as identified in Table 5. This figure shows that for even each life cycle category or for general sustainability information, that the net number of "No" answers were more than the net number of "Yes" answers. However, for the general sustainability information category and the use phase of the product life cycle that the number of "Yes" to "No" answers was nearly equal.

**Figure 6 – Net Number of Answers Per Apparel Life Cycle Category**



The last summary tabulation is the table below which depicts the pure net number of “Yes” and “No” answers, the average number of “Yes” and “No” answers per brand, and the highest and lowest number of “Yes” and “No” answers for any one specific brand.

**Table 7 - Benchmark Tool Summary**

| Summary Criteria | Yes Answers | No Answers |
|---|---|---|
| Net | 63 | 119 |
| Average No. Answer Per Brand | 4.5 | 8.5 |
| Maximum No. For One Brand | 9 | 0 |
| Minimum No. For One Brand | 0 | 4 |

An examination of the above results from the benchmarking tool revealed that the majority of outdoor brands examined, at a rate of nearly two (2) to one (1), either do not implement apparel product sustainability measures or do not provide sustainability related information via their websites. However, this review did reveal that some brands do provide a breadth of information regarding sustainability measures. Those brands, MEC, Patagonia, prAna, REI, and The North Face, all scored more “Yes” than “No” answers for the benchmark tool.

## VI. Conclusion

This capstone provides an in depth look at potential environmental impacts that can occur during the life cycle of apparel and examined whether a majority of outdoor brands had implemented and advertised their enactment of sustainable product measures with the premise that these same outdoor brands, with their history of environmental conservation, would be able to influence the broader apparel industry towards adoption of sustainable apparel practices. This capstone tested that question in several ways by first reviewing literature to understand influencers for green consumers and whether those traits would be shared by the outdoor brand's main consumer, the outdoor recreationalist, and if the recreationalist would be more inclined to purchase green apparel at a higher price tag than other consumers. The next section performed a review of the environmental impacts that could occur during apparel's life cycle and identified which life cycle part may cause the greatest environmental impact. Apparel sustainability best practices by industry trade organizations were then reviewed to assist with development of a benchmark tool to measure outdoor brands' product sustainability practices through a collection of "Yes/No" questions. Lastly, a benchmark survey of publicly available literature was performed to determine if a majority of outdoor brands had implemented or provided information on sustainable apparel practices.

The first part of this capstone did identify that the typical green apparel purchaser was usually those individuals who displayed traits such as being environmentally responsible, considered environmental issues when making purchases, and were involved in environmental organizations (Lin, 2010). It was also identified that some outdoor recreationalists, particularly those associated with an "appreciative" forest-based type of

recreation, were likely to exhibit environmentally friendly traits, such as participating in an environmental organization and purchasing environmentally friendly products (Teisl & O'Brien, 2003). An additional review also noted that a company's financial performance generally benefitted in both the short and long term when positive changes ensued that were associated with a company's corporate social responsibility performance in environmental and social areas (Ruf et al., 2001).

The review of an apparel's life cycle for any fiber type showed that apparel production and use phases were by far the main contributors for all environmental impact categories, approximately 90 percent and greater, and that transport and end-of-life impact categories were found to cause far less impacts (Beton, et al., 2014). A review of environmental impacts specifically from the production and processing stage for four main fiber types reviewed (cotton, wool, nylon, and polyester) also showed that cotton is the fiber generally associated with the highest environmental impacts because it is the most dominant fiber type, and that per fiber, impacts are higher for cotton than any other because of the amount of fertilizers and pesticides used during production (Beton, et al., 2014).

The two synthetic fibers (polyester and nylon) are generally thought to have the next highest measure of environmental impacts because of the large energy amounts required for fiber production from their raw material (petroleum resources) which releases more greenhouse gas emissions than natural fibers (Beton, et al., 2014). Wool was shown to be the most sustainable fiber with the least environmental impact of those examined because it is not associated with large amounts of pesticide/herbicide use or

greenhouse gases during production (Defra, 2010). Wool production can still impact the environment with land use impacts from sheep overgrazing (Defra, 2010).

