DECLAMATION

Embracing the Arid State in the Hetch Hetchy Water System

by
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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Architecture

Waterloo, Ontario, Canada, 2019

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Land reclamation is a form of land management, common in the American Southwest, that seeks to alter arid landscapes through a fabricated re-balancing of the hydrological ledger: taking water from one location, sometimes at great expense and through vast infrastructures, to irrigate a different landscape. San Francisco, looking to flourish in a dry climate, has been the beneficiary of one such reclamation project: the Hetch Hetchy Water System, an infrastructure of remarkable and often-overlooked means.

At one end of the system lies Yosemite National Park's Hetch Hetchy Valley, occupied for thousands of years by indigenous peoples, now dammed and flooded. At the other is the west edge of the San Francisco Peninsula, once covered in endless dunes and now home to Golden Gate Park, the city's parkland crown jewel. Between these two points, an immense and obscure infrastructure carves gentle lines through thirsty almond groves on its way out to the coast, and the necessity of these decisions go unquestioned.

Unfortunately, reclamation may prove to be an inflexible basis for settlement, as climate change begins to manifest signs of stress within the infrastructural system. Meanwhile, contemporary discourse around the future of this system fundamentally fails to question the historic context behind its initial development. Investigating the Hetch Hetchy Water System's history provides an opportunity to question the future of the system, and the inherent assumptions behind the reclamationist struggle against climate, ecology, and history that justified the project in the first place. This thesis thus seeks to interrogate and subvert the dominant condition of land reclamation in California in the context of changing climatic and political conditions.

The extent of the Hetch Hetchy Water System is mapped and explored, and three sites within the larger system –Golden Gate Park, the Central Valley's San Joaquin Pipelines and the Hetch Hetchy Reservoir – are identified. Following a thorough overview of the environmental and political forces surrounding these sites – including reflections on a series of overlooked proposals from Frederick Law Olmsted, Mary Hunter Austin and John Muir that, in opposing reclamation, ended up on the wrong side of history – this thesis will propose a series of landscapes that seek to reintegrate presently-subsumed ecological forces – sand dunes, seasonal flooding, and Native American land management practices – rather than rejecting them. Drawing on the overlooked alternatives to San Francisco's reclamation project, these landscapes seek neither to return to a long-lost pristine nature nor to support a purely manmade ecology. Instead, they look to balance the needs and desire of humans against the potential for native ecologies to function resiliently, with the goal of creating enriching and generous environments that sustain us all through the challenging futures to come.

Acknowledgements

First and foremost, I would like to thank my supervisor Jane Hutton for her patience working through this process with me, and for always being willing to seek the balance between being flexible and pushing me out of my comfort zone. It has been a long and, at time, frustrating process, and I have endlessly appreciated Jane's consistency, when I myself have not been entirely level. I would also like to thank Rick Andrighetti, whose consistent excitement and engagement for the narratives and designs within the thesis has been a motivator since we first started meeting. Finally, I would like to thank Val Rynnimeri and Brendan Stewart for their willingness to engage with the thesis on such a short timeline, and their excellent feedback during the defense.

In addition, I would like to thank Louis-Pierre Bélec, as his unyielding support was essential to the completion of this thesis; Samuel Ganton, for his wholehearted interest in and engagement with my research early on, which gave me an excellent and essential conversation partner; and Allison Suffel, who I could always count on for reassurances and cute dog pictures when I needed them the most.

To the archival staff at the San Francisco Public Library, the California Historical Society, and the Yosemite Archives: thank you for your patience.

Finally, I would like to acknowledge my family for their ongoing support throughout my ever-changing array of timelines and deadlines: thank you for always believing I would finish.

Dedication

This thesis is dedicated to my mother, Beverley. Without her joining me for my research trip in 2017, I have no idea what this book would be today. Her willingness to take some risks for my research meant we made it to Moccasin, Cherry Lake, and Hetch Hetchy, none of which I could have reached alone. Her refusal to take other risks probably saved me from being eaten by a bear.

Most importantly: during the long drives up and down the Sierras, she taught me that the ideas I was forming could make sense outside of my head. Thanks, Mom.

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1.

introduction

California's worst drought in history was barely half a year old when, midway through a summer internship in San Francisco, I realized Golden Gate Park was not what it appeared to be.

A coworker had suggested visiting various hills within city limits, and I was digging through Dave Schweisguth's *How Many Hills Are There In San Francisco?*, planning trips and plotting maps when I read the following, emphasis mine:

> Details of Golden Gate Park have often been neglected by San Francisco geographers.[...] *Many of the undulations of its underlying sand dunes have been preserved*, both hills and depressions, sometimes seeming such a jumble of topography that individual features are hard to discern.[1]

Golden Gate Park is the city's largest urban park, both a little bit bigger and a little bit younger than New York's Central Park. It cascades from the center axis of the city through the between the Richmond and Sunset Districts, forest and lawn, forest and lake, down to the ocean.

In all the times I had visited the park, I had never suspected it was once wind-swept dunes. Suddenly, I could see the evidence throughout the landscape: the strange patch of low-lying trees in the northeast corner, the prevalence of Australian blue gum eucalyptus throughout, the sandy soils exposed by trails running through the western groves and grasslands, the tortured shrubs fronting the park at the edge of Ocean Beach. Most obvious, however, was the water; nearly any time of the day, I remember encountering sprinklers watering lawns, sprinklers watering bushes, sprinklers spraying directly into forests.

Golden Gate Park is a landscape saved from waste by water - water the landscape did not have before, water from somewhere else.

This realization begat a line of inquiry reaching beyond the bounds of the park itself and resonating with the foundational ideas of settlement in the American Southwest. Golden Gate Park is an early marker of the promise and problem of reclamation: what we do to land when we don't know how to live with it. Golden Gate Park had been *reclaimed.* To understand reclamation in this sense of the word, we'd best begin with one of its earliest opponents. During the late 1870s, John Wesley Powell, a civil war veteran, geologist, and the first to explore the Colorado River, was head of the *Geographical and Geological Survey* devoted to the careful scientific examination of the western United States. [2]

After the Civil War, the United States was preoccupied with the land west of the hundredth meridian representing the last reaches of exploration for the American people. The problem was the region's aridity: it was unclear how it could be settled when the regions receive, on average, less than the twenty inches of rain a year required for proper agriculture. [3] Nevertheless, manifest destiny would not be denied: America wished to see the deserts bloom, to reclaim the wasted, useless lands from the wild and to establish their Garden

Figure 1.1
John Wesley Powell's *Arid Regions of the United States Showing Drainage Districts.*

of the World.[4]

It was within this context that Powell issued his *Report on the Lands of the Arid Region of the United States* in 1878. He had come to a simple, but powerful conclusion: there was not enough water to fully irrigate the entire western region. Powell drew this conclusion by paying attention to the ecologies, geologies, and the climate of the region, all of which he knew better than anyone else. He was merely recognizing and respecting the limitations of the landscapes as they existed, and working within them.

For instance: rejecting the Homestead Act's relentless imposition of identical, orthographic 160-acre homesteads over the landscape, Powell rec-

ognized that different conditions require different responses, and so suggested 2,560 acres of arid land, divided with regard to topography could ensure every homesteader the capacity for grazing.[5] Anything less would almost certainly fail, or otherwise consolidate water rights to a select few lots.

By 1890 Powell had drawn a map of the arid regions which depicted the land as organized by existing drainage basins. Watersheds, he insisted, should be the primary manner of administrative organization rather than the imposed grid or historic state lines.[6] It is a remarkable, empirically-minded proposal. It was also immensely unpopular; Wallace Stegner asserts that in publishing his report Powell had issued "a denial of almost every cherished fantasy and myth associated with the Westward migration."[7] Some seized on his tentative proposals to irrigate certain landscapes with small, communal infrastructure projects, only strip them of any co-operative undertones to advocate for the vast irrigation and infrastructure that would eventually come to pass in the region. Otherwise, his ideas were too foreign, too irregular, too communal. They required people, practices, policies, and government to fundamentally change; they did not change the landscape enough.

During the International Irrigation Congress in 1893, Powell found attendees discussing the large-scale irrigation of the entire region as though he had never published anything at all. In an impromptu speech, Powell angrily reminded the delegates that no matter what they built, there was not – and there would never be – enough water to irrigate the west. By ignoring facts and falling for ideologically-convenient narratives, they were ensuring that future governments would be trapped in perpetual conflict over water. Of their response, Stegner writes, "he told them, and they booed him."[8]

Powell was on the wrong side of history, for the reclamation age had already begun. By 1893, Golden Gate Park was well-established among the dunes of west San Francisco, irrigated with water from elsewhere. Over the next few decades the city would complete a grand infrastructural project to support its rapidly expanding garden in the desert: a vast project of reclamationist landscape management known as the Hetch Hetchy Water and Power System, which collects pristine glacial meltwater from a controversially dammed box canyon in Yosemite National Park on the other side of the state and pipes it over 250 kilometers, under a broken watershed, through endless fields of almonds, to flow out the faucets of the Bay Area.

This is reclamation: the grand human project of re-balancing of the hydrological ledger to our benefit. We wish for an unpleasant landscape to become pleasant, arable, livable; to "reclaim" the wasteland is to save it from its unproductivity. As early 20th century irrigation expert John Widtsoe put it:

"The destiny of man is to possess the whole earth; and the destiny of earth is to be subject to man. There can be no full conquest of the earth, and no real satisfaction to humanity, if large portions of the earth remain beyond his

highest control."

There are reasons to argue in favour of reclamation that go beyond a desire for domination, but the fact is that reclamation occurs when someone looks at a naturally occurring condition that is, for one reason or another, unfavourable to them, and then goes to great lengths to improve it. It is a rejection of existing conditions; a shared dream that maybe we don't live in the *Great American Desert*, and thus we do not have to change how we live in the landscape.

If only that reclamation could sustain us, after all.

It turns out Powell has the last laugh: in recent decades the limitations and failures of the reclamationist model in arid climates have become clear. For instance, the endlessly dammed Colorado River, which John Wesley Powell once explored, faces a very real nightmare condition because of faulty ideological research and climate change .where the basin states who occupy the watersheds may be unable to provide the quantities of water set out by the multi-state Colorado River Compact; where the rivers run low and dry; and where, eventually, the reservoirs run so near empty that the water drops to the lowest dam outflow, a state called *dead pool* where it becomes clear that our attempt at the management of nature has fundamentally failed.[9]

Consider the archaeological evidence of the multifarious ancient cities within the Fertile Crescent, societies which over and over developed highly sophisticated irrigation techniques, and which over and over again collapsed.[10] Or the Hohokam, who thrived on the site of what is now Phoenix, Arizona via a system of elaborate canals and irrigation systems until suddenly vanishing in the mid-15th century after thousands of years of continuous existence, which is increasingly linked to the effect of long-term drought on an irrigation system that had no capacity to deal with it. After all, if your dams are all empty, it does not matter how many you had to begin with.

Donald Worster describes this phenomenon, the fragility of the reclamation system, by first describing a forest, an entity that has "considerable regenerative properties... it can evolve, adapt, then come back from its degradation." Reclamation, on the other hand:

It is a technical stunt that, as the experience of other irrigation societies shows, cannot be indefinitely sustained. As the irrigation system approaches maximum efficiency, as rivers get moved around with more and more thorough, consummate skill, the system begins to grow increasingly vulnerable, subject to a thousand ills that eventually bring about its decline. Despite all efforts to save the system, it breaks down here, then there, then everywhere.[11]

The reclamation infrastructure system is a fragile one, and so too are all of the systems that have now come to rely on it. When there are no alternatives within a society beyond a reclamation state, the failure of reclamation means the failure of the society.

So, what of San Francisco, and it's system of reclamation? The Hetch

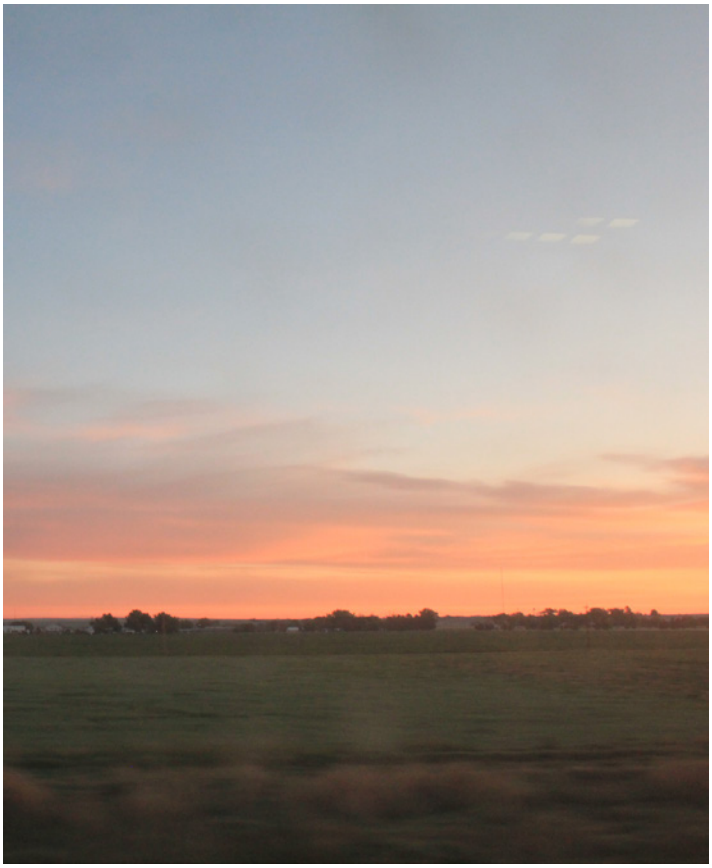


Figure 1.2
Somewhere between Nebraska and Colorado, just beyond the hundredth meridian, headed west.

Hetchy Water System is regarded by its proponents as an extremely stable water source, and that may be so.[12] Nonetheless, the most recent drought, barely begun when I was in San Francisco in 2012, and the deluge that followed the drought's end, as I was commencing work this thesis in 2017, have revealed the cracks in this system. And still, the water is collected at one end, and at the other it emerges from a sprinkler to sustain a forest floor. The problem, of course, is that we cannot yet imagine alternatives, which is by design: reclamation is a tool for maintaining a landscape status quo, creating conditions suited to our culture, rather than a culture suited to, inspired by, or otherwise occupying a space within limited, non-ideal conditions, no matter the cost.

Perhaps Golden Gate Park need not be constantly watered. Maybe the

Hetch Hetchy Reservoir is unnecessary. Possibly, we should plan for the end of the Central Valley's agricultural economy before it arrives. But we remain too invested in the reclamation state to imagine what else could be, and the reclamation state serves to assure us these questions need not be asked. Under the march of progress enabled by the reclamation state, any questioning inevitably puts you, like Powell, on the wrong side of history. And yet – Powell's ideas were fundamentally sensible. His proposal for the settlement of the region was radical and unfamiliar but would have prevented many of the issues that we now find ourselves encountering today in these arid landscapes; there are many such alternatives to be found throughout reclamation's history, careful considerations of the landscape that have long fallen by the wayside.

I thus propose a dissent from the reclamationist status quo. This is a *declamation:* an exploration of what San Francisco's reclaimed landscapes could have been, and what they might yet become in a world that increasingly requires post-reclamation thinking. My thesis investigates the histories of these landscapes, including the sensible proposals of those who, like Powell, ended up on the wrong side of history. Using these views of the as-yet-unreclaimed landscape as launching points for the reconsideration of reclamation and its consequences, the thesis proposes landscapes that embrace the ecological, geological, and climatological forces that act on them rather than reject them outright; landscapes in which the destiny of man is to be present and to take part rather than to retain them within our highest control. As with Powell's proposals, humanity may both change and be changed by the land we occupy.

In *Travelogue*, I explore the limits of the Hetch Hetchy Water System, establishing a region of study within the confines of the hydrological, legal and infrastructural territories of the Hetch Hetchy reclamation project through the study and analysis of physical and human geographic information. Three regions are identified within the overall system, including Golden Gate Park in San Francisco, the distribution systems and agricultural land use in the Bay Area and the Central Valley, and the large-scale infrastructures in the Sierra Nevada. These three sites, and the infrastructures they contain, are documented through maps, diagrams, and photography taken during a site visit in 2017.

