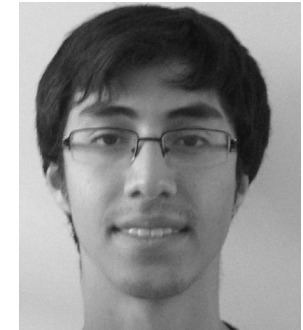


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Solar Agriculture: A Repeat of History

RAUL MOYA



WRITER'S COMMENT: The last essay assignment of my UWP 101 class challenged me to observe, analyze and comment on any location in California of our choosing. The location had to exhibit a conflict between urban and wild, and I saw this as an excellent opportunity to learn more about my hometown. I grew up in the High Desert, a triangular stretch of sparse land tucked between two mountain ranges. For me, the desert has always had a sort of rugged, wild appeal which grew the farther it got from any population centers. Over time, as more and more people came to the High Desert, the cities got bigger, and so did their energy needs. The constant sunshine that characterizes the desert enabled the development of massive solar farms that now encroach upon untouched lands. This contrast between the wild spaces of the desert and the urban expansion of solar farms provided the perfect backdrop to my essay, and so I delved into the various historical, technological and environmental variables that comprise the continual conflict between development and conservation that exists in the High Desert and California as a whole.

INSTRUCTOR'S COMMENT: The students in section 29 of UWP 101 in Fall 2014 persisted through pretty adverse conditions: the class met for three hours at a stretch, met at night, met only once a week, even skipping one week for Veteran's Day. To make things worse, the instructor (that would be me) set up a writing project in which those same hardy students wrote a series of components of a single long essay that only came into being in the process of writing. And each student had to actually visit and care about the place – the contested ground – that was his or her subject. That “caring about” that makes for good writing is often the hardest thing for students who are working so hard in so many arenas. But it came naturally to Raul. In the very first draft of the descriptive component of his essay, his deep affection for the place he grew up, and his equally deep distress at what is happening there, was evident. But merely expressing his own concerns would not have made this the essay that it is. Raul's ability to give equal care to considering the legitimate concerns driving the very changes he laments creates an essay that

can resonate with all Californians who see what their state needs and at the same time see their communities changing beyond recognition.

— Laurie Glover, University Writing Program



Coming to a stop at the intersection of 110th Street West and Avenue K, in Lancaster, I am met with an unfamiliar sight. Six months prior, the drive to my old job passed through vast, nearly empty desert plains before entering the Angeles National Forest. Sheep once roved about where solar farms now exist. No more do I see the old collie ambling by, keeping the herd from the road. Chain-link fence is now the sole guardian of the area. Solar farms have sprung up as if from the ground, covering three quadrants of this four-way intersection. The last is left alone, perhaps because the owners of the home nearby will not sell. Stepping out to investigate, I notice the faint hum of electrical units permeating the air. A few birds flit near the border of the farms, but never actually venture inwards. I walk towards a gap in the enclosure; looking in, I see rows of carefully planted arrays, photovoltaic panels mounted atop steel carriages. The metal creaks as gusts of wind nudge at the structures. The very same gusts are used by the wind turbines, still visible as faint white lines, far off at the base of the mountains. A quick drive up a small hill nearby allows me to see the extent of change. The fields are

massive: each nearly three hundred square acres.¹ From a distance, the reflective surfaces of all the arrays merge, the entire farm appearing like a lake of black water. At this height, other fields are visible, glaringly obvious against the desert backdrop. Agriculture, what Lancaster has long been known for, now includes more than wool, or alfalfa, and other historical agricultural products. Lancaster now also harvests sunlight, a crop the desert enjoys in abundance. Each new solar farm is lauded as an example of green technology helping to reduce carbon emissions and other such unwanted byproducts, yet I am inclined to wonder at what cost.

