REIMAGINE WOOL DIGITAL POSTER CONTEST

Finalist Posters

Wool is the Miracle Fiber!
Right now, there is untapped potential with millions of pounds of American wool being underutilized.

Innovative ideas were submitted for >25 micron wool that showcases a new use, twist on a current product, or a new method of processing.

Winner received
$1,000
+ Networking Opportunities

Congratulations 2026 Winner:
Center, CO
Conservation District

AMERICAN WOOL

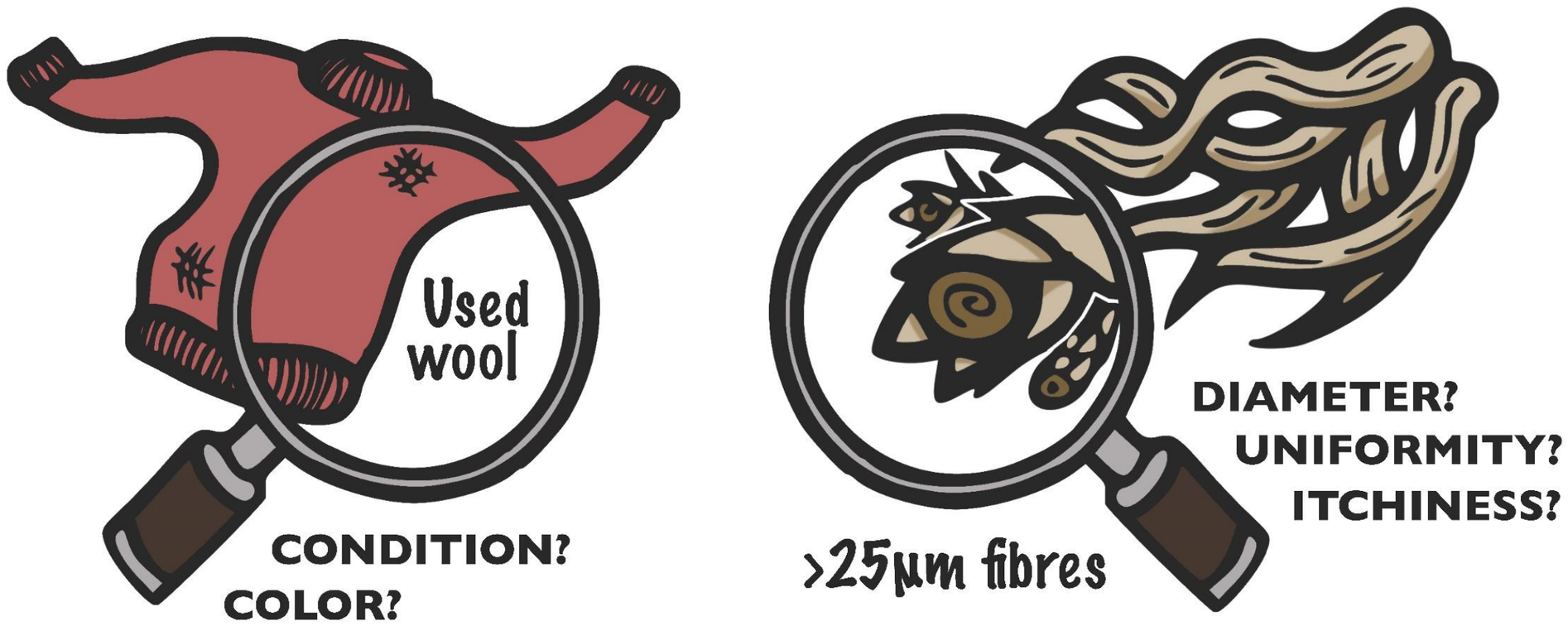
ASI

www.sheepusa.org/reimagine-wool-digital-poster-contest

1. Rylee Nelson

This product is a revolutionary way of using non valuable, unwashed wool to create a natural alternative to erosion prevention. This product is going to be made from unwashed, low quality wool that would otherwise be discarded. The way it works is the wool fibers will be laid together in one direction in a mat as large or as small as it is wanted. Then the wool will be crossed over it the other direction creating a criss cross pattern. This process will be repeated until the product is approximately 2” thick. Doing this will allow the wool to felt together better when weathered and create a stronger bond. Nextly, twine or thick yarn can be woven through the product such as a rug is woven, which will bind the wool fibers together. Keeping the wool unwashed will allow it to retain the lanolin in it which will act as a natural water repellent. The vegetable matter that is left over in the wool will not affect the product quality because it will either fall through the wool into the soil or remain in the wool which will not affect the product quality. This product is revolutionary because the production costs and labor are minimal and it is an all natural product that will not negatively affect water quality, our wildlife, or cause issues in the future. This product can be laid down on the erosion prone areas and be left as long as needed. They will eventually biodegrade over time and add organic matter back into the soil. We further improve this product and make it more advertisable to customers by layering grass seed into it when we are producing it. Wool provides a suitable environment for the germination of seeds so this wool mat will further reduce soil erosion because it will help create a barrier of plant cover over top of the affected soil which will be effective in stopping erosion. This product can be highly marketable to customers because it can be produced at a low cost and is all natural.

2. Clemence Belbeoch



UPCYCLED REGARDLESS

USING A LOW-TOXICITY ENZYMATIC PROCESS.

Wool is a remarkable material, possessing unique properties. Its most familiar application is in fashion; however, for a substantial portion of the annual American production, this market remains inaccessible. Unlike superfine wools, fibres with diameters exceeding 25 µm often lack viable value-adding pathways due to certain aesthetic limitations - such as coarse scales, irregular fibre diameters, and occasional brittleness. This represents a significant waste of potential: a high-quality raw material, the pride of national farming communities, and the underutilized co-product of a well-established meat industry.

For these coarser fibres as for post-consumer wool, the challenges are similar - to sum it up: the condition of the fibre is not suitable for fashion, especially in a competitive market flooded by synthetic alternatives. Fortunately, wool is made of proteins: enzymatic chemistry can unlock a variety of applications that reveal its full potential, and valorize its many qualities.

