Anthropogenic Landscapes: Owens Lake, CA

by

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Abstract

In the Age of the Anthropocene, human activities have greatly altered and transformed all aspects of the geological environment, typically extracting what is considered valuable and leaving behind degraded landscapes. Often existing in between the city and wilderness nature, these landscapes are largely forgotten and assumed to always have been like that. How can we re-engage with these landscapes and can they become a meaningful part of our culture?

A prime example is Owens Lake in eastern California. It has a rich history: earliest agricultural domestication, silver and salt mining, death by a greedy neighbor far south, worst particulate matter pollution, and a surprising resurrection. Starting in the early 2000s, Owens Lake was carved up into ‘cells’ and a new infrastructure of pipes, roads, sensors, and dust monitoring equipment was overlaid. Each cell was re-tilled, re-watered, re-planted, or re-paved, resulting in a strange yet fascinating ecology where multiple “natures” (wild, artificial, and reconstructed) co-exist uncannily.

As state-owned land, public engagement was a required part of the dust mitigation efforts. Architecture, an important contributor to anthropogenic change, offers the opportunity to re-engage with the site. Stan Allen writes that “any work of architecture is (first) a transformation of the landscape.” [1] Inevitably, architecture sits on and interacts with land, is composed of materials extracted from the land, and most importantly, reorders the landscape through artificial constructs. Here, a network of architectural interventions draw people, whether casual passerby, adventure seekers, or scientific researchers, to key areas around Owens Lake to discover the human and non-human dynamics that shape this particular place and whose presence re-shape the landscape they are situated in.

Aga Khan Professor of Architecture

Praise God for the opportunity to undertake this 3.5 year journey at MIT: to be constantly challenged, expand my horizons via travel, forge new friendships, mature in character, and work on thesis with peace, joy, and no all-nighters(!).

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Owens River Valley was inhabited by the Paiute and Shoshone. The indigenous name for Owens River was *Wakopee* and for Owens Lake *Pacheta*.

- **1845** - John C. Fremont names Owens Valley, River and Lake for Richard Owens, one of his guides.
- **1849** - Gold rush attracts miners to the area
- **1850** - California becomes a state in the Union.
- **1860s** - White farmers and ranchers settle in Owens Valley; clashes between whites and Indians.
1872 - First steamboat *Bessie Brady* begins ferrying ore from mines to the east to the west side of Owens Lake.

1880s - Farmers in Owens Valley begin to divert water from Owens River for irrigation.

- 1885 - Inyo Development Company opens plant near Keeler to produce crude soda ("trona"). Closes in 1920.

- 1902 - Reclamation Act is enacted by Congress. Planning begins on a federal irrigation project in the Owens Valley.

- 1904 - LA Board of Water Commissioners authorize Mulholland to find new water sources for growing city. With Fred Eaton (former mayor of Los Angeles), Mulholland identifies the Owens Valley.


- 1913 - Los Angeles Aqueduct is completed. Longest single water project of its time (223 miles).

- 1924-1927 Water wars between Owens Valley farmers and Los Angeles.

- 1926 - Owens Lake dries up


- 1933 - Merchants and farmers demand reparations due to loss of water. Los Angeles purchases 85% of the valley's residential and commercial property and 95% of the valley's farm and ranch land.

- 1937 - Lone Pine Paiute-Shoshone Reservation is established through a land exchange between the Department of the Interior and the City of Los Angeles.

- 1940 - LA Aqueduct is extended to Mono Lake (total 338 miles)

- 1962 - US Borax /Rio Tinto continues trona mining; lease until 2048
1970 - LADWP completes a second aqueduct from Owens Valley.

1972 - California Environmental Quality Act (CEQA) is enacted.

• 1974 - California lawmakers establishes Great Basin Unified Air Pollution Control District (GBUAPCD)

• 1987 - EPA declares Owens Lakebed to be the worst dust pollution problem in the US.

• 1994 - CA Supreme Court requires LADWP to raise Mono Lake water level by 20 feet.

• 1998 - GBUAPCD and LADWP adopts $1.2 billion State Implementation Plan (SIP) which requires LADWP to implement dust control measures on Owens Lake.

• 2000 - LADWP begins to implement dust control mitigation measures (DCM) Migratory birds return when water is pumped back.

• 2012 - LADWP required to complete DCM for remaining 3 acres to achieve 99% efficiency.

