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CREATING AN ENVIRONMENTALLY SUSTAINABLE COSTUME SHOP

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CREATING AN ENVIRONMENTALLY SUSTAINABLE COSTUME SHOP

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Fine Arts at Virginia Commonwealth University.

by

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Abstract

CREATING AN ENVIRONMENTALLY SUSTAINABLE COSTUME SHOP

By Katherine Stone, MFA

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Fine Arts at Virginia Commonwealth University.

Virginia Commonwealth University, 2009

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The goal of my thesis is to provide the reader with a better understanding of how to create an environmentally sustainable costume shop. I chose to focus on certain elements of the costume shop that are imperative to the function of the shop, but desperately need to change for the sake of the environment. The elements I focused on were fabric, energy, and chemicals. Armed with a better understanding of why and what needs to be changed, the reader will be able to take this knowledge and apply it to their costume shop and life. We need to change how we interact with the environment and I hope this information will help bring about this action.

INTRODUCTION

I have been working and learning in professional and educational costume shops for the past ten years of my life. It was only last year, when I was working in my studio at home that I really truly recognized the need for change. I had just finished designing a musical and I was taking out the trash. There was so much of it! A lot of it was leftover fabrics and scraps, pattern paper, etc. It was then that I realized how much waste costume designing a single show produces. In the professional and educational costume shops I had previously worked, I had contributed to the trash, but I never had to physically take it out to the dumpster. I moved on to designing my next show, but I couldn't move on from my thinking that my work was having a harmful impact on the environment. I started thinking about the fabric I was purchasing and where and how it was grown and manufactured. I thought about all of my trips riding around town in my car looking for that specific item, only having to go back to Wal-Mart (again) to purchase 20 pairs of black shoes made in China. In my personal life I never shop at Wal-Mart and whenever possible I support the local retailer and purchase local products. I bring my reusable grocery bags to the farmer's market every Saturday morning! So, why am I compromising my values when I costume design? Two reasons: time and money. Time and money have always been an issue in costume design and the theatre world in general. We must break this cycle of

thinking that being environmentally sustainable, that is, using Earth's resources, such as the land, air, and water at a rate at which they can be replenished requires too much time and money. We must realize that although being environmentally sustainable might be more expensive and time consuming in the beginning, in the end it will be well worth it because not only can we make things more economical over the long term, we will also be correcting behavior destructive to our environment and thereby allowing us to continue living on this planet. Reusing and recycling costumes will help our budget and the environment. Changing the light bulbs, washing machines and cleaning solutions that we use will help our budget and the environment. Every change we make for a more environmentally sustainable theatre is a step in the right direction.

For a community that embraces change, we seem to be slow to change when it concerns the environment. We need to take the lead from such theaters as the Mo`olelo Performing Arts Company in San Diego, California which has Green Theatre Categories and Sustainable Guidelines that include all aspects of the theatre from production to administrative to the audience. Some of these green initiatives include providing carpooling for cast and crew, using sustainable materials for set construction, such as bamboo, whenever possible, and sending audition materials, welcome packet materials, and other correspondence electronically to reduce paper use (Green Mo`olelo). The Furious Theatre Company in Pasadena, California is participating with small changes in order to help create environmental sustainability. They have replaced all of the toxic cleaners with non-toxic solutions, given reusable water jugs to cast and crew members in order to cut down on waste, provided recycling containers next to the trash cans and placed

baskets in the lobby for audience members to leave their programs in after the show, in order for them to be reused for the next performance (Greening the Theatre). The 9Thirty Theatre Company (9TTC) is a theatre company founded on environmental sustainability. Their mission is to cultivate creativity and artists while working towards viable solutions for a sustainable future. 9TTC's mission is reflected in both their Ecological Programming and Administrative Operations. In the Ecological Programming, each season celebrates an ecological theme. Artists who have experience working with earth-friendly materials produce the work in a sustainable manner. When necessary 9TTC introduces the artists to resources such as Material for the Arts, Craigslist, Freecycle and local "trash" facilities, ensuring that materials used for the productions are reused or repurposed. 9TTC also produces works in outdoor, found or abandoned spaces to create a theater experience that is presented without massive energy and materials use. The Administrative Operations run 95% digitally and almost has a zero waste output. All of these theatres are creating a more environmentally sustainable theatre with both big and small changes (About 9Thirty Theatre Company). It is up to us as theatre practitioners to follow their lead and start making environmental changes in our theatres today.

CHAPTER 1

FABRIC

Reusing Costumes

While fabric is one of the most important elements in a costume shop, it can also be one of the most environmentally unfriendly elements. With cooperation from the costume shop employees and costume designers, we can change how we traditionally purchase and consume fabrics, reducing our negative impact on the environment.

The first step in constructing a costume is determining if construction of the costume is necessary or if the costume already exists. Costume storage containing costumes from previous performances exist at many theatres and costume rental is available from other theatres and costume shops, providing an environmentally friendly resource. Many of these costumes can be rented and slightly altered while still maintaining the same design aesthetic of the original idea of the costume designer. A factor to keep in mind with rentals is that although slight alterations are possible, in accordance with most rental agreements, rented costumes cannot be permanently altered and must be restored to original condition upon return. Although some of these costumes could possibly have been made with non-environmentally sustainable elements, the costume is already made, therefore counteracting the need to use new fabric, even if it is environmentally sustainable, for a new costume.

Another alternative is purchasing the costumes second hand through a vintage or thrift store. This is a great alternative and usually an inexpensive resource. The added benefit to purchasing the previously used item is that the theatre now owns the costume, so the costume shop is able to alter the garment in whatever way the designer deems necessary in order to gain the look of the costume design.

Choosing the Fabric

Sometimes, using a previously made costume is not an option and the costume must be made. If a costume has to be constructed, care in choosing the fabric for both the mock up and costume should be used. Traditionally, muslin fabric is used in the construction of the costume mock up, while the fashion fabric selected by the costume designer is used in the construction of the garment to be worn onstage for the performance.

When choosing the fabric for the costume to appear on stage, several factors must be considered besides the obvious design aesthetics of color and drape. With the environment in mind, the designer should consider a fabric that will hold up against the wear and tear created by performing a show for the specific amount of time that the show will be running. If the garment is able to hold up for the entire run, it has the possibility of being stored and used for another show, increasing the life cycle of the costume. Other questions the designer needs to ask before choosing a fabric include the care of the fabric. How will this fabric need to be cleaned? Dry cleaning, as discussed in Chapter 3, is very harmful to both the environment and wearer of the clothing and should be avoided if possible. Harmful treatments to the fabric, including dyes, also need to be considered

when choosing the fabric to purchase for the costume. Another question to be asked is what resources are being used in order to get the fabric to the costume shop? How far does the fabric have to travel? According to Ethan Zuckerman, a research fellow at the Berkman Center for Internet and Society at the Harvard Law School:

Shipping stuff around the world may not cost much, but it weighs heavily on the planet. Sending things around the world can significantly swell their ecological footprint, and the shipping industry itself has not been known as a green standard-bearer, as oil spills, toxic-ship breaking (the process by which old ships are scrapped), and the dumping of polluted ballast water are all commonplace. In addition, transportation is a major contributor to climate change (45).

Taking Zuckerman's warning into consideration, it is important to the costume shop to know exactly where and how far our goods are coming from in order to get to the costume shop. If possible, it is necessary that we start purchasing goods locally in our community or nearby communities.

The questions asked for the fabric should also be applied to the purchase of muslin. Since muslin is used for mockups, it is most often bought in bulk and the color and care of the fabric is not as important since the mockup will never appear on stage. Traditionally, costume shops purchase unbleached muslin, which is usually one hundred percent cotton. Costume shops should continue to purchase their muslin or mockup fabrics unbleached, but they need to switch to a more environmentally sustainable fabric whose options include organic muslin, hemp and bamboo fabrics. The same thought and research discussed below for choosing an alternative to the traditional cotton purchased should also be applied

when purchasing the fashion fabric for the costumes to appear on stage as discussed above. The fashion industry is beginning to use more of these natural earth friendly fibers, creating a demand for these products, increasing the supply. Just as the fashion industry is changing how they do business, so should costume shops and theatres.

Before we make any decisions on what is the most environmentally sustainable fabric to purchase, we must examine the vocabulary used to determine what is the best for the environment and the process from which the fiber becomes a fabric. Since there has been an explosion in the demand for eco-friendly products, many companies have jumped on the bandwagon, claiming their product is “green” in order to capitalize on this current trend. As conscious supporters, we are forced to examine these claims in order to determine if the fabrics are manufactured in an environmentally sustainable way. The most commonly used and misused terms causing confusion are “natural,” “organic” and “eco-friendly.” According to Susan and Yves Gagnon, owners of SYKA (Trademark) Textiles Trading Corporation, textile wholesalers determined to produce fabrics with less environmental impact than traditional fabrics:

These terms have often been used interchangeably, diluting any specific meaning. For instance, “natural” and “organic” are not the same. Yet we have many people asking us for “natural” or “organic” fabrics, when they actually mean “eco-friendly.” “Natural” means that the fiber has been harvested and produced with minimal human processing. For today’s most popular fibers, this usually means cotton, wool, silk and linen. In apparel, unless specified (and certified) otherwise, natural fibers are not organic. To qualify a fiber as “organic” as in “organic

cotton,” fiber production must adhere to strict standards and be certified by the appropriate governing body. An “eco-friendly” fiber may or may not be natural and/or organic. The most straight forward way to define an “eco-friendly” fiber is by specifying that at least one major step in its production has less of a negative environmental impact than the conventional alternative (38 – 39).