The next part of the capstone reviewed advocated product sustainability practices by certain apparel and outdoor industry trade organizations to identify best practices and measures for creation of the benchmark tool used to evaluate the sustainability performance of the various outdoor brands. Some of the best practices or measures sponsored by some organizations included an apparel eco-index tool, The Higg Index, that could be used to measure environmental and social impacts at a brand and manufacturing facility level for both apparel and footwear that was developed by a stakeholder group of both brands, retailers, and manufacturers (SAC, 2014). Also observed were promotion of environmental declarations for raw materials such as OIA's (2014) common content standards and the AAFA's Voluntary Product Environmental Profiles (2014). Other environmental measures advocated by industry groups were best practices and tools for chemicals management within the supply chain, such as use of a chemicals restricted substance list to help ensure that brands or manufacturers are not using chemicals prohibited by law or regulation (AAFA, 2014).

The last part of this capstone included creation of the benchmark tool, selection of the brands to evaluate, and then analysis of those brands' product sustainability measures to determine if a majority had implemented those measures. The benchmark tool in part was created by examining the best practices as identified by the industry trade groups, in particular The Higg Index from the SAC (2014). The outdoor brands selected for evaluation were also identified as members of either the OIA or SAC. The results of the benchmarking evaluation of product sustainability measures revealed that the majority of

outdoor brands examined, at a rate of nearly two (2) to one (1), either do not implement apparel product sustainability measures or do not provide sustainability related information via their websites and that only five (5) of the fourteen (14) brands reviewed publicly exhibited a comprehensive sustainability strategy.

The review however did reveal that some brands scored a positive count of sustainability measures according to the benchmark tool. Those five (5) brands, MEC, Patagonia, prAna, REI, and The North Face, all scored more "Yes" than "No" answers. Some of the sustainability practices that set these brands apart from the others included publication of sustainability reports, third-party certification of organic cotton and other raw materials using the bluesign® criteria (Business Ethics, 2012), performance of factory audits to ensure compliance with their manufacturer code of conduct and local laws/regulations, and offering instructions for enhanced product care to try and mitigate consumer impacts from use of appliances for product washing and drying.

While it was observed that the majority of the outdoor brands evaluated did not implement product sustainability measures, some brands were identified as best in class, and it was identified that these same brands were already advocating for the broader apparel industry to adopt product sustainability measures. Model practices identified to support this include Patagonia teaming with Walmart in 2011 to spur creation of the SAC to construct their eco-index (Higg Index) that allows for comparison against a common standard for the wider apparel industry, rather than having an index solely for outdoor brands (Zeller, 2011). It was also observed that MEC and REI joined with Patagonia in pledging to move their entire apparel product line to 100 percent certified bluesign® fabric, which ensures that fabric manufacturers have undergone third-party auditing to

identify areas where their environmental operations could be improved and optimized (MEC, 2014; Patagonia, 2014; REI, 2014). The above initiatives (the creation of the SAC and utilizing 100 percent bluesign® fabric) show that there are brands within the outdoor industry that already are and will continue to advocate for sustainable apparel production and processing practices in the wider apparel industry.

# VII. Appendices

## Appendix A – Benchmark Tool

**Brand:** _____

**1.** Does the brand have a publicly available mission statement showing a commitment towards sustainable apparel practices and improving environmental performance throughout the life cycle of their products? **Yes / No**

**2.** Is any information offered on the brand's website for consumer knowledge that describes potential environmental impacts from apparel processing and production? **Yes / No**

**3.** Does the brand report on their sustainability efforts and performance via a formal report, such as a Sustainability Report, CSR Report, or equivalent? **Yes / No**

*Is the data verified by a third-party organization?* ***Yes / No***

**4.** Has the brand performed a Life Cycle Analysis (LCA) for at least one product and is sharing the results? **Yes / No**

Is the data verified by a third-party organization? **Yes / No**

**5.** Does the brand offer sustainable apparel verified by a third-party organization? **Yes / No**

*If yes, what third-party organization is used to verify?* ____

*If yes, how many or what percent of apparel?* _____

**6.** Does the brand list a code of conduct for manufacturers requiring compliance with applicable local environmental laws and regulations? **Yes / No**

*If yes, does the brand publicize if audits are performed to determine compliance with the code of conduct?* ***Yes / No***

**7.** Does the brand make available data regarding the environmental impacts from the production and finishing of apparel products (air, water, or waste impacts)? **Yes / No**

**8.** Does the brand make the content of their chemical restricted substance list (RSL) publicly available? **Yes / No**

