SENSOR-FIELD: making social-ecological place across spacetime scales

**team art narrative** | In support of the *Fly Ranch Project’s* goal of becoming “a catalyst for innovation and creativity in the world” and in accordance with its nature as ”unfolding and experimental process,” we propose a work of *process art* based in the ranch’s *situated knowledges[[1]](#footnote-1)* thatwe believe can operate across its diverse issues and spacetime scales to fulfill this aspiration. If “change is a characteristic of all systems and all aspects of systems,”[[2]](#footnote-2) in *process art,* the processes of making and the initiation of actions and change are as important as the finished things they produce. We believe a process art approach to the Project allows us to effectively interconnect all five competition systems with principles of a *circular economy* and those of life *rewilding* and that it proactively supports the processes of careful research, consensus-building, and decision-making by the Fly Ranch community moving forward, and that it does so with three key moves.

The process of developing our mappings of *Water, Biome, Energy,* and *Place* on the first panel precipitated the personal and collaborative discoveries that have resulted in the first element of our art proposal: a new interactive, software tool we call ***Mapper*** that adapts ArcGIS with open-source software and databases to build powerful ‘maps’ that interconnect layers of visual, computational, and textual information with those of Fly Ranch across spacetime scales. A four-dimensional “collage machine,” *Mapper* joins analysis with synthesis and art with science to help users around the globe discover relationships between layered things and processes to develop insights essential to comprehensive conservation and developmental processes and related ones of research and education as the project unfolds. Importantly, *Mapper* interrelates prior histories and memories of indigenous peoples who lived here for millennia with those of more recent inhabitants. *Mapper* puts Fly Ranch ‘on the map’, literally and figuratively, with a state-of-the-art/science tool to build solidarity and guide its future.

Growing from *Mapper[[3]](#footnote-3)* and our mapping process is the second element of our *process art* proposal:***Sensor-Field****,* a work of infrastructural land art in the form of an array of 57 polished, stainless-steel ***Sensor-Poles***positioned on the USGS half-kilometer-grid the length and width of the ranch, including the parcel near Gerlach. The pole heights vary with their topographic location so that their tops align in a single horizon-framing plane when viewed from the upper northwest corner of the ranch―inscribing human-scale and heightening the process of perceiving this sublime landscape and its extraordinary phenomena of shifting light, reflected in its mirrored surfaces that are both ‘other’ to the landscape and one with it.

*Sensor-Poles* at each *Sensor-Point* house a wireless, bi-directional network of open-source environmental monitoring instruments at the half-kilometer-coordinate grid sites, as well as lightning-rod technologies to limit wildfires from lightning-strikes and telecommunications to link each site to the world, all powered by micro-solar-cells. Sensor technologies record and transmit a wide range of data essential to landscape and ecosystem management at micro-to-mid scales for all three site zone-types, integrating satellite data for remote access, computation, and understanding of trends by research partners.[[4]](#footnote-4) Data sets like the following help develop important new conceptual and analytical approaches to observing landscape change through time, and in turn, actively inform the *Fly Ranch Project* “research laboratory” of conservation and development:

1. **Water-related data** |Water quality is monitored for [*pH,*](https://sensorex.com/ph)[*conductivity*](https://sensorex.com/tds-conductivity/)*,* [*salinity*](https://sensorex.com/blog/2017/11/09/electrical-conductivity-of-water/)*,* and[*dissolved oxygen*](https://sensorex.com/dissolved-oxygen/) *levels* to understand of chemical qualities, human activity impacts, and seasonal fluctuations. Hydrological processes and flow regimes in streams (magnitude, seasonality, flow rates) are tracked for influence on habitats, as are surface and subsurface flows and nutrients for impact on primary productivity.
2. **Critical habitat-related data** |Diversity, abundance, and distribution of species types, and species’ movements and interactions are tracked; small-scale processes at ground surface (formation of soil crusts, infiltration of water) are monitored to understand micro-habitats, as are soil properties influencing vegetation composition of terrestrial habitats, and different types of substrates in wetland habitats that impact species-diversity.
3. **Climate and weather-related data** | Micro-site climatic variables like precipitation, evaporation and temperature are integrated with that of Hualapai Flat Weather Station and regional-to-continental scale databases to understand larger patterns of climate change and influence on local plant and animal species (physiological tolerances, spatial patterns of cover, and availability of food).