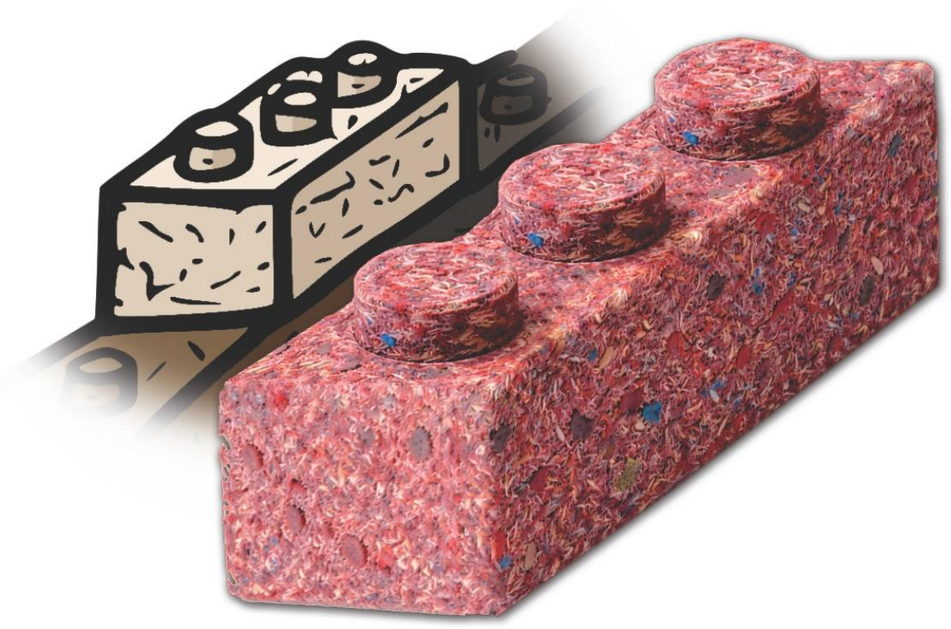
A reducing agent, such as the non-toxic amino acid **L-cysteine**, can erode wool's protective cuticle and open the access to the fibre core's. Then, a **protease** - a digestive enzyme like the one used by wool's natural decomposers in the soil - can solubilize the inner regions.

Once all wool material is dissolved and dried into a powder, it can be regenerated into new shapes of our choice. To rebuild the previously cleaved bonds within the fibre's protein chains, another enzyme can be used: **transglutaminase**, which naturally contributes to the fibre's growth in the sheep's hair follicle. This cross-linking compound regenerates strong, cohesive and smooth wool-based structures.

Resorting to enzymes is an optimal choice: they are inexpensive, effective in small quantities (< 20% w/w), and deactivated into an inert compound simply by heating the solution to 176°F.

By following this simple and easily upscaled protocol, it is possible to build wool-based bricks, pads or moldings for indoor builds.

The perks? Plenty! Regenerated wool preserves most of its native physical properties: insulation - thermal (cold or hot), but also acoustic, fire-resistant, antimicrobial, non-toxic (no microplastics or resin volatilisation), lightweight and eventually, biodegradable.



Besides, regenerated wool keeps its native color: raw fibres' natural pastels or recycled fabrics' vivid shades.

Wool material is dissolved and dried to a powder form, using L-cysteine (20 g/L) as a sustainable reducing agent to break down the fibres' cuticle, and a protease (0.35% w/v) to dissolve the inner regions of the fibres. The condition of the fibre - whether issued from fabrics that will not be mechanically recycled or from large-diameter supply that also cannot be valorized in traditional fashion usages - does not matter, nor does its coloration, length, or age. Scoured wool is preferred, but a preliminary stage of non wool-specific enzymatic scouring can be carried out to remove the wool grease and excessive lanoline, without any risk for the process, as entanglement or deterioration of the cuticle does not matter.

The obtained dissolved wool is air-dried into a powder, that is then mixed with water and a low concentration (10 to 20% w/w) of food-grade transglutaminase enzyme, and casted into molds of our choice, for example insulation stacking bricks. The bricks are then oven-dried at 50°C. Wool color can be sorted before this dissolution process, to regenerate bricks of a chosen shade.

3. WINNER

Center, CO Conservation District

Southern Colorado Wool Pellet Project

An agricultural wool pellet application study

Developed by the Center Conservation District

Introduction

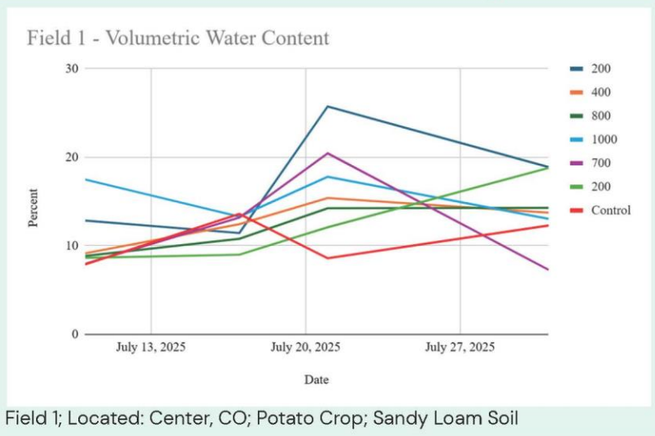
The Southern Colorado Wool Pellet Project (SOCOWPP) was developed as a research study to determine the efficacy of wool pellets as a means of increasing the soil moisture holding capacity and organic matter in agricultural applications while providing a unique market for local sheep growers.

Methodology

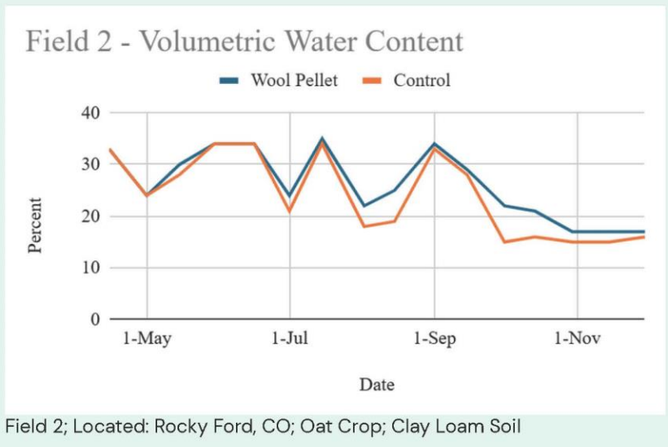
There are three components of the SOCOWPP:

1. **Field Trials**: The SOCOWPP just concluded its second year of field trials, with three fields involved in the study. Each field was monitored for soil moisture levels, tested different application rates, and performed the study using varying soil types and crop structures.
2. **Business Planning:** Building a market for the wool pellets in the agricultural industry is key to the project's longevity. The SOCOWPP has determined the following necessities for its business plan: the target supply chain, value proposition, market analysis, and a revenue model.
3. **Engineering:** To ensure that wool pellets are being made to a standard that can withstand agricultural equipment, the SOCOWPP's team of engineers has been developing prototype mill equipment to produce pellets with high integrity.

2025 Study



Field 1; Located: Center, CO; Potato Crop; Sandy Loam Soil



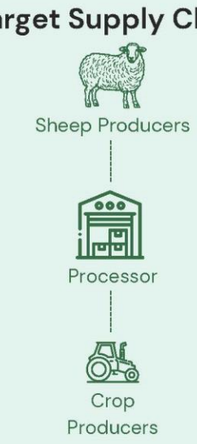
Field 2; Located: Rocky Ford, CO; Oat Crop; Clay Loam Soil

Engineering

The current most common use for wool pellets is in horticultural settings. With the assistance of our engineering committee and staff at Colorado Mill Equipment and Rapid Granulator, our prototype equipment will generate a pellet that is more durable and compact than standard wool pellets, which will allow them to be applied using agricultural equipment. These pellets will be created using unwashed, commercial wool and will be 75-95% wool, depending on the amount additive for soil conditioning and pellet integrity.

