



Ecological Symphony



Gwyneth Long

FIG 1

**How can living plants on clothes artistically
address environmental stewardship?**

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“We are only as strong as
we are united, as weak as
we are divided.”

-Albus Dumbledore



FIG 2

Related coursework:

Fall 2023, Plant Pathology and Microbiology, HORT 2020
Professor Brian Moody and Dr. Dan Peterson
Projects include a plant disease fact sheet

Fall 2023, Landscape History to 1900, HORT 3050
Professor Stevie Famulari
Projects include a cemetery design plan

Summer 2023, Herbaceous Ornamentals II, HORT 2033
Professor Jim Hansel
Projects include a plant list database

Spring 2023, Soil Science and Plant Nutrition, HORT 3010
Professor Tania D. Burgos Hernández and Dr. Dan Peterson
Assignments include a discussion on soil erosion

Spring 2023, Herbaceous Ornamentals I, HORT 2032
Professor Brian Grubb
Projects include multiple plant lists

Spring 2023, Horticulture Science II, HORT 1011

Professor Jim Hansel

Projects include an exotic plant debate

Spring 2023, Woody Ornamentals II, HORT 2031

Professor Steve Foltz

Projects include a tree identification slideshow

Fall 2022, Sustainable Landscape Design I, HORT 2040

Professor Katie Katy

Projects include a landscape proposal for Loveland High School's "Tiger Trail"

Fall 2022, Native Plants and Communities I, HORT 1030

Professor David Gressley and Dr. Donna McCollum

Projects include 4 plant palettes

Fall 2022, Woody Ornamentals I, HORT 2030

Professor Steve Foltz

Projects include a tree identification slideshow

Fall 2022, Introduction to Horticulture I: Technology, HORT 1011L

Professor Jim Hansel

Projects include a professional organization assignment

Spring 2022, Native Plants and Communities II, HORT 2034

Professor David Gressley and Dr. Donna McCollum

Projects include the forest comparison soil assignment

Spring 2022, Urban Landscape IV: Roofs and Facades, HORT 3044

Professor Virginia Russel

Projects include an original green roof design

Abstract:

How can living plants on clothes artistically address environmental stewardship? Living plants growing on fashion garments is a relatively new innovation. A few designers presently are working with different plants, with and without soil, to create dynamic living fashion pieces. The goal of this project is to explore certain methods for creating a living fashion, while also designing a piece that communicates a message about environmental stewardship. The intention is to encourage observers to enjoy the beauty of plants and feel a connection with nature. This project aims to transcend the boundaries of how people see art, fashion, and nature so that viewers engage in conversation and find appreciation for the earth, inspiring a change in perception and behavior regarding stewardship of the earth. The secondary goal for this project is to expand the accessible information regarding how to grow plants on clothing garments. This project contains garden cress, radish, and beet plants that grow in soil. Chia plants are also included but grown without soil. Patches of these plants are attached to a wool coat in sections, similar to a quilt. Smaller patches allowed for trial and error of different seeds and combinations of materials.

Keywords:

Living fashion, seedlings, horticulture, green fashion, art, sustainability, soil, chia, garden cress, radish, beets, fabric, ecosystem, environmental stewardship, germination.

Problem Statement:

How can living plants on clothes artistically address stewardship of the earth?

Project Justification:

Growing plants on clothes is a moderately new innovation. There are no records of the first person to achieve this successfully. However, Paula Ulargui Escalona has become a notable living fashion designer due to her contribution to the 2023 menswear collection for the luxury fashion brand Loewe (2). When looking online for information about growing plants on clothes, the information I found was sparse. This project provides a plethora of research and trials of living fashions; this helps expand the current information in the subject area, and indirectly, shows the feasibility and potential of incorporating living plants in fashion.

This design is inspired by current innovative living fashion designs. It illustrates an admiration for plants and fashion, explored through many facets. Living fashion has a futuristic vibe, partly because it is not normalized within our society yet. Creating a tangible project is a top priority because it allows audiences to interact with the message in different ways. This living fashion initially captivates observers with its beauty but is truly meant to provoke dialogue about environmental stewardship.

This living fashion design displays a message about stewardship of the earth. According to the Guardian, “just 100 companies have been the source of more than 70% of the global greenhouse gasses since 1998” (8). Although larger companies account for the majority of emissions, there are ways that the average citizen can support the earth. Whether this be through recycling or picking up trash, replacing turfgrass with more diverse ecosystems, or using less energy. This project aims to promote conversation and awareness about the environmental crisis affecting the earth. On a smaller scale, it also invites people to

enjoy plants; hopefully connecting people with nature and encouraging them to get their hands in the dirt on their own time.