Any Time but Now narrates the development of these regions' systems of reclamation through historic and archival research, identifying the forces that led to the landscape being altered and the nature of those alterations. Inspired by Powell's dissent, I identify and establish a parallel understanding of these landscapes, and their possibilities, via the writings and histories of figures whose questioning of reclamation was eventually rendered obsolete: *Frederick Law Olmsted*, whose forward-thinking Public Pleasure Grounds for San Francisco were ignored almost immediately; *Mary Hunter Austin*, whose warnings of water wars and writings on the occupation of arid landscapes were literary successes but failed to meaningfully influence land management; and *John*

Muir, who fought to preserve Hetch Hetchy Valley from being dammed. I then outline the increasingly plausible near-future scenarios through which San Francisco's reclamation system may come to be dismantled, rendering these ghosts' long-ignored words and warnings relevant again. The principles and questions they raised are identified and leveraged towards an alternative future for these landscapes.

The final section, *Landscape Fictions*, proposes the declamation of three sites within the previously outlined regions, in reaction to the projected failures of the infrastructure system. Underlying ecological forces are identified alongside the altered circumstances projected in the last chapter, and novel landscape relations are thereby proposed: Golden Gate Park is intentionally desertified, its lost dune systems re-established as a constantly shifting urban dunescape; the Central Valley aqueduct stitches together fragments of former farmland, radically altered by resurrecting long-suppressed natural and manufactured ecological forces; Hetch Hetchy Reservoir is drained and the valley re-grown through native land management practices, while the existing dam is leveraged as touristic infrastructure. These proposals radically redesign these landscapes considering the ecologies, forces, and climates that we currently work hard to suppress, highlighting the changing relationships we could share with the land we occupy.

ENDNOTES

1 Dave Schweisguth, "How Many Hills Are There In San Francisco?" *sfgazeteer.com*, accessed May 1, 2017, http://sfgazetteer.com/how-many-hills-in-san-francisco.html.
2 Wallace Stegner, *Beyond the Hundredth Meridian*, 1952, (London: Penguin Books, 1992), 202.
3 Stegner, *Hundredth Meridian*, 221.
4 Ibid., 212.
5 Ibid., 225-227.
6 Susan Schulten, "This 19th Century Map Could Have Transformed The West," *The New Republic*, published June 8, 2014, https://newrepublic.com/article/118026/john-wesley-powell-19th-century-maps-american-west.
7 Stegner, *Hundredth Meridian*, 212.
8 Ibid., 343.
9 James Lawrence Powell, *Dead Pool*, (Berkeley: University of California Press, 2008), 182.
10 Powell, *Dead Pool*, 28.
11 David Worster, *The Wealth of Nature: Environmental History and the Ecological Imagination*, (Oxford: Oxford University Press, 1994), 138.
12 Laura Tam, "Why We Need Hetch Hetchy More Than Ever," *SPUR*, published May 17, 2012, https://www.spur.org/news/2012-05-17/why-we-need-hetch-hetchy-more-ever.

2.

A travelogue of the landscapes
of the Hetch Hetchy Water System,
from the beginning to the end.

the water pilgrimage

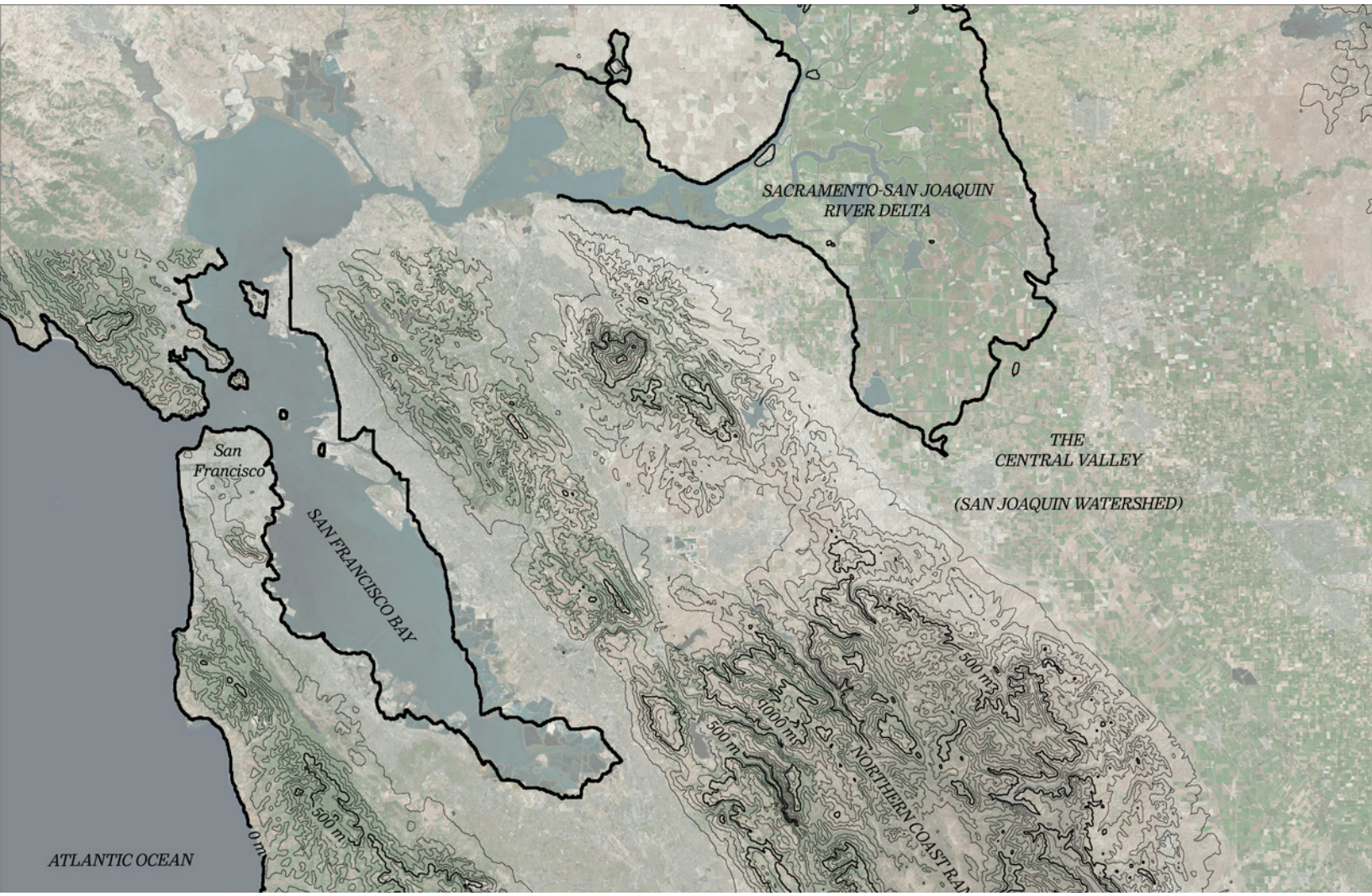
i.
Holism

We begin by identifying the territory of the Hetch Hetchy Water System: the land that it occupies, that it is influenced by and that it changes.

San Francisco obtains most of their city's water from a reservoir on the upper Tuolumne River, over 200 kilometers from the city, bridged by a vast series of infrastructures known as the Hetch Hetchy Water System. It is tempting to believe we can understand the system by looking at the infrastructure in isolation, but the acts of obtaining, transporting, and using this water all have significant impacts and consequences, from the edges of the initial watershed to the faucets at the end of the line. To begin to understand the effects of the Hetch Hetchy Water System, it is important to understand the broader territory of the Hetch Hetchy Water System: the land that influences or is influenced by, that is source for or destination of the reclamation project, as it currently exists.

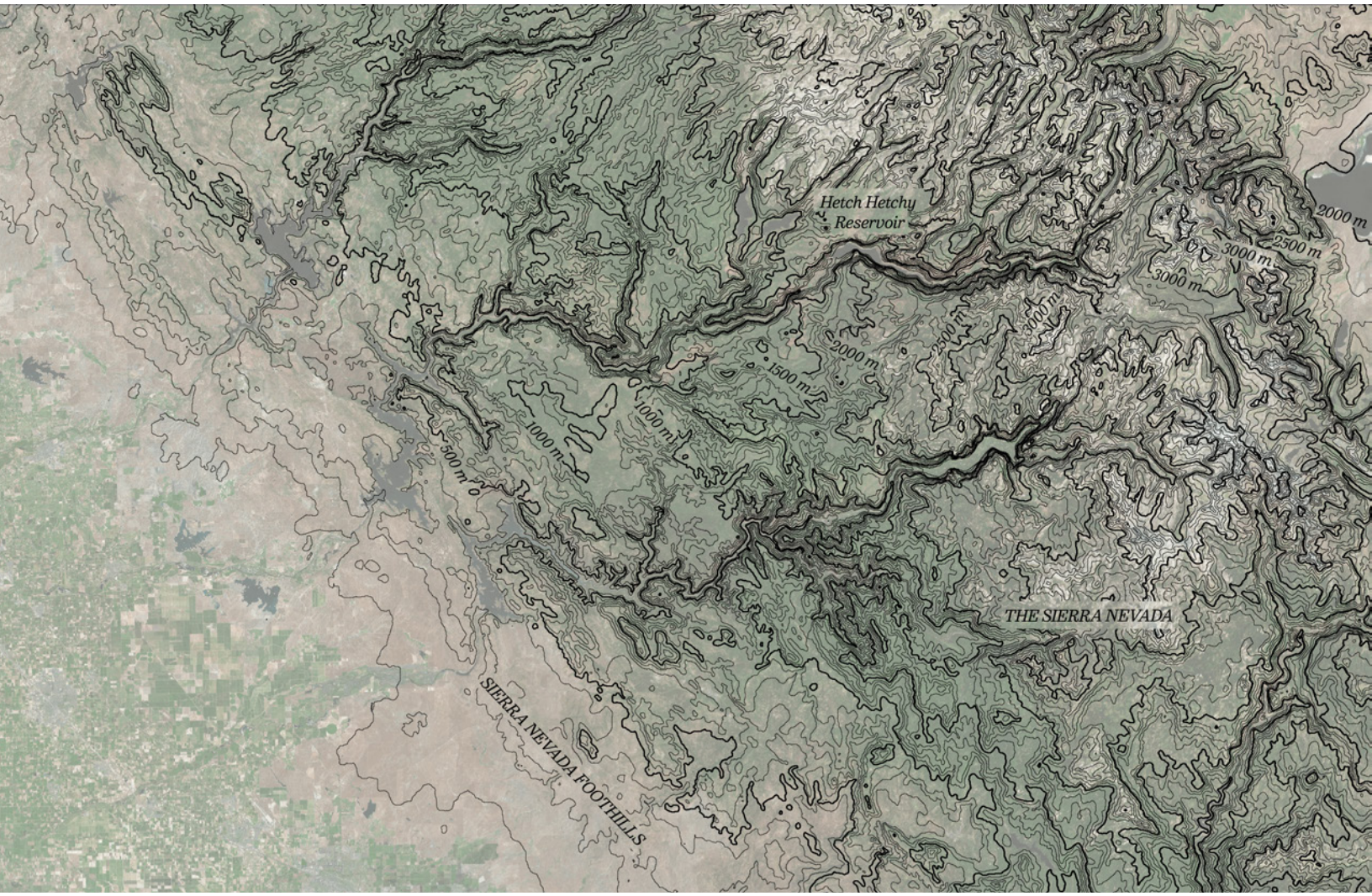
In order to provide the needed context for the sites to come, the following series of maps highlight the climactic, geographic, and infrastructural context that collectively shape and inform the territory and its essential qualities.

Figure 2.1
San Francisco and Hetch Hetchy Reservoir, outlined.

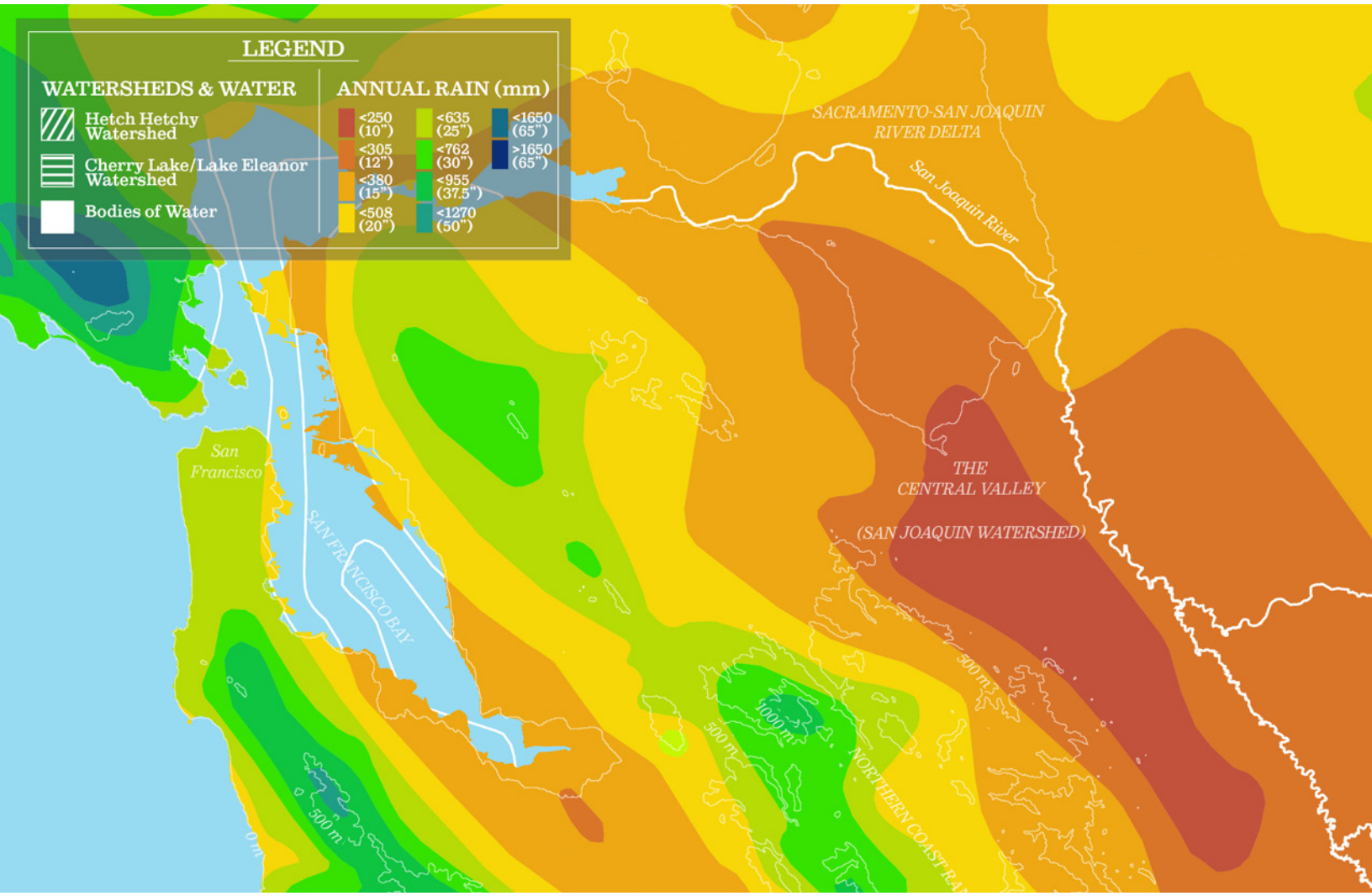


LANDFORMS AND PLACES
Figure 2.2
Satellite imagery and topography of the land crossed by the Hetch Hetchy System.

Through satellite imagery, the scale of the water project becomes clear. San Francisco is separated from Hetch Hetchy by San Francisco Bay, the Coast Range, the Central Valley, and the western slope of the Sierra Nevadas into Yosemite National Park; a remarkable series of landscapes to cross.



The topography underlines this difficulty. The Central Valley lies close to sea level; Hetch Hetchy Reservoir tops out at just under 1200 meters, just inside Yosemite. This is a long way to go for water.