Field 3 in Center, CO. Wool pellets were combined with seed and drilled directly into rows

Target Supply Chain



Purpose

The Rio Grande and Arkansas River basins are facing severe drought conditions. Combined with groundwater irrigation withdrawals and depleting aquifer levels, many producers, especially in the San Luis Valley, face permanent well retirement. To remedy this and build a new market for unwashed, "undesirable" wool for our local sheep growers, the SOCOWPP was created.

Market Analysis

Wool pellets hold up to 25% of their weight in water, provide an NPK of 9-0-2, improve soil porosity, and release up to 50% of their weight in Carbon that stays in the soil. Improving soil health and water retention with wool pellets can drastically reduce input costs for the crop producer while also providing an outlet for excess wool.

The Southern Colorado Wool Pellet Project's prototype wool pellets for agricultural use will require a unique pellet mill setup, unlike those that are currently used for wool pellet production. This assembly line has been developed by local engineers and staff at Colorado Mill Equipment and Rapid Granulator to ensure that the pellet created is durable enough to withstand agricultural equipment, but also maintains integrity in the soil to accomplish its purpose of water retention and increasing organic matter.

The pellet mill assembly line will require a shredder to shred bales of wool to pass through the next segment. The wool will then move into a granulator, which will further grind and shred the wool finely enough to move through the granulator. There, the pellet mill will be fitted with a specific die set that will create pellets that are the right size and strength without damaging the wool or causing felting in the equipment. The pellets will then pass over a cooler to complete the shaping and hardening process. While this equipment is similar to what is used in the production of wood or alfalfa pellets, it will need to be altered to process wool, which our engineering committee has planned for.

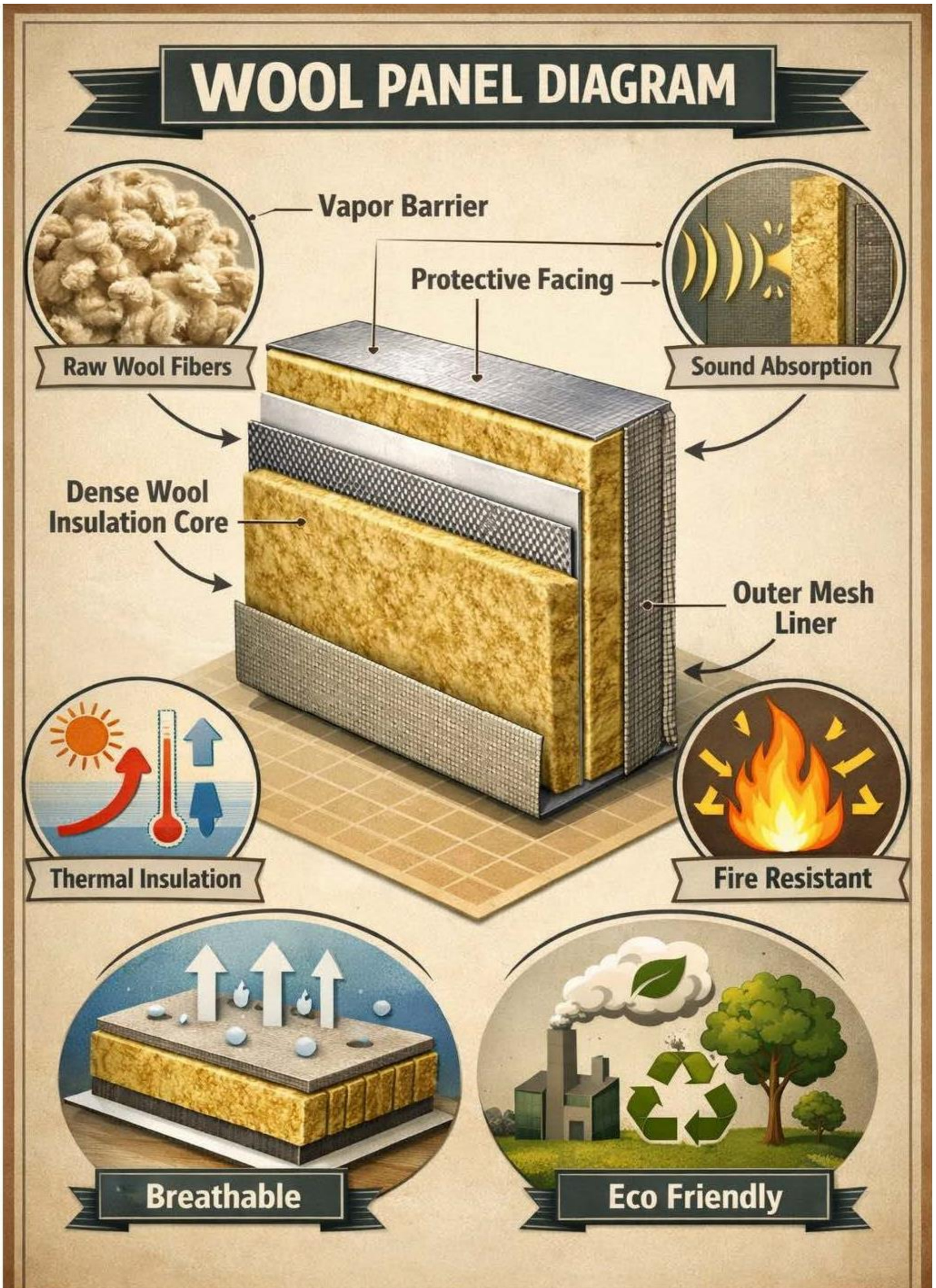
This process differs from other wool pellet mills that are currently being used in the United States. From our studies, other wool pellets tend to felt in agricultural equipment due to rapid moisture absorption. Our system will ensure that the pellets will be durable enough to avoid this issue. The durability of our pellets will also assist the pellets with maintaining form rather than disintegrating (again, something we have experienced in earlier studies).

These wool pellets are intended for agricultural use and are expected to be applied using standard agricultural equipment (drills, fertilizer applicators, planters, etc.). This ensures that the pellets are exactly where we want them - near the crop seed for maximized benefits.

4. Grayson Maxwell

We are selling our whole wool fleeces to wildlife trappers. The wool will not have to be washed. Sold as whole fleece for a higher profit to the sheep producers. Sell directly off farm, Online website. We have meat sheep breeds with lower wool quality. This is perfect for selling lower quality wool that does not have much value otherwise. It costs us more to pay the sheep shearer and we only get $5 for 20 fleeces from Mid State Wool. We keep fleeces and sell wool out of our farm store to wildlife trappers. The benefit of trapping on farms is catching coyotes that are predators fo sheep- a win-win for everyone. Keeping your sheep flocks safe, trappers make money off coyote hides and we sell wool!!!

