OWENS LAKE SYMBIOSIS - infrastructural ruralism

THESIS

The integrating of habitation + recreation + infrastructure will generate a new ruralism; one based on the conservation of open spaces and native ecologies, that sustains the local economy through recreation.

INTRODUCTION

Since 1913, Los Angeles has diverted water from the Owens River to serve Southern California; this diversion accelerated the human induced process of desiccation of the Owens Lake that was started in 1872 with the implementation of irrigated farming[1]. In one of the most fertile agricultural regions of California, the modern landscape of severe dust storms and sagebrush emerged. The issue of particulate pollution – toxic dust – has been key to initiating a shift from the Valley being a voiceless water colony of Los Angeles to representation by a local government with a semblance of local control[2]. Within the mitigation effort, there has been little thought to develop a strategy for the cultural occupation and use of the Owens Lake Playa[3], an issue that requires engaging the broader context of the landscape and pushing the dialectic with Los Angeles from parasitic to mutuality[4]. There is great potential for infrastructure to be central in initiating the cultural shift from parasitic exploitation of resources and territory, to being an agent of mutuality for rural[5/6] regions (not just the generator of urban conditions).[7] This project has developed a public access strategy and infrastructure for the restoration of the Owens Lake Playa that extends to the Los Angeles Aqueduct, it's agent of destruction. The infrastructure for the ephemeral habitation of the lakebed can provoke both the local residents and tourists to engage our hidden infrastructures.

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[1] The highest level of the Owens Lake was about 270' deep 10,000 years ago; the Lake has been slowly evaporating ever since. In 1872 it was 49' deep (elevation 3,597' above sea level), by 1876 it had dropped to 38' deep, in 1913 it was about 29' (elevation 3,577'). There was a seasonal fluctuation of about 6' each year. From: Gale, 1913.

[2] The historic 1998 mitigation Memorandum of Agreement was court ordered after a law suit by several local community groups and national environmental groups; the Great Basin Unified Air Pollution Control District/Inyo Water District are administering the process, with funding/implementation by the Los Angles Department of Water and Power.

[3] Per conversations held with the LADWP and others in the Owens Valley on January 3rd through January 8th, 2005.

[4] Preserving the flow of water to Los Angeles is one of the conditions that the environmental and ethical pressure of OV rehabilitation must balance.

[5] Rural areas are being defined as places that human activities are present sufficiently to be obvious, but with a low population (as the census bureau and others define it), not wilderness where the traces are few and far between. See http://roadless.fs.fed.us

[6] William Cronon reminds us that the rural and the urban are intimately intertwined to the point where they can't be separated.

[7] 'Landscape urbanism' is interchangeable with 'infrastructural urbanism' as they both premise to general emergent urban condition. I am exploring the inverse to see if rural conditions have similar emergent quality.

PROJECT SUMMERY

The restoration of Owens Lake through the development of a hybrid infrastructure that integrates:

- Public access and occupation
- Water capture and containment
- Cultivation and propagation of new habitats
- Generation of energy and purification of water to sustain local towns and visitors

Four design strategies have been implemented:

- Access
- Collection
- Restoration
- Debris Flows

This thesis is an exploration of the cultural role of infrastructure. How can large-scale civil projects (i.e. transportation, utilities, sanitation, and communication systems) adapt to changing or multiple uses outside their design parameters, and be pulled out from visual background noise to become a welcome and valued part of our built environment?

SITE DESCRIPTION

As the antipode to Los Angeles,[8] the Owens Valley has been a territory of exploitation and colonization for more then 100 years.[9] Owens Valley is central to the historical development of Los Angeles and California. By providing capitol from the silver mines of Cerro Gordo in the 1880s, and surplus water in the 1920s, two of the major expansions of Los Angeles were initiated. The Los Angeles Aqueduct also established the modern practice of agriculture based on massive water transfer projects in California and the American West.

As a site of massive shifts,[10] the cultural milieu of extraction and restitution is overlaid on a sublime and tectonic landscape. In 1998, the City of Los Angeles and the Great Basin Unified Air Pollution Control District reached a court-negotiated settlement- the Memorandum of Agreement (MOA). The mitigation process that was initiated, for its scope and cost, was myopically focused on only a few specific and tangible results: the reduction of dust being blown off the dry lake and the preservation of the nesting habitat of the Snowy Plover.[11] With the scenic and historic legacy of the 'Deepest

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[8] Thanks to Matthew Coolidge of the Center for Land Use Interpretation, for suggesting this idea in a conversation on 10/14/04 in Philadelphia.

[9] Fred Eaton and William Mulholland started surveying and purchasing land in the Owens Valley in 1904 - though officially revealed in 1905; LADWP, Complete Report on Construction of the Los Angels Aqueduct, 1916. Then again, European settlement and displacement of the Native American started in 1859 (Putnam & Smith, 1995 pp 231-268).

[10] One of the largest California earthquakes was the 1872 Lone Pine Quake (estimated at a magnitude of 7.6 to 8.0). The geography of the valley is a result of active tectonic movements- technically the valley is a Graben, a sunken portion of the continental plate. Also, the economy has swung from mining, to agriculture and ranching, to finally tourism.

[11] There are three strategies for dust reduction legally specified: shallow flooding, planting, and

Valley', the LADWP and the courts overlooked the implementation of a symbiotic and broader process of mitigation that could have served a greater constituency. Such mitigation and reduction of impact have been integrated into most of the inter-regional water transfer schemes proposed – for the Los Angeles Aqueduct, the pioneering American project, it is time to bring it up to date. The restoration of a larger variety of wetland and aquatic habitats in the Owens Valley will generate a renewed cultural landscape. Development pressure and rampant speculation, which is common through out California, are controlled by several factors: primarily by the ownership of most of the Owens Valley by the City of Los Angeles, and existing or planned conservation easements.