**9.** Does the brand have a packaging restricted substance list or use recycled materials? **Yes / No**

**10.** Does the brand report emissions from transportation of its products? **Yes / No**

**11.** Does the brand make available alternative low-impact instructions for product care on its website? **Yes / No**

**12.** Does the brand offer or make available product repair information on its website? **Yes / No**

**13.** Does the brand advertise collection or processing information for apparel end-of-life, such as recycling collection areas or offer to take back worn products? **Yes / No**

## VIII. References


AAFA. (2012, October 19). *American Apparel and Footwear Association (AAFA)*. Retrieved from AAFA Releases ApparelStats 2012 Report: https://www.wewear.org/aafa-releases-apparelstats-2012-report/

AAFA. (2013, March). *Restricted Substance List*. Retrieved from AAFA: https://www.wewear.org/assets/1/7/RSL12english-March2013.pdf

AAFA. (2014). *AAFA Global Textile Effluent Guidelines*. Retrieved from American Apparel and Footwear Association (AAFA): https://www.wewear.org/assets/1/7/EffluentGuidelines.pdf

AAFA. (2014). *Environmental Committee*. Retrieved from American Apparel and Footwear Association (AAFA): https://www.wewear.org/about/committees/environmental-committee/

AAFA. (2014). *Restricted Substances List*. Retrieved from American Apparel and Footwear Association (AAFA): https://www.wewear.org/industry-resources/restricted-substances-list/

AAFA. (2014). *State-Specific Resources*. Retrieved from American Apparel and Footwear Association (AAFA): https://www.wewear.org/industry-resources/state-resources/

AAFA. (2014). *Supplier Environmental Standards and Best Practices*. Retrieved from American Apparel and Footwear Association (AAFA): https://www.wewear.org/assets/1/7/EnvironmentalStandardsandBestPractices.pdf

Allwood, J. M., Laursen, S. E., de Rodriguez, C. M., & Bocken, N. M. (2006). *Well dressed? The present and future sustainability of clothing and textiles in the United Kingdom.* Cambridge, U.K.: University of Cambridge Institute for Manufacturing. Retrieved from Well dressed? The present and future sustainability of clothing and textiles in the United Kingdom.

Berns, G. N., & Simpson, S. (2009). Outdoor Recreation Participation and Environmental Concern: A Research Summary. *Journal of Experiential Education*, 79-91.

Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., . . . Boufateh, I. (2014, January). *Environmental Improvement Potential of Textiles (IMPRO-Textiles).* Retrieved from European Commission Joint Research Centre: http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=6960

Big Rock Sports. (2013, January 24). *Big Rock Sports, LLC*. Retrieved from Outdoor Product Sales Reach $11.3 Billion in 2012: http://www.bigrocksports.com/services/outdoor-product-sales-reach-11-3-billion-in-2012

Birtwistle, G., & Moore, C. M. (2007). Fashion Clothing - where does it all end up? *International Journal of Retail & Distribution Management, 35*(3), 210-216.

Black Diamond. (2014). *Sustainability*. Retrieved from Black Diamond: http://blackdiamondequipment.com/en/sustainability.html

bluesign. (2013, May 1). *bluesign system substances list (BSSL), Consumer safety limits*. Retrieved from bluesign: http://www.bluesign.com/industry/infocenter/downloads/downloadFile/2/ind-bssl/1-bssl-v3-2-1-pdf

bluesign. (2014). *Industry*. Retrieved from bluesign: http://www.bluesign.com/industry/manufacturers/process

Brosdahl, D. J., & Carpenter, J. M. (2010). Consumer Knowledge of the Environmental Impacts of Textile and Apparel Production, Concern for the Environment, and Environmentally Friendly Consumption Behavior. *Journal of Textile Apparel, Technology and Management*, 1-9.

Burton. (2014). *Sustainability: Burton's Stance*. Retrieved from Burton: https://www.burton.com/default/sustainability

Business Ethics. (2012, November 11). *What Is the 'Bluesign' Standard for Textiles?* Retrieved from Business Ethics: The Magazine of Corporate Responsibility: http://business-ethics.com/2012/11/11/what-is-the-bluesign-standard-for-textiles/

Business for Social Responsibility. (2009, June). *Reports.* Retrieved from Apparel Industry Life Cycle Carbon Mapping: https://www.bsr.org/BSR_Apparel_Supply_Chain_Carbon_Report.pdf

Chen, H. L., & Burns, L. D. (2006, July). Environmental Analysis of Textile Products. *Clothing and Textiles Research Journal, 24*(3), 248-261.