5. Starrie Romero, Super String LLC



Wool-Based Building Insulation Panels

Concept:

Use coarse, underutilized American wool to create natural thermal and acoustic insulation panels for homes, barns, and commercial buildings.

Why it's innovative/beneficial:

Wool is naturally fire-resistant, moisture-regulating, mold-resistant, and biodegradable—advantages over fiberglass or foam insulation.

Potential market impact:

Growing green construction and sustainable housing markets. Could be especially attractive for rural, agricultural, and eco-conscious builders.

Feasibility path:

Wool can be minimally processed (washed, carded, compressed)

Panels formed using natural binders or mechanical bonding

Sold through building supply retailers or agricultural co-ops

6. Sarah Thies

FIGHTING FIRE WITH WOOL

THE PROBLEM & THE IDEA

Wildfires in the western US are increasingly intense and destructive, burning at extremely high temperatures and leaving behind exposed, nutrient-poor soils vulnerable to erosion. Controlling these fires on a large scale is challenging, and new tools are needed to slow their spread and protect at-risk areas. At the same time, many sheep producers have minimal market for coarse or low-volume wool, sometimes leading to discarding or burning it. This waste occurs despite wool's valuable natural properties: it has a high ignition point of 1058°F–1112°F, is self-extinguishing, and requires higher oxygen levels to burn.

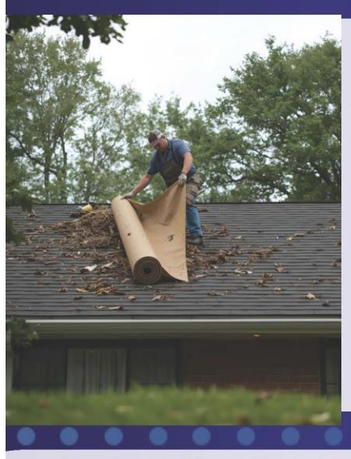
The idea is to harness wool's natural fire-retardant qualities as a practical tool for wildfire prevention. By using wool batting to create fire-resistant barriers or coverings, firefighters and land managers could slow fire progression, protect vulnerable zones, and make better use of a currently underutilized agricultural resource.

THE MARKET IMPACT

Utilizing coarse wool for wildfire suppression could transform a low-value resource into a high-impact domestic market. By creating demand for the fleeces over 25 microns, this innovation would help producers balance the cost of shearing with the value of the fleece, strengthen the wool industry, and reduce reliance on exports vulnerable to trade or tariff disputes. Wool's natural fire-resistant and absorbent properties make it suitable for firefighting applications, appealing to federal, state, and local agencies, and creating opportunities for collaboration. Its adoption could develop a sustainable, functional product segment, expand industry applications, and increase both the economic and environmental value of U.S. wool while aiding wildfire mitigation.

PRODUCTION PLAN

The idea is technically feasible because manufacturers can use the same processes they use for wool quilt batting. The product would be 100% wool, utilizing wool with microns over 25 to provide strength for the batting. Production would begin with raw wool that has been carded to remove vegetative matter. Washing before use would not be a requirement as keeping the wool unwashed preserves the natural lanolin and surface properties that give wool its fire resistance, while also reducing processing costs. Fire season follows most shearing seasons, supporting the sustainability of long-term production by ensuring a steady and renewable supply of wool. Companies such as Hobs Bonded Fibers in Texas already produce similar wool-based materials, which shows that the necessary equipment and methods already exist. Pilot production, research and design, and field trials will verify key performance characteristics and will confirm that the material performs reliably in the intended application.



UTILITIZING THE PRODUCT

The product is designed as a supplementary tool to help slow the spread of wildfires. It can be deployed alongside roadways to cover combustible debris, applied to rooftops to protect accumulated leaves and plant litter from sparks, or placed over lawns surrounding homes. After a fire, leaving the wool in place can provide ground cover to help prevent soil erosion. For efficient deployment, larger rolls can be stored on spools, similar to wire, and unrolled using standard tools, while smaller rolls can be packaged for individual homeowners, similar to carpet, for convenient personal use. The product can be marketed for commercial use or sold directly to private homeowners.

The accompanying images illustrate potential applications and the product's design.

PREDICTED CONCERNS AND CHALLENGES

There may be concerns regarding the production or use of this product that warrant careful consideration:

- Slower biodegradation and dense felt may impede vegetation growth after use
- Higher density increases roll weight, possibly making moving and unrolling challenging
- Wool is susceptible to moths, rodents, moisture, and bacterial growth if not washed during the processing phase, but washing affects the natural properties this product relies on
- Use of the product may require research and development and testing with governmental agencies

References Used:

The product is wool batting designed as a supplementary tool to help slow the spread of wildfires and reduce fire damage in vulnerable areas. This batting would be heavier and denser than traditional quilt batting, more comparable in thickness and weight to a heavy-weight craft felt. Its density would allow it to sit securely on the ground or on surfaces without easily shifting due to wind, while still remaining flexible enough for practical deployment. The product is intended to reduce ember ignition and surface fuel spread rather than stop an active fire, providing a proactive measure to slow fire progression. The production process would closely mirror that of batting commonly used in quilt making, making it feasible to adapt existing manufacturing methods for this new application. The product would be made from 100% wool, specifically utilizing fibers with micron measurements over 25. Coarser wool fibers are stronger and more durable, making them better suited for outdoor use and repeated exposure to environmental conditions. Production would begin with raw wool that has been carded to remove vegetative matter, dirt, and large debris. Washing the wool prior to use would not be required. Leaving the wool unwashed helps preserve its natural lanolin content and surface properties, which contribute to wool's inherent fire resistance. This approach also reduces water use, energy consumption, and overall processing costs. The design allows for multiple deployment scenarios. Wool batting can be placed along roadways to cover dry grasses and combustible debris, applied to rooftops to protect accumulated leaves and plant litter from embers, or laid over lawns and surrounding areas near homes. After a wildfire event, the batting can be left in place to act as ground cover, helping to reduce soil erosion and promote moisture retention. For secure installation, the batting could be anchored with stakes, weighted edges, or overlaps between layers to ensure it remains in place. For efficient distribution and application, the batting could be produced in large rolls stored on spools, similar to wire, allowing commercial crews to unroll it using standard tools. Smaller rolls could be packaged for individual homeowners, similar to carpet or insulation rolls, making it easy for personal use. The product can be marketed for large-scale commercial use or sold directly to private homeowners. Roll width would vary depending on the target market, ranging from yard-wide rolls for commercial applications to narrower, foot-wide rolls for residential use. Fire safety testing and compliance with local regulations would be required to validate the product's effectiveness and ensure safe use in wildfire-prone areas. Overall, this wool batting product offers a practical, cost-effective, and environmentally responsible solution for wildfire mitigation, combining natural fire resistance with versatile deployment options for both commercial and residential use.