Owens Lake is 262 kilometers (163 miles) north of Los Angeles in the South Lahontan[12] hydrologic region of California. Owens Lake is a terminal lake of the Owens River, fed by the abundant snow pack of the eastern slopes of the adjacent Sierra Nevada and occasional storms in the Inyo-White Mountains. In 1913 before the opening of the Los Angles Aqueduct, the Owens Great Lake[13] water depth was between 7-15 meters/25-50 feet[14]; after the ice age, the water depth was the greatest and reached over 60m/200 feet deep and left traces and terraces on the foothills above. With the mining boom of the late 19th century, the lake was plied by the Bessie Brady steamship, transporting silver bullion and supplies for the Cerro Gordo mine in the mountains above Keeler to Cartago. The local Paiute/Shoshone Indians named the lake Pacheta; they harvested brine fly larvae, along with regularly hunted and fished in the waters and wetlands.[15] The lakeshore towns of Olancha, Cartago and Keeler are sited in relation the background canyons and creeks, just to the side of the alluvial fans to avoid floods, yet close enough have access to fresh water streams and potable groundwater.[16] In addition to these surviving towns, there are several long gone mining camps, including the town of Bartlett that was shut down in the 1960s by PPG.

Today, Owens Lake is a 100 square mile playa[17] fringed with a scattered seeps, springs and wetlands, while at the terminus of the Owens River, a riparian estuary that extends south for several miles out onto the playa. The playa consists of miles of sand dunes, alkali

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gravel cover. It is also specified that all berms have 'snowy plover crossings incorporated every 500 feet'. Exhibit B, Joint Statement of GBUAPCP and the City of LA, July 15th 1998. The PM_{10} particle pollution is quite ironic for its reciprocity to the famous smog of LA, yet the dust has a greater national impact- traveling to Texas and beyond in greater quantities with its carcinogenic levels of metals. So far, 300 miles of pipe, 5000 irrigation bubblers, and hundreds of miles of fiber optic control cables have been deployed to tap into two breaches of the Aqueduct.

[12] Lake Lahontan was a Pleistocene era lake north of Lake Tahoe in Northern California and Nevada, second only to the Great Salt Lake (AKA Lake Bonneville) in size in the Basin and Ridge province

[13] Putnam & Smith, 1995 p.247: reproduction of 1888 map

[14] http://geochange.er.usgs.gov/sw/impacts/geology/owens there is a discussion of the effects of the aqueduct on the lake. Additionally, see www.ovcweb.org

[15] Putnam and Smith, 1995, and OVC

[16] Maps utilized includes: USGS – topography & aerial imagery; LADWP - Aqueduct information; Bureau of Land Management; State of California, NASA, and many others.

[17] The lake runs about 24 km/15 miles north from Olancha and is about 11 km/7 miles wide west of Keeler.

flats[18], and deep mud covered with a thin crust, around a brine lake on the western side that seasonally fluctuates between covering one-quarter and one-half of the basin (with a corresponding depth that varies from six inches to six feet). The LADWP Dust Mitigation Project has currently installed sprinklers with fiber-optically controlled valves on over 30 square miles of playa; along the east and north sides on the surfaces that were the most prone to dust emissions. There is also an additional four square-miles of irrigated Salt Grass; with the total expenditure of projected to reach $500 million by the end of 2006.

The state recently designated 10 acres of wetlands at Cartago as a wild life preserve, but there is no public access allowed and no identifying signs to inform the public of it's existence. The privately held lands on the lake includes a 300 acre parcel at the south end that is being half dredged to create a duck hunting club; a 10 acre experimental wetland on the east side north of Swansea[19], and a few smaller parcels at Swansea and Keeler. US Borax currently holds a 44-year mineral lease with the state of California for 16,000 acres where they have estimated an extractable potential of 50 million tons of trona and other carbonate salts.

To the east of Owens Valley are the Inyo-White Mountains, peaking at over 14,000' and home to the xeric Bristle Cone Forest; to the west are the slightly taller Sierra Nevada Mountains, home to the majestic Sequoia. Mount Whitney (14,494') near Lone Pine is the tallest mountain in the Sierra and the contiguous states. On the western slopes of the Sierra Nevada are Sequoia National Park, Kings Canyon National Park, and Yosemite National Park, along with several national forests. To the southeast is Death Valley National Park (and the lowest point in North America), while the remainder of the Inyo-White Mountains are federal lands under the administration of the Bureau of Land Management[20]. Starting south of Owens Lake is the Coso Mountains and beyond is the China Lake Naval Air Station.

Inyo County is the size of Connecticut at about 10,000 square miles, yet it has a permanent population of around 18,000. Various state and federal legislative acts have limited growth and development to 'protect'[21] the watershed for Los Angeles, which have had the effect of preserving the open space of the valley.

The remoteness and the seasonal extremes in environment are the primary challenges offered by the site. Seasonal temperatures peak in the summer with the surface of the Playa reaching up to 150°F; late spring time frosts limit the growing season, and winters can be reach lows in the 10's. The strong winds that generate the dust storms are primarily present in the wintertime and sustained wind speeds 40+ mph are common several times a year. Most of the ground water around the Owens Lake is non-potable, so the Aqueduct must be tapped for local consumption,[22] or bottled water is imported.

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[18] The lakebed salts and minerals are primarily sodium carbonate based: Halite, Mirabilite, Thenardite and Trona.

[19] Agrarian Inc., of Bishop owns the experimental wetlands and designed the duck club.

[20] Much of the BLM land in the Owens Valley is designated as "Semi-Primitive" and open to some off-road vehicular access

[21] Mostly to limit local dissent and demand for water. See Hundley, The Great Thirst (2001) pp141-166 for a chronicle of the politics and efforts.

[22] While the water in the aqueduct is of high quality - it is not treated until it reaches Los Angeles, so

Electricity is abundant through the Owens Valley, though substations and local distribution hide in the shadows of the high voltage lines that bring hydropower from as far away as Britsh Columbia to Southern California. Wintertime travel is quite difficult as the National Park Service closes most of the roads crossing the Sierra Mountains between Bakersfield and Lake Tahoe and does not clear them of snow.