Chouinard, Y., & Brown, M. S. (1997). Going Organic: Converting Patagonia's Cotton Product Line. *Journal of Industrial Ecology, 1*(1), 117-129.

Chouinard, Y., & Stanley, V. (2012). *The Responsible Company: What We've Learned from Patagonia's First 40 Years.* Ventura, CA: Patagonia Books.

Columbia. (2014). *Environmental Responsibility*. Retrieved from About Us: http://www.columbia.com/Environmental-Corporate-Responsibility/Corp_Responsibility_Environmental,default,pg.html

Defra (ERM). (2007). *Department for Environment Food and Rural Affairs.* Retrieved from Sustainable Clothing Roadmap: Mapping of evidence of sustainable development impacts that occur in life cycles of clothing, PLUS 2 reports on sustainable clothing in India funded by the Sustainable Development Dialogue - EV02028: http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14601

Defra. (2010). *The role and business case for existing and emerging fibres in sustainable clothing.* London: Department for Environment, Food and Rural Affairs.

Dunlap, R. E., & Heffernan, R. B. (1975). Outdoor recreation and environmental concern: An empirical examination. *Rural Sociology, 40*(1), 18-30.

European Commission. (2013, August). *Retail Forum for Sustainability.* Retrieved from Sustainability of textiles: http://ec.europa.eu/environment/industry/retail/pdf/issue_paper_textiles.pdf

Geisler, C. C., Martinson, O. B., & Wilkening, E. A. (1977). Outdoor recreation and environmental concern: A restudy. *Rural Sociology, 42*(2), 241-249.

Gilg, A., Barr, S., & Ford, N. (2005). Green consumption or sustainable lifestyles? Identifying the sustainable consumer. *Futures, 37*, 481-504.

GOTS. (2014). *Licensing and Labelling Guide*. Retrieved from Global Organic Textile Standard, Ecology & Social Responsibility: http://www.global-standard.org/licensing-and-labelling/licensing-and-labelling-guide.html

Grail Research. (2009, September). *The Green Revolution*. Retrieved from The Green Revolution: http://grailresearch.com/pdf/ContenPodsPdf/The_Green_Revolution.pdf

Greenpeace. (2014). *Greenpeace International*. Retrieved from Detox: How People Power is Cleaning Up Fashion: http://www.greenpeace.org/international/en/campaigns/toxics/water/detox/

GRI. (2014). *G4 Sustainability Reporting Guidelines*. Retrieved from The Global Reporting Initiative: https://www.globalreporting.org/reporting/g4/Pages/default.aspx

Hustvedt, G. (2006, May). Consumer preferences for blended organic cotton apparel. *PhD Dissertation*. Manhattan, Kansas: Kansas State University.

Joy, A. S. (2012). Fast Fashion, Sustainability and the Ethical Appel of Luxury Brands. *Fashion Theory*, 273-296.

Kim, H. S., & Damhorst, M. L. (1998). Environmental Concern and Apparel Consumption. *Clothing and Textiles Research Journal*, 126-133.

L.L. Bean. (2014). *L.L. Bean and the Environment*. Retrieved from Social Responsibility: http://www.llbean.com/customerService/aboutLLBean/environment.html

Lin, S. (2010). A case study in Hawaii: who will pay more for organic cotton? *International Journal of Consumer Studies, 10*, 481-489.

Marmot. (2014). *Responsibility*. Retrieved from About Us: http://marmot.com/content/about-us/responsibility/

MEC. (2014). *Design KPI: Bluesign®-Approved Materials*. Retrieved from Mountain Equipment Co-op: http://www.mec.ca/AST/ContentPrimary/AboutMEC/Sustainability/AccountabilityReport/FacilitiesWithEMS.jsp

MEC. (2014). *Factory Audit Program*. Retrieved from MEC: https://www.mec.ca/AST/ContentPrimary/AboutMEC/Sustainability/EthicalSourcing/WhatMECIsDoing/FactoryAuditProgram.jsp

MEC. (2014). *Sustainability*. Retrieved from About MEC: http://www.mec.ca/AST/ContentPrimary/AboutMEC/Sustainability.jsp

Meyer, A. (2001). What's in it for the customers? Successfully marketing green clothes. *Business Strategy and the Environment, 10*, 317-330.

