Current ecosystem conservation strategies are based on protecting parts of our planet through utilizing money derived from profits generated by extracting from ‘other’ regions of our planet. When we consider the long-term implications of conserving one region while exploiting another—in accord with the mandate from industry towards unlimited growth—an inherent tension between conservation and industry arises and thus we see the continued destruction of intact ecosystems for the sake of expanding development. Protecting our biological diversity and the intact ecosystems that remain on our planet will require more than a giveback campaign for conservation and more than a commitment to ‘less destructive’ systems—it will require wholly different systems of production.

**1% for Regenerative Fiber Systems** is designed to channel funding from sales of natural fiber-based products to the development of regenerative agro-ecological models whose processes are continually measured and monitored to hone the highest functioning organic and restorative farming and processing techniques. We seek to develop practices that enhance the land and resources they rely upon—reducing and eliminating the need to put pressure on our wild lands and intact ecological communities.

How can we create fiber systems that provide for human material culture while being regenerative by their very nature?
Fibershed’s mission is to develop, support and promote natural fiber resources. We are the only organization that facilitates and builds place-based fiber systems.

Fibershed is focusing on key areas of research and implementation of solutions to provide a path towards long-term resilience and restoration of our fiber systems.

Our Work

Fibershed has begun to answer the questions below. Our work (including that of our partners) to date includes:

- **Regenerative Fiber Systems Begin with the Soil:** Current research by UC Berkeley’s Silver Lab of grazed and managed landscapes suggest that applying a ½-inch layer of compost applied one time on the land where sheep, goats and alpaca graze will sequester one metric ton of CO₂ per hectare per year for 30 years, without any re-application. The implication of this research shows the key connection between climate change solutions and fiber systems.

- **Organic indigo farming for natural dye production in California’s Capay Valley.**

- **Marin Carbon Project applying compost on a research plot.**

Fibershed’s Research Questions for Contemporary Agriculture:

- How can we create fiber systems that persist through the challenges posed by a changing climate? Human activity has raised the temperature of the earth one degree Celsius. This increase is enough to melt the Arctic and stimulate the first wave of climate instability—signs of this are already being felt locally by an unprecedented drought in California in 2013/14. Temperatures are expected to rise four to five degrees by the end of the century if we move forward with extracting and refining existing ‘slated for use’ reserves of fossil fuels to power our systems.

- How do we shift from fossil carbon fueled systems to biosphere-based systems?

- How can we grow what we need utilizing 475 million years of evolutionary intelligence embodied in our land plants?

- How can we maximize 200 million years of evolutionary intelligence embodied in fiber producing animals?

- What innate qualities exist within plant and animal fibers that we have yet to recognize?

- How can we merge food and fiber systems to minimize our agricultural efforts and maximize our yields without using cut-and-splice genetic engineering techniques?
**Supply Analysis:** Regenerative Fiber Systems must maximize the use of existing on-the-ground resources. California wool is currently sold at prices that do not bring the farmer or rancher enough income to focus on fiber production as a means of survival. Wool is often sent to the commodity market, composted, landfilled, and .03% of it is locally processed. Fibershed analyzed the entirety of the California wool supply and found that there were much greater potentials for California wool resources given its surprisingly high quality.

**Wool Mill Vision:** Regenerative Fiber Systems include the design of the most efficient and renewable energy driven value-added processing. The California Wool Mill Feasibility Study was conducted to assess the production of cloth in a vertically integrated supply chain using 100% California grown wool fiber. The study team began with a supply analysis to assess the quality and quantity of California wool, and created an ideal technical roadmap for an ecologically sensitive closed-loop mill design utilizing renewable energy, full water recycling, and composting systems—the products from the mill were analyzed and shown to have a high potential for net carbon benefit. The suggested model outlines the potential for a multi-stakeholder coop that would close the financial loop between profits and the producer community furthering the positive economic impact for our ranching and farming communities.
The possibility for net carbon benefit garments has been made evident: the ability to go beyond ‘carbon neutral’ and into ‘carbon beneficial’ is the near future standard for our clothes.