California as a whole welcomes environmentalism, but nowhere in my travels have I seen renewable energy technologies used as heavily as in the Antelope Valley, the geographically distinct area between the Tehachapi and San Gabriel Mountain ranges. Traveling south from Northern California via Amtrak, I saw one, perhaps two, small solar farms in the expanse between Sacramento and Bakersfield, a distance of nearly three hundred miles. Transferring from train to car at Bakersfield, driving southeast along the 58 Freeway, I noticed barely a hint of green technology, only an intermittent windmill or solar panel appearing out of the blue. This changes upon my arrival at the Tehachapi Mountains. Towards the southern edge of the range, windmills come into view, smaller ones first that are eventually joined by larger variants. These windmills rise like mechanical trees, covering the ridges in a sort of forest. From the mountaintop, the Antelope Valley spreads below, a vast expanse of desert, the lights of Lancaster far off in the distance. At the base of the mountain are the larger wind turbines, appearing as if some giant farmer haphazardly planted them there. Many new turbines are installed each year, advancing the wind farm deeper into the desert. Several solar farms also sit snugly with the wind turbines: all of this within only twenty-one miles.

The cluster of wind turbines eventually dies away as I drive on, revealing the desert as I have known it for so many years of my life. Large sagebrush coexists with the visibly distinct Joshua tree. The tree's spiky exterior and outlandishly twisted arms lend an air of strangeness to the area. If you are lucky, a coyote might decide to make an entrance, but its kind usually stays to itself, away from the roads. Red-tailed hawks are a familiar sight, soaring lazily above the earth, searching for a meal. Buttes rise up in the background, and when the sun is setting, will catch

¹ Based on measurements using GPS.

the light in a manner reminiscent of old Westerns. The unspoiled surroundings last only a short time as, inevitably, the road leads to more civilized and electricity-hungry lands. The landscape begins to clear, the bushes get smaller, and shrubs and flowers take the place of sagebrush and Joshua trees. The change is gentle, the city of Lancaster slowly creeping up until you realize you are within the city itself, the desert now only a matte painting on the horizon behind you.

Lancaster was not always meant to be a city, having sprouted in the summer of 1876 as a humble watering stop on the Southern Pacific Railroad line connecting San Francisco and Los Angeles. A few houses were built for railroad employees, but for the most part Lancaster remained a whistle-stop until 1884. When shrewd businessmen began advertising the valley's ample space and low land prices, the stop soon grew into a bustling community. An agricultural boom was ignited by abnormally plentiful rain, and Lancaster's economy flourished on wheat and barley, although some animal husbandry existed, primarily in cattle. So began the march of city into desert as land had to be cleared at increasing rates to make room for a burgeoning population. A drought lasting from 1894 to 1904 brought an end to agriculture's economic dominance, and although some farming, mostly alfalfa, continues to this day, Lancaster no longer is an agrarian city. The discovery of gold and borax in 1898 brought its own episode of prosperity, and advanced technology was brought in to more efficiently extract resources from the earth. The Antelope Valley hosts what is still the largest open-pit mine of Borax in the world, a reminder of the voracious industrialization that swept through the region.²



² "1876-1910: The Beginning," City of Lancaster, <http://www.cityoflancaster.ca.org/index.aspx?page=219>.

In recent times, Lancaster has embraced green technologies, especially large-scale solar and wind farms, for the same reason that agriculture thrived here: geography.³ As a desert, the Antelope Valley sees almost three hundred days of sunshine per year, which help drive large gusts of wind across the desert. The plains also provide space for large-scale energy operations; great sections of the desert have been bulldozed to make room for these facilities, without preventing the city from expanding in the future. Remoteness also keeps operations far from the public's critical gaze. The oft-criticized ugly appearance of the solar farms is solely the desert's burden. Despite its economic and energy benefits, though, this heavy industry destroys prime desert environments.

To understand the growing tension surrounding solar farming in Lancaster, one must note how the city's history has been influenced by the unique geography of the High Desert. Since the early 1900's, the High Desert's plains and natural resources have allowed for various businesses to expand, especially agriculture. The aerospace industry, reliant on open spaces for test sites, gradually replaced farming, drawing the high-tech industry to Lancaster. Companies began to invest heavily in the Antelope Valley, particularly in renewable energy generation, leading to solar and wind farms. Environmental issues arose as a result of these farms, repeating the history of ecological damage done by earlier agrarianism.