Mountain Hardwear. (2014). *Social Responsibility*. Retrieved from About Mountain Hardwear: http://www.mountainhardwear.com/About_Us_SocialResponsibilty.html

Nike. (2014). *Materials Matter*. Retrieved from Materials Choice and Impact: http://www.nikeresponsibility.com/infographics/materials/index.html

OIA. (2014). *2012 OIA Annual Report: Ensuring the Growth and Success of the Outdoor Industry*. Retrieved from Outdoor Industry Association (OIA): http://outdoorindustry.org/PDF/2012-OIA-Annual-Report-med-res.pdf

OIA. (2014). *Chemicals Management*. Retrieved from Outdoor Industry Association (OIA): http://outdoorindustry.org/responsibility/chemicals/index.html

OIA. (2014). *Materials Traceability*. Retrieved from Outdoor Industry Association (OIA): http://outdoorindustry.org/responsibility/traceability/index.html

OIA. (2014). *Outdoor Industry Association (OIA)*. Retrieved from Sustainability Working Group Members: http://outdoorindustry.org/responsibility/swg/members.php
OIA. (2014). *Sustainability Indexes*. Retrieved from Outdoor Industry Association (OIA): http://outdoorindustry.org/responsibility/indexes/index.html
OIA. (2014). *Sustainability Working Group*. Retrieved from Outdoor Industry Association (OIA): http://outdoorindustry.org/responsibility/swg/index.html
Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate Social and Financial Performance: A Meta-Analysis. *Organization Studies, 24*, 403-441.
Outdoor Foundation. (2013). *Outdoor Participation Report: 2013.* Retrieved from Outdoor Foundation: http://www.outdoorfoundation.org/pdf/ResearchParticipation2013.pdf
Outdoor Industry Association. (2012). *The Outdoor Recreation Economy.* Retrieved from Outdoor Industry Association: http://www.outdoorindustry.org/pdf/OIA_OutdoorRecEconomyReport2012.pdf
Outdoor Research. (2014). *Outdoor Research*. Retrieved from http://www.outdoorresearch.com/en/?gclid=CPrPktL4pL4CFbIDOgodnj8AcA
Patagonia. (2014). *bluesign® System*. Retrieved from Patagonia: http://www.patagonia.com/us/patagonia.go?assetid=68401
Patagonia. (2014). *Common Threads Partnership*. Retrieved from Patagonia: http://www.patagonia.com/us/common-threads/
Patagonia. (2014). *Environmental and Social Responsibility*. Retrieved from Patagonia: http://www.patagonia.com/us/environmentalism
Patagonia. (2014). *Working With Factories*. Retrieved from Patagonia: http://www.patagonia.com/us/patagonia.go?assetid=67583
Patagonia, Inc. (2014, April 27). *Environmentalism*. Retrieved from Responsibly Sourced Merino Wool: http://www.patagonia.com/us/patagonia.go?assetid=92205
Patagonia, Inc. (2014, April 25). *Patagonia, Inc.* Retrieved from Common Threads Partnership: http://www.patagonia.com/us/common-threads?src=vty_cti
Patagonia, Inc. (2014, April 25). *The Cleanest Line*. Retrieved from Don't Buy This Jacket, Black Friday and the New York Times: http://www.thecleanestline.com/2011/11/dont-buy-this-jacket-black-friday-and-the-new-york-times.html
prAna. (2014). *Sustainability*. Retrieved from prAna: http://www.prana.com/life/sustainability/products/
Quiksilver. (2014). *Quiksilver*. Retrieved from http://www.quiksilver.com/
REI. (2014). *Factory Fair Labor Compliance*. Retrieved from REI: http://www.rei.com/stewardship/report/2013/workplace/factory-labor.html
REI. (2014). *REI Stewardship Reports*. Retrieved from Stewardship: http://www.rei.com/stewardship/report.html
REI. (2014, January 21). *Starting at the Source: REI Partners with bluesign technologies ag to Minimize Environmental Impact and Increase Customer Care*. Retrieved from Newsroom: http://www.rei.com/about-rei/newsroom/2014/starting-at-the-source--rei-partners-with-bluesign-technologies-.html
Ruf, B. M., Muralidhar, K., Brown, R. M., Janney, J. J., & Paul, K. (2001). An Empirical Investigation of the Relationship Between Change in Corporate Social

