**DESERT BLOOM:**

**Planting a Paradigm Shift**

**Concept:**

Innumerable species across the globe are considered 'non-native' or 'invasive' due to their aggressive reproduction habits in ecosystems that did not evolve to compete with them. However, invasiveness as a concept must be understood in the context of the Anthropocene era. Not only is the quality of invasiveness or non-nativeness bestowed upon plants or animals by humans, but many species now considered invasive only became so due to human activity. Humans themselves exhibit many of the qualities of invasive species: we dominate ecosystems and as a result threaten the health and well being of other humans, our ecological competition is limited to nonexistent, and our rate of population growth and resource extraction is extreme.

Despite the harm they are capable of causing, invasive species need not carry all negative connotations. Invasive species are also intrepid explorers, overcomers of adversity, and resilient adapters. Bull thistle (*Cirsium vulgare*) is one such invasive species, and is responsible for displacing native plants and changing native ecologies. Yet, it is also a pollinator species and food source for indigenous animals. Like the bull thistle we humans are present at Fly Ranch and impact on the landscape and the environment. Unlike the bull thistle, humans can embody selfless and moral principles such as those honored by the Burning Man community, and through those principles can strive to integrate into natural cycles, restore healthier ecological conditions, eliminate waste, become self sustaining, and give back to a larger community.

 A desert bloom is a phenomenon that occurs in deserts across the globe. Usually occurring in the early spring time when rainfall in an otherwise arid environment is unusually high. The perfect combination of climatic conditions allows for the simultaneous blossoming of a number of desert plant species. The result not only elicits a beautiful landscape but the proliferation of many other species of insects and animals. Like the symbolic solar flowers atop the proposed dwellings in Desert Bloom, our design strives to create a space in which conditions are perfect for both humans and the environment to blossom and thrive.

**Design:**

Desert Bloom proposes two structural forms with an accompanying land management plan for Fly Ranch: the Hub and the Dwellings. The proposed structures provide shelter and energy for users of the site, while offering dynamic programming opportunities that strive to embody the 10 principles of Burning Man.

Both structures are inspired by the landscape; they mimic biological adaptations, as well as methods used by native peoples that have adapted to the extreme local climate. The flower structure of the invasive Bull Thistle, (*Cirsium vulgare*) inspired the forms for both the dwelling and the hub. Like the bull thistle, the buildings display a logarithmic spiral, and take a bulbous semi-spheroid shape, use the sun to harvest energy, and are introduced to the landscape by humans.

**The Dwellings**

The Dwelling structures serve as housing and shelter for visitors to Fly Ranch. Like the homes of many mammals that thrive in the desert, they are partially submerged in the earth and use the ground’s natural insulation to regulate temperature during climatic extremes. A central hydraulic pillar in combination with a rigid frame and durable but flexible tyvek webbing, allows the spiral structure to collapse to ground level leaving only the sculptural solar flower visible, as it continues to harvest solar energy. The domed shape and flexible nature of the dwellings also take inspiration from wickiup shelters used by the Northern Paiute people. By decreasing the visual impact of the dwellings and using energy efficient materials, our design strives to embody the same respect for nature as native peoples have long valued.

**The Hub**

The Hub is an incubator for ideas and a sense of community. It is a space for gathering, for participation, and a place to embody the 10 principles of Burning Man. The central open space allows for flexible programming, and its larger size relative to the dwellings encourages gathering of visitors. The Hub is connected to a microgrid powered by the Dwellings’ solar panels and houses equipment that enables its role as a maker space, a research station, educational center, performing arts venue, kitchen, and more. In addition to solar energy, the Hub, like the dwellings, embodies principles of passive design that reduce energy demands in the extreme desert environment.

**Land Management:**

Desert Bloom includes two major concepts for land management.

1. Operating Fly Ranch land as a native plant nursery provides opportunities for education, volunteering, and participation, as well as encourages successful natural ecosystems. Native seedlings are collected and cultivated in or around the central hub, or in classrooms until they reach an appropriate maturity for re-planting. Areas of Fly Ranch as well as the local community that are impacted by invasive plant species can be targeted for invasive removal and native planting by community members and volunteers.This could be done in cooperation with similar nurseries such as Song Dog Native Plant Nursery in southern Nevada.
2. Fly Ranch can remain a working ranch and give back to the community by offering land to be grazed by local ranchers. In return, participating ranchers agree to practice sustainable grazing methods such as those used by the Shoesole group in collaboration with the Bureau of Land Management and the US Forest Service, that have been shown to be beneficial to native ecosystems and species such as sagebrush. Such methods include dynamic rotational grazing, intentional preservation of riparian areas, and selective livestock breeding to produce animals that can graze on a wide variety of plant species.