The existing ecology surrounding the playa is comprised of alkali meadow and scrub communities with saltgrass and *sacaton* grass extending out onto the lakebed; Nevada saltbrush, rabbitbrush, greasewood, bitterbrush, inkweed, and sagebrush comprise the dominant shrubs, which can reach the water table with their deep roots. The wetlands and seeps have varied riparian community that may include cottonwood, black willow, red willow, coyote willow, and beardless wild rye, rushes and sedges[23] depending on the quantity of water and salinity present. The only significant invasive plant is the Salt Cedar (*Tamarix L.)* and the current eradication efforts seem to be effective.[24] Over 320 species of birds occupy or migrate through the Owens Valley.[25] The common mega-fauna include antelope, sheep, snakes and jackrabbits that range through the Valley, and several ranches have cattle in the area. One of the most striking characteristics of the lake is the intense halobacteria colonies that tint the brine and salt deposit pink to bright red. The water occasionally is tinted green by *Dunaliella* and *Dangeardinella* algae and a thick black border of brine flies may also surround the lake (like at the Salton Sea). The shallow flooding has proved to be excellent avian feeding habitat with an abundance of microbes and insects. The native population of Snowy Plovers is increasing, and a large number species have taken to stopping on the lake during their seasonal migrations. Until the Lower Owens River Project is initiated, the fish population in the delta region will remain rather small; there is a potential for the hydrological regime of the lake to be significantly altered for better or worse.[26] The soils on the lakebed include wide variety of alluvial deposits of sands, silts, and clay; while the brine pool covers a six-foot deep bed of precipitated salts.[27]

The entire lakebed is the potential site for deploying the proposed infrastructure for public access. Several areas of significant interest emerged during the site visit, primarily areas of biodiversity and industrial/cultural sites that will be the focus. Dirty Socks Springs and the adjacent mitigation areas, have the most striking juxtaposition of different habitats; while the Owens River Delta has fascinating emergent qualities. Along the

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there is a need for purification before it is considered potable; the electricity is available from high-tension lines, requiring step-down transformers to reach domestic voltage. While the water to the east has high levels of arsenic, the ground water to the west is of exceptional quality and is tapped by one of the largest bottling plants in California by Sparkletts.

[23] Sources for plant communities include the websites for OVC and http://darwin.bio.uci.edu/~susatain/global.sansem/baked297.htm (Prof. Peter Bowler- UC Irvine, paper written by Steven Bekedam 3/1997). WWW.DesertUSA.Com provided information regarding the halobacteria.

[24] There are several other potentially invasive species to watch for including Giant Reed (*Arundo*), Russian Olive (*Elaeagmus*), and Tree of Heaven (*Ailanthus*).

[25] See Appendix B.

[26] Per conversations held with Mike Prather 1/4/2005 and Paul Lamos 1/6/2005 in Lone Pine.

[27] From the Soil Survey Map Owens Dust Control Program, CH2M Hill prepared for the DWP December 15th, 2000 (unpublished).

Western shore of Owens Lake between Cotton Wood Point and Bartlett Points are a string of old mining sites with a variety of dead-tech fragments and traces of mining activities; and on the Eastern shore, adjacent to Keeler and Swansea, are similarly interesting sites for their cultural history. The dedication plaque and pull-off from highway 136 near Swansea, has some of the more dramatic vistas, while numerous sites along 395 have potential for scenic overlooks and trailheads.

PROGRAM

The core of the project is the development of a deployable multi-use infrastructural system to re-vegetate the Owens Lake Playa. The primary phase includes the construction of access roads and water collection reservoirs. The second phase is the colonialzation of the playa surface with a variety of plant communities that are to be initially sustained through irrigation from the reservoirs. The final phase is the inhabitation of the playa with facilities for the orientation, survival and enhancement of the visitors. Independently of these managed strategies is the anticipated covering of a portion of the playa through natural debris flows that are to be directed to cover the greatest possible area. As a rural infrastructure, the capacity of all services is the limiting factor that prevents uncontrolled development. The availability of potable water is the key constraint, if land use restrictions are lifted, the preservation of the rural character can be sustained through limiting water availability.

Public access to the Owens Lake Playa was identified by many of the residents of Owens Lake Region as an idea they had not considered; the lake is perceived as a dusty, hot place with limited value[28]. Once, the playa was a prime hunting area and an off-road vehicle playground; since the start of construction for the Dust Mitigation Project, public access has been severely limited (like most construction sites). With the projected completion of major construction on the playa in 2006, there has been no work by the LADWP or any of the other parties involved with the Owens Lake in this regard to date. The Audubon Society has published a map of the *Eastern Sierra Birding Trail* with several sites on Owens Lake identified as an *Important Bird Area*. People will come to the lake and they will get stuck in the mud if nothing else is done. The rebirth of the Owens Lake as a tourist destination has other positive repercussions for the economy of the entire Valley, that include greater revenue, longer stays, and wider awareness of the region.[29] The primary programming for human inhabitation of the Playa covers a few topics: survival, orientation, and enhancement. All conceivable activities can fit within these.

Within the bureaucratic limits and zoning of the site,[30] there are a few loopholes that

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[28] From conversations held in Lone Pine January 5th to January 7th, 2005

[29] Ibid, and conversations with Wayne Bamossy of the DWP 1/5/2005, and Richard Cervantes, Inyo County Supervisor 1/7/2005- see Appendix A.