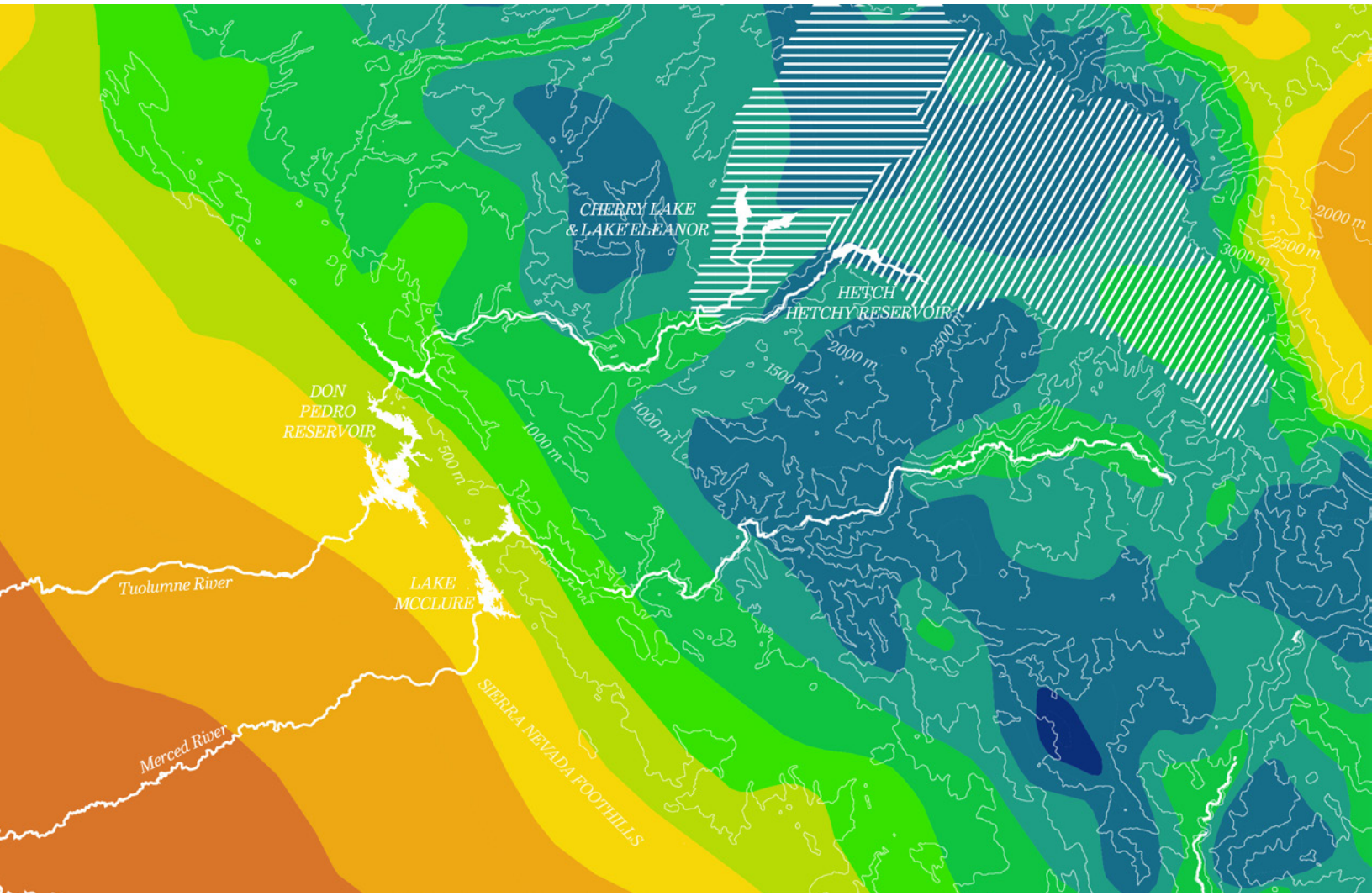


RAINFALL AND WATERBODIES

Figure 2.3

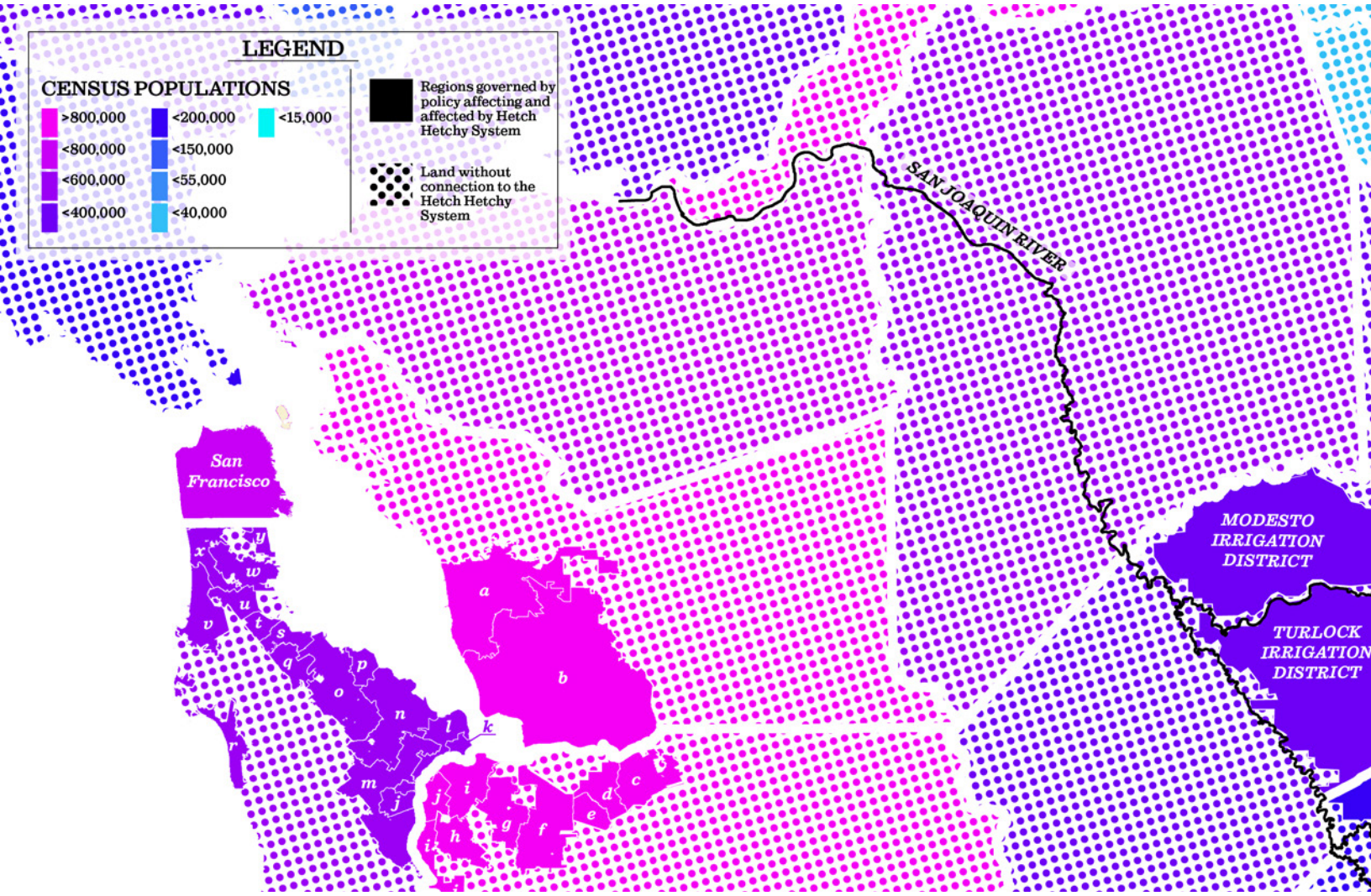
Site map depicting isohyets (rainfall contours,) major rivers, and the two significant watersheds of the Hetch Hetchy System.

When looking at rainfall, the rationale of the system becomes clearer. San Francisco receives under 25 inches of rain yearly, just on the border of what Powell would consider arable; though ven this precipitation is clustered from November to March, leaving the landscape dry the rest of the year.[1] The Central Valley is drier still, which is remarkable, considering it operates as a vast agricultural apparatus.



Meanwhile, the Sierras have significantly higher rates of annual precipitation, explaining the region's appeal for reclamation projects. Hetch Hetchy Reservoir's watershed, along with the watershed of the system's supplemental Cherry Lake and Lake Eleanor reservoirs, receive as much as three times the rain San Francisco does, across a significantly larger area.

The region drains into the ocean through two major rivers, the Tuolumne and the Merced, both of which contain reservoirs along their length through the foothills.

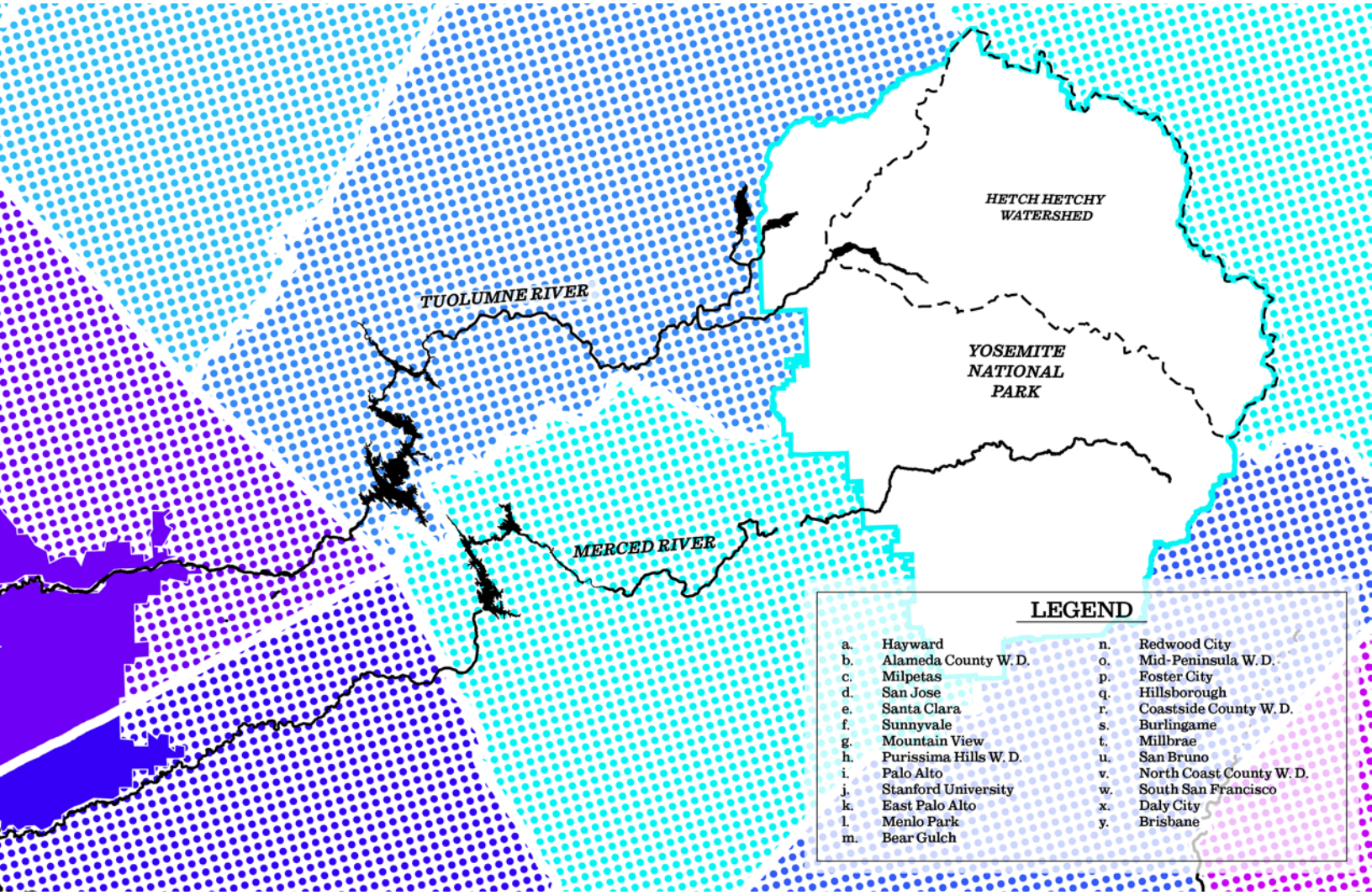


STAKEHOLDERS AND HUMAN GEOGRAPHY

Figure 2.4

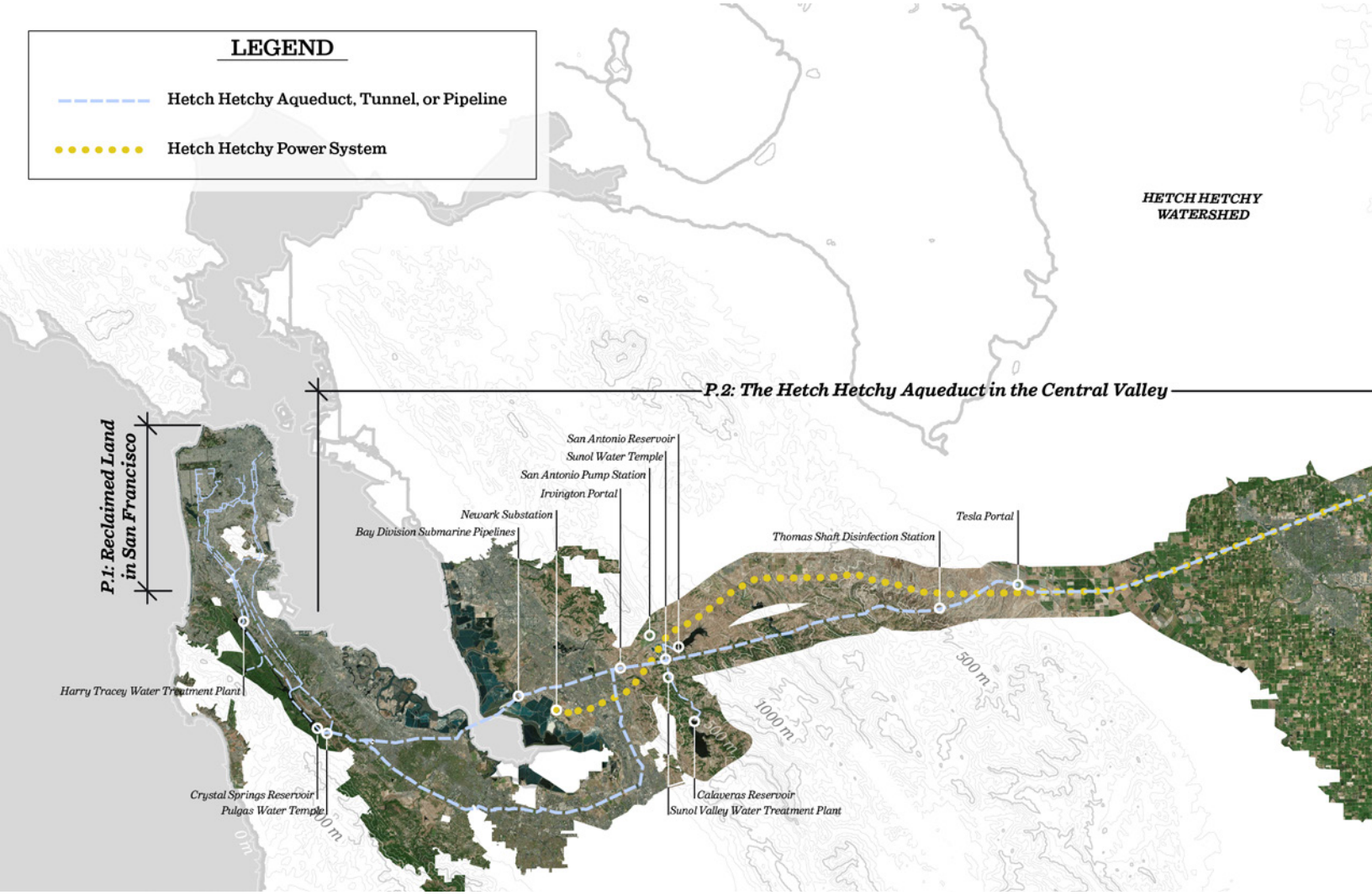
Site map depicting census districts, coloured by total population. Solid sites are regions with direct policy association with the Hetch Hetchy System, whether they purchase its water, source water from the same source, or, in the case of Yosemite, contain the source of water itself.

The populations of the Bay Area are revealing of the extent to which the water source, largely unchanged for nearly a century, has driven expansion and population throughout the region. Water from Hetch Hetchy is sold by the San Francisco Public Utilities Commission to municipalities throughout the southern reaches of the Bay Area.



Similarly significant is the irrigation district, a public body that manages collective irrigation projects. Two of these, the Modesto and Turlock Irrigation Districts, source water from the Tuolumne downstream from Hetch Hetchy while maintaining a senior water claim over San Francisco in the Don Pedro Reservoir.

Meanwhile, in Yosemite, the influence of the Hetch Hetchy System can be seen in the northern boundary of the National Park, which is shaped by the extents of the watershed itself.