In the early 1900's, with Los Angeles' growing populace in dire need of a new water supply, a two-hundred-thirty-three mile aqueduct was built, a section of which cut through the Antelope Valley. The aqueduct also provided water to Lancaster, allowing for a larger population and renewing the drought-decimated agricultural business. Lancaster soon began a second growth spurt, housing many of the aqueduct workers during the five-year span of construction that began in 1908.⁴ Growth plateaued until the 1930's when Lancaster once again hosted an increasing population of construction workers, now those building Muroc Air Force Base, which I skirted just after descending the Tehachapi Mountains. Muroc (now Edwards) brought the aerospace industry, shifting the focus

³ "Natural Resources - Greater Antelope Valley Economic Alliance," Greater Antelope Valley Economic Alliance Natural Resources Comments, <http://socialleadingedge.org/industries/natural-resources/>.

⁴ "Lancaster History," Destination Lancaster, <http://www.destinationlancaster.ca.org/about-us/history/>.

of Lancaster's economy to high-tech industries and drawing technologically trained workers to the valley.⁵ This trend continued in the following years, culminating in the creation of Plant 42, an Air Force manufacturing plant that brought thousands of jobs.⁶ Companies such as Boeing, Lockheed Martin, and Northrop Grumman and government agencies, like NASA and the USAF, employ many of Lancaster's citizens.

Lancaster nowadays is an average town with all the expected amenities. Much of its history has been covered over by new, modern buildings, but a few pieces still survive. Some agricultural fields remain, mostly growing onion or alfalfa. Some locations have cattle, horses, and sheep, but these are mostly at the outskirts of town. In Lancaster proper is the usual assortment of suburban neighborhoods, complete with restaurants, cinemas, and even a baseball stadium. Past the greater part of the city, the landscape slowly transitions back to desert, with only a few roads and houses to interrupt the view. Further along, near the foothills leading up to the San Gabriel Mountains, are the solar farms. This oasis of technology feels alien, an intruder in what was once desert land. City officials do not mind this however, as the incentives paid by both the state and technology companies outweigh any environmental issues and are beneficial to the economy and the populace.

Two types of large-scale solar operations exist in Lancaster. The first, based on reflective mirrors, has a history of inefficiency and high-costs while the alternative, photovoltaic panels, is more lucrative.⁷ In both cases companies capitalize upon Lancaster's ample space, much as did the original farmers who arrived in the late 1800's, by building massive farms. Solar panels arrived in Lancaster in the early 2000's, and despite the technology's shortcomings, such as its high initial cost and reliance on sunshine, they quickly spread throughout the city over the next decade. Arrays appeared over parking lots and homes and empty lots within the city, in general making excellent use of otherwise wasted space. However, increasing energy demands, both local and statewide, required larger and larger arrays. Eventually, massive solar farms were erected, but their size

⁵ "World's Largest Wind Project Is Underway," Renewable Energy World, <http://www.renewableenergyworld.com/articles/2010/07/worlds-largest-wind-project-is-underway.html>.

⁶ "Lancaster History," Destination Lancaster, <http://www.destinationlancasterca.org/about-us/history/>.

⁷ "Disadvantages Of Solar Energy," ConserveEnergyFuture, January 20, 2013, http://www.conserve-energy-future.com/Disadvantages_SolarEnergy

and appearance mandated a remote location in the desert to the east of Lancaster. The region has attracted companies from as far away as Canada, one of whose solar fields takes up a quadrant of that intersection at 110th Street West and Avenue K. Economically, the solar boom has been a force for good in Lancaster, creating jobs, reducing electricity costs and emissions, and increasing per capita wealth.⁸ Located at the fringe of the city, the new fields are anomalies. Earlier farms were secluded, accessible only by dirt roads. These new plots directly contact grazing lands and homes, and they could mark the advent of energy farms coexisting with the city proper.⁹