[30] The lake is "owned" by the state of California, though many federal and state agencies control nearby land or have jurisdiction for aspects of the site including: BLM, Bureau of Indian Affairs, Bureau of Reclamation, National Forest Service, National Park Service, and US Fish and Wildlife. The Great Basin Unified Air Pollution Control District includes the Counties of Alpine, Mono and Inyo. The California Department of Fish and Game, the CA Lands Commission, the University of California, Inyo County, local towns and the City of Los Angeles have a patchwork of control over the perimeter of the lake; private lands are few and far between but include corporate interests for minerals and water rights (Anhueser-Bush, US Borax, and Crystal Geyser Water). The Audubon Society, the Sierra Club, and the Owens Valley Committee are some of the NGOs that have

could allow temporary occupation and recreational uses of the Valley floor. Permanent inhabitation requires either zoning variances or specific legislation. The proposed inhabitation of the protected watershed of the Los Angeles Aqueduct is an act of subversion and a long overdue activation of place. The mitigation process needs to be expanded from only dealing with the environmental impact of dust, into the economic, cultural and ecological realms of the Owens Valley as well. The creation of an ecologically focused regional tourist destination is one model for generating the missing cultural, ecological, and economic benefits. By centering the experience toward the lake and the interpretation of the Aqueduct, two under-utilized resources can be harnessed.

The partitioning the Owens Lakebed[31] will create an expanded habitat by segregating the inflowing fresh water from the high salinity brine and increasing the length of the productive littoral zone. The designed shoreline will provide a wider variety and area of habitats then currently exist, through the intentional variations of shore slopes, thus providing significantly more ecotones. The tectonic strategies to create the desired water depth include excavating a deeper basin and the raising of a levee system above grade. A water column depth of approximately 10 meters (30 feet) will match the pre-1913 level; this depth also creates diverse aquatic strata for benefit of fish and plants and stabilizes water temperature. By decreasing the water surface area, evaporation loses will be proportionately decreased and the salinity levels will be stabilize. Addressing the annual variations of water flow requires a transformative and adaptive system. The strategy of partitioning also opens up the central portion of the playa to the public as the dikes provide a stabilized surface onto the lakebed.

The development of the inhabitable terrain requires some basic elements. Providing access and connections to the regional network of road (as most people will be driving) requires a system of compacted surfaces and paths. Site development requires either utility connections or the generation of resources on site for sanitation, power, and drinking water. The experience of the lake, set parameters for pedestrian paths, jetties, observation towers, bridges, docks and sitting places that can be integrated into the levees for the lake partitioning. Shade is crucial for the human tolerance of the heat of the Owens Valley summer; shelter is required for the cooler nights, winter months and the infrequent precipitation. The interpretation of the Aqueduct sets up the criteria for more paths and a series of informational exhibits. More complex functions, like food services, stores, and overnight accommodations will be evaluated, and implemented if deemed feasible.

Owens Valley is a tourist destination.[32] These travelers are composed of several idiosyncratic and nomadic groups that will engage the mitigated lake in distinct ways. The widest traveled are the foreign tourists (mostly German, Japanese, French and Canadian) seeing the sights of America, with Death Valley and Mount Whitney as frequent goals. Fishermen are drawn to the amply stocked lakes and streams of the

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lobbied for the environmental restoration of the Valley.

[31] Partitioning salt lakes for water management and ecological preservation is a strategy that has been implemented at the Great Salt Lake and proposed for the Salton Sea.

[32] I have seen an unsubstantiated number of 7 million travelers utilizing route 395 each year. CALTRANS, *US 395 Origination and Destination Study 2000*, does not clarify the total number of tourist traveling through the region.

region and served by the infrastructure of the Mount Whitney Fish Hatchery.[33] Mountaineers, hikers and backpackers seek the challenge of the highest peaks in the contiguous 48 states and the solitude of the backcountry. Naturalists and the curious visit the unique Bristle Cone Pine forest in the Inyo-White Mountains to be humbled by their age. Skiers pass through to Mammoth Mountain in the wintertime in search of snow. Sailplanes and hang-gliders utilize the ample and predictable updrafts and aerial mountain waves. Birdwatchers flock to the migratory feeding grounds of the wetlands along Owens River and in the remnant of Owens Lake, along with watching the soaring raptors on the Valley's updrafts year-round. Of these groups, only the birders are drawn specifically to the lake. There is a common thread between these visitors: that they are seeking a source of inspiration and challenge as a respite from urban life; the rural geographic extremes of the Owens Valley serve this vital societal role for both regional and global tourists.

The program for public access onto the playa includes **Extensive Infrastructure**:

- Circulation (trails, paths, roads, tunnels, bridges, parking) with links to the circumference highways.
- Signs to inform, titillate, and intrigue visitors into detouring through the lakebed or to stop and engage the site.
- Water collection, containment and re-distribution, including dams, swales, pumps and pipes.
- Debris flow diversion structures and channels.
- Irrigation and plant propagation mechanisms.

The **Intensive Occupation** of the site requires:

- Energy generation (solar cells, wind turbines, geothermal, fermentation, hydroelectric, biomass, and galvanic cells).
- Energy distribution (electricity, and fossil fuels) & storage.
- Potable water (wells, pipes, solar stills, purification).
- Sanitation (sewers, septic tanks/fields, wetland treatment units).
- Communication (telephone/data lines, wireless/cell/radio antennas).
- Microclimate modification (shade, evaporation/misters, air circulation, hydrothermal, and other heat sources).
- & more.

An **Orientation Center** for bird watching/playa research. Suggested site: near Dirty Socks Spring or between Keeler and Swansea. Requires about 24,000 to 35,000 sq. feet of interior space and should be constructed with as much "green" technology and materiality (wind, solar, geothermal power; high thermal mass, daylighting, water recycling) and be sustainable off grid. The functions include:

- Exhibit space (interactive pools/greenhouses, gallery space)
- Theatre
- Class rooms
- Café/store/restrooms/ commercial kitchen
- Observation galleries and towers
- Multi-use community room

[33] This fish stocking and the artificial fluctuation of water levels has pushed many of the indigenous species towards extinction.