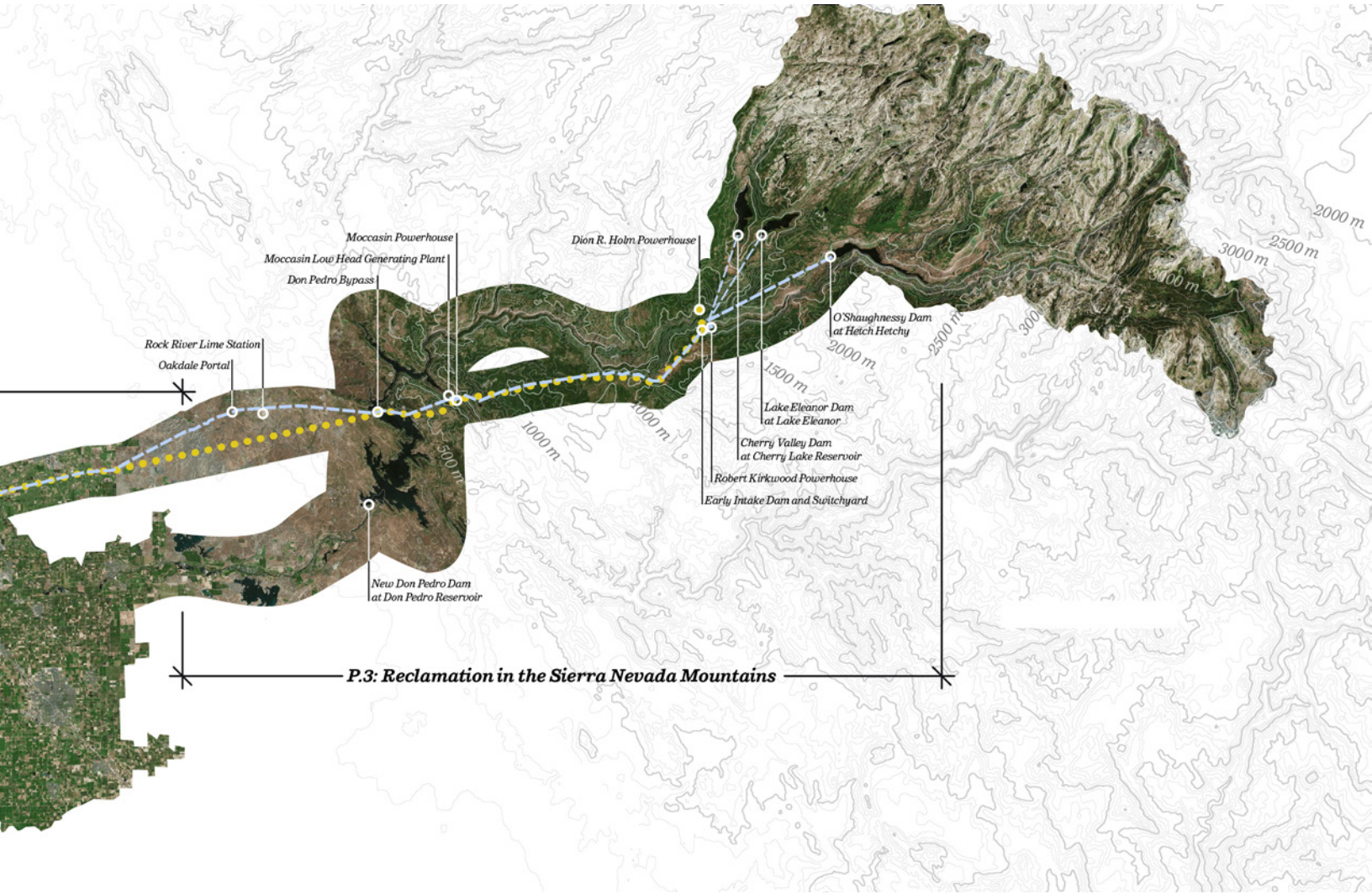
INFRASTRUCTURE AND THE HETCH HETCHY TERRITORY

Figure 2.5

The Hetch Hetchy Water System's infrastructural components, its associated terrain, and the three regions of the landscape overall.

Finally, the infrastructure of the Hetch Hetchy Water System is highlighted here, featuring the corridors carrying both water and power alongside conditions where the water is cascaded, collected, treated, de-treated, and eventually transmitted to local municipalities or San Francisco's own systems of storage.

Adding these infrastructural components to our collection of relevant wa-



tersheds, municipalities, and districts, we can readily encompass the broader territory of the Hetch Hetchy Water System. For the purposes of further investigation, we can subdivide this territory into the three regions described above, based on the different infrastructures, ecologies, and conditions located therein.

What follows is a set of three travelogues documenting a visit to each of these three regions during the summer of 2017. Photography is paired with site analyses to illuminate the experience of visiting these sites alongside the conditions of the infrastructure and the landscapes they create.

ii.
The End

San Francisco rests at the tip of a slim peninsula along the North Coast in California. It is surrounded on three sides by saltwater: San Francisco Bay to the east, the Pacific Ocean to the west, and the Golden Gate joining the two bodies of water to the north. The city is roughly 120 square kilometers of land, about 11 kilometers tall by 11 kilometers wide,[1] containing 884,000 people[2] - for reference, the island of Manhattan is roughly half that size and holds twice as many residents.[3]

The city is filled with signs of hydrological infrastructure, if you know where to look. The most obvious are the voids left in the city grid by urban reservoirs, some as large as an entire block, but there are far subtler clues. For instance, wide brick rings can be seen embedded in the pavement at intersections throughout the city, marking the locations of underground cisterns that supplement the San Francisco Fire Department's water supply.[4] Even better concealed is the Visitacion Valley Greenway, a 15 meter-wide linear park that runs through six blocks of the southern Visitacion Valley, which is built atop a San Francisco Public Utilities Commission right of way,[5] which I suspect routes water to the University Mound North Basin Reservoir.

In 2016, the Trust for Public Land calculated that 99% of San Francisco's residents lived within a ten-minute walk of a park. San Francisco is home to roughly 23 square kilometers of parkland, just under 20% of the city's total area; a further fifth of this parkland consists entirely of Golden Gate Park.[6]

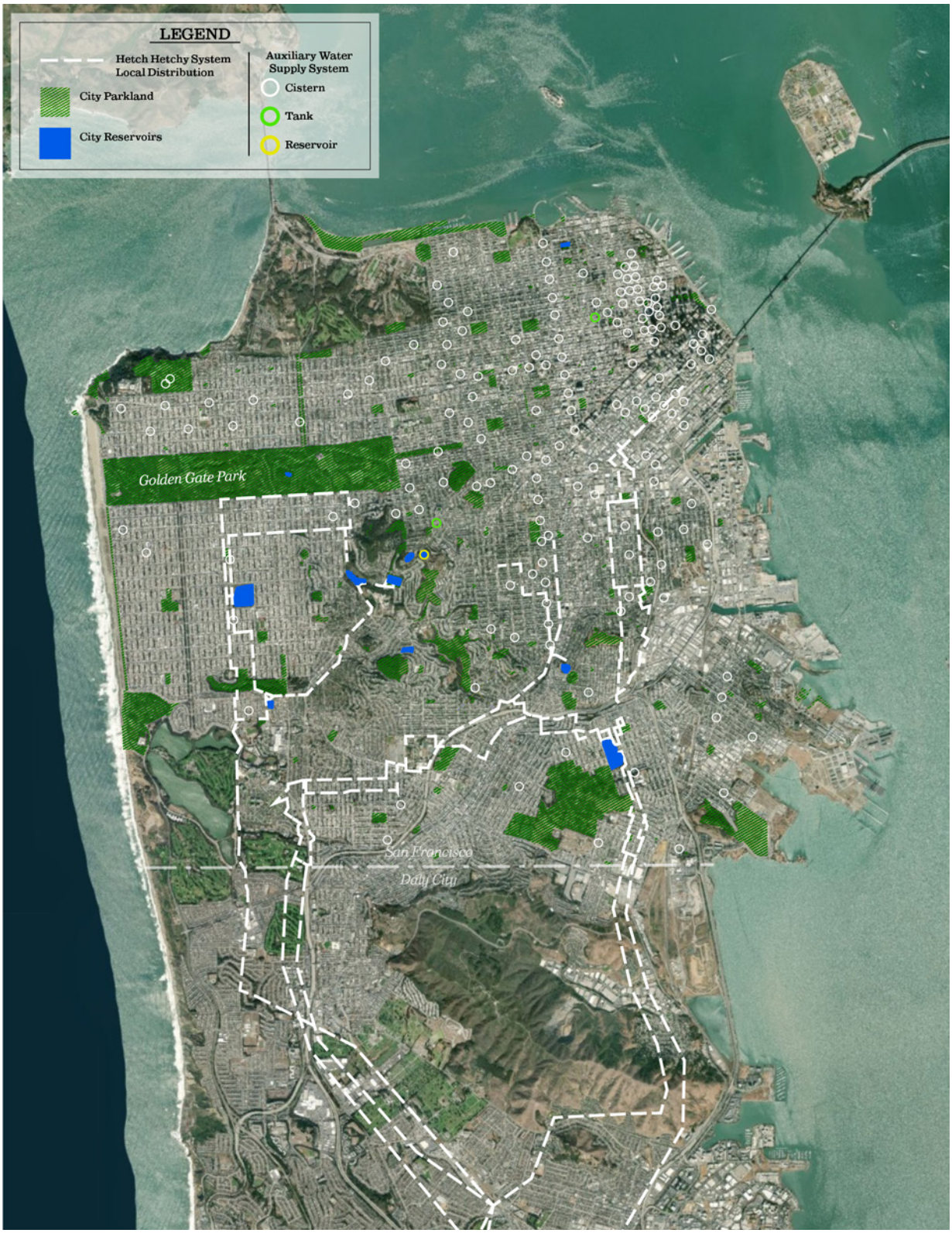


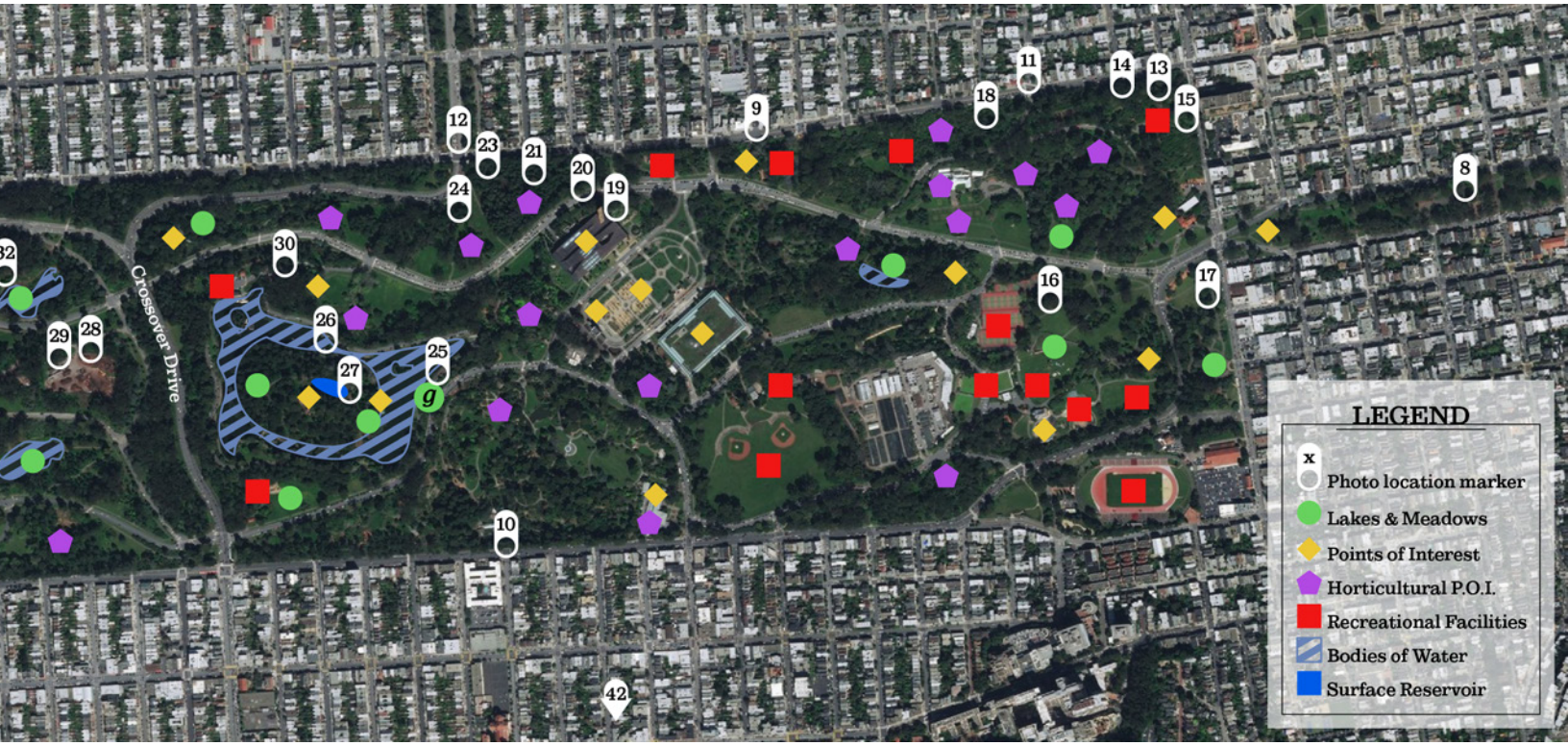
Figure 2.6
City of San Francisco, with Hetch Hetchy Distribution System, Auxiliary Water Supply System, Reservoirs, and Parkland highlighted.

Figure 2.7
Golden Gate Park with overlaid amenities and photograph locations.

Golden Gate Park is a rectangular park in the west end of the city, .8 kilometers wide and 4.8 kilometers deep, making its 4.1 square kilometer (1017 acre) area more than a hundred acres larger than New York City's Central Park. It is, according to Golden Gate Park itself, one of the most visited urban parks in the country, with 13 million visitors each year. [7]

The park begins a little west of the centre of the city, reaching its maximum elevation at Stow Lake before cascading down to Ocean Beach; it nevertheless lies nestled in a low, relatively flat region of the city's landscape, bounded by tall hills and gentle slopes in nearly all directions.

Amenities, attractions, and facilities within Golden Gate Park are readily sorted, on maps and signposts within the park, into four general categories – *Points of Interest*, *Horticultural Points of Interest*, *Lakes and Meadows*, and *Recreational Facilities* – which, when plotted onto a map of the park reveal patterns of dis-



tribution. The east end of the park carries more amenities than the west end, loosely separated by Stow Lake and Crossover Drive, and the types of amenities tend to differ, with the inland park containing most of the Points of Interest, and virtually all Horticultural Points of Interest. Many of the amenities in the western half of the park, meanwhile, are designed for highly specialized activities, including the Dressage Ring (a), Polo Field (b), Golf Course (c), Fly Casting Pools (d), and Model Yacht Club (e).

The landscape of the park is also worth reviewing: the park features ten bodies of water, the largest of which are Stow (f) and Spreckels (g), and only two of these bodies of water occur east of Crossover Drive. Judging, again, from the density of listed amenities, we can see that while the eastern half of the park is packed comparatively tight, much of the landscape in the western region is either forested or occupied with incredibly spacious amenities.

The photos of Golden Gate Park that follow come from a series of visits in late May, 2017. Multiple trips through the park were combined in this photo essay, and the result is extensive photographic documentation of the park's terrain, with native and non-native ecologies, irrigation infrastructures, and reclaimed landscapes presented in context from the inland edges of the park to the beachfront end.

Golden Gate Park's border is marked on all sides by a wall of trees: it is what you see as you approach from any side, and the trees and while it is permeable enough when approaching from the east, this landscape is less accessible than it initially appears: significant stretches of the park's border, particularly on the north and south sides, don't feature sidewalks, and most pedestrian entrances are paired with vehicular entrances at major intersections.

The northeastern corner of the park is home to a coast live oak woodland which, by virtue of being a native old-growth forest, requires no irrigation. This species, rarely found within the peninsula today, features short, wandering trunks and low canopies are a lovely and comfortable park environment; in the few moments where the forest breaks, like the horseshoe court, the oak canopy stands in stark contrast to the tall eucalyptus and pine forests just beyond.

Outside of the oak forest, the landscape is widely irrigated; the forests within this section of the park vary from thick and full to oddly sparse. Blue gum eucalyptus appears here and can be found throughout the rest of the park, recognizable by its shedding bark and long, narrow leaves; along with the monterey pine and monterey cypress, the eucalyptus is an essential tree in Golden Gate Park, imported for their easy growth in San Francisco's sandy soil.

Further in are the park's two contemporary museums, the California Academy of Sciences and the de Young Museum, both of which take pains to mimic, in some way, the landscape they occupy. The landscape here takes strange turns, with redwood groves adjacent to small valleys where worn turf reveals loose sand and elaborate rose gardens bloom. Uphill from the museum lies the tallest point in the park, Strawberry Hill, the island in the middle of Stow Lake; beyond Stow Lake is Crossover Drive, which splits the park in half.