We must keep in mind that there is no single fiber out there that has zero negative impact on the environment (Gagnon 38). All production of fiber has an impact on the environment and that is why it is important for us as consumers to find and purchase the best possible fabric for the environment and our needs. We must examine the entire process of the fabric production in order to come up with our answers because there are numerous steps in fabric production and all have an environmental impact. Susan and Yves Gagnon have outlined a framework in the production process that illustrates the numerous points at which the environment can be affected by fabric manufacturing. The first stage of fabric production relates to how the fiber itself is produced. “Matters such as irrigation levels, natural or chemical fertilizer use, herbicide and pesticide use, land availability, speed at which source plants grow and replenish, and the overall treatment of animals needed to produce hair or silk all must be considered” (40). The second stage after the fiber production is yarn spinning. “Issues here include the energy and materials used to process the fibers, the type of dyestuff used (e.g., for yarn-dyed fabrics), as well as the actual waste by-product derived from the different processes” (40). The third step is the actual fabric production:

This differs according to the particular standards of each weaving and knitting mill, and/or dye house. Mills and dye houses concerned with producing eco-friendly fabrics will often obtain international certifications for compliance. In addition to considerations of energy and other by-products when making greige fabric, energy and water usage along with dyeing/finishing multi-phase processes are extremely important factors (40 -41).

Now that we have a basic understanding of the fiber to fabric process and the way it can impact the environment, we now must explore the different fabric options.

Organic Cotton

Traditional production of cotton is very harmful to the environment. According to Dr. James M. Vreeland, Anthropologist and Business Founder of Peru Naturtex Partners, Cotton cultivation is blighted. Data from the Pesticides Action Network UK fingers cotton farming as the single largest user of chemical inputs, contaminating factories, fields and the families struggling to survive on them. Chemical compounds from conventionally grown cotton not only harm the workers who use them but also leech into the soil, reaching groundwater, rivers, streams, killing fish and contaminating livestock (119).

Although conventional cotton, the “Fabric of Our Lives”, is advertised as a natural fiber it is actually the “most pesticide-intense agricultural process in the world” (Rich 36). Conventionally grown cotton consumes approximately twenty-five percent of the insecticides and more than ten percent of the pesticides used in the world (Organic Cotton

is Different). According to the Organic Trade Association, producing a single cotton T-shirt takes “approximately one-third of a pound of pesticides and fertilizers – chemicals that permeate the soil, run into the water, and pollute the ecosystems with heavy toxins” (Rich 36). An increasingly popular, healthier and chemical-free alternative to conventional cotton is organic cotton. Although farming organic cotton still takes a dramatic toll on the earth due to nutrient soil depletion and water consumption, purchasing organic cotton over conventional cotton will still be beneficial in minimizing harm to the people and the planet.

Organic Cotton must follow specific protocols in order to be considered organic. According to the Organic trade website:

Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilizers, and build biologically diverse agriculture. Third-party certification organizations verify that organic producers use only methods and materials allowed in organic production. Organic cotton is grown without the use of toxic and persistent pesticides and synthetic fertilizers. In addition, federal regulations prohibit the use of genetically engineered seed for organic farming. All cotton sold as organic in the United States must meet strict federal regulations covering how the cotton is grown (Organic Cotton Facts).

The difference between conventional cotton and organic cotton vary in every step of the process from seed preparation to the harvesting process. These differences are outlined

below in Table 1.1 from the About Organic Cotton Website which features American organic cotton farmers and the benefits of organic cotton:

Table 1.1

CONVENTIONAL	ORGANIC
<p><u>SEED PREPARATION</u></p> <ul style="list-style-type: none"> • TYPICALLY TREATS SEED WITH FUNGICIDES OR INSECTICIDES. • USES GMO (GENETICALLY MODIFIED ORGANISMS) SEED FOR APPROXIMATELY 70% OF US-GROWN COTTON. 	<p><u>SEED PREPARATION</u></p> <ul style="list-style-type: none"> • USES UNTREATED SEEDS. • NEVER USES GMO (GENETICALLY MODIFIED ORGANISMS) SEEDS.
<p><u>SOIL & WATER</u></p> <ul style="list-style-type: none"> • APPLIES SYNTHETIC FERTILIZERS. • LOSS OF SOIL DUE TO PREDOMINANTLY MONO-CROP CULTURE. • REQUIRES INTENSIVE IRRIGATION. 	<p><u>SOIL & WATER</u></p> <ul style="list-style-type: none"> • BUILDS STRONG SOIL THROUGH CROP ROTATION. • RETAINS WATER MORE EFFICIENTLY THANKS TO INCREASED ORGANIC MATTER IN THE SOIL.
<p><u>WEED CONTROL</u></p> <ul style="list-style-type: none"> • APPLIES HERBICIDES TO SOIL TO INHIBIT WEED GERMINATION. • REPEATEDLY USES HERBICIDES TO KILL WEEDS THAT DO GROW. 	<p><u>WEED CONTROL</u></p> <ul style="list-style-type: none"> • PHYSICAL REMOVAL RATHER THAN CHEMICAL DESTRUCTION. • CONTROLS WEEDS THROUGH CULTIVATION AND HAND HOEING.
<p><u>PEST CONTROL</u></p> <ul style="list-style-type: none"> • USES INSECTICIDES HEAVILY, ACCOUNTING FOR APPROXIMATELY 25% OF WORLD CONSUMPTION. • USES PESTICIDES; THE NINE MOST COMMON ARE HIGHLY TOXIC; FIVE ARE PROBABLE CARCINOGENS. • FREQUENTLY USES AERIAL SPRAYING, WITH POTENTIAL DRIFT ONTO FARM WORKERS, NEIGHBORING WILDLIFE AND COMMUNITIES. 	<p><u>PEST CONTROL</u></p> <ul style="list-style-type: none"> • MAINTAINS A BALANCE BETWEEN “PESTS” AND THEIR NATURAL PREDATORS THROUGH HEALTHY SOIL. • USES BENEFICIAL INSECTS, BIOLOGICAL AND CULTURAL PRACTICES TO CONTROL PESTS. • MAY USE TRAP CROP, PLANTED TO LURE INSECTS AWAY FROM COTTON.
<p><u>HARVESTING</u></p> <ul style="list-style-type: none"> • DEFOLIATES WITH CHEMICALS 	<p><u>HARVESTING</u></p> <ul style="list-style-type: none"> • RELIES MOSTLY ON THE SEASONAL FREEZE FOR DEFOLIATION. • MAY STIMULATE DEFOLIATION THROUGH WATER MANAGEMENT.

Organic cotton is the better alternative to conventional cotton when choosing the fabric based on environmental sustainability. Along with organic cotton, there are other natural fibers that are environmentally sustainable including bamboo, hemp, ramie and jute.

Bamboo

Bamboo is becoming a very popular fabric in the marketplace for apparel, making it more accessible for costume shops to purchase this fabric, as an environmentally sustainable choice for design needs. Bamboo is still being debated on how environmentally sustainable it is as a fabric, so investigation into the fabric at the time of purchase is necessary. All qualities must be taken into account. The benefits of bamboo include its rapid growth with little water and no pesticides. Bamboo is a renewable plant that can grow back after its three to five year harvesting period (Smith). Bamboo fiber is made of cellulose that comes from woody bamboo grass. The two varieties of bamboo fiber produced are bamboo linen and bamboo viscose. Bamboo linen is extracted directly from the jointed stems of the grass while bamboo viscose, the more common of the two, uses the bamboo as the source of the raw cellulose in the production of viscose or rayon. Bamboo possesses good moisture transmission, so wearing it helps reduce body odor. Bamboo fabrics drape well, much like silk, and they don't have a discernable difference from other fabrics of a similar weight and texture. Bamboo fibers are produced for woven and knitted fabrics in all weights and textures and can be combined with other fibers such as linen, silk, wool and cotton. Bamboo fabrics are machine washable and resist wrinkling

and the fabric dyes easily, so it's possible to produce beautiful colors not available in cotton (Lee).

The ability to turn bamboo into a fiber is the trade-off of what makes it not completely eco-friendly. It takes harsh chemicals and lots of energy to turn stiff bamboo stalks into fibers. "It's not a chemical-free fiber," says Peter Hauser, a professor of textile chemistry at North Carolina State University (Smith). According to Summer Rayne Oakes, a spokesperson for Planet Green, Discovery Networks eco-lifestyle network,

The manufacturing of bamboo fiber is where the debate really heats up. The majority of bamboo on the market is processed as rayon, which means chemicals are used to break down the woody fibers, which are then extruded through heat and pressure to create filaments. Because of the rayon processing, we may never have a purely "organic" bamboo if we take into account the entire production process (Oakes).

Although there is debate in how eco-friendly the process of turning bamboo into a fiber, Rich Delano, President of Bamboo Textiles, describes the two different methods of bamboo fiber production:

One is more chemically intensive and the other is more mechanically intensive. During the former process, a non-toxic acid, n-methylmorpholin n-oxide (amine oxide) breaks down the bamboo stalks into a pulp. In the latter process, the bamboo is crushed into a powder, which is then mixed with water. In both cases, this cellulosic sludge is extruded to form the fiber. In feel and other characteristics, the end products yielded by these very different processes are indistinguishable, but

the mechanical method is four to five times more expensive. I offer clients both products, and not surprisingly, they almost always go for the cheaper option (166). With more support from the government and demand from the consumers Bamboo could become a very eco-friendly fabric. Bamboo itself is a very sustainable resource and according to Rich Delano, there are ways to produce the fabric mechanically without using chemicals. If consumers increase their demand for eco-friendly fabric including bamboo, fabric manufactures and suppliers will have to listen. With simple changes to our shopping list, we can make significant changes to our environment.