User description:

This living fashion design is intended to be displayed in a heavily trafficked area of a public park, so that the design can be viewed by anyone near it, free of charge. There will be a smooth path leading to the design and benches nearby for accessibility purposes. People who may seek out my design would be those who are interested in fashion, sustainability, gardens, or landscape installations. The design is meant to be observed, touched, and photographed.

Photos of the design will be shared on social media to provoke discourse about stewardship of

the earth. The design is meant to be viewed by people of all ages. Children may not be as interested as older age groups, but the message behind the design can encourage a learning lesson if parents/teachers decide to provide context. Students can visit the design on a class field trip to learn about the importance of sustainability. The piece will need to be maintained by one or two people. The living fashion design will not



FIG 3

withstand harsh winter temperatures, so it will need to be relocated during colder months. During this time it could be relocated to a public library, school, or museum, to promote accessibility for a diverse population.

Major Project Elements:

I. Creation of the Living Fashion

A soil medium is used for the radish, beets, and garden cress. This is the best decision for these seeds, rather than attaching the plants to fabric. This choice was made because the soil provides valuable nutrients, the roots have more space to expand and stabilize, and the moisture can be retained for a longer period of time.

Pockets of fabric were made to keep the soil intact. In the first trials, a pocket was made with cotton fabric on the bottom, soil and seeds in the center, and burlap to cover the top. The burlap was not porous enough for the seeds to fully extend themselves and push through the fabric, so the burlap was cut open. After the burlap was cut, the seeds were able to extend themselves easier which allowed them to stay intact when moved vertically; the large number of seeds planted helped them remain in an upright position. Without a top layer, they were more fragile, so they were not utilized in the final design. The next trials have either a cotton fabric or



FIG 4



FIG 5



FIG 6

weed barrier fabric on the bottom and a webbed fabric on the top. This fabric is much more porous and allows the seedlings to push through much easier. There are also trials done without soil, with the seeds directly sown onto the coat. Chia seeds are used for these trials, due to their ability to flourish without soil. After the separate pockets were

grown to a desired length, they were sewn onto the coat. A fishing line was used to sew them on due to the material's ability to stay intact after being watered frequently.

The plants used in this project include chia, garden cress, radish, and beets. Their quick germination rate and visual appeal made them the best option. These plants are often used as microgreens, plants that don't grow to full size and are harvested soon after sprouting, so parts of this living fashion are edible. Cut flowers and dried flowers are also incorporated into the design for a splash of color.

II. Developing the Meaning of Environmental Stewardship

There are two main elements of the overall design which carry the most meaning. The first is trash; the front of the coat is littered with used plastics and dirty, disposable items. This addition speaks to our culture's values: hyper-consumerism, disposable norms, and materialistic behaviors. The trash seems to be slowly creeping onto the back of the coat where the plants are flourishing. Seeing trash and vegetation coexist is not a new or unique sight for viewers. However, seeing the two presented as art begs new, more thoughtful questions.

The plants growing on the backside of the coat symbolize abundance, health, and beauty. They persist amidst the invading trash. They bloom regardless of human recklessness. These small greens represent the larger earth and the strength of nature.

The placement of these two opposite things begs the viewer to think deeper about their connections. How can something made of trash be beautiful? How can used items be repurposed and born again? What does all of this say about our culture, norms, and values? More specifically, this design highlights the fashion industry's role in this. How do they contribute to problems and solutions regarding environmental sustainability?

These are questions that the viewer must decide for themselves. This project is meant to spark conversation; to be representative of our greater world, and bring awareness to our relationship with the earth.

Inventory and Analysis:

To create the design, multiple fabric pieces holding together a soil medium are sown onto a wool coat. The fabric swatches are created by cutting a webbed fabric and landscaping fabric to the same size (around 4-12 inches on each side). The two fabrics are then sewn together on the edges creating a pocket. The pocket was filled with a seedling and cutting soil mix and seeds were placed before sewing the pocket shut. The seeds that are used include chia, garden cress, radish, and beets. The soilless patches are made by cutting landscaping fabric to the desired length and then spreading the chia seeds evenly throughout the patch. The swatches are watered daily and kept in full sun conditions for proper germination. After the seeds grow to the desired length, each patch is separately sewn onto the wool coat.



FIG 7

The landscaping fabric is used as a backing for the roots and keeps the pocket secure. This format allows for change in the placement of the swatches without having to bother with them being fully sewn on the coat. The webbed fabric is added to keep the soil within the pocket, while also leaving space for sunlight to seep through to the seeds. The separate swatches are made so that different seed mixtures can be tested. It is helpful to have multiple smaller pockets so that the soil doesn't sink to the bottom of the coat.