**Life Cycle Assessment:** Contemporary work on life cycle assessment is often carried out by the industry that profits from the sale of the materials being assessed. Modern life cycle assessments measure land use and appropriate quantity of land utilized for fiber production as a detriment to the overall carbon impact. This approach does not take into consideration the movement of carbon between the atmosphere and soils—the soil holding the greatest potential for functioning as a sink for our over abundance of atmospheric CO₂.

The following life cycle assessment (below) is a preliminary carbon and greenhouse gas analysis that compares wool garments. The assessment shows a range of carbon and greenhouse gas impacts based on various scenarios. The most polluting system is shown to be conventional production, followed by various improved scenarios that incorporate more regional manufacturing, and some changes in rangeland management (based on seven years of research by UC Berkeley’s Silver Lab). The best-case scenario shows wool from compost-applied rangelands, processed through the California Wool Mill and worn by wearers who use cold water laundering and air drying processes.

*Local wool yarns dyed with plant dyes.*

Fibershed garments were created by a group of 30 designers using locally farmed wool and cotton and featured at a Fibershed event bringing together local food and fiber. Photos by Paige Green.

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**Net C Footprint (kg CO₂e/garment)**

1. **Conventional Realistic:** CA grid-derived energy, slightly higher C footprint relative to other cases due to loss in soil C, synthetic fertilizer use, higher transportation costs
2. **Conventional Optimistic:** CA grid-derived energy, but no increase in soil C
3. **Fibershed Neutral Soil:** geothermal-derived energy, but no increase in soil C
4. **Fibershed Conservative:** geothermal-derived energy, good land management increases soil C at a more conservative rate than Case 7
5. **Fibershed Realistic:** geothermal-derived energy, conservative compost credit, good land management increases soil C at a more conservative rate than Case 7
6. **Fibershed Possible:** solar-derived energy, conservative compost credit, good land management increases soil C at a more conservative rate than Case 7
7. **Fibershed Optimistic:** solar-derived energy, optimistic compost credit, good land management increases soil C at optimistic rate, minor reductions in C footprint relative to other cases at several steps (transportation distances, commuter mpg, animal emissions, air-dried clothes, etc.)
How You Can Take Part

Enrollment in the 1% for Regenerative Fiber Systems program is now open to companies large, medium, and small. You can can directly take part in the building of regenerative systems, by supporting our efforts described below through your tax-deductible donation. Email fibershed@gmail.com for a membership application.

The 1% for Regenerative Fiber Systems program provides the resources to continue the work of our partners and scientists at UC Berkeley and the Carbon Cycle Institute to provide objective research that will continue to map the carbon impact of our fiber systems. The funding also directly supports our domestic ranchers and farmers in implementing the best protocols for building soil carbon, increasing water holding capacity in our soils, and the restoration of biological diversity in our agricultural landscapes.

Proposed Projects

2014-2015: Implement carbon farm plans on strategically located sheep ranches in our Northern California Fibershed: Implementation of carbon farm plans will make ‘climate beneficial wool’ available in the marketplace for the first time. Replication of our carbon farm plan successes will be taken to our 18 international affiliate Fibershed communities to increase the availability of climate beneficial wool in other regions.

Life Cycle Assessment of existing biosphere-based fibers: There is currently no soil-based carbon life cycle assessment work comparing protein fibers (animal-based, pasture-farmed) with cellulose fibers (row cropped, annual production). Current assessments do not take into account the impacts of plowing soils on atmospheric carbon levels, nor do they measure the impacts of no-till systems. To determine the most climate beneficial biosphere-based fibers, a comprehensive review and study is required to assess the impact of existing farming practices.

Agro-ecology research on industrial hemp: With yields of 12 tons per acre, industrial hemp provides the most biomass per acre of any fiber crop. Seed trials in Colorado and Kentucky will include the analysis of the best dry land strains of fiber hemp for textile production. French and Australian seed banks will be providing the most developed strains for our drought constrained agricultural lands in a Fibershed sponsored seed trial.