Performance and Financial Performance: A Stakeholder Theory Perspective. *Journal of Business Ethics, 32*, 143-156.
SAC. (2012). *Sustainable Apparel Coalition (SAC)*. Retrieved from Oveview: http://www.apparelcoalition.org/overview/
SAC. (2014). *Higg Index Overview*. Retrieved from Sustainable Apparel Coalition: http://www.apparelcoalition.org/higgoverview/
SAC. (2014). *Sustainable Apparel Coalition (SAC)*. Retrieved from Home: http://www.apparelcoalition.org/
SAC. (2014). *Sustainable Apparel Coalition (SAC)*. Retrieved from Current Members: http://www.apparelcoalition.org/current-members/
Sen, S., & Bhattacharya, C. B. (2001). Does Doing Good Always Lead to Doing Better? Consumer Reactions to Corporate Social Responsibility. *Journal of Marketing Research, 38*, 225-243.
Smith, J. (2012, December 10). *Forbes*. Retrieved from The Companies With the Best CSR Reputations: http://www.forbes.com/sites/jacquelynsmith/2012/12/10/the-companies-with-the-best-csr-reputations/
Stevenson, S. (2012, April 26). *WSJ Magazine*. Retrieved from Patagonia's Founder Is America's Most Unlikely Business Guru: http://online.wsj.com/news/articles/SB10001424052702303513404577352221465986612
Stock, K. (2013, August 28). *Bloomberg Businessweek*. Retrieved from Patagonia's 'Buy Less' Plea Spurs More Buying: http://www.businessweek.com/articles/2013-08-28/patagonias-buy-less-plea-spurs-more-buying
Teisl, M. F., & O'Brien, K. (2003). Who Cares and Who Acts?: Outdoor Recreationists Exhibit Different Levels of Environmental Concern and Behavior. *Environment and Behavior*, 506-522.
Textile Exchange. (2013). *Textile Exchange Organic Content Standard*. Retrieved from Organic Content Standard 2013: http://outdoorindustry.org/pdf/Organic_Content_Standard_v1.pdf
The Conservation Alliance. (2014, April 13). *The Conservation Alliance*. Retrieved from Mission and History: http://www.conservationalliance.com/about
The North Face. (2014). *Sustainability*. Retrieved from The North Face: http://www.thenorthface.com/en_US/innovation/sustainability/
Theodori, G. L., Luloff, A. E., & Willits, F. K. (1998). The Association of Outdoor Recreation and Environmental Concern: Reexamining the Dunlap-Heffernan Thesis. *Rural Sociology, 63*(1), 94-108.
Tomlinson, S. (2011, November 18). *Mail Online*. Retrieved from When business turns green: North Face millionaire dreams of setting up vast nature reserve in world's second-largest wetlands: http://www.dailymail.co.uk/news/article-2063283/North-Face-Esprit-millionaire-dreams-setting-vast-nature-reserve-worlds-second-largest-wetlands.html
Twain, M. (1976). *Mark Twain: Collected Tales, Sketches, Speeches, and Essays: Volume 2: 1891-1910* (Vol. 2). (L. J. Budd, Ed.) New York: Library of America.
U.S. EPA. (2014, February 28). *Wastes*. Retrieved from Textiles: http://www.epa.gov/osw/conserve/materials/textiles.htm

UNEP. (2014). *United Nations Environment Programme.* Retrieved from Textiles, fashion that doesn't cost the Earth: http://www.unep.fr/shared/publications/other/WEBx0008xPA/textiles.pdf

USDA. (2011, May 20). *USDA National Organic Program*. Retrieved from USDA: http://www.global-standard.org/licensing-and-labelling/licensing-and-labelling-guide.html

VF Corp. (2011). *2011 Global Compliance Report*. Retrieved from VF Corp.: http://www.vfc.com/VF/corporation/resources/images/Content-Pages/Global-Compliance/2011%20VF%20Compliance%20Report.pdf

VF Corp. (2014). *Corporate Responsibility Global Compliance*. Retrieved from Corporate Responsibility: http://www.vfc.com/corporate-responsibility/social/global-compliance

VPEPxchange. (2014). *VPEPxchange*. Retrieved from Why: https://vpepxchange.com/Home/Why

Wieners, B. (2012, May 2). *Bloomberg News*. Retrieved from Environmental Movement Has Lost, Says Patagonia Founder: 10Q: http://www.businessweek.com/news/2012-05-02/environmental-movement-has-lost-says-patagonia-founder-10q#p1

Zeller, T. (2011, March 1). Clothes Makers Join to Set ‘Green Score’. *The New York Times*.