Irrigation infrastructure is visible throughout the park –there wasn't a day I visited that I didn't witness a lawn being watered – but in my experience, the closer to the ocean, the harsher the winds, and the sandier the soil, the more necessary the water becomes, and thus we witness city workers actively watering forest floors, and desire lines wearing the ground to expose sand.

Further west, where trees grow shorter and turf is so hard to sustain that the park had to rebuild their soccer fields with artificial grass, the park ends suddenly. Then there is only the four-lane Great Highway, a wide parking lot, and Ocean Beach.

Figure 2.8
Golden Gate Park's "Panhandle," a thin, flat landscape of large, older trees.

Figure 2.9
The edge of Golden Gate Park along Fulton Street.

Figure 2.10
A sidewalk ending along Lincoln Way.

Figure 2.11
Park gate and entrance at Arguello Boulevard and Fulton Street.

Figure 2.12
Park entrance at Fulton Street and the Park Presidio Bypass/Crossover Drive.

Figure 2.13
Paved trail through old-growth coast live oak forest.

Figure 2.14
Trail under coast live oak canopy.

Figure 2.15
Coast live oak forest surrounding horseshoe court. The tall forest in the background is non-native.

Figure 2.16
Looking out over Robin Williams Meadow from Hippie Hill during irrigation.

Figure 2.17
A sparse patch of forest at the east end of the park.

Figure 2.18
Eucalyptus trees.

Figure 2.19
The California Academy of Sciences and the Music Concourse, seen from the lookout tower of the de Young Museum. The green roof of the California Academy of Sciences is elaborately engineered to replace the landscape the museum replaced.

Figure 2.20
The de Young lookout tower is clad in copper, which will slowly develop a green patina intended to allow the museum to blend in with the eucalyptus trees surrounding it.

Figure 2.21
A redwood grove near the De Young Museum.

Figure 2.22
A strange valley, worn down by pedestrian traffic, reveals sand beneath.

Figure 2.23
The Rose Garden.

Figure 2.24
A close-up of the Rose Garden planters.

Figure 2.25
The shore of Stow Lake, with Strawberry Hill in the distance.

Figure 2.26
Strawberry Hill, with Stow Lake in the foreground.

Figure 2.27
The reservoir on Strawberry Hill.

Figure 2.28 and 2.29
Water infrastructure under construction on Overlook Drive, just west of Crossover Drive.

Figure 2.30
An irrigation sprinkler, before being turned on.

Figure 2.31
A built-in irrigation valve, to which an irrigation sprinkler would be connected.

Figure 2.32
On the shore of Lloyd Lake, a sprinker irrigates directly into the woods. I witnessed park staff set this sprinker up; it is not performing a full sweep, as evidenced by the dry soil in the foreground.

Figure 2.33
Irrigation at a park entrance, near Fulton Street and 8th Avenue.

Figure 2.34
The vast West Hellman Hollow, formerly Speedway Hollow.

Figure 2.35
Forests surround the Angler's Pond, at the Golden Gate Angling and Casting Club, an in-park facility devoted to fly-fishing.

Figure 2.36
Closer to the beach, the park's forest begins to feel lighter and more open. Here, sandy soil is once again exposed.

Figure 2.37
More open forests near the ocean. The white object in the foreground is an elevated irrigation valve.

Figure 2.38
The Murphy Windmill was once used to irrigate the park with groundwater.

Figure 2.39
The Beach Chalet Fields were built to replace previous natural turf soccer fields, which proved too difficult to maintain this close to the ocean.

Figure 2.40
The end of Golden Gate Park at Ocean Beach.

Figure 2.41
Golden Gate Park's descent toward Ocean Beach is interrupted by the Great Highway. This photo is taken from a lookout in Sutro Heights.

Figure 2.42
The entirety of Golden Gate Park, seen from Grandview Park.

iii.
The Temple, the Corridor and the Flatlands

Moving backwards, against the stream, up the innumerable local distribution channels, we trace the Hetch Hetchy system. The subterranean aqueduct that ends at Pulgas meanders back through the southern Bay Area, tunnels deep into the Coastal Range, and emerges to draw a series of straight lines across the Central Valley towards the foothills of the Sierras, orthogonally mimicking the Tuolumne, its doppelganger, on its route out to sea.

Through most of this route, it is little more than a line scoured into the landscape, an etching where no buildings may be built, no large trees may be grown. In some places, power lines run above the water; this is fortunate for those of us seeking hints of what lies below, because it manifests to a height of 30 meters what is otherwise obscure, hidden just below the surface; in other areas, we have no help, and are left to stare at satellite imagery until, as though a switch has flipped, a series of disconnected parks, empty fields, and oddly barren medians, all in a row, reveal themselves.

Figure 2.43
Bay Area water lines and photography locations.

Figure 2.44
The Pulgas Water Temple.

Figure 2.45
The former water channel behind the Temple, headed for Upper Crystal Springs Reservoir, dating back to when Pulgas marked the actual end to the Hetch Hetchy Water System.

Figure 2.46
Inscription along the Pulgas Water Temple.

Figure 2.47
The Hetch Hetchy Water System passes through Milpetas, in the east Bay Area.

The symbolic end of the line is the Pulgas Water Temple. Built adjacent to the Upper Crystal Springs Reservoir, the Romanesque structure, which seems impossible to reach without a car, once marked the literal end of the Hetch Hetchy project; now it commemorates the lengths we are willing to go for reclamation. Inscribed on the pediment is a peculiar quote:

> I give waters in the wilderness and rivers in the desert, to give drink to my people.

Elsewhere in the Bay Area, the pipelines reveal themselves through linear parks, abandoned lots, and treeless segments of Cisco's campus parking lots.

Figure 2.48
"Park" and fenced-off land at South Grimmer Boulevard and Ishi Drive, Fremont.

Figure 2.49
Infrastructural clues near Ishi Drive, Fremont.

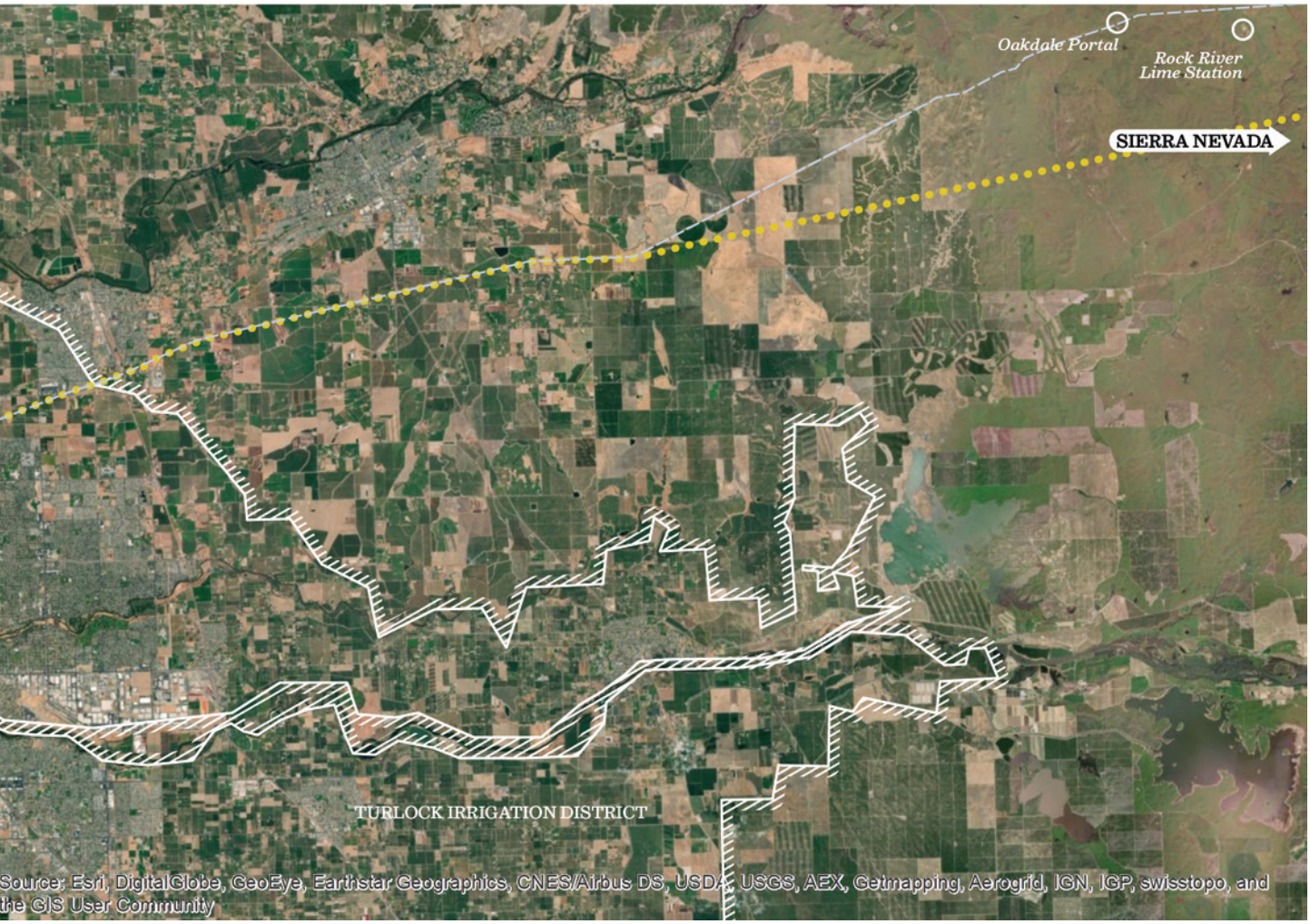
Figure 2.50
Hetch Hetchy Trail in Sandalwood Park along Grayson Way, Milpetas.

Figure 2.51
The Hetch Hetchy right-of-way in Peter Gill Memorial Park, Milpetas.

Figure 2.52
The Central Valley, the San Joaquin Pipeline, and almond groves.

Beyond the Coastal Range, the system resurfaces in the form of the San Joaquin pipelines. We managed to catch up with it as it passed through the Modesto Irrigation District, just beyond the San Joaquin River. It was remarkably easy, as we would search out the signs of the trail via Google Maps, then search the horizon for corresponding power lines, which carry hydroelectricity from the upper Hetch Hetchy System. With a landscape as flat as the Central Valley, you can see the trail coming from miles away.

The agricultural landscape the system travels through here is an inter-



esting one. Dominated by groves of what we assumed, and later determined, were almonds, the ground rarely shows explicit signs of the pipeline beneath – sometimes the land is cleared, and sometimes it isn't, and sometimes the farmers have built dirt roads alongside the power pylons.

The almond groves, however, carry their own evidence of a reclamation process, separate from the Hetch Hetchy system; at times, we stumble upon irrigation canals, which lie as still as ponds. Elsewhere, we witness almond groves flooded several inches deep, without any rain in sight.

Figure 2.53
Power lines carrying Hetch Hetchy electricity straddling a hidden stretch of the San Joaquin pipeline, headed to San Francisco, with the Coastal Range in the distance.

Figure 2.54
A farm access road built parallel to the Hetch Hetchy System power lines and thus the water pipelines.

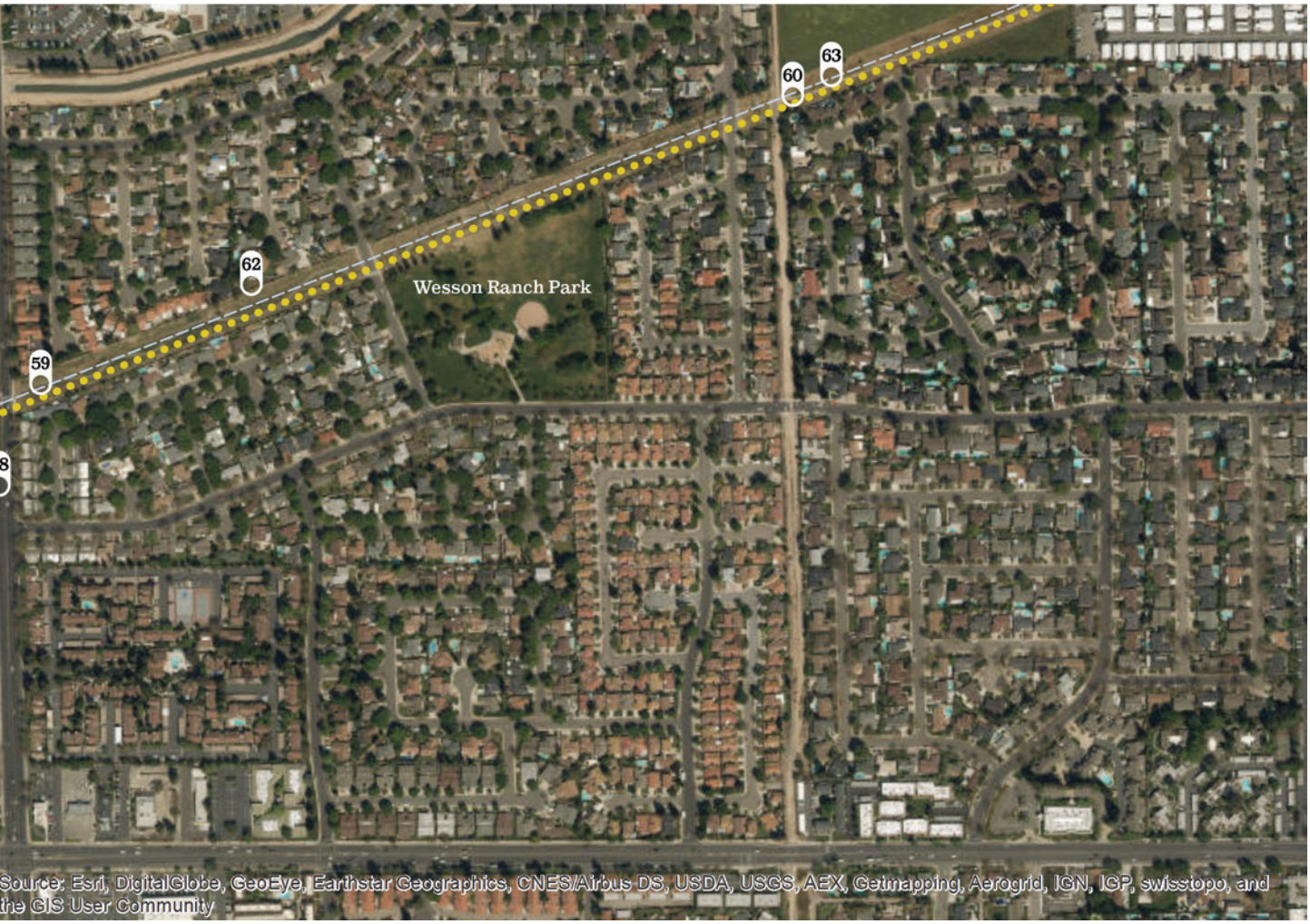
Figure 2.55
An almond grove, in a state of inundation.

Figure 2.56
Lateral Number Seven at Finney Road.

Figure 2.57
The San Joaquin pipeline passes through North Modesto.

Finally, we track the corridor through the north end of the city of Modesto, whose town motto, "Water, Wealth, Contentment, Health" is inscribed on an illuminated, street-spanning archway.

The length of the Hetch Hetchy system that passes through Modesto is the Hetch Hetchy Park, a linear park. Surrounded on nearly all sides by suburban sprawl, Hetch Hetchy Park offers visitors very little, unless you are looking for a gently curving, perfectly flat jogging trail along an endless field of yellowing turf.



We spent roughly an hour walking back and forth among the pylons, along a stretch of Hetch Hetchy Park between a power substation to the west and the edge of the city to the east. I recall the edge of the city feeling like a spectacular opening-up, as the houses on either side dissolved away leaving only the vast one-point-perspective of the power lines, stretching off towards the Sierras; yet, on reflection, I'm disappointed to discover that all my photos look the same.

Figure 2.58
Suburban Modesto; Tully Road at Hetch Hetchy Trail.

Figure 2.59
Hetch Hetchy Trail parkland, looking west at Tully Road.

Figure 2.60
Power Pylons on the Hetch Hetchy Trail.

Figure 2.61
Power substation along the Hetch Hetchy Trail.

Figure 2.62
The parkland of the Hetch Hetchy Trail.