• 2016 - LADWP opens the Owens Lake Trails as part of public access component to SIP
Introduction

In the Age of the Anthropocene, human activities have greatly transformed all aspects of the geological environment, altering flows of key geological elements, extracting what is considered valuable and leaving behind degraded landscapes. Often existing in between the city and wilderness nature, these landscapes are largely forgotten and assumed to always have been like that. However, landscapes are not neutral: they tell stories. They are a “slate upon which the evidence of culture, habitation and labor is written and may be read.”[1] Thus, how can we re-engage with these landscapes? Can new processes be incorporated to further understanding and make them become a meaningful part of our culture?

An example of an anthropogenic landscape is Owens Lake in eastern California, which has undergone a drastic transformation over the last 100 years, through the multiple stages of “nature”: first (wilderness), second (man-made), third (reclaimed), and a fourth which can be considered as “augmented.”[2]

A new approach is needed because the reclaimed approach is inherently problematic. Aside from financial and political issues, it can never be fully restored to a former state and the desire for recovery is a mindset in preference for a lost wilderness that never existed. Drawing parallels to Lucy Lippard’s criticism of the 9/11 memorial in her book Undermining, “eradicating the ruins of a place [like Owens Lake] can function as lobotomy, erasing memory and pretend that what happened never did.”[3] The memory of these places can only be found in museums, books, and photographs, which do not hold the same power as a living site. Since people tend to see landscape mainly as background, strategically placed design interventions focus attention to specific elements and provide a datum to measure processes.

[2] The concept of first, second, and third natures is attributed to John Dixon Hunt, who cites Cicero. The concept of “augmented” is borrowed from Mark Smout and Laura Allen’s Augmented Landscapes.
[3] Lippard, Undermining, 130
Owens Lake sits at the crossroads between major urban centers and renowned natural landmarks, approximately 200 miles north of Los Angeles, 200 miles west of Las Vegas, and in-between two extremes: Mt. Whitney and Death Valley, the tallest and lowest points in continental U.S respectively.
At 110 square miles, Owens Lake was endoheric and fed primarily by the Owens River along with a network of seasonal streams. It was an important site for migratory birds and food source for the local Paiute. Although this phase can be considered “wilderness”, the area has always been modified at small scales and where earliest agricultural domestication occurred.
Second Nature: Manmade (1850-2000)
The surrounding area hit a silver mining boom in the mid to late 1800s. However, the turning point occurred in 1913 when the Los Angeles Aqueduct was completed and cut off the flow of the Owens River to Owens Lake. Within ten years, the Lake dried up and left behind extensive salt deposits that attracted new mining industries. The exposed lakebed also became a major environmental problem as the strong valley winds kicked up tons of dust containing accumulated toxins from previous industrial activities. It choked the Valley and Owens Lake became known as the worst source of particulate matter pollution in the nation. Economic changes, loss of industry, and dust led to major decline in the area. For years, local residents fought the Los Angeles Department of Water and Power (LADWP) to take responsibility.
Extreme Dust Storm at Owens Lake, PC: GDUAPCD
After years of lawsuits, in 2000 LADWP was court-ordered to mitigate the dust. This began the artificial reclamation of the lake—but nothing like what was before. The lakebed was carved up into ‘cells’ and a new infrastructure of pipes, roads, sensors, and dust monitoring equipment was overlaid. For each cell, one of 3 dust mitigation strategies was applied: [4]

1) Shallow flooding with water (up to 3’-0” deep)  
2) Planting with “native” saltgrass  
3) Paving with gravel (4” deep)

Current experiments also include tilling the earth and hardening brine to prevent dust from being lifted up. [5] Gradually, a mosaic of strange yet fascinating ecologies emerged, all which are closely monitored. The multiple natures of wild, artificial, and reclaimed co-exist uncannily. For example, the reintroduction of water appears ‘natural’ but is not. Between October and May (the dust season) most of the lake is flooded with water re-directed from the aqueduct and emerges from artificial bubblers, while it sits mostly dry during summer. [6] The presence of water has also attracted thousands of migratory birds to return, so it can look like a previous ‘wild’ state. [7] On the western side is still an active trona (soda ash) mine, the third largest in the U.S. [8] Trona is often used for industrial applications like glass manufacturing and chemical additives.

