**SAGE SPARK**

*fueling regenerative culture*

Fire fuels Burning Man culture; electric light is no substitute. Feeding those flames is fuel transported from afar, precluding carbon negativity. To reconcile this conflict of environment and culture, we propose a new tradition centered on energy crop permaculture and land attunement: the production of biomass fuel artifacts via a radically cooperative ritual.

SAGE SPARK proposes direct participation in energy production to serve two goals: carbon negative fire and an unforgettable, exportable experience with BM cultural practice. Physical and cooperative rather than thoughtless and solitary, energy production and consumption are unabstracted to becoming tangible points for reflection, discussion, and action.

Miscanthus giganteus, a perennial, non-invasive, sterile grass is an ideal energy crop that sequesters carbon and can grow on and improve marginal land. Visitors will journey across Fly Ranch, bringing harvested biomass from a verdant labyrinth into the playa. There it is transformed into fuel briquettes through cooperative interaction with an installation that serves both as a press and conduit of the elements.

The artifacts created are used to light festivities, heat cold nights, and visualize progress towards sustainable habitation at Fly Ranch.

**Progression**

SAGE SPARK starts with fire and grows as Fly Ranch does. Energy crop agriculture is its cornerstone, the biomass it produces first used for carbon negative light and heat on site. As production increases, so too do the possibilities.

SAGE SPARK will supply Black Rock City’s lamplighters with fuel to illuminate its streets. Combined with food waste fats, ash from the fires can be used to make natural soap to support non-toxic bathing at Fly Ranch and Black Rock City. *Miscanthus giganteus* is also an excellent substrate for the growth of mycelium construction materials for adaptable, semi-permanent shelter infrastructure.

The citizens of Gerlach can and should benefit from activity at Fly Ranch. 20% of the fuel produced will be gifted to Gerlach, fulfilling an obligation to a central BM tenet and spreading the word about energy alternatives.

*Miscanthus* cultivation has been shown to improve degraded soils[[1]](#footnote-2). After a period of 15 years, energy plots will be replanted with food crops.

**Primary materials and major dimensions**

Though we propose four structures, two are made entirely of plants and will rise and fall with the seasons. For those nonorganic, local materials will be used whenever possible.

Much of a material's environmental cost comes with its transport. What if we could eliminate the return trip for just some of what is imported to BRC? When talking to burners about Fly Ranch, they would often express that visitor training in the 'arts of the playa' should be prioritized. Building up the infrastructure of Fly Ranch offers a unique learning opportunity for veterans and newcomers alike. Applying the rich traditions of metal/woodworking and mechanical repair to construction enables the use of scrap materials and would represent edification via communal building.

**PRIMARY DEVELOPMENT ZONE**

Biomass Briquette Press Installation (rammed earth, steel, concrete footings)

The biomass briquette press installation sits on and within a hill occupying an area of 30 m2. Composed primarily of rammed earth and steel, it both blends in and stands out against the landscape. Its form and materiality seek to complement the environment rather than oppose it or disappear.

S.A.G.E - Flame Visualization Scaffold (scrap metal)

Standing 6 meters tall by 5 meters wide, S.A.G.E will be built from scrap metal spared the long journey from BRC to whence it came.

**SECONDARY DEVELOPMENT ZONE**

Labyrinth Agricultural Plot

One hectare in area, the Labyrinth is made entirely from *Miscanthus giganteus*.

Bale Ziggurat

Bales of miscanthus are stored at the Labyrinth's center, occupying 10 m2 in total.

**System inputs/outputs per hectare**

The primary recurring system inputs are visitor labor and rainfall.

System outputs are as follows:

*24 metric tons of biomass*

*446 GJ or 123,592 kWh energy*

*Carbon-negative fire*

*An unforgettable experience, sculptural data visualization, and opportunity to practice BM values*

C*onstruction materials for an adaptable, semi-permanent shelter infrastructure (25 m2)*

*Natural soap (amount dependent on waste available to be combined with ash (2-3% briquette weight))*

**Technologies utilized**

SAGE SPARK focuses on implementing primarily low-tech methods for its structures. Non-customary construction methods include rammed earth walls, polymer stabilized earth foundations, and reinforcement steel. The experience designed rests on the ability to plant, grow, and maintain energy crops. These crops are then processed and formed into briquettes using an assemblage of shredders, manual jacks, water collection systems, and customized molds. This manually operated brick press process serves as the center of the proposal. Further down the line, the processing of miscanthus will also pave the way for creating mycelium bricks, which would be fired to allow for its use as a building material. Once the miscanthus crops are ready to be converted into food crops, a method of permaculture will be utilized.

**Costs**

**Energy crop cost per hectare**

| COST | ITEM | PERENNIAL COST | TYPE |
| --- | --- | --- | --- |
| $1700 | MISCANTHUS GIGANTEUS RHIZOMES | NO | ESTABLISHMENT |
| $1200 | MOWING+BALING (SERVICE) | YES | HARVEST |
| $15 | SOIL TEST | NO | ESTABLISHMENT |
| $200 | SOIL INTERVENTIONS | NO | ESTABLISHMENT |
| $0 | VOLUNTEER LABOR | YES | HARVEST |
| **$3115** |  |  |  |

The energy crop requires no irrigation or fertilizer. Weed control is recommended in commercial contexts during establishment but is not accounted for here as we do not wish to promote a monoculture. Stacking of bales at the labyrinth center is done by hand.