Figure 2.63
Looking out of Modesto at the end of the parkland.

iv. The Source

We head east, upstream, beyond the San Joaquin Pipelines, past the Foothill Tunnel and the Don Pedro Reservoir where the Tuolumne, freed from Hetch Hetchy and the other dams ahead, is caught again. We rise above the powerhouse in the tiny community of Moccasin, past the cascade that starts at Priest, where the Mountain Tunnel ends and where we lose the landscape markers from the water underground. Through Big Oak Flat and Groveland and Buck Meadows, under powerlines channelling electricity from distant powerhouses, by the lookout at Rim of the World, where fire-burnt forest opens to the immense below, we are now in canyon country. Turning onto Cherry Lake Road, we head upwards through an open landscape, maybe burned and maybe natural, where the road gets very thin, and very winding. We pass the turnoff that heads down to the river itself, to the powerhouses and the Early Intake Dam and the other dams, even further isolated; we pass this turnoff where the burnt woods begin and we drive, white knuckled, perched on the side of this immense canyon, through Camp Mather, entering Yosemite National Park, and there, in the distance, we approach Hetch Hetchy.

The inaccessibility of these remarkable sites, which I had researched for so long prior to visiting, rendered the journey them something akin to a pilgrimage. The last road to the reservoir is slim and empty and open, leading towards what ranks among the least visited corners of Yosemite. But the isolation begins earlier, as you lose cell reception driving past empty, inaccessible places,

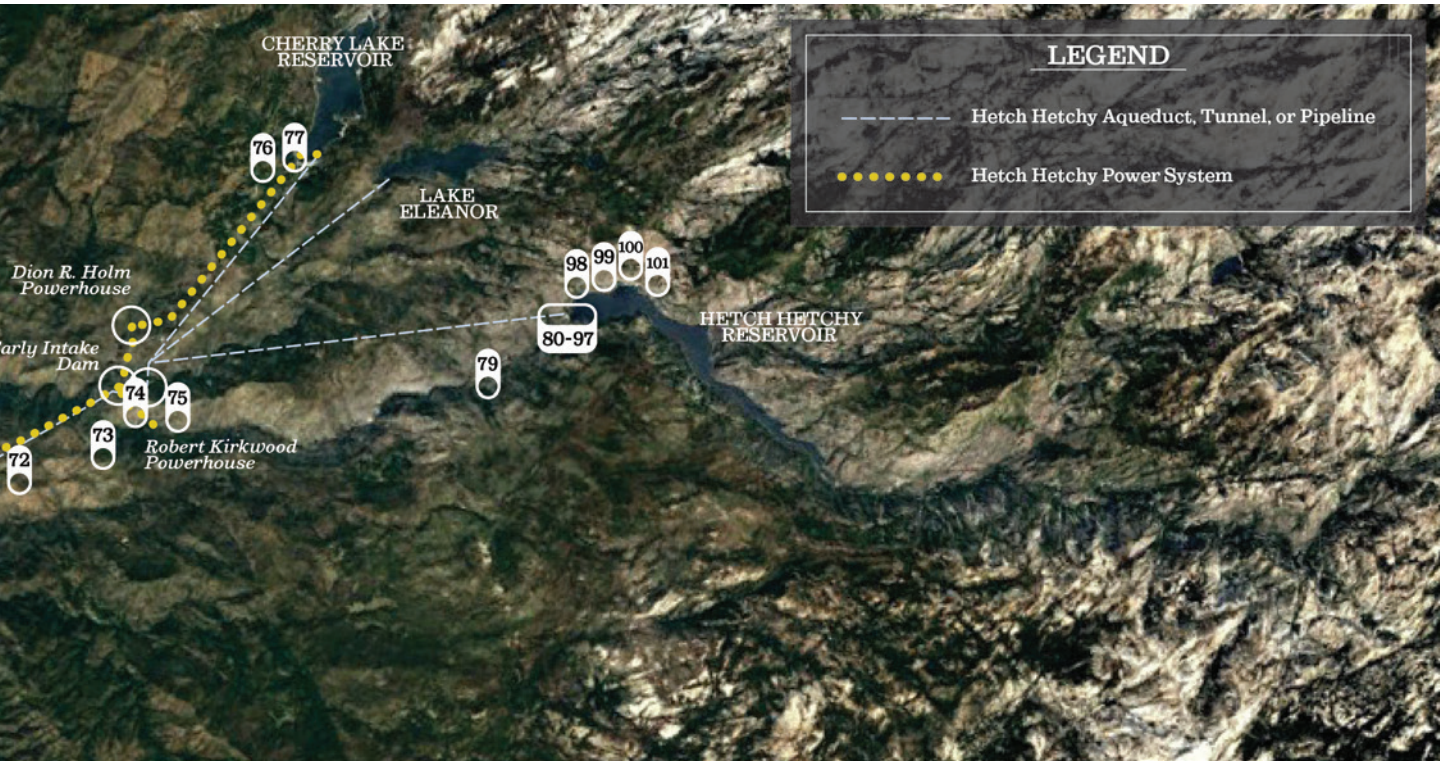
Figure 2.64
Hetch Hetchy powerlines crossing La Grange Road in the middle of nowhere; Don Pedro Reservoir is at the top of this slope.

Figure 2.65
Hetch Hetchy infrastructure of the foothills and the Sierra Nevadas.

names on a map in the pastureland of the foothills, towards the mountains.

If you head to Hetch Hetchy down State Route 120, you will pass over the Don Pedro Reservoir; despite lying along the Tuolumne the Don Pedro Reservoir is not a component of the Hetch Hetchy Water System, but it is significant, for it represents Turlock and Modesto's senior water claim. The power corridor bridges the reservoir south of the 120's viaduct, and the water pipeline passes underneath it nearby.

Just beyond the Don Pedro is Moccasin. A San Francisco "company town"[8] and the hydroelectric lynchpin of the entire system, it sits at the foot of the switchback road up to the Sierras, New Priest Grade. Down one side of the valley, Hetch Hetchy Water cascades from the to the Moccasin Powerhouse, and the power corridor headed for San Francisco ascends opposite it. We only stopped in Moccasin once, and the number of Sheriff's vehicles slowly driving by as I snapped photos of major infrastructure was more than enough to spook us off. Above Moccasin, in the Sierras, the water infrastructure passes deep below, out of sight. Nevertheless, we still witness the presence of the system, as



power lines from the system's upriver power facilities cross back and forth over the river, most notably at the Rim of the World Vista, a magnificent lookout point that I doubt would exist without the power lines running overhead requiring a clearing on the mountainside.

Later, the 120 and high above the Tuolumne, a fork presents a choice: left for Cherry Lake, right to Hetch Hetchy. Take the left, as we did one day, and you'll descend to the Tuolumne and witness a sequence of notable infrastructures, including the Early Intake Dam and both Holm and Kirkwood Powerhouses. Drive even further, however, and you end up at Cherry Lake, an extremely remote reservoir in Stanislaus National Forest, which, along with the nearly inaccessible Lake Eleanor, stores additional water for the system.

I'm not sure I've ever felt more isolated than at Cherry Lake; we ate our lunches in near-silence in the tiny car lot, feeling miles from anywhere in a vast and empty landscape. Setting out for the trailhead across the earthen dam, we hoped for a glimpse of Lake Eleanor but were dissuaded from travelling deeper into the woods when we started, and were thus very startled by, a black bear.

Figure 2.66
Don Pedro Reservoir, near New Don Pedro Dam.

Figure 2.67
Don Pedro Reservoir at its north end, near the State Route 120 crossing.

Figure 2.68
Moccasin, with pipeline cascade, and old and new power plants.

Figure 2.69
Power lines ascend out of Moccasin.

Figure 2.70
Clear-cutting under Hetch Hetchy power lines at the Rim of the World Vista

Figure 2.71
Hetch Hetchy power lines crossing over Statre Route 120.

Figure 2.72
View of the ascent towards the Tuolumne Canyon with Hetch Hetchy power lines in the distance.

Figure 2.73
A look down from the road to Hetch Hetchy at the Tuolumne River and Robert C. Kirkwood Powerhouse with early intake cascade.

Figure 2.74
Hetch Hetchy Substation, seen on the road to Cherry Lake.

Figure 2.75
Early Intake Dam, Tuolumne River.

Figure 2.76
Cherry Lake Dam and Reservoir.

Figure 2.77
Cherry Lake Reservoir.

Figure 2.78
The Hetch Hetchy Reservoir area.

If you turn right at the fork, you are headed towards Hetch Hetchy. The road, hundreds of meters above the Tuolumne, is spectacular; likely a result of the Rim Fire that cleared out much of the landscape so far, as Street View along these roads reveals none of the sweeping vistas I recall seeing. The road is also terrifying, feeling at times as though it is barely a lane and a half wide, particularly when cars travelling opposite suddenly appear around tight corners.

Eventually, the road pulls inland, passing through Mather, a campsite reserved for city employees, a librarian at the San Francisco Public Library informed me. Shortly after follows the point of entry for Yosemite National Park, a spare collection of cabins among a grove of pines, beyond which the road emerges onto the side of the canyon once more.

Eventually, around a corner, in the distance, the dam emerges.

There are a handful of lookout points where it is convenient to park and take in views, which I encourage. I have never seen this stretch of the Tuolumne referred to as the *Grand Canyon of the Tuolumne*; this is usually the term for the river's territory above the reservoir, but I feel this landscape may deserve it, as well. A vast gulf gently divides the earth from itself: below, the river twists and froths; in the distance, soft mountains beget harsh, snow-capped crests. Amid it all, a short, squat barrier, a tiny thing dwarfed by the landscape it sits in, holds back a lake.

When I was planning this trip, Hetch Hetchy's inaccessibility was easily the defining element. I don't have a driver's license, and while I could conceivably get to Yosemite Valley via YARTS, the Yosemite Area Rapid Transit System, from their stops in Merced or Groveland, once in Yosemite I would be out of luck. The park's internal shuttle system only serves certain park regions, leaving Hetch Hetchy in the lurch; the only way to reach Hetch Hetchy Reservoir without a car is by backcountry hiking from Yosemite, which I am not remotely experienced enough to do successfully. I was extremely fortunate, then, that my Mom had enough free time to fly down to California during the post-San Francisco portion of my trip, so I could end up seeing much more than I would have otherwise.

Despite leaving early in the morning on both days that we visit Hetch Hetchy, we always arrived late enough that the handful of parking spaces in the park are nearly full, leaving us to park in an overflow parking area away from the dam and reservoir. It felt appropriate, though, to eat our post-drive meals under a canopy of pine trees, before exposing ourselves to the openness of the reservoir.

Nestled into the thin mouth of Hetch Hetchy Valley, O'Shaughnessy Dam, named for the engineer that built it, is a monolith of remarkable size. We were visiting after the high rains in the winter of 2017, so the dam was nearly full at the time, releasing water in grand, thundering plumes. The front of the dam is a gentle curve sweeping from one side of the blocked canyon to the other,

Figure 2.79
Tuolumne River with Hetch Hetchy in the distance.

perforated at moments with outflow chutes, windows, and entrances hinting at an interior we can't access.

The dam's top bridges to the southern face of the canyon over the dam's spillway. This channel, cut from the living rock, was sitting dry, likely reserved for emergencies. The dam's top is broad and flat, and provides an excellent viewpoint for the landscapes surrounding, including the reservoir itself. Despite the flooding, the view of the valley that was so frequently painted and photographed in the 18th is preserved, albeit incompletely.

The top of the dam conceals some enticing and inaccessible secrets of its own: chained-off stairwells that scale the front face of the dam, or descend into lower levels inside the dam, while dusty skylights seem to hide mechanical rooms inside. Meanwhile the rear of the dam, peculiarly shaped, reveals none of its secrets when the water is this high, though I've seen photos from low water that reveal hints of the shorter infrastructures atop which this dam was built.

Near the southern end of the dam, a trail descends away from the reservoir; we walked this on our second visit to Hetch Hetchy. After a while the trail

curls back, running adjacent to the Tuolumne before ending beside a small building not far from the base of the dam, which loomed overhead. The mist from the constant discharge ebbed and flowed over us, even at a good distance, and when I went as close as I was able, I ended up soaking wet with no good photos.

At the north end of the top of the dam is a tunnel bored clear through the mountain. This trail takes day-hikers, like us, into the pine forests that thrive on the valley's sides. From this vantage, overlooking the reservoir, you can clearly see the thick band of bleached between the trees and the shifting water levels. Recreation on the reservoir itself is forbidden in the interest of maintaining the water's purity. If you go at the right time of year, you will witness some of the valley's most spectacular waterfalls: Tueeulala Falls, which I believe tapers off as the snowpack dwindles, and Wapama Falls, a larger series of cascades. Though it was late in the year, Wapama was so strong that it was washing over the bridges at its base; for that reason, and that it was getting late and the drive back would take hours, we went no further into the valley than this.

Figure 2.80
Front of O'Shaughnessy Dam during water release.

Figure 2.81
Dam Spillway with Tueeuala and Wapama Falls in the distance.

Figure 2.82
Rear of dam spillway and reservoir.

Figure 2.83
Dam spillway, looking downstream.

Figure 2.84
The reservoir, with shallow rock formations.

Figure 2.85
Rear face of O'Shaughnessy Dam.

Figure 2.86
Walkway atop dam.

Figure 2.87
Top of dam.

Figure 2.88
The vista of the valley, p.l., containing Tueeuala and Wapama Falls.

Figure 2.89
The vista of the valley, p.2., featuring Kolana Rock.

Figure 2.90
Access into the dam's innards.

Figure 2.91
Skylights and hatches.

Figure 2.92
The river, downstream.

Figure 2.93
The front of the dam.

Figure 2.94
Approaching the dam from below, with the Tuolumne beside.

Figure 2.95
The dam from below, and a dam building in the foreground.

Figure 2.96
The tunnel to the trails.

Figure 2.97
The opposite side of the spillway.

Figure 2.98
The dam and reservoir from above.

Figure 2.99
Part of the reservoir trail.

Figure 2.100
Tueeulala Falls.

Figure 2.101
The rest of the reservoir, further than we care to go.

ENDNOTES

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3.

Investigating origins, visionaries, and current trajectories.

any time but now

i. The Future is Resistant to Change

In the seminal contemporary history of American reclamation, *Cadillac Desert*, Marc Reisner mentions San Francisco proper only twice. First, he summarizes the mid-nineteenth-century transformation from small port to immense boomtown in contrast with Los Angeles, which "remained a torpid, suppurating, stunted little slum"[1] until migrating Mormons introduced the region to successful irrigation practices.[2] Suggesting Los Angeles failed while San Francisco prospered due to a lack of water is striking, as it ignores the lengths San Francisco went to in order to ensure early access to water. Its boomtown status following the gold rush is what proliferated access to water, not other way around.

The second mention of San Francisco outlines this nature a little better. Reisner notes that "San Francisco is slightly rainier than the Chihuahua,"[3] yet:

> Actually, San Francisco looks green all year long, if one ignores the rain-starved hills that lie disturbingly behind its emerald-and-white summer splendour, but this is the second part of the fraud.... There was not a single tree growing in San Francisco when the first Spanish arrived; it was too dry and wind-blown for trees to take hold. Today, Golden Gate Park looks as if Virginia had mated with Borneo, thanks to water brought nearly two hundred miles by tunnel.

Ignoring Reisner's minor mistake here (as we have seen, San Francisco absolutely once had native trees and by some miracle still does,) and recognizing

that much of Cadillac Desert is a history of the Bureau of Land Management, who were not involved in the construction of the Hetch Hetchy Water system, it is remarkable to me that he can recognize the intense impact that San Francisco's infrastructural works have had on the city and its empire, and not see reason to further document them. Perhaps it is a result of the first impression he gave of San Francisco, above: the idea that the city is, despite its vast expansion within an arid climate, just fine.

This is a notion I found myself up against frequently. If you take a look at John Wesley Powell's map of the drainage districts of the arid regions, San Francisco exists just outside the border of the "arid regions," and thus outside the study of Powell, which I suspect, without evidence, is due to the average rainfall the city receives yearly being just above the 20-inches-a-year that Powell held as the minimum or arable land.

Today, we need only look as far as SPUR, the extremely contracted acronym for the San Francisco Bay Area Planning and Urban Research Association, to see a similar narrative at play. In her article *Why We Need Hetch Hetchy More Than Ever*, Laura Tam, SPUR's Sustainable Development Policy Director, lays out the case for keeping Hetch Hetchy in the face of actions and lawsuits from activist groups like Restore Hetch Hetchy who wish to see the reservoir drained and the valley restored.