**Energy Technology:**

The story of the microgrid for this design is a further extension of the design’s theme of biomimicry as the flower shaped solar PV from the dwellings produce energy from the sun similar to how plants produce energy via photosynthesis. Additionally, excess energy generated by the system will be sent into the macrogrid or stored on site in AC batteries in the underground section of the dwellings where the temperature is cooler and more consistent, much like how nutrients are stored in the root systems of many plants. Furthermore, this microgrid involves connected and interdependent systems that provide an array of benefits for all parties involved, thus mimicking the ecological interaction of mutualism which is ideal given the scalable nature of the design. Lastly as another testament to the design’s theme of biomimicry there are multiple options for the structures’ layout, each of which resemble natural groupings of plant communities, and encourage a variety of uses.

Microgrids are small scale power grids which can function independently of or in collaboration with the traditional main power grid (macrogrid). A microgrid consists of distributed generation (solar PV, wind turbines, etc.), a load (consumers), energy storage (batteries), and control devices to enable the system to work with the macrogrid or independently. This enables microgrids to serve multiple purposes such as providing a potential safe zone during times of crisis, greater local reliability of power, greater efficiency via cutting down on transmission losses, aiding in the transition to a cleaner more resilient macrogrid, and a potential stream of revenue from the excess energy produced by the system.

The main technologies employed by the design are microinverters and AC batteries from Enphase, flexible customizable solar panels from Metsolar, and luminescent solar collectors from Soliculture.The flexible customizable solar panels will be used for the solar PV flowers, as they allow flexibility, can be cut to the shape of the designed petals, and be the intended color without sacrificing technical efficiency. Furthermore, specially designed luminescent solar collectors will be used for the main hub for the dual purpose of generating additional power and to boost plant growth by converting green light into red light. Additionally, to ensure that the solar PV flowers of the dwellings maintain their effectiveness, each panel (petal) will be outfitted with a microinverter. These microinverters enhance the overall microgrid system and the panels themselves via converting the DC power produced by the panels to AC, which immediately enables it for onsite use, makes the system safer (lower voltage), and ensures that if one panel loses efficiency the whole system can continue to run at peak performance regardless. Lastly, to boost the overall resiliency and efficiency of the system, AC batteries will be used to store excess power produced on site for later use.

**Conclusion**

Desert Bloom combines the technical innovation of the Anthropocene with a knowledge of traditional practices and a respect for natural processes. It embodies an awareness of human environmental impact and prioritizes ecological and social health over commodification and resource extraction. In the Hub, an open-source exchange of ideas, science, art, and community values becomes a year-round source for the experience that Burners usually seek out once per year. Visitors can stay in Dwellings inspired by the animals that thrive there as well as the native peoples who first developed a relationship with the land. Participation and education through native plant cultivation and sustainable ranching form the foundation of a functioning, self-sustaining site, and equip Fly Ranch with the necessary tools to carry out its mission well into the future.

**Energy Production:**

System size x hours in a year x capacity factor / months in a year = Estimated Monthly Production

**4 kW x (365 x 24) x 0.191 / 12 = ~ 557 kWh/month = Estimated Production per Dwelling**

**4.5 kW x (365 x 24) x .183 / 12 = ~ 600 kWh/month = Estimated Production of Hub**

Average household use / average people per household x use reduction factor x 50 people = Estimated Peak Demand Baseline

**935 kWh/month / 3 people x 0.3 x 50 people = ~ 4,675 kWh/month**

(Estimated Peak Demand Baseline -- Estimated Production of Hub) / Estimated Production per Dwelling = # of Required dwellings to meet peak demand

**(4,675 kWh/month - 600 kWh/month) / 557 kWh/month = ~7-8 dwellings**

**Environmental Impact Statement**

 Though construction of shelters is limited to a small area, the construction phase will have the largest environmental impact. This can be minimized by designating a specific path for all vehicles and machines to use and using existing roads wherever possible for construction traffic and equipment storage. Soil removal for structure foundations is essential to the passive design of the dwellings. Excess soil not used as backfill can be used to assist in the cultivation of native species on site, all other excess soil will be properly disposed of and dust creation will be minimized to preserve air quality.

Both during and after construction compaction from vehicles and foot traffic will be a major environmental impact on this site. To minimize this impact, the use of motorized vehicles is discouraged on site, with walking and cycling the preferred method for able-bodied visitors. Directing foot traffic to certain areas such as the main connection corridor and concentrating trails based on the hierarchy of spaces provided by LAGI in the design brief can prevent the degradation of large areas of land within Fly Ranch.