[4] Ramboll Environ. 2016 Owens Valley Planning PM State Implementation Plan. Shallow flooding accounts for 36.5 square miles, vegetation for 3 square miles, and gravel for 2 square miles. The total cost has been over $1 billion to date. The native grass is not exactly native because it was not present originally but was chosen for its tolerance to high salinity and contamination and fast growth.  
Shallow Flooding Ponds, PC: Robin Black

Migratory Birds, PC: Robin Black

Planted Saltgrass
Field of Gravel, PC: Jennifer Little

Experimental Tillage Field

Pool of Brine, PC: George Steinmetz
Fourth Nature: Augmented (2017 - future)
What I propose for Owens Lake is an increased engagement with the landscape and further blurring between natural and artificial. Architecture, an important contributor to anthropogenic change, offers the opportunity to re-engage with the site. Stan Allen writes that "any work of architecture, before it is an object, is a transformation of the landscape." [9] Inevitably, architecture sits on or interacts with land, is composed of materials extracted from the land, and most importantly, reorders the landscape through artificial constructs. The aim is to draw people, whether casual passerby, adventure seekers, or scientific researchers, to key areas around Owens Lake to discover the human and non-human dynamics that shape this particular place and to find cultural understanding in an anthropogenic landscape.

The architectural interventions is a network consisting of four elements: a rest pavilion, field of observatories, research center, all linked by an internal circulation road.
This Key Plan shows the areas of focus and views taken across the site.
Rest Pavilion

Driving up I-395, the main thoroughfare in the Valley, we are feeling hungry and desperately needing to use the restroom. Thankfully, our GPS calls out a rest stop right ahead. From a distance, we spot the Owens Lake Rest Pavilion perched on a hill just off the highway.

The Rest Pavilion serves as one of several entry points to Owens Lake. It a place where different users of the desert (casual daytrippers, extreme thrill seekers, and environmentalists) who normally avoid each other, will have to come together due to their unignorable biological needs, since a public developed toilet is unavailable elsewhere for miles.

Turning in, we drive up past part of the landscape before arriving at the top of the landform, where we look back at where we came from as we park. The hill is built from excavated soil from the construction of other design interventions plus additional excavation of an adjacent marsh area. The raised elevation is necessary for a better overview since the site is so flat.
Landform Process Over Time
In line with the typical minimalist government standards, the design of the pavilion is simple but provides ample shade from the hot desert sun, public toilets, and a fresh local food stand. The roof structure appears heavy, but is a surprisingly light structure. Standing underneath, voids open to the desert sky. The changing light dances across the smooth interior surfaces. An interactive map display introduces the Lake and history to pique interest in exploring further. The structure is made of concrete mixed with local materials: trona on-site and dolomite (source of lime) from a quarry northeast of the lake. The toilets are self-composting, with waste compost used to fertilize the quasi-native saltgrass. Even if most people only use the toilets, take a selfie, and leave, they leave behind a deposit of their existence which contributes to the anthropogenic process.
From the Rest Pavilion, we have the grand panoramic view of the lake and spot the second system of interventions: the observatories are spread across the lakebed in a grid and fall at different site conditions. The observatories collect weather and site data which feed back to the research center, and bring people to different parts of the site to directly experience the phenomena present.
Rest Pavilion: Desert Gathering Place
The observatories exist as four main typologies. The first is a special rammed-earth structure on a small artificial mound with wetland and bird habitat islands. The raised elevation of 30'-0” allows people to see farther, up to six miles away on a clear day, and also corresponds to the maximum depth of the lake before the construction of the Los Angeles Aqueduct.
Tillage Field

Shallow Flooding Pond with Bird Islands
At the viewing platform, visitors can connect their phones or another digital device to network wifi and access the Lake’s sensor dashboard where they can see charts and graphs depicting current site conditions. Without data, the site does not appear much, but data alone is a two-dimensional experience too. Since natural phenomena has been abstracted to numbers that are hard to grasp (i.e., what does 500 lbs of CO\textsubscript{2} mean?). Here, they can pair data with site experience and access the augmented reality app to see data and drawings digitally overlaid on site, past and future projections, and provide feedback. The digital and physical can be merged to provide for a richer understanding.

Dry and Wet Season Views from Observatory
Continuing along the internal road, we encounter the most common observatory typology in the shallow flooding cells. Access is seasonal: during the dry summers, we can walk right up. When it is wet for most of the year, we can not as easily access unless we wish to wade through the water or have a floating pontoon. Looking at the water glimmering in the sunlight, we are struck by how much water is used to flood the lake and wonder how it used to look like as thirty feet deep lake (now three feet maximum). A sister version is sited on the berms and controls the culvert pipes that allow water to flow from one cell to the next. Automatic and manual controls open and close the culverts to maintain water levels.