After, in my opinion, thoroughly understating the turn of the century controversy that was the initial damming of Hetch Hetchy by noting that "It would be almost impossible to build a new dam [on a site within Yosemite] today," Tam goes on to argue that Hetch Hetchy should be maintained going forward, even if it is imperfect, because it currently works fine, going so far as to note that "In terms of quality, Hetch Hetchy water is so pristine that it is one of only a handful of water supplies in the country that doesn't need to be filtered, a process that is expensive and energy intensive."[4]

Many of her objections to the proposal to restore the flooded Hetch Hetchy Valley are based upon a keen and mostly accurate understanding of the multiple overlapping political systems that would be involved, noting that replacing the dam would result in the loss of many megawatts of sustainable power and require the public utilities commission to "somehow convince senior water-right holders like the Modesto and Turlock Irrigation District on the Tuolumne River to let us store drinking water in their reservoirs."[5]

The latter is an excellent point about the restrictive nature of water rights in California only slightly undermined by the fact that the San Francisco Public Utilities Commission contributed $45 million to the construction of the New Don Pedro Dam and thus already holds the rights to store 740,000 acre-feet of water in Modesto and Turlock's Don Pedro Reservoir, a quantity that resolutely dwarfs the amount stored within both Hetch Hetchy and the supplemental Lake Eleanor reservoirs, though the senior shareholders have a senior claim to

Figure 3.1
Oblique satellite view of the Bay Area, including San Francisco.

the water in times of drought.[6]

Nevertheless, to take this system as the site for a speculative project about the post-reclamation future begins to feel somewhat quixotic, because the Hetch Hetchy Water System is, in its current form, an incredibly stable system. Very little goes wrong with the system, there have been no major disasters, and the Hetch Hetchy reservoir is considered fairly reliable during drought conditions.[7] If nothing goes wrong, why would we invite a change?

To better answer this question, we should take a step back and understand both where we are coming from, and where we may be headed.

The 2011-2017 drought season was first recognized to be the worst drought in the last 500 years by the fall of 2015 when researchers, spurred on by the total lack of snowpack in the Sierra Mountains conducted dendrochonological studies that rendered it conclusively. [8] It is easy to consider this major drought as an expression of climate change's as-yet inexorable progression – but you would only have half of the story.

In fact, there is evidence that the drought is not a fluke, but a return: scientists now recognize that in fact the 160 years since California has been a state, the centuries that we have been using to determine the carrying capacity of the land, are relatively wet. Scott Sine, a professor who has researched megadroughts at California State University, suggests that we have fundamentally been misled by this period of moisture, and as much of our infrastructure is designed on the assumptions this wet era have led us to, it may not be sustainable in the long term.[9] Evidence exists of decades, if not centuries of drought hidden in California's climactic history.[10] All of this suggests that California has been experiencing is an already mutable climate regressing to a historic mean, a pendulum that has now begun to swing backwards. A vast amount of colonial and American occupation of this state has occurred in the fraction of a climatological moment and we are not prepared.

In this context, the spectre of anthropogenic climate change becomes an even worse omen of what is to come: research models of climate change in California have suggested that the region will experience "precipitation whiplash," periods of intense wetness and extended dryness.[11] Reclamation systems are fundamentally programmed to function with relatively minor, predictable variations in wetness annually; if you have a ten year drought, it does not matter how reliable your dam used to be.

Thus, when we observe and project the future of this system it is valuable to avoid predictions on how the system will perform under relatively anodyne conditions, as SPUR and others have done. We have already based our infrastructural systems of reclamation on skewed data we did not fully understand. There is no reason to compound our mistakes. The consequences for moving beyond a culture of reclamation may be severe, but the consequences of the fundamental failure of a reclamation state could be disastrous; see, once more,

the Hohokam.

The problem posed by the Rim Fire, an enormous forest fire that started near the Stanislaus National Forest Rim of the World lookout point in 2013, provides a valuable clue for where this system may be headed. This fire ended up burning incredibly close to Hetch Hetchy Reservoir.

This would not be a problem for many water systems but, if we recall the words of Laura Tam, "Hetch Hetchy water is so pristine... that it doesn't need to be filtered."[12] Indeed, when the prospect of ash from the forest fire falling into the reservoir became a plausible event, the pure glacial melt-water no longer seemed so appealing, and the *doesn't need to be filtered* very quickly became *we cannot filter this water*. While the Public Utilities Commission insisted that the water had was still fine (and by the end of the forest fire the threat they were proven right,) the fact is that San Francisco does not have, and has never had, the proper infrastructure to filter all of the water passing through their system.[13]Whether or not the lack of filtration is seen as a benefit is entirely dependent on whether you can be certain that the water entering your system is clean, and during the Rim Fire, they could not.

In the year after the fire, the SFPUC did make some changes – most notably, tapping Lake Eleanor and Cherry Lake reservoirs, which had not been used to provide drinking water since 1988. These reservoirs came with apparent downsides: as those reservoirs are open to recreational use, the water needed to be filtered, and the updates required them to bypass an essential aqueduct that had gone unused for two decades. SF Gate wrote an article in which the necessity of these efforts was attributed to fears that late-season rainfall would not come to fill Hetch Hetchy to capacity.[14] I think this is a plausible but incomplete narrative; it seems fundamental to me that these changes, hooking up filterable water systems to an unfilterable one, came a year after the realization of the fundamental threat posed by an unfilterable system.

Here, despite the stability, the immense practicality of the Hetch Hetchy system, we nonetheless find ourselves at the start of Donald Worster's reclamationist end-state: "as rivers get moved around with more and more thorough, consummate skill, the system begins to grow increasingly vulnerable, subject to a thousand ills that eventually bring about its decline."[15] The system has begun to show its weaknesses, and I believe we are presented with a choice: to pursue a future of endless, furious fixes, further and further afield, with ever-diminishing returns before we cannot fix any more and it all falls apart; or to recognize the failings of the reclamation system and reject it.

In the following sections, I will outline the relevant infrastructural histories within the three sites of study, profile the voices that historically spoke out in dissent against the forward march of reclamation and attempt to construct a set of plausible post-infrastructural scenarios through which to explore our declaimed future.

ii. Dancing on the Brink of the World

The first permanent occupants of the San Francisco peninsula were the Yelamu, a small population of Ohlone Indians distinguished from other Ohlone by their language. They lived on the peninsula in extremely small numbers, only 150 to 300 individuals at a time, in 20 or so families across several encampments. They lived in this way, apparently with relative consistency, for roughly 4500 years, only to be run out of the peninsula by another Ohlone tribe shortly after the Spanish arrived in 1776; the last of the Yelamu was dead by 1930, with much of their culture lost.[16] In *The Ohlone Way*, author Malcolm Margolin claims that among what evidence remains of their culture, we have one line of lyrics from an otherwise long-lost Ohlone song which reads merely, "Dancing on the brink of the world;"[17] while Margolin appropriately refrains from commenting on any potential meaning of the solitary line, it strikes me as an apt description, regardless of their original intent, of continued existence on this thin, fragile peninsula.

We can gloss over much of the early history of San Francisco because very little happened until the end of the 1840s – in 1846, the population of what was then called Yerba Buena was 450 – but, of course, in 1849, someone found gold in the Sierra Mountains, and the population readily exploded.[18]Not long after, water was being shipped across the bay and sold in barrels in the streets, but by 1856 the San Francisco City Water Works, so far as I can tell a private company, had dammed a creek and was bringing millions of gallons of water

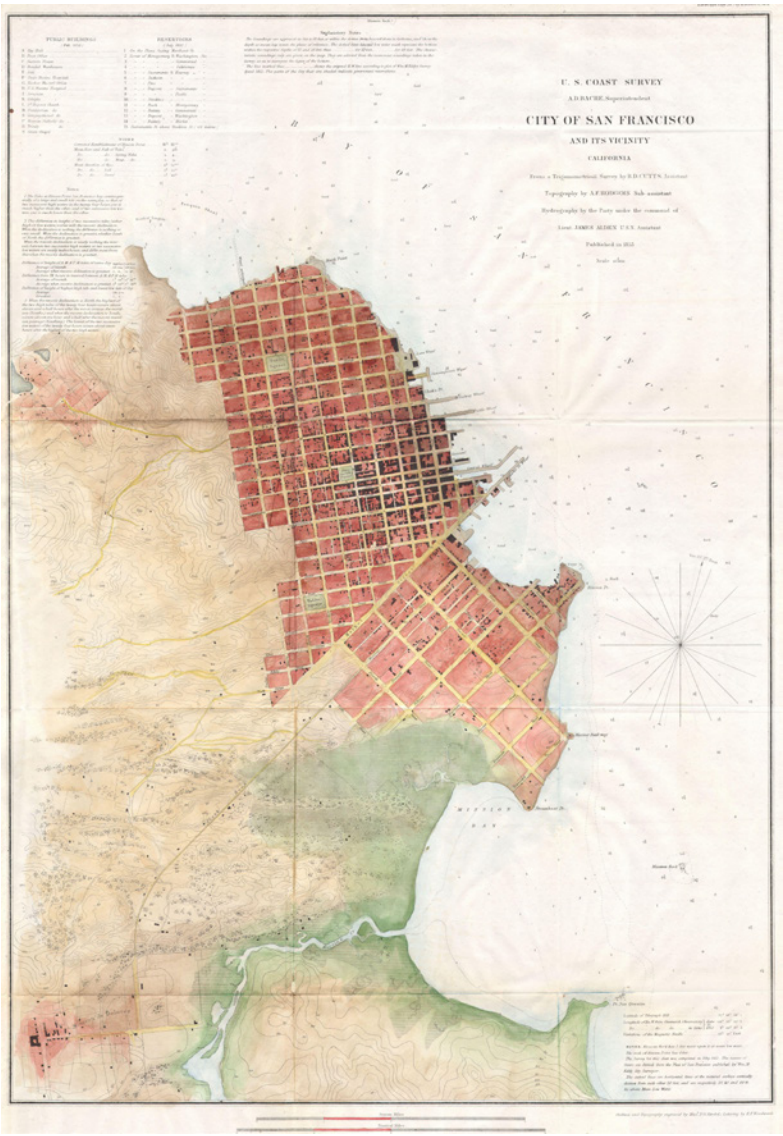

Figure 3.2
1853 United States Coastal Survey of San Francisco.

daily via a flume to be stored in reservoirs that remain in use to this day. By 1860, San Francisco had roughly 78.000 residents.[19]

They also had a problem: their rapidly growing city was hedged in by vast

sand dunes, known as the Outside Lands, that stretched across the western half of the peninsula, a windswept, barely occupied dune field. Much is made of the barrenness of this landscape, and its unacceptability to the city's residents at the time; in his essay *Claiming the Urban Landscape: The Improbable Rise of an Inevitable City*, historian Eric Sandweiss describes the vista that would have appeared before early settlers in the peninsula:

> [Sand] blew from the hilltops in the cold, gusty winds that plagues the area; it slowed the steps of their horses on the trail from the presidio to the mission; it prevented all but the hardiest ground plants from taking root across the landscape.[20]

Though I note with pleasure that park historian Raymond H. Clary remarks "boys and men visited the natural lakes in the sand dunes to shoot wild ducks and gather wild rice and frog legs to be sold to French restaurants in the city," the fact remains that the sand dunes were seen as an inanimate barrier to the city's growth.[21]

Following the submission of a petition to the San Francisco Board of Supervisors insisting that "no city in the world needs such recreation grounds more than San Francisco," Mayor H. P. Coon made the decision to see both the city's lack of a park and the outside land's barrenness repaired:[22] he contacted Frederick Law Olmsted, fresh off his work on New York's Central Park, and asked him to write a report addressing the possibility of a large park in the city. Olmsted, like Powell before him, went on to write and in 1965 release his remarkable and forward-thinking Preliminary Report in Regard to a Plan of Public Pleasure Grounds for the City of San Francisco.[23]

FREDERICK LAW OLMSTED

In 1863, Frederick Law Olmsted had briefly taken a job at the Mariposa Company, a gold mining company that fell under hard times before Olmsted could even show up. Nevertheless, having arrived in California, Olmsted was taken by the radically different social and climactic conditions he found there, and in 1864 he proceeded to take on a set of projects in and around the Bay Area, including a masterplan for Berkeley's campus which was never built, and a proposal for a cemetery in Oakland, which was. He was coming to recognize, as he approached his final project in the region, how essential it was to treat this landscape as a distinct and difficult set of conditions and not impose the standards of eastern or European parklands on an environment where maintaining them would be costly and inefficient.[24]

Regarding the possibility of a park in San Francisco, Olmsted was clear that he had learned from his previous experiences that San Francisco would never be able to support a park of the sort he had developed out east, even going so far as to refuse the term "park," replacing it with "public pleasure

Figure 3.3
Comparative site map depicting the existing location of Golden Gate Park and Olmsted's proposed site for a Public Pleasure Ground.

ground" throughout the entire document.[25]

> Neither in beauty of greensward, nor in great umbrageous trees, do these special conditions of the topography, soil, and climate of San Francisco allow us to hope that any pleasure ground it can acquire, will ever compare in the most distant degree, with those of New York or London.
>
> There is not a full grown tree of beautiful proportions near San Francisco, nor have I seen any young trees that promised fairly [....] It would not be wise nor safe to undertake to form a park upon any plan which assumed as a certainty that trees which would delight the eye can be made to grow near San Francisco[.] [26]

If San Francisco had hoped for another Central Park among the dunes, what they got instead was something new. Rejecting both their western site and the notion of a regular, orthogonal parkland imposed onto a landscape, Olmsted proposed a network of parks (his first!) nestled into the city's topography. A linear promenade, sunken 20 feet as to maintain the views at close quarters, would begin at the city's northern coast and travel four miles inland. The slopes of this trail would be filled with evergreen shrubs with the potential for occasional decorative sequences containing display shrubs from canyons elsewhere in the region, or international regions with similar climates, displayed either naturalistically or highly formalistically, so long as they would be easy to care for and maintain with minimal effort and water. It was only inland, in a location protected by existing topographies such that it remained protected from harsh winds, that he began to play with the language of rambles, and lawns, and dells. [27]

Olmsted was engaged directly with the landscape in a way he had not been with Central Park – paying attention both to the limitations of the site, but also to the possibilities. In particular, he was struck by what he perceived as the tendency of the residents of the densely-built San Francisco to maintain small, confined gardens that flourished in conditions where trees would have failed, and the possibilities these gardens presented for their designs to be focused on intimate, up-close experiences, rather than the "expanded landscapes... of parks and gardens in the East."[28] This is a remarkable attempt at the synthesis of a new character, a new approach to landscape design, driven by an altered set of conditions.

Unfortunately, I have not found very much on the reception of Olmsted's report. The sole impact I have read is that according to Clary, "Since he was an acknowledged authority on the subject, Olmsted's report had been used by all the local papers and periodicals to thwart plans to locate a large in the sand dunes near the ocean."[29] I tend to take Clary's interpretation of this event with a grain of salt – his history leans, in my opinion, towards light hagiography of

Figure 3.4
The Sand Dunes of Golden Gate Park Before They Were Converted Into A Garden
(1865)

the early park and those who built it – but he also suggests that transportation and accessibility to a theoretical park several miles away was a major concern for many residents, so it is plausible that there was some political will against a park in the outside lands. Nevertheless, around the same time a coalition of "Illustrious men" (again, Clary's words) had gotten together as the Outside Lands Committee and, as Clary puts it, realized "that San Francisco would grow into a great city," some going so far as to propose a park as large as 5000 acres.[30] By 1870 the city had purchased over a rectangular lot of over a thousand acres in the outside lands; they were going to have their own Central Park.

I can only speculate on what led to Olmsted's report being rejected, but I feel it safe to imagine that that drive to become a great city – driven by the growth barely thirty years prior – inevitably influenced what the *illustrious men* imagined their city should look like. For San Francisco to become a great city, like New York, it must inevitably look like New York, regardless of what the experts might say. Thus, land secured, they set out to make it look like New York.