**Structure costs**

| COST | ITEM | STRUCTURE |
| --- | --- | --- |
| $500 | FOOTING CONCRETE | PRESS |
| $5500 | FOOTING 5% POLYMER BITUMEN | PRESS |
| $3000 | COMPRESSED EARTH BLOCK PLATFORMS | PRESS |
| $12500 | PRESS MACHINERY STEEL | PRESS |
| $1500 | RAMMED EARTH FRAMING WOOD | PRESS |
| $800 | RAMMED EARTH REBAR | PRESS |
| $400 | PRESS MECHANISM COMPONENTS | PRESS |
| $500 | CISTERN | PRESS |
| $1000 | PUQUIO STONE | PRESS |
| $20 | PVC PIPING | PRESS |
| $500 | SCRAP STEEL SCAFFOLD | VISUALIZATION SCULPTURE |
| $10000 | SKILLED LABOR | PRESS |
| $8000 | EARTHMOVING | PRESS |
|  |  |  |
| **$44220** |  |  |

**TOTAL FULL SCALE COST: $47,335**

**Proof-of-concept prototyping cost**

| COST | ITEM | SYSTEM COMPONENT |
| --- | --- | --- |
| $10 | MISCANTHUS GIGANTEUS RHIZOMES | ENERGY CROP LABYRINTH |
| $15 | SOIL TEST | ENERGY CROP LABYRINTH |
| $40 | CARRYING POLE LUMBER | ENERGY CROP LABYRINTH |
| $100 | CAR JACKS | BRIQUETTE PRESS |
| $400 | LUMBER | BRIQUETTE PRESS |
| $200 | OLD BICYCLES | BRIQUETTE PRESS |
| $60 | MANUAL SHREDDER | BRIQUETTE PRESS |
| $20 | MISCANTHUS BIOMASS | BRIQUETTE PRESS |
| $10 | WATER JUG | BRIQUETTE PRESS |
| $15 | FUNNEL | BRIQUETTE PRESS |
| $10 | PVC PIPING | BRIQUETTE PRESS |
| $10 | SIPHON | BRIQUETTE PRESS |
| $100 | LUMBER | VISUALIZATION SCULPTURE |
| **$990** |  |  |

**Summary of strategy for on-site prototyping**

Two prototyping options are proposed:

Option A: Quarter Scale

All components but the top briquette press site tier are built at 1/4 scale for roughly 1/4 of the cost, or $12,000.

Option B: Proof-of-Concept

A bare bones functional prototype. Components and cost listed above.

AGRICULTURE

*Miscanthus giganteus* Cultivation

We will first conduct a soil test to determine which, if any, soil interventions are necessary prior to planting. Next, a 10 m2 plot of land will be prepared for a miscanthus labyrinth planting.

STRUCTURES

Briquette Press

Bicycles and standard car jacks will be used to prototype the press machinery. The dancing platforms will be made from lumber. A water cooler jug will be used for the cistern and for the puquio, a plastic funnel. Briquettes will be pressed using shredded biomass brought to the site until the miscanthus

Visualization Sculpture

A 2m x 3m scaffold will be built from lumber.

**Experience summary**

Visitors are introduced to SAGE SPARK their first night at Fly Ranch. As darkness falls, the lamplighters go to work, first illuminating the commons and finally igniting S.A.G.E., a beacon and interactive art installation that broadcasts progress towards sustainable habitation at Fly Ranch. The S.A.G.E serves to spark discussion and inspire action. A conversation about SAGE SPARK is a conversation about Fly Ranch, its relationship to the land, and how actions on and off the playa can translate into something captivating. Fire was and is emblematic of BM culture. Now it represents its future.

The path towards sustainable, then regenerative habitation is neither easy nor straightforward. Miscantheus giganteus is planted to form a labyrinth in a structural nod to this reality. As a landmark, it serves to attract/promote engagement with the process. A literal regenerative structure, its annual destruction and regrowth afford a dynamic space for visitors to use and explore. At its center is the resting place for harvested biomass. No matter the season, visitors start their journey amongst the plants. There, they open a bale and set off towards the playa carrying the material on a shoulder pole - harkening to lamp lighting as it is now and foreshadowing what it is to become.

The farm, commons, and Black Rock City define the axes of the press site, located at the site. Approaching it, visitors are met with an unfamiliar feature: elevation change, affording a unique perspective of the local landscape. The biomass fuel press is operated by at least two people performing a synchronized, adaptive choreography. The dancers are separated by both a difference in elevation and a wall of miscanthus yet must coordinate their movements to direct power to the press mechanism.

The pressed bricks are brought back to camp and used to light and heat the night. The fuel produced is best used in situations where flame has no substitute. Cultural touchstones like lanterns and sculpture can now blaze freely, consonant with BM values.