Hemp

Hemp is a very versatile and environmentally sustainable fabric that should be used more often in costume shops as an alternative to cotton and other not so environmentally friendly fabrics. Hemp is not only used for fabric production, but it is also used for all grades of paper, structural reinforcement building materials, fiberglass replacement products, lightweight sandwich boards, composite boards, absorbency products such as kitty litter, potting mix, nappies and feminine-care products, and fuel. Hems benefits for the environment begin in the growing process. Hemp grows very rapidly, not allowing weed growth and insects, which means that it requires no pesticides or herbicides therefore eliminating the effects of the toxins (About Hemp). Kate Fletcher, a consultant in sustainable fashion and textiles, is very familiar with the benefits of growing hemp:

Hemp (sometime called cannabis hemp) grows very rapidly, naturally smothering weeds and controlling pests, and so is thought to be suited to low impact systems of

agriculture. Growing hemp also helps clear land for other crops; improves the structure of the soil, its strong roots control erosion; it has a high yield and can be grown in cool climates. It grows to between one and four meters tall and yields around six tones per hectare. Between 20 and 30 percent of the plant fibre and its productivity is far superior to other natural fibers (see Table 1.2). This leads to claims that hemp gives a ‘double dividend’: a reduction in the ecological footprint of production by about half, if grown to replace cotton for use in textiles, and wood for use in the pulp and paper industries (Fletcher 25).

Table 1.2

	Average fibre production (kg) per hectare
Cotton	300 – 1100
Flax	800 – 1500
Hemp	1200 – 2000
Wool	62

Because hemp is able to thrive without chemicals and is beneficial to the earth it is planted in, hemp can be harvested 120 days after seeding, up to three times per year without putting a strain on the land. According to Lawrence Serbin, President and owner of Hemp Traders, “Farmers have reported excellent growth on land that has been cultivated steadily for nearly 100 years (49).

The benefits of hemp go beyond the growing fields. The hemp fiber has superior strength and durability with three times the tensile strength of cotton (Herer Ch.2). Due to hems durability and strength, the fabric does not wear out as quickly, requiring garments to be replaced less, saving money and energy. This quality is very beneficial for costumes

that are worn onstage every night for the run of the show and are sometimes subjected to frequent abuse on stage. Another benefit of hemp is that it is beneficial to actors wearing the costume because of the breathability and absorption factor. Hemp is more porous than cotton, allowing the fabric to breathe and absorb water. Hemp is also naturally resistant to mold, bacteria and ultraviolet light (Serbin 49 -50). Hemp fiber also has insular qualities that allow the wearer of the garment to stay cool in the summer and warm in the winter (Kane). All of these qualities aid actors when they are under the hot lights of the theatre or the hot light of the sun when performing in outdoor productions. Hemp is a very beneficial fabric for both the wearer and the environment. As a consumer of fabrics, costume shops need to recognize the benefits of this fabric and show their support by purchasing the fabric and therefore creating a demand for hemp production.

Jute and Ramie

Other fabrics that are both environmentally sustainable and can replace cotton are Jute and Ramie. While Ramie is very absorbent and quick drying, both fabrics are resistant to mildew and bacteria and have good strength. Due to the nature of their finishes, both Ramie and Jute are not produced for apparel fabrics as much as other fibers. But, according to Gail Baugh, a textiles and merchandising professor at San Francisco State University and the Fashion Institute of Design and Merchandising, production of both fibers could be expanded with improved finishing technology (338). In the table below, Baugh compares the jute, ramie, and hemp to flax and cotton, showing their qualities are similar, encouraging the use of these fibers in Table 1.3.

Table 1.3
Alternative Plant Fibers Compared to Flax and Cotton

Fiber Name	Absorbency	Abrasion Resistance	Machine Washable	Wet Strength	Drape	Hand	Comments
Compare to Flax (linen) and to Cotton	Excellent	Excellent	Yes	Excellent	Fair	Fair	New finishing techniques are improving the drape/hand
	Very Good	Very Good	Yes	Very Good	Good	Good	
Jute	Excellent	Excellent	Yes	Excellent	Fair	Fair	“ “
Ramie	Excellent	Excellent	Yes	Very Good	Fair	Fair	“ “
Hemp	Excellent	Excellent	Yes	Excellent	Fair	Fair	“ “

Note: Cotton replaced flax (linen) from the 1940s as the fiber choice of the United States.

It is important for us as consumers to know that that there are alternative fibers to cotton that are not as detrimental to the planet. Bamboo, hemp, jute, and ramie are all possible replacements for fabrics in the costume shop. It is our responsibility to request and use these fabrics in our costume shops, costume designs, and our everyday life.

With the growing concern and awareness of the need to protect the environment from ramifications of producing some fabrics there has been a surge in the development of new fabrics from many different sources. Corn, soy, cow’s milk and even chicken feathers are being considered alternative sources for fiber. Also, another very eco-friendly solution being explored is the use of using recycled fiber in to create new fabric (Baugh 346 – 347). With all of these new ideas and solutions, it is important for us as consumers to stay current and up to date on new, environmentally sustainable products that we can use in our theatre shops and productions.

Recycling, Reusing and Reducing

Once fabric is purchased and inside the costume shop, recycling, reusing and reducing play an important role. When a costume mockup has completed its necessary steps, it is taken apart in order to make the pattern for the costume. Sometimes this leaves large enough pieces of fabric to be reused for the next mockup or mockup muslin can be used to flat line the garment instead of using more fabric to line the costume. The costume shop should have a specific location for these large pieces for the cutter/drafter to pull from. This will reduce the waste of fabric and save money while saving resources. Scraps of fabric are often left over from both the mockup fabric and the actual costume fabric. There are many different uses for these scrap fabrics that can spare them from being thrown into the trash and dumped into a landfill. Another location in the costume shop should be designated for scraps, sorting if possible, between natural fibers and man-made fibers. Natural fibers have the ability to be composted. While there might not be an area in the vicinity of the theatre to do composting, hopefully there is a member of the theatre who is able to take these home and compost at another location. Another option for scraps is using them for craft projects including quilts or filler in dog toys and pillows. Contacting local art centers and after school programs may prove helpful in reducing the waste of the costume shop. Also, contact donation centers to see if they would like the bags of scraps to be donated for customers to purchase for rags. More possibilities for fabric donations include retirement communities, senior citizen centers, and rehabilitation and physical therapy centers. If none of these resources work, you should be able to find someone to take the scraps for free by posting on Craigslist.org, freecycle.org or possibly a

local earth conscious website. The design process includes many choices for fabric type.
We need to start including the environment in our design process and decisions.

CHAPTER 2

ENERGY

The production of energy creates greenhouse gas emissions and uses resources such as coal, natural gas and oil that are not renewable. In order to reduce the greenhouse gas emissions and depletion of our natural resources, we need to change our energy habits. We can do this by consciously monitoring and then restricting our use of electricity and by using energy efficient electrical appliances.

Washing Machines

It is important that all of the appliances in the costume shop are efficient, energy saving machines. Although, there probably is not a budget to replace current machines that are still working, when the time comes for replacement, energy savings, both environmentally and financially, need to be taken into account when choosing the product to purchase. One of the easiest ways to identify these energy savings is through ENERGY STAR. ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping consumers save money and protect the environment through energy efficient products and practices. According to the ENERGY STAR website:

In 1992 the US Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labeled products. Through 1995, EPA expanded the label to additional office equipment products and residential heating and cooling equipment. In 1996, EPA partnered with the US Department of Energy for particular product categories. The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, and more. EPA has also extended the label to cover new homes and commercial and industrial buildings. (History of ENERGY STAR).

Probably the biggest appliance to use the most energy in the costume shop is the washing machine. The beneficiaries of an ENERGY STAR washing machine include both the costumer and the environment. ENERGY STAR lists the following reasons to purchase an ENERGY STAR washing machine:

Let the savings pay for the dryer.

Purchasing an ENERGY STAR qualified model rather than a non-qualified model will save you an average of \$50 a year on your utility bills. Over the life of your new washer, you'll save enough money to pay for the matching dryer. Washers built before 1998 are significantly less efficient than newer models. If your washer is more than 10 years old, you're paying about \$145 more each year on your utility bill than you would if you owned a new ENERGY STAR qualified model.

Get a shower of water savings.

New ENERGY STAR qualified clothes washers use advanced technology to dramatically reduce water use. If you buy a non-qualified clothes washer, you'll use 18 more gallons of water every time you wash a load. That wasted water is equivalent to a daily shower.

Long live your clothes.

Instead of twisting and pulling clothes around a turning agitator, front-load and advanced top-load clothes washers use sophisticated wash systems to gently flip and spin clothes through a reduced stream of water. This lengthens the life of often-washed items. Because they are so gentle, many models can safely clean silk, wool and other hand-washables.

Take time out.

Without a bulky agitator, there is more usable space in the washer for laundry — especially larger items like comforters. More capacity means fewer loads of laundry each week.

Save the environment.

Nearly 70 percent of U.S. electricity is generated by burning coal and natural gas, which releases greenhouse gasses into the atmosphere and causes global warming. ENERGY STAR qualified clothes washers use less energy and help us reduce our impact on the environment. By reducing water consumption, ENERGY STAR qualified washers also help protect our lakes, streams, and oceans (Save in So Many Ways!).

Compared to normal washing machines, using an ENERGY STAR machine allows you to cut water and energy consumption by over 40%. Washing fabrics and costumes is an integral and necessary part of a costume shop, using an ENERGY STAR appliance really will make a difference. Along with energy and water saving is the added benefit of the preservation of the costumes. During the run of the show, costumes are sometimes required to be washed every single evening for weeks, sometimes months at a time. With the new advancements in technology, eliminating the agitator, clothes will be able to withstand the numerous washings and last for longer periods of time, allowing for saving in water, energy, and fabric consumption.

ENERGY STAR has specific guidelines in order to help choose the best possible appliance for you. First, you want to make sure that the washing machine is ENERGY STAR rated. This ensures that it passes the EPA and government standards for an energy

efficient machine. You also want to choose a model with a high Modified Energy Factor (MEF) and a low Water Factor (WF). MEF is a measure of energy efficiency that considers the energy used by the washer, the energy used to heat the water, and the energy used to run the dryer. The higher the MEF, the more energy efficient the clothes washer. WF measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. ENERGY STAR's website, *energystar.gov*, has a qualified product list that separates the following categories: Brand, Model, Volume, kWh/year, MEF, Federal Standard MEF, Percent Better, Water Factor, and Annual Water Use. The ENERGY STAR website defines these factors as following:

Brand and Model

This is how a particular washer is identified. Retailers can identify products they stock using the brand and model number. Some products may also be identified with a name or SKU which is different from the brand or model number, but you should always be able to find the brand and model number on a product.