7. Alex Rodriguez, Utah State University

Reimagining unwashed American wool as a new mulch that conserves water, adds nutrients, and boosts crop yield

Alex Rodriguez[1], Melanie Stock[2], and Chad Page[3]

Introduction

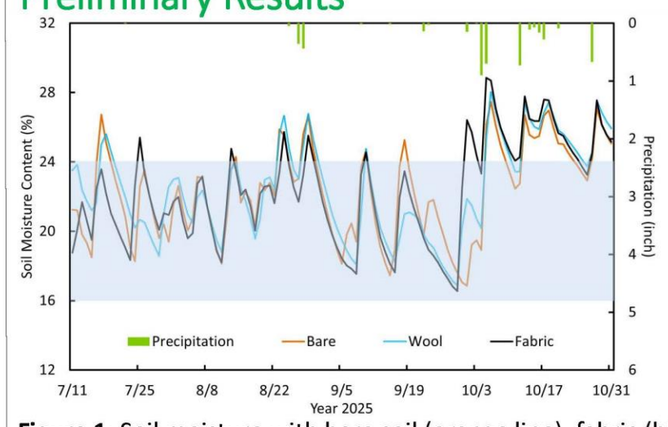
A new market: can underutilized wool serve as an innovative surface mulch to improve crop production and reduce waste?

This study tests wool mulch to reduce water use, moderate soil temperature, and provide slow-release nutrients that increase productivity compared to traditional practices: plastic mulch and bare soils.

Methods

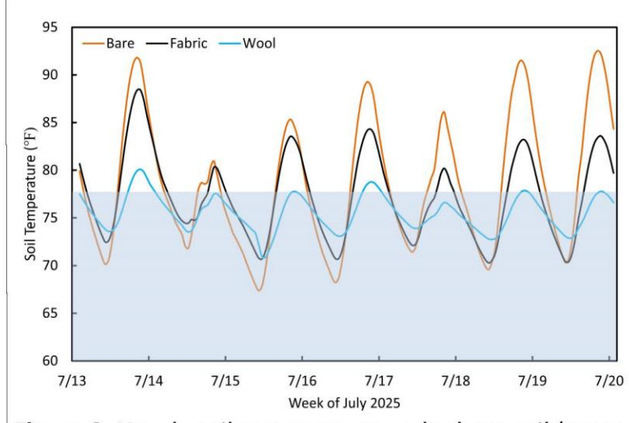
- **1 Site:** Greenville Research Farm in North Logan, UT.
- **3 Perennial cut flower crops**:
  - echinacea
  - eryngium
  - echinops
- **3 Mulches**:
  - unwashed wool (0.5 lb ft^{-2})
  - woven plastic fabric
  - bare soil control
- **4 crop x mulch replicates** tested in 2025 and 2026.
- **Measurements**:
  - ***96*** environmental sensors to measure water storage, plant use, and temperature.
  - **8** plant metrics to measure crop establishment, overwintering, growth, yield, and water stress.
  - **12** lab tests of wool and soil for nutrient release.

Preliminary Results



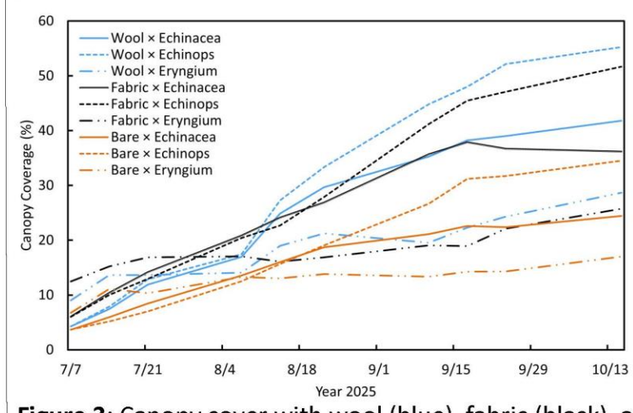
Wool mulch maintained optimal soil moisture levels and used 30% less water than bare soil and fabric.

Figure 1: Soil moisture with bare soil (orange line), fabric (black line), wool (blue line), and rain (green bars). The optimal soil moisture (16-24%) is shaded blue.



Wool mulch moderated temperature in summer heat. The root zone averaged 10 °F and 6 °F cooler with wool than bare soil or fabric, respectively.

Figure 2: Hourly soil temperature under bare soil (orange), fabric (black), wool (blue) during peak heat. Optimal root-zone temperature is shaded blue.



Within the 3 perennial crops, all canopies were 10-25% greater with wool mulch compared to fabric and bare soils.

Figure 3: Canopy cover with wool (blue), fabric (black), and bare soils (orange) by crop (echinacea, solid line; echinops, dotted; eryngium, dashed) in 2025.

Table 1: The irrigation used in 2025 by mulch type: bare soil (control), fabric (traditional mulch), and unwashed wool (new mulch), given as the average time (number of hours the system ran), volume of water (gallons applied), and frequency (number of events) with standard deviation (SD), as well as the percent difference between mulches.

Mulch	Water Used from July 11 — October 31*:					
	Hours (± SD)	% Time Savings Compared to Bare Soil	Gallons (± SD)	% Water Savings Compared to Bare Soil	Events	% Fewer Irrigation Events Compared to Bare Soil
Bare	16 (4)	—	1426 (322)	—	13	—
Fabric	14 (5)	9.8%	1432 (351)	0.4%	11	15.4%
Wool	11 (3)	30.9%	1003 (221)	29.6%	8	38.5%
Average per 4 ft x 74 ft (296 sq. ft) bed						

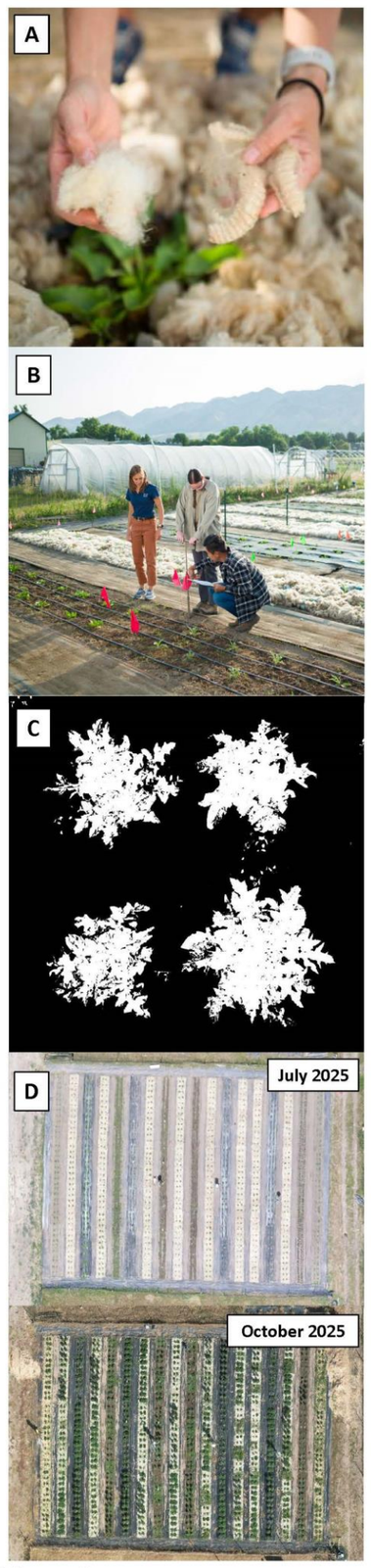


Figure 4:

A. We applied unwashed Romney White and Suffolk wool fibers.
B. Beds with bare soil (front), wool and plastic (behind).
C. Example measurement of plant canopy growth (Canopeo App v2.0).
D. Drone images of our **¼-acre field** established with **18 beds** to test **mulch x crop**. Establishment after 1-mo in **July 2025** (top) and 4-mo in **October 2025** (bottom).