Case studies:

I. Paula Ulargui Escalona

Designer Paula Ulargui Escalona has created living fashion designs for the brand Loewe, including chia and catswort plants in jeans, shoes, and coats (2).



FIG 8

Escalona's website exudes the same creativity as her work;

the videography, photo gallery, and aesthetics are

captivating. She collaborated with designer Cristina

Pedroche in 2023, creating a sustainable outfit to

symbolize the importance of protecting and saving water

(1). It included a cape made with Red Amaranth seeds and

Nasturtium plants grown hydroponically (1). The dress in this design is organic and

biodegradable, made of gelatine, agar, glycerine, and water (3). Some

of her most notable designs are included in her sustainable research

project named *Paula Ulargui x Nature* (12). When introducing this

project she writes, "Taking into account the problematic Anthropocene

era (current period where human development and activity is influencing the

environment) in which we live, the proposal of the pieces created is to raise

awareness of our need to reconnect with nature. A nature from which we are so

disconnected that we can't even feel the price of its absence. We live at a distance



FIG 9



FIG 10



FIG 11

from our essence, denying its rhythms and processes within us: garments in which the human body is the support for nature to grow, live and create its life cycle, feeling and putting ourselves at its service” (12). She has used Air moss to create a woven jacket and grown mycelium on a vest (3)(11).

Paula Ulargui Escalona’s work is relevant to this design because she has many different clothing designs that incorporate growing plants. Similar to Escalona’s work, this project includes seedlings, specifically red amaranth due to its aesthetically pleasing bright reddish-pink color. Escalona’s designs show how the placement of seeds is very crucial to the final product. The photographs she takes of her designs are clean and professional; which is something this project emulates. Understanding the meaning behind Escalona’s designs is crucial to grasping the entirety of her work. Looking at the reasoning behind her choices helped this design effectively convey a message.



FIG 12&13



FIG 14

II. Stevie Famulari

Stevie Famulari created a living fashion collection, *Green Line*, which displays transportable landscapes (7). “Famulari aims to ‘penetrate boundaries and engage human connections’”, and her designs do just that (7). Her captivating creations aim to provoke conversations and reflection about indoor and outdoor spaces as well as the movability of landscapes (7). Her designs intricately weave detail, texture, and flow, challenging viewers to reconceptualize the conventional definition of landscapes. The incorporation of flowers and different types of grasses allows viewers to visualize the landscape; the outline of flowers and lace on the cape may prompt observers to picture what her design might look like as a backyard garden.



FIG 15



FIG 16

Looking at Stevie Famulari’s work helped to induce thought about different ways the plants in this design could be arranged. It was beneficial to see the difference between Famulari’s designs being fully covered in plants compared to Paula Ulargui Escalona’s garments which had empty spaces of fabric. Famulari’s insight on how living fashion designs can be viewed as moveable landscapes provided a meaningful perspective when crafting a piece with an

effective message. Seeing Famulari's integration of different types of plants was valuable in deciding how this research could compare and contrast different textures of plants.

III. Nicole Dextras

Nicole Dextras is an artist who has created wearable botanical fashions. Her designs are mostly made from cut flowers and leaves. She photographs the designs when they have dried out, “a metaphor for accepting our own aging process” (14). Most of her designs are colorful, exhibiting a gorgeous arrangement of flowers and plants; her designs aim to encourage viewers to try sustainable clothes (14).



FIG 17

Dextras's designs prompted consideration of different ways to incorporate plants into the design, as some of her designs resemble clothing from a certain time period. It was crucial to examine the intricate detail she put into her designs and the diversity of plants she uses. Her designs encouraged the exploration of different non-living elements of plants in the design, whether that be seeds, dried leaves, sticks, cut flowers, or dried fruit. Examining her techniques for creating texture was beneficial.



FIG 18

Case Study Summary:

It was valuable to examine the living fashion designs of Paula Escalona, Stevie Famulari, and Nicole Dextras to see different ways to arrange the plants based on texture, color, spacing, and height. The designs also gave insight into different materials that could be used, as well as how to effectively convey meaning through the living fashion.

While looking at Paula Escalona's work, it was beneficial to investigate the placement of plants within her design, comparing the empty spaces of fabric with Stevie Famulari's designs which are fully covered. The clean and aesthetic photos and videos of Escalona's work will be emulated in the display of the living fashion. Escalona's message of reconnection with nature is apparent in her pieces and resonates deeply with the goal of the project.