Volume

This is the tub capacity of the clothes washer in cubic feet.

KWH/Year

This number is the estimated annual energy use of this machine under typical conditions. It is based on an average usage of 392 loads of laundry per year, or just under 8 loads per week. Your actual energy consumption will vary depending on the amount of laundry you do, the size of the loads, and the temperature settings you use. This figure is calculated according to Department of Energy test procedures and incorporates the estimated energy consumed by the washer, and the energy needed to heat water with an electric water heater. If you use a gas water heater, you will use significantly fewer kilowatt-hours, but will consume some gas to heat the same water.

Modified Energy Factor

Modified Energy Factor (MEF) is a new equation that replaced Energy Factor as a way to compare the relative efficiency of different units of clothes washers. The

higher the Modified Energy Factor, the more efficient the clothes washer is. MEF takes into account the amount of dryer energy used to remove the remaining moisture content in washed items.

Energy Factor

Energy Factor is a metric that was previously used to compare relative efficiencies of clothes washers. The higher the Energy Factor is, the more efficient the clothes washer is. For clothes washers, Energy Factor is calculated using the following formula:

$$\text{Energy Factor} = \frac{392 \times \text{Volume (ft}^3\text{)}}{\text{Annual Energy Usage (kWh)}}$$

Water Factor

The Water Factor is the number of gallons per cycle per cubic foot that the clothes washer uses. The lower the water factor, the more efficient the washer is. So, if a clothes washer uses 30 gallons per cycle and has a tub volume of 3.0 cubic feet, then the water factor is 10.0 (Definitions for Clothes Washer Product Listing).

Along with the explanation of the vocabulary, the formulas will help the costume shop determine their energy factor, further aiding them in choosing the correct machine for their needs. In considering the correct machine for the costume shop, limitations must be realized. A front-loading washing machine is unable to be used to dye fabric and dye vat would need to be purchased to replace the top loading washing machine. ENERGY STAR also requires by the Department of Energy (DOE) that all major home appliances be properly labeled that they meet the Appliance Standards Program. In order to meet these standards, manufacturers must use standard test procedures developed by DOE to prove the energy use and efficiency of their products. Test results are printed on yellow Energy Guide label, which manufacturers are required to display on many appliances. This will give you the information you need to make an informed decision. Keep in mind that the

label is required on all machines, so it is important to also look for the ENERGY STAR label as well. An example is listed below:

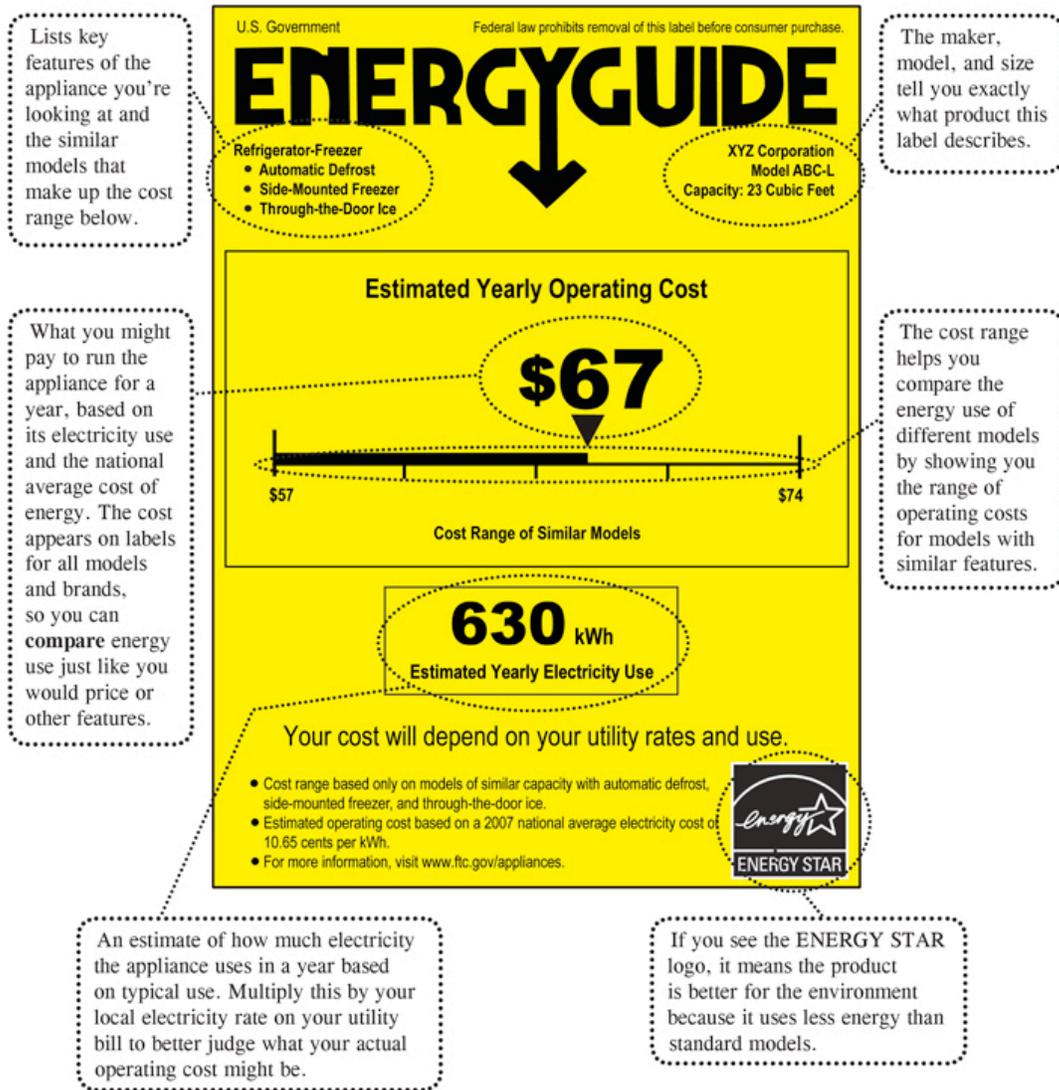


Figure 2.1

This label estimates how much energy the appliance uses, compares energy use of similar products, and lists approximate annual operating costs (Energy Guidance: Appliance Shopping with the EnergyGuide Label). Exact costs will depend on local utility rates and the type and source of the energy. Another factor to consider when purchasing for the

costume shop is that the average usage of electricity could be higher than the average predicted if your costume shop will be washing the clothes more frequently than the average household. The ENERGY STAR website constitutes the washing average to be 400 loads of wash per year which averages to about 8 loads per week.

Other ways to save energy while doing the laundry

Once you own the ENERGY STAR washing machine, the U.S. Department of Energy has some more helpful facts and energy saving tips dealing with water temperature and amount. About 90% of the energy used for washing clothes in a conventional top-load washer is for heating the water. To reduce the amount of energy used for washing clothes use less water and cooler water. Unless you're dealing with a specific costume problem, like stage blood or stains, the warm or cold water setting on the machine will be sufficient to clean clothes. Switching the temperature setting from hot to warm can cut a load's energy use in half (Best Practices: Clothes Washer Tips). Aiding in energy and water conservation can be as easy as just switching the kind of washing machine you are using. If a costume shop has other large appliances, such as refrigerators, dehumidifiers, and air purifiers, they should consult the ENERGY STAR website in order to obtain a list of models of these appliances with the ENERGY STAR rating. It is with these small steps that we will be able to make a big difference.

ENERGY STAR does not rate dryers because most of them use similar amounts of energy, which means there is little difference in energy use between models. But, they do suggest that when choosing a dryer look for one with a moisture sensor that automatically

shuts off the machine when your clothes are dry. Not only will this save energy, it will save the wear and tear on your clothes caused by over-drying. Periodically inspect your dryer vent to ensure it is not blocked. This will save energy and may prevent a fire. Manufacturers recommend using rigid venting material, not plastic vents that may collapse and cause blockages. Other suggestions include separating heavier items, like towels, to be dried by themselves, instead of with lighter weight fabrics (Best Practices: Clothes Dryer Tips).

Lighting

Lighting is a very important element in the costume shop. We need light for everything from seeing the fabric, texture and color properly to threading the needle properly. More than likely, the location of the costume shop is in a windowless room therefore relying on artificial light for its illumination every minute of the day. Besides being a crucial element in the costume shop, lighting is crucial to the environment.

Conserving electricity and money and therefore benefiting the environment is as easy as turning off the lights when the costume shop, dressing rooms, stock, etc. are not being used. In February 2009, schools in Idaho Falls District 91 received the Energy Star Label for conserving energy by turning off the lights. The school district saved more than \$40,000 a month by turning off lights when rooms were not in use. Ed Graff, Energy Education, said “What we’ve accomplished is getting everybody in a pretty complex environment in a school district to do months and months and months what most people

can't get their families to do in a day.” (District 91 Schools Get Rewarded for Saving Energy). It is all about getting into the mindset that every little change can make a difference. Sometimes, costume shops are lucky enough to have sensors that detect when there is movement in the room and automatically shut off when no movement is detected, saving energy. If your costume shop is not outfitted with this device, make shutting off the lights part of the checklist upon leaving the costume shop. Place a sign on the exit door asking if the lights have been shut off – this sign can be placed next to the probably already present sign asking if you have shut off the irons.

Turning off the lights is helpful when you are not in the room, but what can you do when you are there? You can use energy efficient light bulbs. Encourage and petition your theatre or university to install these light bulbs, especially in dressing rooms and bathrooms.