Although these technologies have provided abundant clean energy to the Antelope Valley, thus reducing the populace's carbon footprint, the technology has also received harsh criticism.¹⁰ Historically, the expansion of farming created many ecological issues. Desert habitats disappeared to clear room for Lancaster's early wheat and barley plots in 1893, reducing the populations of jackrabbits, coyotes, and tortoises.¹¹ In recent times, solar and wind farms have similarly affected the environment despite their emission-reducing benefits. Like their agricultural counterparts, technology farms require large tracts of land at the expense of aesthetics and wildlife. Wind turbines, which kill thousands of birds and bats each year, threaten the already endangered population of red-tailed hawks that soar through the valley.¹² Solar farms now compete for space with the desert tortoise, the California poppy, and the Joshua tree – flora and fauna on the endangered species list. Many bird species not on the list,

⁸ Barringer, Felicity. "With Help From Nature, a Town Aims to Be a Solar Capital," The New York Times, April 8, 2013, <http://www.nytimes.com/2013/04/09/us/lancaster-calif-focuses-on-becoming-solar-capital-of-universe.html>

⁹ Green, Miranda. Solar Mandates?, The Beast, <http://www.thedailybeast.com/articles/2013/05/10/california-towns-pass-law-requiring-new-buildings-to-have-solar-panels.html>.

¹⁰ Simmons, Ann. "Antelope Valley Residents Not Fired up over Green Energy Projects," Los Angeles Times, July 4, 2011, <http://articles.latimes.com/2011/jul/04/local/la-me-wind-turbines-20110704>.

¹¹ "1930-1945: Depression to Jets," City of Lancaster, <http://www.cityoflancasterca.org/index.aspx?page=222>.

¹² "Supervisors Knock down Antelope Valley Wind Turbine Study," <http://latimesblogs.latimes.com/lanow/2012/01/antelope-valley-wind-turbine-plan.html>

especially migratory birds, suffer from high heat produced by reflections and from disorientation caused by the lake-like appearance of the farms from the air.¹³ The beautiful and exotic nature of the desert has been traded for the benefits, environmental and economic, of green technology and city expansion. Lancaster, though, has mounted investigations and created laws that have led to wildlife preserves and limits on where development can occur.¹⁴ As the city has moved forward with green technology projects, it has been recognized by the State of California as an exemplary “green” city, a model for future developments in sustainable cityscaping. Air pollution has been dramatically reduced, much of the city’s electricity needs are cleanly met, and jobs have been created, all benefiting Lancaster tremendously. I only wonder if in our vision for the future, we have lost sight of the place we call home.

¹³ “Solar Farms Threaten Birds,” Scientific American Global RSS, <http://www.scientificamerican.com/article/solar-farms-threaten-birds/>.

¹⁴ “Supervisors Knock down Antelope Valley Wind Turbine Study,” <http://latimesblogs.latimes.com/lanow/2012/01/antelope-valley-wind-turbine-plan.html>

Bunker Hill Mining and Metallurgical Superfund Site

CANDICE PETERS



WRITERS' COMMENT: I wrote “Bunker Hill Mining and Metallurgical Superfund Site” in my senior year at UC Davis, for Dr. Robert Rice’s “Toxic Tragedies” class. Majoring in Environmental Toxicology, my background at that point was primarily in the science behind environmental contamination. Writing this paper allowed me to explore the impact industrialization and pollution can have on specific communities. I am grateful to have had the opportunity to investigate the human and political aspects of environmental toxicology.

INSTRUCTORS' COMMENT: Our society is faced with recurring toxic tragedies in the workplace, in consumer products and in the environment. Often society responds slowly, where resolution may require a century of struggle. A legacy is a notable distrust that citizens feel toward social institutions (industry, government) reflected today in bitterly partisan opinions on topics such as mining activity (including fracking), global climate change and food safety (including genetically modified organisms). We see a continuing tension between safety and productivity, between regulation and personal liberty. The tragedy of lead includes its use in indoor paint and as a gasoline additive as well as the refining process, of which this paper describes an egregious example. We must hope that examining these failures of the market system will help us understand how to improve toxic regulation and to reduce the impact of future tragedies.

– Robert Rice, Department of Environmental Toxicology