We thank: USDA NIFA UDAF UtahState University

Visit our **lab websites!** Smallfarmslab.com & flowers.usu.edu

Follow us on Instagram! @usu_smallfarms

As new high-value crops, such as cut flowers, emerge and increase the economic viability of small farms, developing sustainable practices that reduce waste, conserve resources, and improve production are needed. This project evaluates unmarketable, coarse (>30 micron), unwashed sheep wool as a new field mulch product compared to traditional practices of applying plastic mulch or farming bare soils. In 2025, we established one, ¼-ac field site in North Logan, UT, to test three mulches replicated four times: 1) wool applied to the soil surface at a rate of 0.5 lbs. per ft2, 2) woven plastic mulch (0.5 oz, 28-mil, weed barrier fabric), and 3) bare soil as a control. Within each bed, we planted three, low-water perennial cut flower crops (echinacea, eryngium, and echinops) that were identified for increased production for floral markets and have contrasting growth rates and plant architectures to assess with mulch. We monitored the volume of water applied with flow meters, frequency and length of irrigation events, soil moisture storage and temperature, air temperature and humidity, solar radiation, plant height and canopy coverage for growth over time, and soil nutrients and salinity. In 2026, we will continue these measurements, as well as winter survival, time to and length of flowering (harvest), yield, bloom quality, and change in soil nutrient status. To maintain soils within the optimum moisture range for the crops, preliminary results indicated that unwashed wool required an average (±standard deviation) of 1,003 (±221) gallons of water from 11 July to 31 October, compared to soils with plastic fabric at 1,432 (±351) and bare soils at 1,426 (±322) gallons, representing up to a 29.6% savings in water use with wool mulch. In July 2025, during peak summer heat, the wool mulch moderated the root zone temperature by maintaining hourly soil temperatures (4 inch depth) 10 °F cooler than those with bare soil surfaces and 6 with fabric. In response, the growth of the three crops, as measured by canopy cover, was 10 to 25 % greater with wool mulch than fabric or bare soils. The first year of this study demonstrates a viable use for underutilized and unprocessed American wool that reduces waste, conserves water resources, enhances crop growth, and connects with sheep producers with crop growers for a new market.

8. Kate Rasmussen,
World Wildlife Fund Great Plains

Innovating Streambed Recovery with Wool Based Materials

Streambed Restoration

- Prairie streams, both intermittent and perennial, are an essential lifeline for life in the grassland ecosystem, from western tiger salamanders to migratory birds to grazers like cattle and sheep
- The goal of stream restoration in the grasslands is to help heal the watersheds that sustain the prairie plants, wildlife, livestock, and people that call the ecosystem home by encouraging plants to grow over installed low tech structures to hold water in the system as well as slow erosion

Barriers to Pairie Streambed Restoration

- Hauling in rock for restoration structures has been a common practice for stream bed recovery, but bringing rock into a prairie system that doesn't already have rock is expensive, labor intensive, and if improperly installed can cause more erosion

Wool As a Solution

- The unique qualities of wool may make it an exceptional alternative to rock structures as the fiber is porous, so it may increase the soil's water holding capacity, add structure to soil, catch silt, and offer a slow-release fertilizer as it contains about 17% nitrogen. Researchers from Montana State University conducted a study using wool as a restoration material on severely degraded ground and found three to four times the amount of perennial plant cover grew in the test sites using wool (Arment, 2018).

Supply Channel and Application

- Intermittent and perennial stream restoration using low tech structures is becoming a common practice across the west for water shed recovery – the WWF Great Plains team is currently conducting a pilot project in South Dakota using 100% wool in burlap sacks for restoration structures as an alternative to using woven willow, sticks, and rocks
- WWF's Sustainable Ranching Initiative (SRI) works in partnership with a large network of ranchers and tribes in the Great Plains spanning over 1.4 millions acres, many of whom are actively participating in or interested stream bed restoration projects offered by WWF and many other conservation collaboratives

The WWF Sustainable Ranching Initiative team has the opportunity to connect a large network of land managers interested in improving their grazing lands and watersheds to wool-based streambed restoration resources. The longterm goal of the project is to make using wool in stream restoratation a common practice, connect sheep producers with a value addition to their wool, and improve current prairie stream restoration practices

Poster submitted by: **Kate Rasmussen, World Wildlife Fund**
Sustainable Ranching Initiative Speciliast

Contact:
kate.rasmussen@wwfus.org

A key effort across Western US to help bring functioning streams and the adjacent wetland zones, or riparian areas, back has been the implementation of low-tech structures into streambeds. These low-tech structures, often referred to as Beaver Dam Analogues (BDA's-- a bit of a misnomer as they are used in many contexts, not just for beaver habitat restoration -- are also commonly referred to as mesic structures), are made without the use of heavy equipment and engineering firms and are instead built by hand in streambeds intermittently to mimic the dams beaver historically placed on the landscape. The structures put (gentle) flooding back in the water system and are the first step in facilitating the conditions necessary for riparian plant communities to recover and flourish which in the long term heals watersheds and improves the land's drought resilience.

These BDA's are typically made by hand using local materials. Natural materials are preferred for BDA's as the long-term goal is for the succession of the natural plant communities to take over and for the structures to eventually become part of the landscape. Near mountain landscapes, BDA's are made using rock, local sod, willow, and sticks. Aside from sod, the prairie ecosystem has a limited or nonexistent supply of local materials, creating a major hurdle for prairie streambed restoration projects.

*you can follow this link to see a visual of common rock structures-- and also much more info/visuals on stream restoration practices here: https://lowtechpbr.restoration.usu.edu/resources/recipes/Rock/erosionControl

Kate Rasmussen (submitter), WWF Sustainable Ranching Specialist in South Dakota, has begun trials using wool in burlap bags as an alternative material for restoration structures.

The Ollila ranch in South Dakota graciously offered to be a test site for a small pilot project using wool as a material for low-tech streambed restoration structures on their ranch. So far, the wool structures have performed very well in moisture events and required a fraction of labor and time to install compared to the traditional structures. More time is needed to better understand how the wool structures compare to traditional ones over time, but so far, the trial has exceeded expectations.