- Board room/conference room
- Laboratories
- Media center/computer lab
- Offices for staff and researchers
- Dormitory for researchers (up to 10 private rooms & communal bunks)
- Kitchen
- Library & herbarium
- Halobacteria growth pods
- Aviary and condor breeding facility
- Bird rescue wing (plants, animals, geology)
- Systems (power generation, water purification/pumping, HVAC, trash)

Operations Center for DWP with public relations, exhibits, and classrooms. (The DWP is currently planning to build a permanent Operations Facility about 3 miles south of Keeler). Currently in Keeler there are 6 mobile offices (12x60' ea) and several utility sheds for the construction administration and operations. Offices for the operations staff (4-8 people) from DWP should be linked together; while Keeler Community Service District, and GBUAPCD need closed offices. Integrated with these complexes is the rural infrastructure for water purification (solar stills, 20,000 liter/day and up to 2 weeks storage), water treatment wetlands, and power generation (as supplemental to the power grid).

Survival kiosks are to be deployed out on the playa, adjacent to trails and situated for scenic purposes. Primary functions include potable water storage and generation (100 liter/day, one week capacity), sanitation, and shelter. Secondary uses include an observation deck and picnic areas.

Multi-use trails along the existing railroad grades (including replacing the bridges that don't exist any more at the arroyos) and across the playa as integrated into the infrastructure.

Enhancements to the trails include:

- Equestrian support, hitching posts, stables, paddocks, watering trough (can serve cattle and wildlife).
- Bicycle rental kiosks.
- Café/restaurant (near Owens River, Keeler, & Olancha).
- Canoe rental/ fishing outfitter (at Owens River).
- Motocross /OHV zone.
- Hang gliding landing/recovery zone.
- Barbeque and picnic areas
- Boardwalks
- Primitive camping
- Hunting blinds

'Loop trail' from the existing interagency visitors center between the lake and the aqueduct (ADA accessible).

Turnouts/scenic overlooks along the highways and connected to the trails.

Camping/RV facility (enhancement)

- Office/store/café

- Swimming pool is traditional

Environmental constraints/limits for structures:

- Seismic zone (requires tie downs, base isolation, shearwalls, and other structural solutions)
- High winds (similar to seismic solutions, additional lateral strength and wind breaks)
- High heat (overhangs and shade structures, can be combined with wind breaks; heat pump/geothermal solution)
- Flooding (raise floor above water level or create waterproof 'hull')
- Shallow water table (engineer footings for this, no basement, waterproof utility vaults with pumps if required)
- Highly corrosive/alkaline (galvanic protection or use inert materials)
- Dust/sand storms (hermetic seals, air filters or surface/wind modification strategy)

PHASING

Phasing strategies are graphically explored and include serial phasing, parallel phasing, and strategic phasing. Each has advantages and disadvantages that need to be further explored. The phases are:

Phase 1A: **Signs**

Fast deployment/low cost

Phase 1B: **Access**

Moderate deployment - months each type

Temporary construction access

Temporary/Permanent scenic drives

Temporary/Permanent multi-use trail

Temporary/Permanent walking path

Phase 1C: **Collection**

Moderate deployment- many months each

Collection dams

Height: high; width: wide; slope: 1:7 engineered; surface: rough, impervious

Diversion berms

Height: low; width: narrow; slope: steep; surface: smooth;

Swales channels

Depth: low; width: narrow; slope: steep; surface: smooth

Phase 2a: **Soil conditioning and preparation**

Mixed deployment: weeks, months, years

Alluvial soils:

Desalination/leaching: minor; amendments: organic mater- nurse crops; drainage: average to good

Playa clays:

Desalination/leaching: significant; Amendments: organic mater- nurse crops, sand; Drainage: poor;

Playa alluvial soils:

Desalination/leaching: significant; Amendments: organic mater- nurse crops, sand; Drainage: average;

Playa sands:

Desalination/leaching: minimal; Amendments: organic mater- nurse crops, clay; Drainage: high;

Phase 2b: **Growth**

Mixed deployment: weeks, months, years

Barley fields: 90 day growth cycle - nurse crop

Salt tolerant, high organic, moderate mesic, monoculture, seeds

Sage brush fields:

Slow growth- year round, long life span, xeric, symbiotic soil microbial/rhizome, low plant diversity, high insect & animal utilization, seeds, plugs, transplanting

Riparian corridors:

Fast growth/seasonal, mixed life span, mesic/high moisture, tall profile- high shade, high diversity, seeds, cuttings

Wetlands patches/edges:

Fast growth/seasonal, annuals & perennial, mesic/high moisture, moderate profile, high diversity, plugs, cuttings

Cottonwood

Slow to moderate growth, long life span, deep roots - access to ground water, tall profile- moderate shade, plugs, transplanting

Phase 3: **Facilities**

Survival

Water, shelter, sanitation + energy

Orientation

Map kiosk/parking; Classrooms/exhibits; Restrooms/café; Viewing stations

Enhancement

Equipment rental concessions; Food concessions; Guide/outfitters

Inhabitation

Short term: camping/motel/resort concessions

Long term: employee housing & local services

CASE STUDIES

Infrastructural Ruralism

Infrastructural urbanism as explored by Stan Alan[34], offers a glimpse into contemporary redefinition of metropolitan and suburban generation. Inverting and expanding this idea into an infrastructural ruralism is a test of the efficacy of this concept and a probe of the underlying issues of infrastructure. The augmentation of the rural land in America is typically done with an economic agenda, whether it is mining, farming, industrial, or exurban subdivision. Finding the projects and places that are intentionally intensifying their rural qualities are rare. Urban strategies that celebrate and amplify the metropolitan precept of density, diversity, activity, and culture are proliferating. If human traces are what separates the rural from wilderness, when does the density of activities transform a place into urban? The structures of the rural landscape are identical to those in urban regions; a road is still a road, utilities lines still hang from poles. However there is a diffuse distribution of these remnants that both can reassure the closeness to civilization and frustrate the search for the pristine place in the rural landscape.