Growing within *Sensor-Field’s* network of environmental monitoring stations is the third element of our proposal: a system of interventions and processes for *human inhabitation* called ***Spine- Line Interventions****:* a linear settlement plan the length of the ranch, oriented north-south along its central spine of road, irrigation canal, and reservoirs and working within the competition boundary system. Its pattern of 50m (184ft) x 10m (33ft) building lots alternating with equal open-spaces joins functional logics of *centralization, distribution,* *flexible use,* and *accessibility* to water and road with perceptual logics of *seriality, scaling,* and *permeability* for variable, self-sufficient and self-sustaining clusters of settlement to coalesce wherever needed without promoting problematic density. *Spine Line* is constructed with the ***Rib-Cages***:50m (164ft) x 6.1m (20ft) scaffolds of seventeen pairs of prefabricated, galvanized steel ribs on portable foundations that carry long, mirrored parabolic troughs overhead oriented north-south.  Troughs pivot to the sun’s path with sensors, reflecting and focusing light onto CSP absorber tubes and shielding things below from direct solar radiation. Mirrored on both sides, all troughs move in sync from vertical positions oriented due east at dawn to reverse vertical positions at sunset, reflecting light and producing spectacular inverted reflections of the surrounding landscape. Below this, *Rib-Cages* carry prefabricated wood decks that “float” two feet above grade, allowing water and wildlife to move freely, and three types of 20ft locally-recycled/adapted shipping container units: galvanized SIP-clad habitation-units, polycarbonate-clad greenhouse units, and red SIP-clad energy-conversion/recharging-station units. The mirrored pairs of habitation units frame broad landscape views and accommodate housing, spaces for research, art production, education, and administration. *Rib-Cages* without habitation-units function as porches for event gatherings and agricultural uses. Potable water is supplied by nearby wells, and gray water is channeled to greenhouses and new bioswale systems where native tule species of traditional Paiute culture filter it while other waste produced is composted*.* The larger effect is one of a segmented-line of kinetic land art extending as far as the eye can see through the point-grid of *Sensor-Field,* “camouflaged while locally framing and contrasting” its singular landscape of natural and man-made conditions within one larger *circular economy.*

The final element of our renewable-energy art infrastructure is the ***Wind-Light Tower****―*oriented to the compass points at the northwest corner *Sensor-Point* site*―*a place for elemental encounter with wind, light and breathtaking panoramic views across the ranch and valley into Black Rock Desert. The tower’s outer layers of dense chain mesh “drapes” veil a layer of stairs cantilevered from a diagonally-trussed steel structure of galvanized steel framing a central void open to the sky, which is enclosed by a layer of recycled wood boards with gaps between them that carry windbelts harvesting devices and produce dramatic light projections. Joining horizontal and vertical axes, this *skyspace-chapel* affords a place of rest to look out over the ranch and contemplate extraordinary shifting daylight phenomena overheard as air rises through the tower from ‘stack effect’. The tower’s height and volume, with an equal volume of light projected upward at night, are a beacon to signal Prehistoric Lake Lahontan’s highest level―the ranch’s significant aquatic prehistory―and the writing of an inspirational new history.

**conclusion** | We that believe that *Sensor-Field* and its infrastructural *process art* fully embody the *Fly Ranch Project’s* nature as ”unfolding and experimental process” and the community’s goal of becoming “a catalyst for innovation and creativity in the world,” doing this in the following ways:

* by *integrating* all five competitions systems into one larger, inclusive *social-ecological* system laboratory for researching and managing causation between natural and cultural systems;
* by *imbuing* its material-constructional-technological code with a *beauty, flexibility*, *durability* and *circular economy* that *galvanize* its singular nature as a cold desert landscape; and
* by *making* accessible to fellow planetary citizens inspirational stories of the *rewilding* of life in its fieldthrough pulsing plant, animal *and* technological ‘sensors’―ancient and new.