Ideally this will become a practice for the WWF restoration program across the Great Plains, as well as for the many other partner organizations doing similar restoration work across the plains and the Western US. The long term goal for this project is to create a value addition to less marketable wool while improving prairie streambed restoration practices. Each structure uses from 100lbs - 500lbs or more of wool depending on project scope and most project sites implement any where from 3-50+ structures on a stream channel or watershed system. My counterpart in Wyoming recently installed 90 structures on one ranch last summer. My team and counter parts in other conservation orgs have no shortage of landowners who would like streambed restoration work on their ranches.

9. Katelyn Ford

Wool as an Outoor Sound Barrier

Reimagine Wool Digital Poster Contest

Basic Design

A conceptual design of a sustainable, woolen, outdoor sound barrier is shown in Figure 1. The design features wool as the primary sound-absorbing material. Unwashed, >25-mircon wool is desirable for this design due to its nutrient-richness and durability. The wool is packed between sturdy concrete posts, which provide structure while minimizing use of non-sustainable materials. The entire structure is bound by a wire mesh. The mesh holds the wool in place while providing an interface to support the outer layer, foliage. A viny groundcover, such as ivy (Figure 2), has been chosen as the outer layer of the sound barrier for its durability, environmental benefits, and sound-absorbing potential

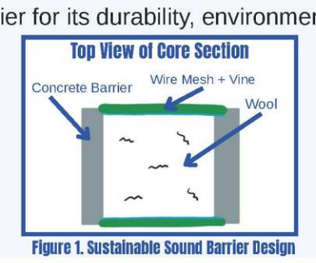


Figure 1. Sustainable Sound Barrier Design

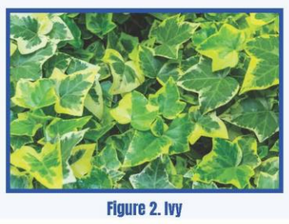


Figure 2. Ivy

Viability

When designing a sustainable sound barrier, two of the most important criteria to consider are: Does the design absorb sound well? Is the design sustainable? Let us explore these criteria further:

Ability to Absorb Sound

- Materials that absorb sound well are often porous, or composed of many small spaces where air, liquid, or sound waves can pass through (2025, *Porous)*.
- When sound waves enter a porous substance, the waves collide with the many walls.
- With each collision, sound waves lose energy to friction (Ghermezgoli, 2020). Thus, porous substances are excellent at dampening sound (Figure 3) (2024, *Atelier*).

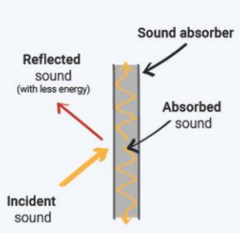


Figure 3. Sound Absorption

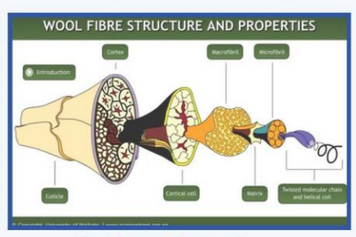


Figure 4. Wool Fibre Structure

- As seen in Figure 4, wool is composed from crimping and layering of many different components. This makes wool a very porous material, well suited for absorbing sound (2018, *Wool*).
- Dense foliage also creates a complex macroscopic network that is good at dampening sound (RHS, 2025).

Sustainability

- Raw wool is an underutilized resource, making it highly sustainable (Beck, 2023).
- Thick, raw wool requires minimal processing before being incorporated into the design, increasing its sustainability.
  - The durability of >25-micron wool is desirable for an outdoor product.
  - Raw wool is naturally porous, nutrient rich, moisture regulating, and insulating, making it ideal for supporting the growth of ivy, the outer layer of the design (2024, *Wool*).
- The foliage on the exterior of the barrier works to absorb sound, while simultaneously providing habitats, purifying air, and increasing aesthetic appeal (Sanders, 2023).

Significance

Urbanization has been steadily increasing across the globe for the past 50 years (Ritchie, 2025).

- This has led to increased economic development but has also caused excessive noise pollution.
- Noise pollution poses severe threats to human health, such as hearing impairment and cardiovascular disease (Ghermezgoli, 2020).

Outdoor sound barriers are a common method of reducing noise pollution caused by urbanization. However, these barriers are often not sustainable. They are mostly comprised of man-made materials, like concrete and stone wool.

There has been a major public demand to switch to environmentally friendly alternatives when possible. This is due to the rapidly heating climate caused by human emissions (2025, *Causes*).

Wool has many of the same properties as modern materials used in outdoor sound barriers, but is much more sustainable (Figure 5)

- 1 ton of concrete produces approximately 0.9 tons of CO2 (Grier, 2025)
- Roughly 12 tons of CO2 are produced for every ton of stone wool (Windfield, 2025).
- 0.021 tons of CO2 are produced per ton of wool (Foster, 2023).

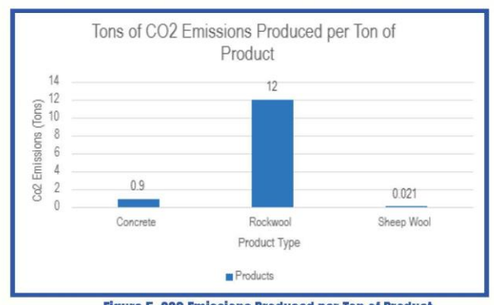


Figure 5. CO2 Emissions Produced per Ton of Product

Economic Impact

Modern outdoor sound barriers contain a material called stone wool. Stone wool is produced by a complex melting, spinning, and packaging process (Figure 6) (2022, Power*)*. This process is labor-intensive and produces many harmful emissions. Sheep's wool, alternatively, is an underutilized resource world-wide. 150 tons of wool are thrown away each year (Beck, 2023). By taking advantage of this natural resource, money can be saved in labor and materials costs, while significantly reducing environmentally harmful emissions.

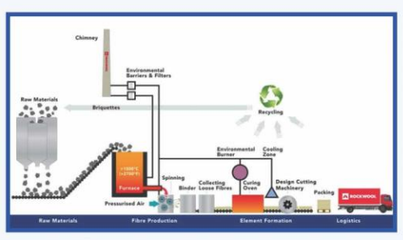


Figure 6. Production Process of Stone Wool

Concluding Thoughts

While a modern, concrete sound barrier may be a little bit more effective and durable than a woolen sound barrier, a woolen sound barrier is significantly more sustainable. A woolen sound barrier takes advantage of one of the most underutilized resources, wool, reducing pollution, and making our world a quieter, healthier, place to live.

Urbanization has been steadily increasing across the globe for the past 50 years. This has led to increased economic development but has also led to a large increase in noise pollution, which can be harmful to human health. Other types of pollution, like CO2 emissions, remain a prevalent issue as well.