Compact Florescent Light Bulbs (CFLs) are energy efficient light bulbs designed to replace traditional incandescent light bulbs. Incandescent light bulbs are not very energy efficient due to the amount of energy they use in order to produce a small amount of light. The ENERGY STAR website offers this description and on the difference on how the two kinds of light bulbs work.

CFLs produce light differently than incandescent bulbs. In an incandescent, electric current runs through a wire filament and heats the filament until it starts to glow. In a CFL, an electric current is driven through a tube containing argon and a small amount of mercury vapor. This generates invisible ultraviolet light that excites a fluorescent coating (called phosphor) on the inside of the tube, which then emits visible light.

CFLs need a little more energy when they are first turned on, but once the electricity starts moving, use about 75 percent less energy than incandescent bulbs.

A CFL's ballast helps "kick start" the CFL and then regulates the current once the electricity starts flowing.

Older CFLs used large and heavy magnetic ballasts that caused a buzzing noise in some bulbs. Most CFLs today — and all ENERGY STAR qualified CFLs — use electronic ballasts, which do not buzz or hum (How DO CFLs Work?).

Included in the description, ENERGY STAR has also illustrated the parts of a CFL seen below:

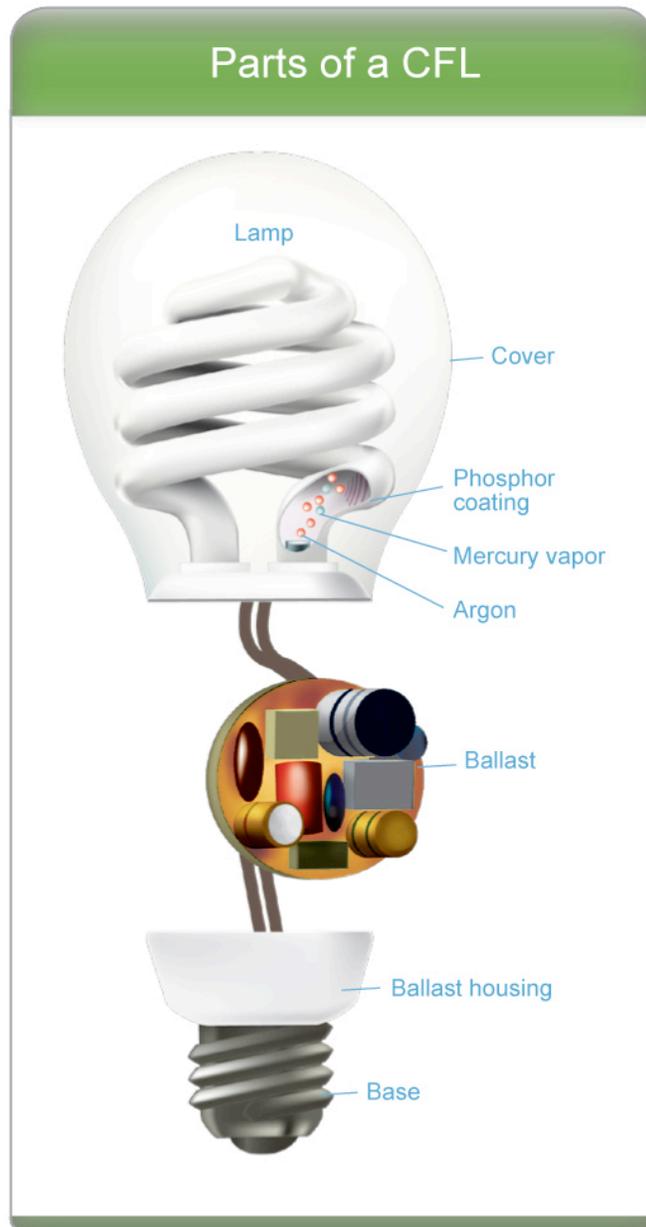


Figure 2.2

Besides operating differently, CFLs have other beneficial advantages over incandescent light bulbs, making them a good choice for an environmentally sustainable costume shop.

The advantages of a CFL compared to an incandescent light bulb include the following:

- Use about one-quarter of the energy to produce the same amount of light.

- Last about 10 times longer.
- Produce about 75 percent less heat, which reduces cooling costs.
- Save about \$30 or more in electricity costs over the lifetime of the bulb.
- Have manufacturer-backed warranties.
- Meet strict energy efficiency and performance requirements.

According to ENERGY STAR, in 2007, Americans saved \$1.5 billion by switching to ENERGY STAR qualified CFLs. The energy saved could light all the households in a city the size of Washington, DC for over 30 years. Put another way, changing these bulbs removes as much greenhouse gas pollution as planting 2.85 million acres of trees or taking 2 million cars off the road each year. (Why Choose ENERGY STAR?).

Since these light bulbs are lighting the costume shop where color is very imperative, it is important to understand how CFLs are measured according to shades of light. The following information is available on the ENERGY STAR website:

CFLs are available in a wide variety of shades of white light, ranging from yellowish to white to bluish white light, which allows you to customize the mood of your space. Many CFLs come in "warm" colors to match the yellowish light of incandescent bulbs, but you can also choose "cooler" colors with whiter or bluer light.

Choosing the right color:

- Light color is measured on a temperature scale referred to as Kelvin (K).
- Lower Kelvin numbers mean the light appears more yellow; higher Kelvin numbers mean the light is whiter or bluer.
- Most ENERGY STAR qualified bulbs are made to match the color of incandescent bulbs at 2700-3000K.
- For a whiter light, look for bulbs marked 3500-4100K.
- For bluer white light, look for bulbs marked 5000-6500K (Color and Mood).



Figure 2.3

It is important to choose the correct light bulb for the costume shop and the environment. The impact of the light bulb on both has to be researched and the costume shop should choose a light bulb that does not compromise either value. It is important to protect the environment by choosing the most environmentally sustainable product, but it is also equally important to choose a product that will support the costume shop in its daily activities so that it can function and operate normally.

Once you have replaced incandescent light bulbs with CFLs in all of the fixtures possible the next step is replacing the standard long, fluorescent tube lights. While fluorescent lights are reasonably efficient at converting input power to light, there are new lights that should be used for the most energy efficient results (Light Guide: Fluorescent

Ballasts). Traditional fluorescent lights are T12 while newer, more efficient versions of the fluorescent tubes are called T8. The tubes get their names from the number of eighths of an inch in diameter; T12 is 12/8 or 1.5 inches, while T8 is 8/8 or 1 inch. The old T12 have magnetic ballasts, while the more modern T8 has an electric ballast. T8 are the best choice because they use the least amount of electricity, produce more light compared to the T12 and contain less mercury, which means that less mercury will make its way into our drinking water and landfills (T8 and T12 Fluorescent Light Bulbs). Besides having an impact on the overall environment, the new electric ballasts have a positive impact on the environment in the costume shop. Magnetic ballasts are the cause behind the fluorescent hum and flicker that is also known to cause headaches and poor working conditions. The electric ballast are quiet and do not produce a noticeable flicker (Bluejay, Michael). Since T8 fluorescent tubes will not work with a T12 ballast system, changing the already existing lighting fixtures into a more environmentally sustainable fixture is a project that will require money and lighting and mechanical expertise. Someone with an electrical background must complete this project. While it is important for the costume shop to be as environmentally responsible as possible, sometimes it is easier to start with the smaller projects first and work on the major changes when the opportunity presents itself.

CHAPTER 3

Chemicals

Founder of seven Risk Management Corporations, Dr. Randall W.A. Davidson, also known as Dr. Doom, said, "It is more hazardous to work in a theatre costume shop than in a nerve gas factory" (Fried 31). While Davidson may be overstating the dangers of a costume shop, it is important to identify and know all of the hazardous chemicals used and stored in the costume shop and the risks and dangers they present to the people and environment in both the costume shop and the world. While there are laws and regulations in place dictating proper use, storage and disposal for chemicals in order to protect the artist using these chemicals, Monona Rossol, President and founder of Arts, Crafts and Theater Safety, Inc., states most theatres don't abide by the laws. In an interview with Mike Lawler, writer, artist, and eco-theatre activist, Rossol cites four main points as the primary reasons for poor health and safety behavior in the arts:

1. Insufficient education in health and safety. Academic institutions are simply not providing proper training to their theater students. Why? "They say, 'Well, that's how it is out in the real world, so they may as well learn it now,'" Rossol told me, adding that "school is supposed to be the place where you have the time and the patience and care about a student [enough] to teach them the right thing."
2. The Occupational Safety and Health Administration (OSHA) is underfunded, and so cannot enforce safety regulations. "They only show up after the accident," Rossol said.

3. The fines meted out by OSHA are too weak, according to Rossol, who believes that arts organizations consider the fines nothing more than "the cost of doing business."

4. According to Rossol, who has worked hard to implement changes in theaters across the country, arts organizations don't tolerate whistle blowers. "If you're the one to complain [about a safety infraction], you're a wet blanket," Rossol said. "It's much easier to fire you than it is to fix the problem." (Monona Rossol and the Toxic Theatre We Create).

If we follow the rules and regulations and act in accordance with OSHA and the EPA we would be able to reduce the harm to both the environment and the theatre. Creating an environmentally sustainable costume shop goes hand in hand with creating a safe environment for humans in the costume shop. If it is harmful to the environment, it is more than likely harmful to the humans in the environment. Below are alternative ways to operate in the costume shop and protect the environment and the humans.

Dry Cleaning

As mentioned in Chapter 1 it is important to choose fabrics that do not need to be dry cleaned as dry cleaning uses a lot of chemicals that are harmful to both humans and the environment. Sometimes, a costume has to be dry cleaned, and in that case it is important to understand why conventional dry cleaning is harmful to humans and the environment and familiarize oneself with other environmentally friendly alternatives.