We live in an environment saturated by such visible and hidden systems. The infrastructure of everyday life is a benign presence until it breaks. We rarely challenge the tradeoffs we make for every benefit gained: the environmental, economic, and social repercussions of modern conveniences. Cities could not exist without the prosthetics of highways, electric grids, communication satellites, landfills, oil pipelines, and more. In the countryside, the availability of communication has shifted the economic reach from the local to the global and relieved the cultural isolation of most corners of the world. As one of the oldest augmentations to our cities and towns, plumbing is one of the simplest to comprehend; yet, its origins in the irrigation ditches of the Indus Valley and elsewhere overshadow the modern sophistication and scale of the typical municipal water supply. Water is one of the essential ingredients for terrestrial life. Only with water, can we grow our food, sail around the planet and synthesis the chemicals that modern industry relies on. The simple desire of turning on a faucet or opening a bottle of spring water has the moral implications of diverting water from one ecosystem or depleting a finite fossil source to serve the human will. In the industrial age and in the parched American West, the ecological value of free flowing was ignored.

Most public infrastructure is created with a single purpose; a highway is rarely combined with new parkland, sewers with mass transit, or the electrical grid with public housing. The social context and benefits of infrastructure are multiplied beyond the narrowly engineered realm of bureaucracy. Swimming pools illustrates a few of the interconnections as they are connected to the infrastructure of drinking water, fire prevention, public health, parks and recreation, the ideals of childhood summertime, along with many other parts of culture. In the shift from the industrial economy, there is an emerging trend for reuse and adaptation of infrastructure and sites as they become obsolete, from entire airports abandoned after the cold war, to individual factory buildings being converted into apartments. This reprogramming needs not be limited to underutilized resources. There have been several attempts at the emergence of a new architecture based on multiplicities of use.

[34] Points + Lines, pp 48-57

Most Americans today, experience the hinterlands and spaces between our cities from the infrastructure enabled air-conditioned comfort of driving of the interstate highway. Travelers have limited contact with the local residents. Only at the interchangeable rest stops, gas stations and fast-food restaurants is there a chance to interact with local citizens; yet the diffuse presence of the American corporate ideal mitigates all most local affect. The local is relegated to the quaint past and the presence is regulated by the national franchises. Technocrats and highway engineers clone bridge after bridge across a state. The road emerges as less as an expression of place, but as the economic engine, that champions the efficiency of reproduction. As the highway enters the metropolitan fringes, the expansive sweep of the countryside and the verdant pleasures of the forest are channeled into the concrete barricade and sound walls that isolate the inhabitants of the dormitory subdivisions from the voyagers and commuters. The road is such an alienating experience that it must be hidden from sight, and excised from the private realm[35].

The visible expression of infrastructure is integral to the experience of small towns. The water tower, grain elevator or smoke stack are visual indicators of habitation from afar, of the human presence that most of us cherish. The farmhouse with its aggregation of barns, silos, paddocks, and rusting combines is a concentration of forces of production and extraction - and tied into a global distribution network and commodities market- ultimately supporting the urban inhabitant. While on the strip malls of Main Street the vernacular blocks of stores and showrooms, the connections to the commodities markets, the loading dock, is often hidden around back. The omnipresent sign and billboard become a semiotic infrastructure that never seems to coalesce into a recognizable place distinct from the clones of the national brand. The infrastructure of Main Street is often an afterthought of tangled transmission lines, painted stripes on the road, and the continual construction required to accommodate the boom times. Does the presence of Main Street represent the triumph of infrastructure or just the expression of the dream of commerce? Once escaped from the exurban interface, what is the heart of the rural region? Is it open space, the few inhabitants, or the visitor from the city appreciating the openness around them?

Where settlement is sparse and dispersed across the region for agricultural, mineral extraction, industrial purposes, and undeveloped areas; the small clusters of amenities that occur in the towns have a greater significance then similar resources have in urban areas. The geographic distribution of towns reflects the fertility of the land and the range of travel possible in a convenient time. As both speed of travel increases and populations dwindle due to the increased mechanization of rural places, the spacing of towns can increase. Where urban infrastructuralism is striving to establish systems for greater density and complexity of the urban fabric, rural infrastructuralism needs to address decreasing density and the simplification of the territory.

The present conditions in the Owens valley today are directly tied to emergence and suppression of critical infrastructure. The presence of the Los Angeles Aqueduct has preserved (or even reverted) the openness of the valley. The lack of a year-round east-west road across the Sierra Nevada Mountains between Bakersfield and Lake Tahoe leaves a 150 miles gap that has limited the economic pressures and development

[35] There are a few rare cities where the highway experience is part of the local identity and public experience, the best example is Los Angeles as the zenith of the car culture.

potential for Inyo County. This poses a question for Infrastructural Ruralism - is it the existence of infrastructure or the lack of infrastructure that holds the greatest potential to generate rural conditions. The answer seems to be somewhere in the middle where a thin and non-rugged infrastructure sustains rural economic productivity, but not urban development. Water is key to the development of a large population- so the natural or artificial scarcity is one attribute that can preserve a rural or wilderness condition. Transportation is the second variable. The cities of the American manifest destiny era either were developed adjacent to major transportation networks (rivers, harbors, canals, railroads, roads) or resources such as minerals (mining created funds to import the life sustaining water and sundries). With the shift into an idea-based economy and the utopian movements of the 1960's, the trend back to the land has expanded the locations of urban economic activities into the far hinterlands, but only to sites that had sufficient water resources to sustain a population.

The Los Angeles River- the cause and effect

Los Angeles has historically relied on irrigation ditches to provide water for its residents and for agriculture. The *Zanja Madre* (mother ditch) diverted water from the Los Angeles River in the Elysian valley to the Mexican residents of the Alta California city. By the late 19th century, the network and local population had expanded to the point of overdrawing the resources of the river and the local aquifer. Looking north to the Owens Valley was a technological leap of faith and a cultural milestone for Los Angeles, allowing the modern metropolis to emerge by providing ten times the water required by the population. Accompanying the construction of the Aqueduct is the noir stench of corruption and greed as the darker legacy of the Aqueduct. Resolving the issues of compensation for past injustices and environmental damage of the Owens Valley has only recently been brought up.