Grazing research with fiber producing animals: From a holistic management understanding of grazing practices, it is known that flocks and herds of domestic animals grazed strategically across a grassland can enhance the above ground forage. Increasing biomass means more photosynthetic processing occurs, thus more transfer of carbon dioxide into carbohydrate form, and eventually into soil carbon. The question remains: “Can grazing alone sequester CO₂ from the atmosphere?” The research question will be addressed so that we can maximize the ecological benefit of grazing management and potentially build permanent soil carbon storage in our grazed lands.

Natural dye farming & extraction research: Moving to biosphere-based forms of color will include advancements in how we farm and process natural sources of color. Arable land and water-constrained systems will require careful budgeting of resources for color farming. The development of hedgerows, the use of weedy species, food scraps and landscaping pruning ‘waste’, and the aggregation of contributions from small dye gardens are all potential sources for color extraction. Extract equipment and natural dye systems design is a critical aspect of the movement to divest from fossil fuel based material culture.

The task of our generation is to close the loops in our human constructed systems in the most energy efficient manner possible. Trees in North America don’t import their water from Fiji, nor their food from Chile. For over 250 million years, they’ve found ways to partner with countless networks of fungi and bacteria to receive nourishment from that which lands on the soil surface above their roots, and they capture the rain to quench their thirst. How can we mimic the efficiency of forests in our agriculture?
Dr. Marcia DeLonge is an ecosystem and atmospheric scientist at the University of California, Berkeley. Since 2010, she has been working as a Postdoctoral Scholar in Whendee Silver’s lab as part of the Marin Carbon Project, a team effort to identify land management strategies that increase soil carbon storage while reducing greenhouse gas emissions. Marcia is conducting field experiments on grazed grasslands amended with compost and dairy manure and has also developed a life cycle model to estimate greenhouse gas emissions from grassland management. She received her PhD in 2010 from the University of Virginia.

Dr. Jeff Creque is the head of implementation for the Carbon Cycle Institute, and Co-Founder of the Marin Carbon Project. He brings thirty years of applied experience and theoretical training to the task of informing and facilitating the goals of the Project. He is an agricultural and rangeland consultant and Natural Resources Conservation Service certified nutrient management planning specialist and an Agroecologist for the McEvoy Ranch. In addition, he has many organizational affiliations including: Founding Board Member, Alliance for Local Sustainable Agriculture (Marin); Co-Founder, Bolinas-Stinson Beach Compost Project; Agricultural Director, Apple Tree International; and Co-Founder, West Marin Compost Coalition. Dr. Creque holds a PhD in Rangeland Ecology from Utah State University, and is a California State Board of Forestry Certified Professional in Rangeland Management.

Dr. Whendee Silver is Professor of Ecosystem Ecology in the Department of Environmental Science, Policy and Management at the University of California, Berkeley. Whendee’s role on the Steering Committee of the Marin Carbon Project is to conduct and coordinate the scientific research of the project. She also participates in the outreach and education activities by helping to translate scientific findings to project participants and the general public. Dr. Silver consults on the implementation plan and manages the long term monitoring program and carbon monitoring protocol development. She also holds an appointment on the Geological Science Faculty of Lawrence Berkeley National Laboratory. Her research seeks to determine the biogeochemical effects of climate change and human impacts on the environment, and the potential for mitigating these effects. She holds PhD and MS degrees from Yale University.

Rebecca Burgess is an author, weaver, and educator. She wrote the book *Harvesting Color* to promote the wild, weedy, and cultivated plants that can be used for natural color creation. She received a M.Ed. in place-based education in 2011, and is the Executive Director of Fibershed, having founded the non-profit organization in 2011.

Dustin Kahn is a graphic designer, permaculturist, natural dye enthusiast and instructor. She brings over 35 years of graphic design and marketing experience to her work as graphic designer and administrator for Fibershed.

Fibershed is a California non-profit corporation, exempt from federal tax under section 501(c)(3) of the Internal Revenue Code. EIN# 20-0879422. Donations are tax deductible to the extent allowed by law.