**environmental impact + cost summary** | Given the Fly Ranch community’s commitment to “testing small versions of different visions to see what works,” we’ve balance innovation with feasibility, avoiding technologies, components and processes that are still in early stages of development. We foreground *social-ecological* systems thinking throughout our proposal, privileging water and biome conservation,designing and engineering for the following ‘quality attributes’ that minimize negative environmental impacts and build positive ones:

 *sustainability*

 *scalability*

 *affordability*

 *flexibility*

 *adaptability*

 *buildability*

 *durability*

 *insurability*

*Incremental growth, self-sufficiency* and *evolvability* for each site installation also matter― learning from the past to improve systems performance based on maintenance experience.Our use of a mass-produced modular elements can provide economies of scale in production and make large-scale creative renewable concepts more feasible. At the same time, these systems can be fully-vetted and -developed in accordance with circular economy principles.

***Sensor-Poles*** | Our *Sensor-Field Sensor-Poles* are adaptations of a Monumark™­ flagpole housing made by their manufacturer, Flagsystems (Dallas, Texas)―beautifully-crafted in polished stainless / ASTM A500 Structural Steel to conform to NAAM FP-1001-97 with ‘reduced prevailing sections’ for a seamless appearance. They have access panels at the base for locating and accessing environmental-monitoring and communications equipment powered by micro-photovoltaic cells. A first phase could start with 19 poles on the one-kilometer-grid sites.

→ estimated cost for 100’ *Sensor-Pole / Sensor-Site* prototype + installation: $15,000-18,000.00

**Concentrating Solar Power (CSP)** |The parabolic trough solar collector system technology employed on the *Rib-Cages* is similar to that of Nevada Solar One, built by ACCIONA in nearby Boulder City, Nevada: a major renewable-energy success story…a renewable utility-scale power solution with near-zero carbon emissions” built in 2007 on a comparable desert site of 400 acres. 760 parabolic trough solar collectors concentrate the sun’s rays onto receiver tubes heating up the fluid that flows through them to produce steam that drives a conventional turbine connected to a generator to produce electricity which, in our proposal, would be at each *Spine-Line Intervention* site. Nevada Solar One “represents a major renewable-energy success story[”having their expertise nearby can provide major support for installations at Fly Ranch.

→ estimated cost for 100’ *Rib-Cage* prototype + installation: $300,000-350,000.00

 40ft heated & cooled double-habitation unit prototype + installation: $30-35,000.00

**Windbelt Wind Generators** |Windbelt technology is an alternative to costly wind turbines that uses “Aeroelastic Flutter” or air passing over a thin strip of material that is converted into energy. They are good at taking power from turbulent flows like those Fly Ranch, and they operate quietly. **They’re** an easy and affordable DIY project that can be made of parts and recycled materials costing less than $10.00 each. We propose that dozens of windbelts could be made for the Wind-Light Tower by members of the community and/or high school and college students during weekend workshops, building solidarity and opportunities for renewable energy education.

→ estimated construction cost for *Wind-Light Tower:* $600,000-700,000.00

1. situated knowledges as “the idea that all forms of knowledge reflect the particular conditions in they are produced, and at some level reflect the social identities and social location of knowledge producers. The term was coined by historian of science, Donna Haraway.” *Oxford Reference* [↑](#footnote-ref-1)
2. Richard Levins & Richard Lewontin, *The Dialectical Biologist.* Cambridge: Harvard University Press, 1985, p. 275. [↑](#footnote-ref-2)
3. **mapper,** *noun* (plural mappers) one who produces a map; a software and/or hardware component that performs a mapping. *Wiktionary* [↑](#footnote-ref-3)
4. Research partners could include University of Nevada Desert Research Institute for its work on global climate change, water quality, air quality, sustainability of desert lands, archaeology, and education; Oregon State University Open-Sensing Lab for its development of new environmental monitoring technologies, National Ecological Observatory Network for its data for understanding aquatic and terrestrial ecosystems, Western Association of Fish & Wildlife Agencies for its *Crucial Habitat Assessment Tool.* [↑](#footnote-ref-4)