The aqueduct is the über river of Los Angeles, expanding the watershed and hinterlands 250 miles north to the eastern Sierra Nevada Mountains and Mono Lake.[36] As part of the political maneuvering to finance the original construction, the city of LA expanded its borders by annexing the San Fernando Valley and claiming most of the unincorporated area of the basin. As a result of purchasing the water rights from the Owens Valley ranchers, the Los Angeles Department of Water and Power became the 3rd largest landholder in the California after the State and Federal government.[37] Efforts to tame the flood prone Los Angeles River have resulted in a concrete lined ditch through densely populated neighborhoods. The Aqueduct runs through minimally settled areas, yet provides two of the required elements for the modern city: electricity and water.[38]

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[36] The Los Angeles Aqueduct flows by gravity through a system of canals, siphons, tunnels and reservoirs. As a byproduct it generates significant quantities of electricity through the 3000' drop down to the San Fernando Valley terminus and added the word 'Power' to the name of the LADWP.

[37] So, the Owens Valley became a colonized territory to be exploited without representation until recently. LADWP owns 314,000 acres in the Owens Valley.

[38] Two of the largest corporate users of water in Los Angeles also own water rights in Owens Valley. The Anheuser-Busch brewery in Van Nuys bought the Cabin Bar Ranch in Cartago for the ground water, and then brokered a deal with the LADWP to transport the water along the Aqueduct. Crystal Geyser bottled water is situated just north of Olancha and is the most popular bottled water in Los Angeles - but delivers by truck.

The transplant of water from the Owens Valley to 'The Valley' has spawned a loaded and derogatory cultural presence in the context of urbanization. Sprawl, vapid gum-snapping big-haired shop-a-holics, and a lack of identity are the stereotypes of the modern San Fernando Valley. If the water had been left in the Owens Valley, then Inyo County probably would have become the Eastern Sierra equivalent of the sprawling California exurbs of endless subdivisions for commuters to Las Vegas or Los Angeles.

Water Issues

There is urgency when engaging the flow of water in the American West due to a growing urban population's demand for water and the competition of agriculture. With the evidence of a climatic change providing a lower annual rainfall and the depletion of aquifers that augment the flow of the snow fed Owens River and other watersheds, the moratorium of development in the Owens Valley protects the watershed from competition for water rights. This also protects the dominance of Los Angeles. In the American west, water is rarely allowed to flow unharnessed through a pristine watershed and discharge untapped into the ocean or to evaporate from the terminal water bodies.[39] These issues have an architectural implication, beyond that of sustainability, as they connect with the core urbanity of Los Angles and its future prosperity and growth. Change is an issue that is often overlooked in architecture. The fleeting moment when a building is first built is its peak, and then rust and entropy set in. In contrast, the practice of Landscape Architecture actively seeks out and engages change: plants grow, land erodes and the site accumulates meanings and memories.

Saline Lake Partitioning

In 1903, a railroad causeway trestle was built across the Great Salt Lake in Utah. In 1953, the Southern Pacific Transport Company decided to replace the aging trestle with a rock-filled causeway, dividing the lake into two parts. The unintended and emergent changes that took place after the 1959 completion were caused by the reduction of water circulation between the north and south arm of the lake. The southern arm, with its greater inflow of water, maintains a higher water level, then the saltier north arm.[40] After the floods of 1987, a 200' breech through the causeways was constructed, allowing for the water levels to equalize, though the salinity level has remained different.

The Salton Sea is in California is primarily sustained by agricultural runoff that contains significant levels of pollution and salts.[41] As a terminal water body, evaporation has been increasing contaminant levels through evaporation, causing problems like fish-kills and poisoning birds. In 1998 the Salton Sea Authority, initiated the study of how to maintain the lake level, stabilize salinity, economic development, agricultural water Depository, with the goals of creating shallow water wetlands, healthy deepwater fishery, improve air

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[39] Where this happens, it is viewed as a wasting a precious resource, a point driven home in several books, including the seminal *Cadillac Desert*. It's not isolated to the developed world; China seems to be using dams as more of a political tool then generator of economic or social growth.

[40] http://www.ugs.state.ut.us/online/PI-39/pi39pg07.htm viewed on 12/02/04 &

http://edcwww.cr.usgs.gov/earthshots/slow/GreatSaltLake/GreatSaltLake

[41] http://www.sci.sdsu.edu/salton/SaltonSeaSymposiumJan2000.html from the summery of introduction presentation by Dr. Milton Friend.

quality through dust mitigation, and improve water quality.[42] Several ideas and schemes were proposed by the bidding firms- Tetra Tech was selected in 2002 to develop the complete project. Several environmental groups including the Pacific Institute, responded with alternative proposals that placed a greater emphasis on environmental issues then economics. Of the various schemes studied (see appendix), splitting the Sea into two water bodies, one saline and the other hyper-saline, has gained the greatest support and appears to be the most economical solution. Two alternative techniques being studied include a dam (able to support different water levels) and a barrier (only separating the water bodies). The most recent report describes the possibilities:

> The concepts developed for the mid-Sea dam [in early 2003] included a 1) "seismic dike" consisting of an compacted earthen embankment constructed in a dewatered area, 2) a steel sheet pile cellular dam with a compacted earth dam constructed when one side of the Sea became dry, and 3) a dumped fill dike with slurry wall cutoff…. Concepts developed for the [alternate Mid-sea] barrier include 1) a dumped fill barrier, 2) a rock dike with a dredged fill barrier, and 3) a "beach barrier" constructed of hydraulically placed fills.[43]

These reports on the Salton Sea project, offers the basic technical criteria and material that can be utilized as the basis for developing the dikes that contain the new reservoirs on Owens Lake.

[42] www.saltonsea.ca.gov on 12/2/04.