WoolWall is a sustainable, woolen, outdoor sound barrier. The design features wool as the primary sound-absorbing material. Unwashed, >25-mircon wool is desirable for this design due to its structure, durability, and nutrient richness. Wool is naturally a very porous material, making it great at absorbing sound. The strength and durability of 25> micron wool is ideal for the outdoor setting that this sound barrier is meant to be used in. Additionally, unwashed wool is rich in nutrients, specifically nitrogen. This property makes wool compatible with the outer layer of the design.

The wool is packed between sturdy concrete posts, which provide structure while minimizing use of non-sustainable materials. Concrete and other modern materials produce over 42 times more CO2 emissions per ton than wool. Minimizing the use of such materials and using wool instead makes this design more sustainable than other sound barriers.

The entire structure is bound by a wire mesh. The mesh holds the wool in place while providing an interface to support the outer layer, foliage. A viny groundcover, such as ivy, has been chosen as the outer layer of the sound barrier for its durability, environmental benefits, and sound-absorbing potential. Ivy is another natural sound absorber, due to the complex macroscopic structure created by the vines. Additionally, vines are durable, provide habitats, and help to purify air. Utilizing vines further increases the sustainability of this design.

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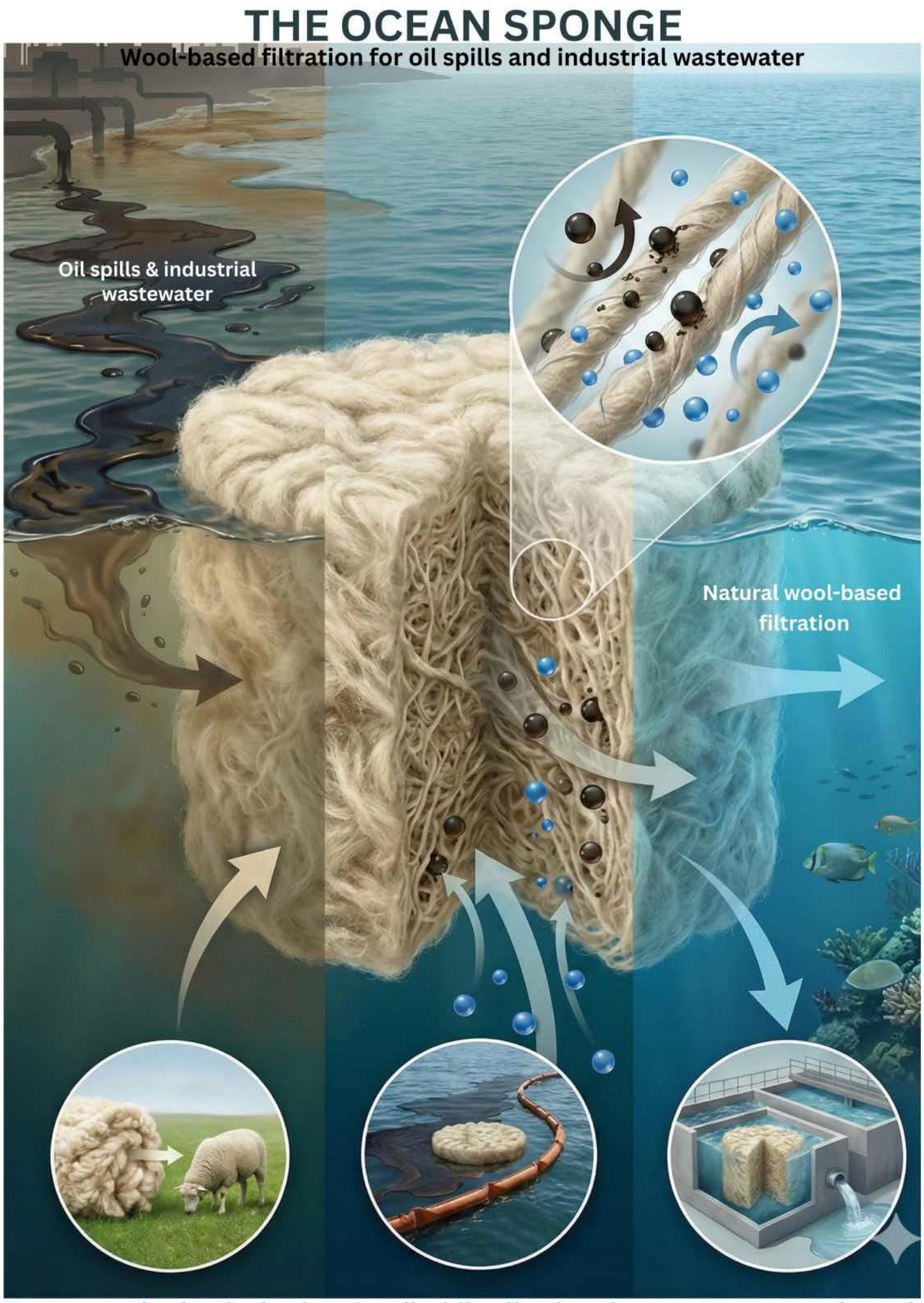
10. Sneha Surana



The Ocean Sponge is a wool-based filtration product designed to address two major environmental challenges: oil spills and industrial wastewater contamination. It uses the natural physical and chemical properties of coarse wool to selectively absorb oil and certain pollutants while repelling water, offering a sustainable alternative to synthetic filtration materials.

The product is formed from coarse, low-grade sheep wool that is typically unsuitable for apparel and often underutilized or discarded. This wool is cleaned and mechanically processed into dense, sponge-like structures or mats that can float on water. Due to wool's naturally hydrophobic and oleophilic surface chemistry, the material repels water while attracting and binding oil. This allows the Ocean Sponge to absorb oil efficiently from the water's surface without becoming waterlogged, maintaining buoyancy and effectiveness during use.

In addition to oil absorption, the high surface area and keratin-based structure of wool fibers enable interaction with certain heavy metal contaminants commonly found in industrial wastewater. When used in filtration channels or containment systems, the sponge structure can help reduce concentrations of metals such as copper and lead through physical adsorption and ion-exchange interactions, contributing to cleaner discharge water.

The Ocean Sponge is designed for practical deployment in real-world settings. In marine environments, it can be deployed as floating units during oil spills or placed within containment booms for passive absorption. In industrial contexts, the same material can be integrated into simple filtration systems for wastewater treatment. After saturation, the sponges can be removed, cleaned for reuse, or safely disposed of through composting or controlled processing, minimizing secondary pollution.

The innovation behind the Ocean Sponge lies in repurposing a natural, renewable material using minimal processing to solve a complex environmental problem. By replacing or supplementing synthetic absorbents with a biodegradable wool-based solution, the product reduces plastic waste, lowers environmental impact, and creates a new, value-added application for coarse wool. The concept emphasizes simplicity, scalability, and environmental responsibility, making it suitable for adoption by environmental agencies, ports, and industrial facilities seeking sustainable remediation solutions.