Conventional dry cleaning process uses a lot of toxic and dangerous chemicals. The most commonly used is the chemical called perchlorethylene also referred to by the Agency for Toxic Substances & Disease Registry (ATSDR) as perc. On his eco theatre website, *ecoteater.wordpress*, Lawler states the problem with the use of perc:

The fact that PERC is a known carcinogen is alone enough information to provoke us toward action, for through the simple act of taking our bevy of costumes to a conventional dry cleaner we are contributing to the exposure of underpaid (and obviously undervalued) workers to a toxic substance known to cause cancer in animals, and also believed to cause reproductive problems in women (including the induction of miscarriage). It's also probable that exposure to PERC goes beyond the dry cleaners, including residual PERC left on the clothes that continue to off-gas once they're back in the costume shop (and even being worn onstage), as well as contamination of areas surrounding and connected to dry cleaning establishments (How to Go Green).

Due to the realization of how harmful perc is to the environment and humans, some states are beginning to ban the hazardous chemical. On January 25, 2007 the California Air Resources Board voted to gradually reduce and eventually ban the use of perc, as a solvent used in dry cleaning. Beginning in 2008, no new perc using machines may be installed in California and by July 2010, dry cleaners must remove all perc machines housed in apartment buildings and other residential facilities. By 2023, perc will no longer be allowed in any California dry-cleaning establishment (A "Perc" You Can Do Without). Due to these changes, the dry cleaning industry has come up with several other methods to cleaning the dry clean only clothing. While these methods do not use perc, and are therefore better for the environment, it is still heavily debated the extent of how much

better they are for the environment. The cleaning alternatives to traditional dry cleaning are GreenEarth, CO₂ and a process called wetcleaning.

GreenEarth is a silicone-based cleaner that uses the same base ingredient found in everyday shampoos, soaps and lotions (Green Earth Cleaning). The liquid is non-toxic and when it breaks down it becomes sand, small amount of water and carbon dioxide. None of these elements are inherently harmful to the air, the ground, the water, or the people who come in contact with them (Shreeves, Robin). Besides being a better solution to perc, GreenEarth is gentler on clothing than perc. Clothes do not fade or wear out as quickly as they do when the chemical perc is used. Also, since GreenEarth is odorless and non-toxic, the clothes do not outgas or smell as they do with traditional dry cleaning.

CO₂ cleaning is another method of dry cleaning that uses liquid carbon dioxide to clean the clothes. Cool Clean Technologies, Inc. describes the CO₂ cleaning process and benefits as:

The CO₂ Cleaning Process is a carbon dioxide-based garment cleaning process that has been developed for use by commercial and retail dry cleaners. Carbon dioxide is a non-flammable, non-toxic, naturally occurring gas that, when subjected to pressure, becomes a liquid and is a very effective solvent. Since the solvent is recognized as being environmentally friendly, it is not subject to any environmental regulations or liability potential from soil or groundwater contamination (There's a New Way to Clean).

The CO₂ dry cleaning machine looks like a very large washing machine due to the large bulky door that maintains the pressure necessary to keep the CO₂ in liquid form. Clothing

is placed inside the machine and the CO₂ is pumped in from tanks stored in the rear of the machine. The CO₂ method is much better for the garments because of the way the CO₂ solvent gently rubs the stains out of the clothing. Additionally, no heat is used in this process, helping the clothing to stay in better condition and protecting any buttons or hardware attached to the clothing. The pressure is lowered in the machine, drawing the CO₂ out of the clothing and back into the storage tanks (Nobel, Justin).

Wetcleaning is becoming a more popular method of cleaning ‘dry clean only’ clothing. Professional wetcleaning requires a range of techniques and technologies such as computer controlled washer and dryers, the use of special soaps and conditioners and the knowledge of fabrics and fibers (The Facts on Professional Wetcleaning). Earth911 (*earth911.com*), a website devoted to educating people reducing their impact, reusing and recycling trash explains the process of wetcleaning:

Professional wetcleaning uses water, the most benign and abundant solvent available on the planet. The input of the four elements of garment cleaning (solvent, detergents, agitation and heat) are computer controlled based on the type of fabric being cleaned. In water, non-toxic detergents and conditioners are used to lift dirt out of the garment and revitalize the fabric. The garments are agitated in the computerized wet cleaning machine just enough to extract the dirt and grime, but not enough to alter the structure, size or color. The garments are then transferred to a high-tech drying unit that senses humidity as many as 400 times per minute. To ensure that no shrinkage occurs, the dryer automatically stops once the prescribed

level of moisture is reached. During drying, the conditioners that were added earlier are heat-activated to soften and freshen the garment. (Wetcleaning).

Although the fabric or the clothing is labeled 'dry clean only,' many of these items can be wetcleaned. Some of these fabrics include cottons, wools, cashmere, down-filled items silks, leathers, suede and beaded and sequined garments. Items that should not be wetcleaned are some acetate linings and highly structured or tailored garments. Also, antique satins and gabardines should not be wetcleaned. Wetcleaning is beneficial to the environment because no hazardous chemicals are used, no air pollution and no water or soil contamination (The Facts on Professional Wetcleaning).

It is important to know what chemicals your dry cleaner is using and if possible locate a dry cleaner that does not use perc. If you are in a situation where you must use a dry cleaner that uses perc, the Sierra Club offers some tips on how to minimize your exposure to the harmful chemicals:

- Remove the wrapper outside or in your garage. Let your clothes air out for at least a day, preferably four or five before wearing them.
- Try to move towards clothing that doesn't need to be dry cleaned.
- Dry clean as infrequently as possible (Mayville-Cox, Patricia).

It is important for us as the consumer to be aware of the chemicals we are using and how they affect our environment and us. If perc free dry cleaning is not offered in your area, it is your responsibility to create a demand for that service in order to speed the along the process of change.

Cleaning Products

The costume shop can be a dirty place that requires a lot of cleaning. The problem with most cleaners is that they contain chemicals harmful to both the environment and the person using the cleaning product. According to Deborah Lynn Dadd, author of *Non-Toxic, Natural and Earthwise*, states the following about the harmful effects of cleaning products:

Cleaning products also produce tons of toxic waste in their use, manufacture and disposal. Each day Americans pour more than 32 million pounds of household cleaning products down the drain (that's almost 12 billion pounds per year). Most of these products contain toxic substances that are not processed by sewage and septic systems and eventually pollute our groundwater, streams, rivers and oceans. Leftover cleaning products turn refuse sites into toxic-waste dumps, jeopardizing the health of sanitation workers and polluting the earth and groundwater. All this in addition to the toxic waste produced by manufacturers as the chemicals that go into these products are synthesized (Fried 87).

Along with threatening the environment, these cleaning products can cause many health problems through ingestion, inhalation, eye contact or skin absorption. These products also cause problems with the environment inside the costume shop by giving off hazardous volatile organic compounds (VOCs) that can stay trapped in the costume shop and build up over time. With continued exposure to these chemicals they can have a hazardous effect on the user, so it is best to limit contact as much as possible (Fried 87).

It is important to read the labels of all of the cleaning products in the costume shop. Manufacturers are not required to reveal their ingredients and therefore often do not. This makes identifying the toxic ingredients difficult, but the best label indications of toxic substances are generally the warnings and precautionary statements they carry. "Poison," "Danger," "Warning," "Caution" are a descending order of acute hazards (Fried 87). Fortunately, due to an increasing demand, environmentally friendly products have become easier to obtain. Although these products are becoming mainstream and able to be purchased in the mass market and claim to be environmentally friendly, it does not mean that the labels are any easier to read than the previous toxic cleaning products. The National Geographic breaks down a few of the green labels that can be misleading on the Green Cleaning section of its website, *greenguide.com*:

Biodegradable: This unregulated term is meaningful only if it specifies the amount of time it takes for the product to decompose, as most substances will eventually biodegrade over time given the right conditions, such as sunlight.

Non-toxic: There is no official definition or third-party verification for this claim. Not meaningful.

Organic: Household cleaning products aren't regulated by the Organic Foods Production Act, but some of their ingredients, such as plant oils, can be labeled "certified organic."

The website also lists the following ingredients to avoid when purchasing products:

Alkylphenol ethoxylates (APEs), common in detergents and disinfectants, are suspected hormone disruptors.

Ammonia is poisonous when swallowed, extremely irritating to respiratory passages when inhaled and can burn the skin on contact.

Indiscriminate use of Antibacterial cleansers containing triclosan may be contributing to the rise of antibiotic-resistant germs.

Butyl cellosolve (aka butyl glycol, ethylene glycol monobutyl) is poisonous when swallowed and a lung-tissue irritant.

Chlorine bleach (aka sodium hypochlorite), an all-purpose whitening agent, can irritate the lungs and eyes and in waterways can become toxic organochlorines.

Diethanolamine (DEA) can combine with nitrosomes (often-undisclosed preservatives) to produce carcinogenic nitrosamines that penetrate skin.

Fragrance frequently contains phthalates, chemicals linked to reproductive abnormalities and liver cancer in lab animals and to asthma in children.

Phosphates soften water for detergents but contribute to algae blooms in our waterways, which can kill off fish populations.

Sodium hydroxide, found in drain, metal and oven cleaners, is extremely irritating to eyes, nose and throat and can burn those tissues on contact.

Sodium lauryl sulfate, a common sudsing agent, can penetrate the skin and cause contact dermatitis (Pennybacker, Mindy).

Labels can be very confusing, but there are resources to help educate and clear up the confusion that product marketing creates. Consumer Reports Green Choice website has an eco label section allowing consumers to find out what the labels on the products really mean. Using the search tools provided, consumers are able to see expert evaluation of labels on food, wood, personal care products and household cleaners. Consumers can search by product, category, or certifier, and easily compare labels using the report cards (Eco-Labels Center).