Stevie Famulari's observation of the movability of landscapes offered a different perspective on the communication of an idea through design. Famulari's wide range of plant textures and sizes allowed for introspection of how different plants may look together and what feeling they exude.

Nicole Dextras' use of cut flowers and dried flowers in her designs encouraged the use of those materials in the final design. Some of Nicole Dextras's designs emulate fashion from different time periods, which evoked additional thoughts on how the arrangement of plants could allude to different messages.

Historical Context:

Clothing has been utilized as a medium for protest by many different groups of people. In the 1960s, movements such as the Civil Rights Movement, the Women's Liberation Movement, and the Anti-War Movement used clothing to further their cause (16). During the Civil Rights Movement, the Black community often wore suits to marches to convey their dignity and respectability (4). Members of

The Black Panther Party wore black berets and leather jackets, signifying their power (4). "The look tapped into the toughness and counter-culture connotation that came with leather, and drew on the beret's history as a



FIG 19

component of military uniforms." (4). At the Miss America Pageant of 1968, women threw high heels, bras, and undergarments on stage to signify their disgust at the sexualization and objectification of women (16). During the Anti-War movement, many protesters would wear black armbands which conveyed their sadness for the loss of life during the Civil Rights Movement and the Vietnam War (16). The younger generations in the 1960s also dressed differently from previous generations, some styling longer hair and more casual clothes to challenge the status quo (16).

Although the concept of growing plants on clothing is newer, people have been using plants to make clothing for thousands of years. One of the earliest discoveries of plant-made fabric dates back 34,000 years ago, and is made of flax (9). Ancient civilizations in Egypt, Mesopotamia, and Europe also used flax (15). Hemp has a long usage history as well, found in ancient Mesopotamia (15).

Literature review:

To develop the meaning of environmental stewardship, research is done to explore current practices that harm the earth. It is crucial to identify destructive actions so that awareness can be promoted. The following research highlights the critical need for environmental stewardship, as it affects both human and ecological health.

- “A net 5 billion metric tons of human-produced carbon remain in the atmosphere each year, raising the global average carbon dioxide concentrations by about 2.3 parts per million per year” (6).
- “Between 5% and 10% of global greenhouse gas emissions are generated by the fashion industry”(5).
- “20% of industrial water pollution comes from the treatment and dying of textiles”(5).
- “The fashion industry uses 1.5 trillion liters of water per year amidst a water scarcity crisis that affects more than 884 million people”(5).
- “An estimated 35% of all microplastics in the ocean come from synthetic textiles” (10).
- “Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary landfills contribute to contamination of drinking water and can cause infection and transmit diseases”(13).
- “7 times in average, a garment is worn before being thrown away” (5).
- “24% of the insecticides & 11% of the pesticides produced globally are used for cotton production” (5).

Project Goals:

The main goal of this project is to create a fashion piece that displays living plant material, as well as trash, that conveys a message about environmental stewardship. The design is meant to inspire and educate observers on the importance of environmental stewardship. This is done by adding trash that coexists with living plants in the design. This contrast of materials is meant to symbolize greater issues of hyperconsumerism and materialistic behaviors that damage our environment.

The design is meant to be aesthetically pleasing, even in the areas where trash resides on the piece. The initial attractiveness convinces the viewer to learn more. The design engages viewers, prompting them to observe the intricate details and feel the different textures. Placing interactive elements within the design for engagement is crucial to promoting conversation about environmental stewardship.

Another goal of this project is for the back of the coat to be completely covered in growing plants. This is achieved through trial and error of different plant types and media for planting. The growing plants are essential to convey a message about environmental stewardship, as well as fulfilling the objective of creating a living fashion.

A major design goal is to inspire viewers, whether that be to make a change in their current habits or just to start up a conversation. The goal of this design is not to place blame on the viewer, but rather to assist them in being more aware of certain routines they hold. The intent is for the observer to interpret the design uniquely. Lastly, it is important that this project is well documented throughout the process and explained in detail so that it can be replicated.