From here, we look west and see a vast white plain: the trona deposit. The observatories located here are the third typology and are vertical structures anchored in the ground with weather and dust collection devices. Unlike the other observatories, it is not inhabitable by humans because of the soft unstable ground. Daring ones who traverse this area will quickly discover themselves in a waist-deep sinkhole.
Trona Deposit

Shallow Flooding Ponds
Looking across in the middle of summer, the cells are an array of colorful reds and oranges due to the halobacteria present. A thick salty and marshy smell hangs in the air. In the fall when the water is released again, thickets of brine flies buzz in the water’s edges while hungry migratory birds feast. In winter, these cells can freeze depending on the water’s salinity, creating a mix of ice, slush, and freezing briny water. The landscape is ever-changing palette.
Taking a little detour from the observatories, we arrive at the interagency Research Center, which is staffed by LADWP, CalEPA, CA Department of Fish and Wildlife, and University of California Dust Research Institute. The Research Center studies desert geology, plant and animal life, desertification, design of anthropogenic landscapes, and monitors the Lake conditions. Researchers and visitors around the world come to learn about the crucial work done to fight desertification. The collection of labs allow for more interdisciplinary collaboration.

Located on the Lake’s east side, it is near the town of Keeler and adjacent to the Keeler Dunes, one major source of remaining dust emissions. The Research Center is strategically placed here to serve as a windbreak for the Keeler Dunes. The design includes a landform building surrounded by polygonal mounds designed to slow down wind speeds and trap dust particles. Over time, dust accumulates and the mounds grow bigger.
Approach to Research Center
Capturing Dust, Reshaping Landscape
The building is organized as three volumes: research labs requiring with sunlight, research labs requiring darker spaces, and a soil vault that holds the prized collection of soils around the world, much like Norway’s Seed Bank. The building volumes are pulled and pushed to limit southern exposure to the hot desert sun, maximize daylight to the north, and create a wind-protected area to the east, where the main entry is located. To maintain cool internal temperatures, most of the building is underground and the exposed exterior walls are made of thick rammed earth. A wind catcher on the roof also draws cool air inside for passive cooling.
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Sectional Model
From the east, we enter the sloping plaza and escape into a cool, interior space. We walk around the top level and note that it has various lab and staff spaces: wildlife rehabilitation, plant lab and greenhouse, atmosphere lab and control room, staff lounge.

In the center is the prized soil vault, which extends two more stories below ground. We peer over the railing and see thousands of vials. Each contains samples from different geological times and locations. Owens Lake has samples ranging from pre-reclamation days to current. In an era where surface topsoils globally are constantly being eroded or altered, the soil vault preserves for record-keeping and future use.

Descending down the main stairs, we reach Sublevel 1 which contains additional lab spaces for soil and water analysis and the material research library. On Sublevel 2 is the Aeolian Lab, with a wind testing and simulation tunnel, and water cistern. Returning to the main level, our guide tells us that a small afternoon dust storm is approaching. We rush over to the control room, whose digital displays are beeping with live updates streaming in from the lakebed’s observatories. After the dust storm dissipates, we leave and notice that the ground and our car are covered with fine white powder. When we breathe, the particles enter our lungs. We can even taste the sandy particles in the air. Now, the lake has become a part of us.
Soils of the World
Control Room: Small Dust Storm Passing By
Concluding our trip around the Lake, we have one last stop at the Cloud / Star Gazing observatory. It is located near an old glass manufacturing plant on the northwest shore of the Lake. Instead of being elevated like the other observatories, it is excavated out of an existing dry salt evaporation pond. The excavated trona is used for concrete construction for the Rest Pavilion and Research Center. Over time, the excavated walls will weather and crumble inward to fill up the void. Once full, it will be re-excavated again.
Here, we stop and take a break. We sit and lean back against the dry crunchy trona and stare up into the changing canvas above. Mesmerized, we wonder why we have never noticed the patterns of clouds in the city before. As dusk falls, stars appear. We ponder the whole irony of Owens Lake’s existence: died because of the LA Aqueduct yet the rural character ‘preserved’ to protect the purity of water, and then ‘resurrected’ when environmental regulations forced it. [11] Often, we do not consider the impact of our anthropogenic actions because the consequences are not realities directly in front of us, and the amassed scales of effect is too large to conceptually grasp. Owens Lake serves as a powerful reminder that if humans can have a profound effect in a place which is huge in architectural scale, but miniscule in the larger planetary context, how much more have humans affected the entirety of the planet?