If you want to avoid labels completely and make your own cleaners, National Geographic Green Guide has a Do it Yourself (DIY) section on how to make the less toxic, inexpensive cleaners. For example, Paul McRandle of the National Geographic's The Green Guide for Everyday Living says:

The healthiest, least-toxic cleaners you can find are the ones you make yourself. They're effective too: According to a study at Virginia Tech, spraying hydrogen peroxide and vinegar right after one another is just as effective at killing germs as lung-irritating, stream-polluting chlorine bleach...

For more examples of less toxic homemade cleaners see appendix A.

Spray bottles can be purchased from the hardware or drugstore in order to mix and distribute these cleaning products. As discussed in Chapter One, leftover scraps can be used as cleaning rags. Not only are these solutions more environmentally friendly to the earth and the humans using them, they are cost efficient as well. The only drawback to these DIY cleaners is the time it takes to make them.

There are non-toxic or low-toxicity cleaners on the market today that are environmentally friendly and already mixed if you are looking for time-saving convenience. It is important to research the product being purchased in order to make sure it is truly environmentally friendly to both the earth and the humans being exposed to the product. Two brands of cleaning products that have become increasingly popular in the green cleaning market are Seventh Generation and Method. Seventh Generation cleaning products include non-toxic, phosphate-free cleaning, dish and laundry soap. Along with creating healthier products, Seventh Generation dedicates 10% of their profits to non-profit community, environmental, health, and responsible business organizations working for positive change. The website describes how they came up with the name of Seventh Generation:

The company derives its name from the Great Law of the Iroquois that states, "In our every deliberation, we must consider the impact of our decisions on the next seven generations." Every time you use a Seventh Generation product you are making a difference by saving natural resources, reducing pollution, keeping toxic chemicals out of the environment and making the world a safer place for this and the next seven generations (About Seventh Generation).

Another company dedicated to the environment is Method. Method believes that if you "want to clean up the environment, start with your own" (Method and the Environment). Their cleaning formulas contain biodegradable ingredients derived from natural materials like soy, coconut and palm oils. The packaging is made from the most readily recyclable materials. The CO₂ emissions from employee commute and travel are offset with carbon credits and the energy used in the manufacturing sites and office from renewable energy credits. Their products are never tested on animals because they "believe guinea pigs should never be used" (Method and the Environment). The Method products have been designed with wide accessibility in mind and are readily available at major retailers, bringing natural cleaning products out of small health food shops and into the mass market (Brower 134). Whether your costume shop decides to make its cleaning products or purchase non-toxic commercial ones, it is important to know the hazards and risks associated with each product.

Dyes

Dyes are an important element in the costume shop because they provide a way of producing a very specific color in a fabric, allowing the dyer to meet the needs of the costume designer. Although dyes can create a necessary look, they should be used and treated with extreme caution because of the possible harm they can cause. Industrial experience has demonstrated that many dyes can harm those who use them. Some have caused cancer, produced birth defects and caused severe allergies (Rossol 102). According to Monona Rossol, “the hazards of most dyes are unknown, because only a few of the several thousand commercial dyes have been tested for long-term effects” (102). This means that using dyes in the costume shop present the possibility of creating a hazardous environment for the people in the costume shop. If your costume shop must work with these substances it is imperative to follow Monona Rossol’s Rules for working with Raw Pigments and Dyes lists in *The Artist’s Complete Health and Safety Guideline*:

Rules for Working with Raw Pigment and Dyes:

1. Try to use materials which do not expose you to pigments or dyes in the powder state. Use instead premixed paints, liquid dyes and oil pastels (instead of dusty pastels). Pigments or dyes are easier to use safely once they are mixed with water or oil and cannot be inhaled. Dust from pigments and dyes in the powdered state are likely to be in the respirable range of particle size (10 microns in diameter and under). They can be inhaled deep into lungs and can contaminate hands, clothing and environments.
2. Identify your pigments and dyes. Only use materials for which Material Safety Data Sheets are available. Avoid purchasing materials from companies which do not also provide Chemical Abstract Service numbers and /or Color Index names and numbers.
3. Never use techniques which raise dust such as sprinkling dry colors onto textile paper.

4. Weigh out, slurry, mix or handle pigment and dyes only in local exhaust ventilation or in a glove box.
5. Avoid skin contact with pigments and dyes by wearing gloves or using barrier creams. Should skin stains occur, never use bleach or solvents to remove them. (Bleaches are especially hazardous because they may break complex colorant molecules in the skin into more toxic components.)
6. Wear protective clothing including a full-length smock, shoes and a hair covering (if needed). Leave these garments in the studio to avoid bringing dust home. Wash clothes frequently and separately from other clothes.
7. Clean the studio properly. Work on easy-to-clean surfaces and wipe up spills immediately. Wet mop or sponge surfaces and floors or use HEPA vacuums. Do not sweep.
8. Practice good hygiene and do not eat, smoke or drink in the studio.
9. Keep containers of pigments and dyes closed at all times when not using them.
10. If lead-containing pigments are used, blood tests for lead should be done regularly (at least once a year). If the studio is in a workplace or school, The OSHA Lead Standard must be followed
11. All finely powdered metals used as pigments such as powdered aluminum or bronze should be considered flammable and/or explosive. Any spark or static discharge can set them off once they are open to the air. Use premixed metallic pigmented paints or buy metallic pigments sold in paste form instead. Store these pigments in the flammable storage cabinet (102 -103).

In order to have an environmentally sustainable costume shop and theatre we have to have safe, healthy people produce and create. This means that we must be familiar with all of the elements in our surroundings and take the necessary precautions in handling chemicals and potentially harmful materials. Creating an environmentally sustainable costume shop begins with creating a health environment in the costume shop.

CHAPTER 4

OTHER WAYS TO BE ENVIRONMENTALLY SUSTAINABLE

We do not have to make drastic changes to the way we work to make that work more environmental sustainable. One way to make change happen is to make the change easy and convenient. If you place a recycle bin next to the trashcan and properly label it with the items that can be recycled, this convenient step will make recycling easier for everyone. If the costume shop does not provide a collection service of the recycled goods, it is important to organize a system for recycle removal to the appropriate recycling center. This small step is very important, especially in a costume shop that uses and discards pattern paper on a daily basis.

Power strips should be used for all large electrical appliances like irons, microwaves, coffee pots, etc. These electrical appliances still pull energy from the electrical outlet even when they are turned off. The use of the power strip stops the drain, therefore stopping unnecessary waste of electricity.

Besides purchasing environmentally friendly items for the costume shop including fabrics and cleaning supplies, make sure that if there is a work/computer station in the shop that it is also being supplied with environmentally sustainable items, such as recycled paper. It is easy to overlook such spaces since they are omnipresent today.

Employees can participate in the environmentally sustainable movement individually, by bringing in reusable container for beverages and food. Employees should

also participate in alternative transportation whenever possible. Riding bikes, public transportation and car-pooling are all environmentally sustainable options that should be explored. When a shopping trip is planned, map out the most efficient route and purchase all of the items necessary in order to avoid extra trips back to the same store. Items with less packaging should be purchased whenever possible, and packaging of items purchased should be recycled. Always bring reusable shopping bags with you for the purchases. These bags can be made in the costume shop using scrap fabric and customized to fit the varying size of items purchased by the costume shop. When cleaning out the costume stock do not throw away the costumes. Either save them for a costume sale to be held before Halloween or donate them to the local thrift store. A happy environment creates happy employees. Make the environmentally sustainable changes easy and convenient and you will have happy employees in a happy environment – both the costume shop environment and the planet.

CONCLUSION

IT IS TIME FOR A CHANGE

It is time to change how the costume shop purchases and uses fabric, energy and chemicals. In the usage of fabric, it is possible with the cooperation from the costume shop employees and costume designers to change how we traditionally purchase and consume fabrics, reducing our negative impact on the environment. Energy conservation in the costume shop is very important in reducing our impact on the environment. In order to reduce the greenhouse gas emissions and depletion of our natural resources, we need to change our energy habits. We can do this by consciously monitoring and then restricting our use of electricity and by using energy efficient electrical appliances. Chemicals, including everyday chemicals, can be very dangerous, therefore, it is important to identify and know all of the hazardous chemicals used and stored in the costume shop and the risks and dangers they present to the people and environment in both the costume shop and the world. If costume shops begin to follow these guidelines, they will be creating a healthier and more environmentally sustainable environment for all.

This thesis should be used as a guide for further explanation. Not all environmental topics were covered or discussed and many new solutions are being developed each day. Each day more and more people are concerned with the environment and are looking to take action. Share information with each other. Develop and implement an Environmental

Plan in your costume shop. Make mandatory changes to the way the shop operates. Change the way the costume shop employees think about the environment.

It is important for us not to become overwhelmed with the change towards environmental sustainability. If we become overwhelmed, it will create a resistance to change. We must realize that change must happen and it can begin today, one small step at a time. Our environment has reached a state where we can no longer afford to make excuses. We must be aware of what our actions and consumption are doing to the environment. We must become informed and take action. It is time for change.

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APPENDIX A

EIGHT ESSENTIALS

These eight items make up the basic ingredients for nearly every do-it-yourself cleaning recipe.

Baking soda: provides grit for scrubbing and reacts with water, vinegar or lemon by fizzing, which speeds up cleaning times

Borax: disinfects, bleaches and deodorizes; very handy in laundry mixes

Distilled white vinegar: disinfects and breaks up dirt; choose white vinegar over apple cider or red vinegars, as these might stain surfaces

Hydrogen Peroxide: disinfects and bleaches

Lemons: cut grease; bottled lemon juice also works well, although you might need to use bit more to get the same results

Olive oil: picks up dirt and polishes wood; cheaper grades work well

Vegetable based (liquid castile) soap: non-petroleum all-purpose cleaners

Washing soda: stain remover, general cleaner, helps unblock pipes; should be handled with gloves due to its caustic nature. Washing soda is usually found in the laundry aisle of grocery and drug stores.