**Environmental Impact Assessment**

**PROPOSED ACTIVITIES**

1. Energy Crop (*Miscanthus Giganteus)* Cultivation
	1. Purpose

An energy crop will be grown to produce biomass briquettes and construction material substrate. Planted to form a maze, crop also serves to enhance the visitor experience at Fly Ranch.

* 1. Existing Environment

The proposed plots occupy sagebrush-grasslands having marginal soil quality.

* 1. Reasonable Alternatives
		1. Do-Nothing

Fly Ranch relies upon imported fuel for fires, e.g., wood, natural gas.

* + 1. Annual Energy Crop

A less efficient energy crop is grown, using more water and requiring mechanical/chemical maintenance.

* 1. Potential Impact on Environment
		1. Land

Cultivation has been shown to positively affect soil structure, erodibility, organic matter content, and nutrient content[[2]](#footnote-3), in part due to the high rate at which it sequesters carbon in the soil, around 2.5 T CO2e per hectare per year.[[3]](#footnote-4)

Studies suggest that it can filter pollutants, reduce runoff, and support wildlife diversity.[[4]](#footnote-5)

* + 1. Water

No irrigation is necessary as the >1000 mm average rainfall[[5]](#footnote-6) received annually at Fly Ranch exceeds the 800 mm required for high miscanthus yields[[6]](#footnote-7). Should drought occur, the plants would tap into the groundwater as they have deep roots.

1. Construction of Biomass Press Pavilion
	1. Purpose

To compress biomass into briquettes for use in lighting and heating applications.

* 1. Existing Environment

The proposed sites sit on the edge of the playa in a primary development zone.

* 1. Reasonable Alternatives
		1. Do-Nothing

The biomass is not processed and instead used or sold in its raw state.

* + 1. Industrial Machinery

An industrial biomass pellet machine is purchased to process biomass. Energy production is solely a technical process rather than an experience.

* 1. Potential Impact on Environment
		1. Land

A foundation for the structure will be dug to a depth of 1.6 meters. A hill 2.8 meters tall on the otherwise flat playa will be visible from a distance.

* + 1. Water

Rainwater will be collected by a cistern. The water exuded during briquette pressing will likely affect the immediate area; wetter-than-normal conditions on this small area of playa may promote plant life.

* + 1. Materials
			1. Press Steel

The steel press components represent a one-time carbon cost of 7500 kg CO2e.

* + - 1. Earthen Substrate

The 28 m3 earthen substrate required for rammed earth walls and platforms will come from Fly Ranch infrastructure excavation waste to minimize ecosystem disruption. Earthmoving/excavation carries a cost of ~50 kg CO2e per hour.

* + - 1. Wood

Rammed earth walls require framing. Using standard softwood lumber will represent a one-time carbon cost of 1240 kg CO2e.

* + - * 1. Bitumen Concrete

The concrete footings represent a one-time carbon cost of 3640 kg CO2e.

* + - * 1. Plastics

The cistern and PVC water tubing represent a one-time carbon cost of 1900 kg CO2e.

1. Construction of S.A.G.E Visualization Grid
	1. Purpose

An interactive analog artwork that serves to visualize progress towards sustainability goals at Fly Ranch and engage visitors.

* 1. Existing Environment

The proposed site sits on the as-of-yet most developed part of Fly Ranch - the primary development zone situated at its center.

* 1. Reasonable Alternatives
		1. Do-Nothing

Biomass briquettes are used only for utilitarian purposes.

* + 1. Mycelium Scaffold

The grid is built from mycelium bricks and must be rebuilt seasonally.

* 1. Potential Impact on Environment
		1. Land

The structure, a grid, will be visible from afar, standing 6 m tall x 5 m wide. Insects and birds may find the structure attractive for nesting.

* + 1. Materials
			1. Scrap Metal

Metal spared the return journey home from BRC will be used to construct the scaffold on which the briquettes are placed. Welding will carry a carbon cost.

1. Nsanganwimana, Florien, et al. "Suitability of Miscanthus species for managing inorganic and organic contaminated land and restoring ecosystem services. A review." Journal of Environmental Management 143 (2014): 123-134. [↑](#footnote-ref-2)
2. Fernando, Ana L., et al. "Environmental impact assessment of energy crops cultivation in Europe." Biofuels, Bioproducts and Biorefining 4.6 (2010): 594-604. [↑](#footnote-ref-3)
3. Dondini, Marta, et al. "The potential of Miscanthus to sequester carbon in soils: comparing field measurements in Carlow, Ireland to model predictions." Gcb Bioenergy 1.6 (2009): 413-425. [↑](#footnote-ref-4)
4. Blanco‐Canqui, Humberto. "Energy crops and their implications on soil and environment." Agronomy journal 102.2 (2010): 403-419. [↑](#footnote-ref-5)
5. Western Regional Climate Center [↑](#footnote-ref-6)
6. Cosentino, Salvatore L., et al. "Effects of soil water content and nitrogen supply on the productivity of Miscanthus× giganteus Greef et Deu. in a Mediterranean environment." *Industrial Crops and Products* 25.1 (2007): 75-88. [↑](#footnote-ref-7)