1.Wool Erosion Mat

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.

Wool Content

Sourced from: Wool mills, commercial producers, etc.
Size of product: Can range from small to very large depending on the size of the erosion prone area. This is a benefit to this product because there is so much wool that can be utilized to make this mat.
Thickness and length: 2” thickness to allow for felting and ensure that the mat is most effective. The staple length can be anything longer than 1” to ensure that the wool will not slip out of the woven bindings. Second cuts and short fleece will need to be removed.
Micron count: This product can use wool that is >25 micron count.
Vegetable Matter: We promote vegetable matter in this product because it can be used to add fertilizer and nutrients into the soil. The lanolin in the wool will serve as water repellent.

2.Wool Melt

Clemence Belbeoch

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

Wool Content

Any wool supply, blended fabrics are also acceptable (the enzymatic hydrolysis is specific to wool proteins and will not affect other materials). The condition of the fibre does not matter, if anything the larger diameter of certain types of supply can be used as a scaffolding material for the bricks, and embedded into dissolved wool material. Vegetable contents must be removed however (they represent a fire hazard), in another possible preliminary stage consisting of an enzymatic breakdown of cellulosic material (or any mechanical or other sustainable version of carbonisation).

WINNER

3.Wool Pellets

Center, CO Conservation District

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.

Wool Content

These wool pellets will be approximately 75-95% wool, depending on additional additives to ensure pellet integrity and assist with soil conditioning. The wool for our wool pellets will be sourced from local sheep growers who have excess wool that is not commercially "desirable". The micron of wool will be >25, but we do not have an accurate number at this time. The ideal length of these pellets will be ~1/4" and will be compacted and durable enough to withstand agricultural equipment for application.

4.Wool For Trapping

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!!!

Wool Content

100% Wool

5.WoolPanel

Starrie Romero, SuperString 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

Wool Content

Moderate strength acceptable
Insulation performance relies on fiber crimp and air trapping, not tensile strength

Processing Level:

Lightly washed or scoured wool to remove excess lanolin and dirt
Full apparel-grade scouring is unnecessary, lowering water and energy use

Why This Wool Works for Insulation:

Coarse fibers create more air pockets, increasing thermal resistance
Natural crimp improves insulation and acoustic absorption
Wool's natural properties provide fire resistance, moisture regulation, and mold resistance

Waste Reduction Impact:

Uses wool that is currently underutilized due to coarse micron, contamination, or inconsistent length
Converts a low-value byproduct into a high-demand construction material

6.Wool Shield

Sarah Thies

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.

Wool Content

The proposed product will be manufactured using 100% wool sourced exclusively from sheep raised in the United States. The project will prioritize the use of fleeces with a fiber diameter of 25 microns or greater, which are well-suited for durability-focused, non-apparel applications. To ensure efficient processing and product consistency, vegetative matter must be removed during production; therefore, clean, tight fleeces will be preferred to minimize waste and processing costs. Short (under 3 inches) to medium (3–6 inches) staple lengths are ideal, as they felt more readily than longer fibers and support the production requirements of this application. Fiber crimp is of lesser importance, as the end product does not require the loft or air retention desired for quilt batting. As a result, wool from a wide range of sheep breeds may be utilized, expanding sourcing flexibility and supporting broader domestic wool producers.

7.Reimagining Unwashed American Wool

Alex Rodriguez, Utah State University

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.

Wool Content

The mulch consists of fleeces from Suffolk, Suffolk-cross, and Romney sheep (white and natural colored) with a staple length ranging from 3.5 to 6 inches, sourced from animals grazed on pasture from May to October and supplemented with hay and barley during winter barn access. The raw wool contains approximately 35–40% vegetable matter and incorporates fleeces with a variety of fiber strengths, including those with breaks, consistent with non-clinical mulch application.

8.Innovating Streambed Restoration

Kate Rasmussen, World Wildlife Fund Great Plains

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.

Wool Content

100% wool in burlap bags -- currently using pellets sourced from Utah for a weed free option, but exploring cheaper alternatives with less processing. Currently have ranches signed up to host projects using their own loose unprocessed wool, which in the longterm WWF (and other conservation orgs) would pay the ranchers for their wool to be used as a material

9.WoolWall

Katelyn Ford

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.

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.

Wool Content

Micron: 25 or greater

Design is mostly wool. Features a wool core with minimal concrete and metal support (See "WoolWall Top View" attached below.

10.THE OCEAN SPONGE

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.

Wool Content

Fiber type: Coarse sheep wool
Percent by weight: ~90–100% wool fiber (optional: up to 10% biodegradable binder for structural stability, if required)
Source: Low-grade or waste coarse wool sourced from sheep breeds not suitable for apparel-grade textiles. This includes wool typically undervalued in the market and often discarded or underutilized.
Approximate fiber diameter (micron): 28–40 microns (coarse wool range)
Fiber length: 80–150 mm staple length (suitable for mechanical matting and felting)
Vegetable matter (VM): Moderate; removed through basic washing and mechanical cleaning prior to processing.
Fiber strength: Moderate tensile strength, sufficient for repeated handling, deployment, and recovery in water-based applications.
Key functional properties used: Natural oleophilicity (oil-attracting),Hydrophobic surface behavior (water-repelling), High surface area due to crimped fiber structure, Biodegradability and renewability
Reason for wool selection: Coarse wool's natural chemistry and fibrous structure make it ideal for oil absorption and filtration, while being safer and more sustainable than synthetic absorbents.