Cloud/Stargazing Observatory
Day and Night at Cloud/Stargazing Observatory
Conclusion

When preparing for this thesis, I felt like I was diving into the deep end and hoping that I will float in the end. Many issues and questions arose: how to deal with such a large (and rural) site where even a large building is just a speck; should the existing landscape be re-designed; what constraints should I set for myself; how to make architecture critical; how to graphically represent since aesthetics of disaster tend to isolate the viewer from subject. Even before the final thesis review and while listening to the critics’ comments, I knew I was scraping the surface of a more nuanced and complex topic of architecture, landscape, and ecology, a concept that was missing and would have strengthened the thesis more. Regarding architecture, although landscape architect Diana Balmori thinks the goals of architecture and landscape are opposing where “architecture strives to be timeless; landscape, to be ever changing,” my hope is that architecture can evolve too over time and projecting further into the future (50, 100 years) will help illustrate. [12] Additionally everyone experiences landscape differently and each person creates their own version through visual and sensorial experiences. [13] Only one thread of a day’s events was explored in this proposal but there are many more possibilities. Technology as plays a significant role in discovering and raising awareness of such type of places, whether capture through photography or recording and transmission via Internet. I think its potential can be further explored to more fully engage people to care about places like Owens Lake. Something I can still thinking about is J.B. Jackson’s quote: “a landscape is not a natural feature of the environment but a synthetic space, a man-made system of spaces superimposed on the face of the land...thus a space deliberately created to speed up or slow down the process of nature...it represents man taking upon himself the role of time.” [14] How pertinent it is still. Some have finally recognized the self-destructive practices of the past and tried to reverse it while others still carry forth blindly in the name of capitalism.

[13] Stilgoe, John R. What is landscape?, 52
[14] Jackson, J.B., Discovering the Vernacular Landscape, 1984, 8
Appendix A. Thesis Review Boards  
December 22, 2016

First Nature: “Wilderness”  
Pre-1950

Second Nature: Manmade  
1950 - 1999
Third Nature: Reclaimed
2000 - 2016

Fourth Nature: Augmented
2017 -
Appendix B. Thesis Research & Studies

(T) Owens Lake 1913; (M) Aqueduct construction; (L) Salt Harvesting, All PC: Eastern California Museum

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(T) Dirty Socks Hot Springs; (M) Lake Construction PC: Barnard Construction; (L) The Lake Project by David Maisel

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Series of photo manipulations juxtaposing the multiple "natures" present at Owens Lake
Extent of Dust Spread
Situated along the Pacific Flyway
Flow of People

Settlements

"Natural"

Gradient of Wetness

Wind Direction

Dust Emissions Zones

Site Analysis
Shallow Flooding

Vegetation

Gravel, PC: Jennifer Little

Experimental Tillage

Dust Mitigation Strategies
Pacific Flyway

Owens Ark

Saltgriculture Works

National Toxic Land Reservation

Owens100

AnthroPark

Initial Owens Lake Schemes
Rest Stops in Vicinity
Rest Pavilion Studies
For One
Dry/Hard Ground

Wet Ground

Dry/Soft Ground

For Multiple
Dry/Soft Ground

Observatory Studies
Research Center Building Process Models
Appendix C. Site Visit

“a land of contrasts, of layered and diverse human history, and of change”
- Rebecca F. Ewan, A Land Between: Owens Valley, California, xvi

Though appearing forlorn and another valley to just pass through, the Lower Owens Valley where Owens Lake is situated has many historical and natural points of interest. Immediately adjacent to the lake are the former salt works factory, the dying town of Keeler, ghost towns, charcoal kilns. Just north is the new Eastern Interagency Visitor Center, which serves as the information gateway for southern Owens Valley. Designed to complement its surroundings, it exemplifies Californian regionalist architecture. Further north is the town of Lone Pine, Mt. Whitney Trailhead, Alabama Hills, and Manzanar National Historic Site (WWII Japanese internment camp). While human settlements pale in comparison against the towering Eastern Sierra Mountains and sun-baked Inyo Mountains, my travels through the area impressed upon me a sense that human presence and the land are closely intertwined.
Eastern Sierra Interagency Visitor Center; Lone Pine
(T) Looking Down from Road to Mt. Whitney; (L) Alabama Hills Looking to Sierras
(T) Keeler; (L) Manzanar National Historic Site
(T) Owens Lake Plaza Trailhead; (L) Trail near Plaza Trailhead, see LADWP’s Owens Lake Trails Brochure.

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Map from Los Angeles Department of Water and Power. Owens Lake Trails Brochure. 2016
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