Programmatic Requirements:

One component of this project involves growing living plants. This is done by creating patches, both soil and soilless that are sewn onto the coat. The soil pockets are made by cutting a landscaping fabric and webbed floral arrangement fabric to the same size. These pockets are about 4-12 inches long and cut into squares and rectangles. The perimeter of the landscaping and webbed fabric are sewn together with a fishing line, and filled with a seedling and cutting soil mix. Garden cress, beet, and radish seeds were dispersed evenly underneath the webbed fabric, and covered with a ½ inch or inch of soil. The soilless patches are created by cutting the landscaping fabric to the desired size and shape. Next, chia seeds and garden cress seeds are placed in water and stirred until a thick paste is created. This paste is placed directly onto the landscaping fabric and smoothed out until the seeds are not on top of one another. There may still be some places of the patch where there is more than one layer of seeds, but it is important to ensure the seeds are dispersed as thinly as possible without gaps. All of the patches are watered or misted directly after their placement to foster germination. The patches need 8-12 hours of sunlight a day. Patches that include soil need to be watered once a day; the soilless patches need to be watered more frequently, about three or four times a day because they dry out more quickly due to the lack of soil to absorb the moisture. After the patches grow to the desired length, they can be sewn onto the coat with a fishing line. Desired lengths were achieved after 8-12 days for chia, 20-30 days for beets, 5-8 days for garden cress, and 15-20 days for radish.

The patches are grown over two months. The first trials that included burlap fabric began on February 5th; they were cut open a week later due to the inability of the seedlings to grow through the burlap. The next trials with webbed fabric began on February 17th and

growth was spotted only a few days after planting. There were two more trials done with webbed fabric, one trial on March 15th and another on March 31st. In the last trials, the garden cress was grown on soilless fabric.

Final Project Solution:

The implementation of trash into the design is highly successful. This is done by hot-gluing different pieces of trash onto the front of the coat. The trash pieces are selected for their



FIG 21

aesthetic value, color, and variety.

The majority of trash needed to be common, the waste of something the observer uses or has seen. The trash is arranged in a visually pleasing way; the different textures and sizes add depth and tactile interest. There

are some symmetrical and some

asymmetrical components. The bottles at the

bottom protrude, causing them to flow nicely into the thicker soil patches on the back of the coat.

The attachment of the plant patches is successful as well. The patches are sewn to the coat around the edges with a fishing line. An error was made while sewing the patches at the bottom of the coat, which made it harder to sew patches that



FIG 20



FIG 22



FIG 23

were higher up. If this project was reproduced it would have been ideal to start sewing the patches in the center of the coat first and move outwards. It also would have been easier to sew the chia patches on if there was a ½ inch of bare fabric on the perimeter. Another factor that would have made the sewing process easier would have been adding the trash after the patches were sewn on the back of the coat. It was helpful that the patches were watered thoroughly the day they were sewn onto the coat, this made sure that

the plants weren't wilting which would have made them more difficult to sew on.

A last-minute challenge in creating the piece was mold that quickly caused the patches to wilt and die. The lack of drainage caused the mold to form, which could have been avoided if the patches were able to dry up quickly. It would have been ideal if the patches could have been outside, but due to cool temperatures, they had to be indoors. The loss of these patches resulted with using underdeveloped patches on the back of the coat for the final design.



FIG 24

If this project was reproduced, a few factors would be changed. First would be the initial start date of the trials; starting earlier would have allowed time for different trials, as well as room for error correction. It would be optimal if this design could be created during

the summertime so that patches could be left outside, causing them to dry out quicker and increasing the space available. There should be double the amount of patches made, in the case that the patches develop mold. The mold should also be scouted and identified quickly so that it can be eradicated. Another factor that could be changed would be how the chia is implemented into the design. It may have been more efficient to grow the chia seeds directly on the jacket, rather than growing them on the patch and sewing the patch on the coat. The only downside of this method would be that if they became moldy, it would be harder to remove.



FIG 25

To the left is a photoshopped version of what the coat would theoretically look like without the loss of patches with mold.

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FIG 1: “Green fashions coats made of plants and moss and flowers”. DALL-E, version 3, Bing AI image creator, 14 Jan. 2024, <https://www.bing.com/images/create>

FIG 2: SPRING 2024 (Personal Photo)

FIG 3: “One living fashion coat design made of seedlings, flowers and moss in the middle of grass park next to an accessible concrete pathway”. DALL-E, version 3, Bing AI image creator, 6 April. 2024, <https://www.bing.com/images/create>

FIG 4-7: SPRING 2024 (Personal Photo)

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FIG 9: “LOEWE MENSWEAR.” *Paula Ulargui Escalona*, paulaularguiescalona.com/LOEWE-SS23. Accessed 18 Jan. 2024.

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FIG 18: “Maple Flapper Jumper.” *Nicole Dextras*, 8 Dec. 2015,
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FIG 19: *The Black Panther Party: Challenging police and promoting Social Change*.
National Museum of African American History and Culture. (2020, August 23).
<https://nmaahc.si.edu/explore/stories/black-panther-party-challenging-police-and-promoting-social-change>

FIG 20-25: SPRING 2024 (Personal Photos)