WHOLE HOUSE

All-Purpose Cleaner

½ cup borax

1 gallon hot water

Mix in pail (or use smaller amounts in a spray bottle: 1/8 cup borax to 1 quart of hot water) dissolving the borax completely; wipe clean with rag.

Floors

Wood

¼ cup white vinegar

1 gallon warm water

Linoleum

1 cup white vinegar
2 gallons warm water
Mix in mop bucket, rinse afterwards.

Furniture Polish

½ cup white vinegar
1 tsp olive oil
Mix and apply with a clean rag to dust and polish. Reduce the olive oil if wood looks too oily.

Metal Polish

Copper and Brass

2 Tbsp salt
White vinegar
Add vinegar to salt until you've created a paste. Adding flour will reduce abrasiveness. Apply with a rag and rub clean.

Stainless Steel

Baking soda
White vinegar
Apply baking soda with a damp cloth, using the vinegar to eliminate spots.

BATHROOM

Toilet Bowl

Baking soda
White vinegar
To clean and deodorize, sprinkle toilet bowl with baking soda, add white vinegar and scrub with a toilet brush.

Tub and Tile

½ lemon
Borax
Dip the face of the lemon half in borax to create a hand-held scrubber for dirty areas. Rinse and dry the surface afterwards.

KITCHEN

Countertops

Marble: Mix one Tbsp castile soap with a quart of warm water, rinse well, then dry with a warm cloth.

Other surfaces: half a lemon and dip the face in baking soda to scrub off residues. Follow up by spraying with glass cleaner mix (below).

Drains

1 cup baking soda

1 cup vinegar

Add baking soda and vinegar to a pot of boiled water and pour down the drain, then flush with tap water. For more stubborn clogs, use a "snake" plumbing tool to manually remove blockage, or try suction removal with a plunger. To prevent clogs, install inexpensive mesh screen, available at home improvement and hardware stores.

Glass

¼ cup vinegar or 1 Tbsp lemon juice

2+ cups water

Fill a clean spray bottle with water and either white vinegar or lemon juice; wipe with a rag or old newspaper.

Oven

Baking soda

Water

Sprinkle baking soda on surfaces, spray water, then let soak several hours or overnight.

Rinse with water.

Stovetop and Oven Grease Remover

½ tsp washing soda

½ tsp liquid soap

2 cups hot water

Add washing soda and soap to hot water in spray bottle. Since washing soda is caustic, wear gloves.

LAUNDRY ROOM

Bleach alternative

½ cup hydrogen peroxide (McRandle, Paul)

APPENDIX B

Arts, Crafts, and Theatre Safety

artscraftstheatersafety.org

ACTS is a not-for-profit corporation that provides health, safety, industrial hygiene, technical services, and safety publications to the arts, crafts, museums, and theater communities.

Biokleen

biokleenhome.com

Non-toxic and environmentally safe cleaning products

Center for Neighborhood Technology

www.cnt.org

Founded in 1978, the Center for Neighborhood Technology has been a leader in promoting more livable and sustainable urban communities. As a creative think-and-do-tank, they research, invent, and test urban strategies that use resources more efficiently and more equitably.

Earth 911

earth911.com

Earth911.com is your one-stop shop for all you need to know about reducing your impact, reusing what you've got and recycling your trash.

Ecology Action

ecoat.org

Ecology Action is a nonprofit environmental consultancy delivering cutting edge education services, technical assistance, and program implementation for initiatives that assist individuals, business and government to maximize environmental quality and community well being.

ecoTheater

ecotheater.wordpress.com

Blog written by Mike Lawler The ecoTheater project is concerned with how as theater artists we can strive to create theater without sacrificing the environment and the long term health of our communities.

Ecovian

ecovian.com

Ecovian is an online green city guide created by a community of passionate members dedicated to living a sustainable lifestyle. Ecovian city guides are a comprehensive sources

of regional green living information, covering topics such as where to find organic & local food (CSA programs, farmers markets, organic restaurants, grocery stores, etc.), natural clothing and baby stores, eco-friendly cleaning services, solar system installers, and many other green resources and local businesses. City guides also provide an up to date calendar of upcoming green and environmental lectures, talks, and events, and a community discussion group where the latest regional environmental news and policy issues are posted and discussed.

ENERGY STAR

energystar.gov

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices. Lists all ENERGY STAR qualified products.

The Freecycle Network™

freecycle.org

The Freecycle Network™ is made up of 4,743 groups with 6,718,000 members across the globe. It's a grassroots and entirely nonprofit movement of people who are giving (& getting) stuff for free in their own towns. It's all about reuse and keeping good stuff out of landfills. Each local group is moderated by a local volunteer and membership is free.

Geekcorps

geekcorps.org

Geekcorps is an international 501(c)(3) nonprofit organization that promotes stability and prosperity in the developing world through information and communication technology (ICT). Geekcorps' international technology experts teach communities how to be digitally independent by expanding private enterprise with innovative, appropriate, and affordable information and communication technologies.

Global Exchange

globalexchange.org

As an education and action resource center, they advance their vision by working to ensure our members and constituents are empowered locally and connected globally to create a just and sustainable world. Global Exchange takes a holistic approach to creating change, realizing that in order to advance social, environmental and economic justice they must transform the global economy from profit centered to people centered, from currency to community.

GreenEarth Cleaning

greenearthcleaning.com

GreenEarth Cleaning is the world's largest solution provider for environment friendly dry cleaning.

Greener Choices

greenerchoices.org

Launched by Consumers Union, the non-profit publisher of Consumer Reports, greenerchoices.org is a Web-based initiative to inform, engage, and empower consumers about environmentally-friendly products and practices. Offers an accessible, reliable, and practical source of information on buying “greener” products that have minimal environmental impact and meet personal needs.

Greener Choices Eco-Labels Center

greenerchoices.org/eco-labels

Eco-labels center where you can find out what the labels on your favorite products really mean by using the search tools to get an expert evaluation of labels on food, wood, personal care products and household cleaners. You can search by product, category, or certifier, and easily compare labels using the report cards.

Green Guide for Everyday Living

thegreenguide.com

Dubbed the “green living source for today’s conscious consumer”, the GREEN GUIDE makes living in an environmentally-aware way personal, practical and positive. Intended for general consumers, GREEN GUIDE shows people how to make small changes that add up to big benefits for their wallets, for their health, and, of course, for the health of the planet.

Greenlight Magazine

greenlightmag.com

Greenlight provides you with information and ideas that show you how you can live well and still make a difference. Their philosophy is to support and encourage the efforts of all companies, organizations and individuals who are trying to make the earth a better place.

Green Seal

greenseal.org

Green Seal works with manufacturers, industry sectors, purchasing groups, and governments at all levels to "green" the production and purchasing chain. They evaluate a product or service beginning with material extraction, continuing with manufacturing and use, and ending with recycling and disposal. Products only become Green Seal certified after rigorous testing and evaluation, including on-site plant visits.

Hemp Traders

hemptraders.com

Hemp Traders, the world’s largest supplier of hemp products.

Lamprecycle.org

lamprecycle.org

a resource for any light bulb ("lamp") user seeking details on recycling spent mercury-containing lamps.

Method

methodhome.com

Entire line of home care and personal care products are non-toxic, made with naturally derived, biodegradable ingredients. They offset carbon emissions by planting forests and by buying electricity from renewable sources like solar and wind energy. They design our products to meet the environmental design standard of Cradle to Cradle. They make recyclable bottles from 100% recycled plastic and use natural materials like bamboo, corn and coconut oil in our products and packaging.

Mother Nature Network

mnn.com

Mother Nature Network is resource and an everyman's eco-guide offering original programs, articles, blogs, videos, and how-to guides along with breaking news stories.

The Nature Conservancy

nature.org

Use The Nature Conservancy's carbon footprint calculator to measure your impact on the climate. The carbon footprint calculator estimates how many tons of carbon dioxide and other greenhouse gases your choices create each year.

The Organic Pages Online

theorganicpages.com

Organic Trade Association (OTA) presents The Organic Pages Online(TM) to provide users with a quick, easy way to find certified organic products, producers, ingredients, supplies and services offered by OTA members, as well as items of interest to the entire organic community.

The Organic Trade Association

www.ota.com

Organic Trade Association (OTA) is a membership-based business association that focuses on the organic business community in North America. OTA's mission is to promote and protect the growth of organic trade to benefit the environment, farmers, the public and the economy.

Renewable Choice

renewablechoice.com

Renewable Choice helps businesses and individuals understand and reduce their environmental impact with renewable energy and other clean technology solutions.

Risk International and Associates

riskit.com

Risk International and Associates (RIA) specializes in Risk Management and Risk Assessment of Public Assembly and Entertainment facilities.

Seventh Generation

seventhgeneration.com

Seventh Generation is committed to becoming the world's most trusted brand of authentic, safe, and environmentally-responsible products for a healthy home.

Virginia Department of Environmental Quality

deq.state.va.us

Measures your Ecological Footprint, which means it measures the amount of nature (acres) needed to support your lifestyle.

wattwatt

wattwatt.com

wattwatt (a play on the words 'what' and 'Watt') is an independent community website set up by the International Electrotechnical Commission (IEC), a Geneva-based, non-governmental and not-for-profit organization, leader in electrotechnical standardization. IEC believes that the question of electrical energy efficiency is one that needs to be addressed and that everyone of us, as individuals, has a part to play.

Worldchanging

worldchanging.com

Worldchanging is a 501(c)3 media organization that comprises a global network of independent journalists, designers and thinkers covering the world's most intelligent solutions to today's problems.

VITA

K. Stone was born in Evanston, Illinois with her twin sister on September 4, 1980. K. currently lives in Richmond, VA with her husband but is always open to living in a new location. She graduated from The College of William and Mary in 2002, with a Bachelor of Arts degree in Theatre. K. hopes that one day everyone will be able to experience the sense of superiority she feels when she recycles.