[43] URS, Preliminary In-Sea Geotechnical Investigation, 2004 p.10

FINAL PRODUCTS AND PROJECTED SCHEDULE

The two aspects of my thesis will play off each other: the lake rehabilitation process will resonate with the architectural occupation of the site. Preparation and collection of scientific criteria, relevant site information and theoretical texts will precede the initiation of the spring semester. Additional case studies and research will be pursued with the advice of the advisors. Please note that drawing sizes are not determined yet and will be based on the scale and scope of information being presented. (Sections to be up to 20' long, plans will be up to 6'x8' and other drawings to be sized per territory covered - as the lake is about 15 miles by 7 miles, a 1:10 000 scale plan would be about 8 feet by 3.5 feet).

An ongoing series of case studies of the residents and visitors will frame each week. For each group, their travels will be speculatively mapped and indexed to the site. A catalog of behaviors, needs, desires and habits will be compiled to supplement the development of the program. The continued exploration of *infrastructural ruralism* will tie the semester together and be the bridge between landscape and architecture.

Fall Semester:

Weekly meetings with Susan Snyder. and coordination with Anita Berrizbietia.

Architecture 790, taught by David Turnbull is providing a wide range of theoretical models and case studies along with critical feedback.

Architecture Thesis Group Meetings (4 time over semester)

Architecture Thesis Presentation: December 10th afternoon

January 3rd-10th: **Site Visit - Owens Valley**

4 days of photography in the Owens Valley. The focus will be the collection of material samples and anecdotes to serve as the foundation of my thesis. I am coordinating ~~flying,~~ driving, ~~boating,~~ & walking tours from the LADWP, Inyo County Water Department, US Borax, and Owens Valley Committee/Audubon Society. Primary goal is getting my hands dirty and feet wet, while soaking up the *genus loci*.

Spring Semester:

Week 1 (January 10th) I: Assimilation & Analysis

- Assimilation of the fieldwork and the preparation of base maps & materials: sections through the lake (1:1000), digitalization of topography and shape files.
- Analysis including the mapping of the watershed and tributaries of Los Angeles (plan & section), network diagrams that explore the temporal traces of historic flows and occupations (1:50k), relations between the current tourist infrastructure and the lake (1:20k) contrast between the historic settlement patterns and contemporary land use (1:20k & larger)
- Defining and cataloging the rural character of the Owens Valley; collage/ montage/diagrams (4 pieces at 24x36)
- Assemblage of the panoramic photographs and indexing of images taken during the visit (each panorama 12"x60")

  (This work to carry on through week 5)

Week 2 (January 17th) II: Hydrology

- Landscape: Analysis of partitioning feasibility with inflow water volumes for different volumetric data and surface areas scenarios (text & plan/section sketches @1:40 000)
- Architecture: parameters of infrastructure + anthropomorphic study of mitigation strategies- one or two sketches/montages per strategy (plan/sections @ 1:1200)
- Case Study: Infrastructure of dislocation, relocation and understanding + Foreign Tourists

Week 3 (January 24th) II: Hydrology

- Land: Matrix/grid of different configurations of partitioning and hybrids systems, (plan/sections @1:20 000) exploring new shoreline and channel/dam configurations (shrink to 1:80 000 for final presentation)
- Arch: exploring the parasitic potential of each configuration- where additional program can be sited, continued development of parameters for users (plan/section 1:600)
- Case Study: Infrastructure of observation and magnification + Birdwatchers

Week 4 (January 31st) III: Settlements

- Land: Landscape of settlements- map existing settled areas and temporal shifts (1:10 000)
- Arch: programmatic development- parts and areas of for potential habitation (1:500) and the determination of population and timeframes. Explore proximity and connections between programmatic zones diagram & sketch
- Case Study: Infrastructure of aquatic movements + Fishermen

Pin Up - review of settlement strategies (1 hour maximum)

Week 5 (February 7th) III: Settlements

- Land: temporal shifts across the lake study model (1:10 000) & the development of plan with flows and traces for the lake (1:5 000)
- Arch: study model or 3d model showing spatial sequence and connections
- Case Study: lightweight deployable structures + Hikers

Week 6 (February 14th) IV: Synthesis

- Land: Grading and sections for mitigation, start of riparian strategies (1:5 000)
- Arch: Anthropomorphic sketches, paths/trails – life support. Sections with inhabitation and articulation of edge details and material studies (1:100) & material strategies
- Case Study: Infrastructure of wind + Sailplaners/Hang-gliders

Week 7 (February 21st) IV: Synthesis

- Case Study: Infrastructure of cataloging and analysis + Naturalists
- Presentation preparation - project development and refinement

Architecture Mid-Review February 25th(full size and real time)

Week 8 (February 28th) IV: Synthesis & post mid-review revisions

Spring Break

Week 9 (March 14th) V: Detailed Hydrology

- Arch: Desert habitation strategies and studies, case studies (1:200)
- Land: Revision of mitigation plan as needed, strategic regional plan started.
- Case Study: Infrastructure of leisure + Retirees

Week 10 (March 21st) VI: detailed settlement

- Arch: environmental performance criteria defined. Sketches, plans, sections, axonometric diagrams for 4 typologies (1:100)
- Land: flora and fauna (1:1000)
- Case Study: Infrastructure of emergence + Ranchers

Week 11 (March 28th) VI: detailed settlement

- Arch: development – 3d modeling
- Land: physical site model initiated (TBD)
- Case Study: Infrastructure of extraction + Miners

Pin-Up

Weeks 12 VII: Case Study Wrap Up

- Collation and formatting of case studies either overlay all paths or separate into individual frames- scale to be determined.
- Implementation strategy diagrams to identify potential funding sources and alternate activation/use for the site as it develops.

Weeks 13/14 VIII: Detailed synthesis

- Final presentation preparation

Pre-Final Review (April 15th)

Landscape Final Review (April 25th)

&

Architecture Final Review (May 3rd)

The actual spring semester schedule was very different.