THE PARK

The first superintendent of the new Golden Gate Park was a young man named William Hammond Hall. Having worked by the Board of Military Engineers

in the 1860s, he ended up the lowest bidder on surveyor's contract to begin mapping Golden Gate Park, which he eventually leveraged into developing a plan for the park's development and, by 1871, he was named superintendent at the age of 25.[31]

At some point during the survey, they discovered (allegedly after a horse spilled its feed bag on the sand dunes) that a combination of barley and lupine could stabilize sand dunes long enough to be able to begin planting trees.[32] As time went on, and as Hall was joined by horticulturalist John McLaren, the park was gradually transformed into an increasingly naturalistic landscape of blue gum eucalyptus, Monterey cypress, and Monterey pines – all species which could sustain themselves in drier conditions against ocean winds – were imported from elsewhere.[33]

These species require water for their long-term success – one of the reasons for the initial use of Lupine grass was that it could survive several years without water)[34] – and while the park originally received their water from Spring Valley Water Works,[35] who had a private monopoly over the city's water supply until being bought out by San Francisco around the completion of the Hetch Hetchy Water system, [36] it was clear early on that additional water infrastructure was needed to support the parkland. Among the earliest built components of the park was the Strawberry Hill Reservoir, dating back to 1885, followed by a second at the on-site waterworks in 1895 and a third in 1902, with a total combined capacity of 3.4 million liters.[37] [38] Two other major water features, Stow Lake and Elk Glen Lake, retain some amount of usable water, and there are projects underway to construct a new reservoir underneath the park to double their current storage capacity.[39]

With the knowledge that there was freshwater beneath the dunes, two windmills were built in 1902 and 1905 and provided a remarkable amount of water for the park – the Murphy Windmill, the larger of the two and one of the largest in the world at the time, could draw upwards of 150,000 gallons of water an hour.[40] However, the windmills were only in use for an extremely short time, as they were replaced in 1913 by equally-efficient electric pumps. Additional pumps, along with gravity-powered systems, are used to distribute water throughout an extensive network of pipes which can be seen in nearly every corner of the park, if visitors keep their eyes peeled.

The park system does not appear to talk publicly very often about precisely how much water they are use for irrigation, but I found a report outlining the Utilities and Infrastructure component of Golden Gate Park's 1998 Master Plan which happens to give a range:

> The total park irrigation need is estimated to range between 1.5 mgd (million gallons per day) during low use periods, to 4.0 mgd during high use periods. [41]

In metric, this quantity of water required to irrigate Golden Gate Park in 1998 ranged between 60 and 175 liters of water *per second*; this is the equivalent of roughly three and a half cubic meters of water per minute, minimum. For comparison, in August 2017, the average residential customer of the San Francisco Public Utilities Commission used 154 gallons of water a day.[42]

According to the 1998 Master Plan, roughly a third of the water the park was using was sourced from municipal water, i.e. primarily Hetch Hetchy water, with the remaining two thirds of their water coming from well water. However, in recent years this number has likely changed, as San Francisco has begun to blend more well water sourced from beneath the Sunset District into its drinking supply,[43] and as Golden Gate Park proceeds with plans to introduce recycled water into certain areas of its park.[44]

THE FUTURE

There is an irony here, which I think should not go unremarked upon: San Francisco has dammed a valley and created a reservoir, an area of somewhere over a thousand acres, and is subsequently using that water to assist in establishing a parkland, covering an area of just over a thousand acres. In this instance, the normally abstract act of reclamation which we usually understood as grand adjustments to the hydrological ledger manifests as the literal transference of a landscape, with one sacrificial parcel of land being lost in favour of another, hundreds of kilometers away.

Of course, the landscape of Golden Gate Park is not the same as the landscape of Hetch Hetchy Reservoir: Golden Gate Park is, after all, not an attempt at creating a landscape capable of growing, of self-repair, of the sort of functional processes and life-cycles that mark what we might consider natural landscapes. The primary goal of Golden Gate Park is to create a naturalistic landscape, a sort of floral collage of easily-grown, low-irrigation plants that could only exist through human intervention, which has worked but is not without consequences. Consider the Monterey Cypress, one of the trees originally planted as a part of the overstory of the park: as these trees reach the end of their lifespan, the San Francisco Botanical Garden's website states, "their absence is slowly changing the skyline silhouette of the park."[45] Similarly, we can read of park workers trimming or outright removing significant numbers of cypresses and eucalyptuses because the trees, "most of which are 80 to 100 years old, are unhealthy, dead or a risk,"[46] alluding to incidents with aged trees that have led to injury and death. The San Francisco Recreation and Parks Department, in their description of the scope of their Park Forestry Improvement Program, says that an assessment for the "care, repair and the planting of new trees" has not been performed, and that they have devoted $4 million towards assessing and treating their "aging canopy."[47] The ecology of this landscape is fundamentally reliant upon active, constant stewardship.

Figure 3.5
Golden Gate Park's dunes, in the process of stabilization.

That's not even addressing the water use. The presence of near-constant irrigation throughout the park, including the irrigation of areas underneath the forest canopy, hint at the lifeblood that underlies this ecology. The essential nature of ongoing irrigation within the park is apparently infrequently addressed in public, perhaps because it is seen as self-evident, or perhaps because it would reflect poorly on the park. Unfortunately, the only source I have found that discusses it outright is on *Found SF*, a San Francisco history wiki, in which an anonymous author describes an otherwise undocumented conversation with an unidentified park gardener who allegedly suggests "it'd be dunes again in ten or fifteen years … though a few eucalyptus trees might survive."[48] As implausible as the provenance of this statement is, I do not see anything inherently implausible with the notion that a landscape, once a sand dune and continuously irrigated ever since, would rapidly return to its original state without further irrigation. The multitude of geological, ecological and climactic forces that once shaped this peninsula have not gone away; the continuous work of reclamation merely serves to override them.

This is, I think, an essential point to build upon, as I do not wish to suggest that all urban parks do not see some form of ongoing maintenance. The difference with San Francisco is that the city has done an immense amount of work just to have the water in the first place, and then this water is needed to prop up a landscape that cannot propagate itself, cannot sustain itself in this climate, is collectively aging and which would likely begin to collapse the instant the water is turned off.

One of the most memorable parts of Golden Gate Park for me is the Rose Garden beside the northern entrance to the park at Park Presidio Boulevard.

Passing through this garden, you often see the gardeners at work, watering and trimming the various rose species. They are incredibly beautiful, but also so fragile and needy that I am left wondering whether the small bushes in their tiny planters are worth the trouble. It occurs to me now that Golden Gate Park is, in many ways, an ornamental garden that hides an immense hydrological obligation at odds with the fundamental precepts of basic water conservation.

I found an article, published at the height of California's drought, which pondered whether San Francisco is truly "a part" of California's water crisis. Amid explanations that San Francisco's residents use among the lowest rates of water daily and recognition that then-supervisor (now Mayor of San Francisco) London Breed was working on legislation requiring new buildings to incorporate greywater reuse is an illuminating anecdote on the impacts of San Francisco's landscape preferences. Noting that even during 2015's intensely droughted summer many lawns in the park system continued to be watered every day, author Camden Avery explained:

> according to another memo from the Director of Operations of Rec & Parks to Phil Ginsburg, the reason the city continues to water Golden Gate Park [...] in the face of a years-long drought is because these parks were planted with non-drought tolerant grass, because the city's department of the environment banned the invasive, drought tolerant alternative species, which means the Marina Green [a much smaller park] alone would take an estimated $450K to re-sod if and when the drought ends.[49]

This, here, is the astonishing pressure hidden behind Golden Gate Park's false ecology. The city wants lawns, because illustrious men once decided that great cities have grand parks and San Francisco is surely a great city, but as they cannot use the drought-tolerant alternative, and it would be even more expensive to let the grass all die and re-sod it, the only rational, practical option is to constantly irrigate lawns with potable water during a drought! At no point, it appears, was the presence of lawns themselves under question.

And while San Francisco currently plans to replace their potable lawn-irrigating water with recycled wastewater from newly-built treatment plants, treating this is an efficient solution to the fundamental wastefulness of Golden Gate Park only finds us once more playing reclamation's game of ever-diminishing returns on endlessly-multiplying problems. While I cannot speak to the water recycling process itself, it would be foolish to treat recycled water as anything other than a processed resource with costs and consequences similar though not necessarily as troubling as that of desalinated water, an expensive and energy-intensive resource whose reverse osmosis process results in a highly toxic brine by-product we often have trouble disposing of safely.[50] Recycled water will undoubtedly carry costs greater than that of the less-processed potable groundwater already used to irrigate the park. In a long-term drought,

should we use our energy-intensive processed water used on lawns, or directed towards the greywater systems the city government is already encouraging be installed within new buildings?

This is how I believe the reclaimed Golden Gate Park falls apart: at some point in the life of the park, either during or in anticipation of drought, it will become apparent that the cost of maintaining the park as it has been in the past is simply too high to maintain. In a sense, this has already begun, given the previously-mentioned recycled water initiatives and the recent controversial decision to replace the Beach Chalet Soccer Fields, long suffering from proximity to the ocean and extremely sandy soils, with artificial turf.[51] As it stands, the park cannot use less water without the landscape catastrophically failing: when the canopy begins to die off, the less hardy species of the understory will be increasingly exposed to harsh sea winds and sun in drought conditions while the turf will die more or less immediately. There remain, then, two alternatives: continue to attempt more and more elaborate solutions to maintain the status quo – perhaps we should replace Speedway Meadow and Hippie Hill with artificial turf, as well? – or we choose to abandon the reclamation attempt and approach Golden Gate Park anew.

POSSIBILITIES

If Frederick Law Olmsted made any mistakes in his approach to Golden Gate Park, it was not because he was wrong in his interpretation of the site; he recognized what the land could sustain and made a reasonable proposal as to how, with relatively little maintenance, a park could be created there. Instead, Olmsted's mistake was in underestimating the lengths to which the growing city would go to ensure they ended up with the park they felt befitted them; he could not anticipate the act of reclamation. Nonetheless, when approaching the declamation of Golden Gate Park, Olmsted's alternative poses an excellent starting point.

While Olmsted did eventually codify his own semi-arid landscape design principles in writing, I find them to be overly concerned with hiding what he saw as the unpleasant dustiness and droughtiness of the existing landscape.[52] Having experienced these landscapes myself, I'm not convinced that they are anything to avoid; moreover I don't think these four rules are necessarily the best summary of Olmsted's work at Golden Gate Park. As a result, I will attempt to synthesize novel design guidelines based on my reading of his proposed park.

Work within the landscape's limitations
Olmsted refused to consider the Outside Lands as a site because he recognized it was wholly inhospitable to the sort of park he felt was reasonable to produce. Certain landscapes cannot be easily altered to produce desired conditions; Olmsted chose to work in a smaller, damper section of the landscape.

Different conditions beget different conditions
The design for a pleasure ground in San Francisco was so distinct from eastern parks that he refused to call it a park at all. The insistence that all parks must resemble each other regardless of local conditions is a mistake: a park in arid conditions should invite a novel reckoning of what a park entails.

Design for new occupation
Olmsted did not design his public pleasure grounds exclusively to suit the behaviours of park-goers as he knew them. He proposed alternative ways of occupying his alternative landscape.

Plan for maintenance
One of the considerations of Olmsted's sub-arid work was how much effort it would take to maintain the plants (including insisting plants be accessible so dust can be washed off them.) The maintenance of a difficult park can and should shape it.

Consider the framing of space
While Olmsted's fear of the dusty, naked landscape is perhaps not worth maintaining, his understanding that without trees we need to focus on alternative methods of shaping parkland is valuable.

Play with large and small scales
Feeling that the middle distance was lost to him, Olmsted was compelled to propose intimate and close-up experiences alongside vistas._

iii. Agromania

Much of the Hetch Hetchy Water System's route through the Central Valley passes through two irrigation districts to which the line provides no water; yet all share the Tuolumne River as a water source, with no small set of legal obligations besides. Once extensive grasslands, the landscape is now heavily agricultural with the occasional pocket of preserved land; while the landscape of the Hetch Hetchy Aqueduct is an overlooked by-product of its infrastructure, the irrigated landscape the aqueduct runs through is the intended result of the reclamation process and is worth examining in greater detail.

At the time of European settlement this was the land of the Plains Miwok and the Northern Yokut;[53] the lower Tuolumne River appears to have been occupied by group referred to as the "Tawalimni" or "Tuolumne," and it is unclear whether this group was a Miwok or Northern Yokut tribe, leaving the border between the two unclear. [5455] Further into the foothills, the residents were more certainly Plains Miwok.[56]

The Yokut were one of the many native groups to be referred to under the epithet of "Digger Indians," a reference to their perceived laziness and squalidity as much as their food-gathering practices.[57] It is true that the Yokut would harvest roots and bulbs, such as the wild carrot, for food. Their digging would aerate the soil as they searched, and they would leave bulbs behind to ensure future growth.[58] They would also use fire to fight insects and to prevent worm infestations in acorn supplies,[59] as well as to aid in the hunting of ducks,

Figure 3.6
Building the San Joaquin Pipeline in 1931; in the background, pylons already carrying Hetch Hetchy power are visible.

insects, and ground squirrels.[60] Their seedbeater tools, though uncomplicated, allowed them to harvest ripe seeds from living grasses without killing them, while also scattering seeds to replenish the stock.[61]

Unlike the Yelamu, there still exist tribes of Yokut and Miwok. Yet, as William J. Wallace notes, writing about the Northern Yokut in the the *Handbook of North American Indians*, "No large section of California is so little known ethnographically as the lower or northern San Joaquin Valley." It is the result of rapid loss in population following the settlement of the region by Mexicans and Americans[62] that we don't know how many Yokut were in the Central Valley at the start of the 18th Century. A proposed range between 18,000 to 50,000 suggests among the largest aboriginal population densities in North America; today there are around 2500 Yokut counted in recognized tribes.[63] They, like this landscape, are not what they once were.

Modesto, whose city slogan would one day read "Water, Wealth, Contentment, Health," was founded within in 1870 at an intersection of a newly-built rail line and the Tuolumne River; Turlock would follow a year later, further down the line.[64] I now refer to the account of the region's history listed in Stanislaus County's 2017 Agricultural Report, which is conveniently themed around water:

> In the mid-1800's, the early settlers in the San Joaquin Valley were blessed with fertile soil and weather conducive for dryland farming and raising cattle. Having to rely on winter seasonal rainfall left much of the valley parched during the best growing months of the year. These were the conditions until farmers joined forces with urban residents to approve irrigation districts, harnessing the waters that flowed from the Sierra Nevada Mountains, turning the valley into the agricultural oasis we know today.

This is revisionism: very few settlers knew what they were getting into. The early rush to settle the American West was helped along, Marc Reisner notes, by a decade of strong rains after 1865 that let the Great American Desert appear to bloom as it was settled. "Such a spectacular climactic transformation was not about to be dismissed as a fluke," Reisner writes, "not by a people who thought themselves handpicked by God to occupy a wild continent."[65] This natural variation in wet and dry cycles led to the idea that "the rain follows the plow," an unscientific notion that the arid regions were arid because they were unoccupied; once farmers started settling the land the rain would arrive, driven by the dust from plowing, or by trees, or by trains, or by vibrations from the commotion of settlement, or by god himself.[66] This immensely powerful idea, popular among some meteorologists, politicians, and the railway owners who doubled as land speculators[67] provided a magnificent justification for the expansionist goals of manifest destiny. Even the General Land Office, the government body responsible for dividing the west into those 160-acre plots of land Powell rejected, would eventually create the Timber Culture Act in 1873, granting settlers an additional 160 acres if they planted and maintained 40 acres of trees for ten years, to encourage rain.[68]

During the 1870s many of the Central Valley's farmers, having settled a landscape of arid grasslands, seasonal flooding, and tough soil with the expectation that the rain would inevitably follow the plow, continued to believe as much. It wasn't until the 1880s irrigation's doctrine began to grow in popularity, as investment in the region increased, mechanical farm equipment became more commonplace, as the rain never did show up.[69]

The passing of the Wright Act enabled the creation of centralized bodies for the collective management of regional resources, in 1887.[70] The Turlock Irrigation District was the first created, followed by the Modesto Irrigation District several months afterwards,[71] marking the start of the age of irrigation in California.

Irrigation Districts are not inherently problematic. Powell advocated for the communal management of water based in the science of geology, climatology, and hydrology, as he felt that the best chance for the west was managing watershed in districts, studying and developing small projects to redirect water in the most effective manner. But this is not what was established by

the Wright Act: Turlock and Modesto were not representing watersheds, but distinct political bodies.

More problematic, the common-law doctrine of riparian rights had been brought to the west from the east without recognition of potential consequences. Reisner points out that this doctrine "made it possible to monopolize the water in a stream if you owned the land alongside it[.... One] could divert all he wanted, leaving his downstream neighbours with a bed of dry rocks."[72] In a land without enough water, this system of rights allows for water monopolization and water theft, which is useful to understanding the Central Valley, and essential to understanding a larger project like Hetch Hetchy.

MARY HUNTER AUSTIN

In a passage of *Cadillac Desert* examining William Mulholland, then-superintendent of the Los Angeles Water Department, and his scheme to obtain the rights to the entirety of the Owens Valley water supply, we find an ally. Mulholland had obtained the rights to forty miles of the Owens River, but assured the public there that Los Angeles only needed some of the water, not all of it, and there was nothing to worry about. [73]

Yet a writer, Mary Hunter Austin, had suspicions:

Austin was convinced that the valley had died when it sold its first water right to Los Angeles – that the city would never stop until it owned the whole river and all of the land. One day, in Los Angeles for an interview with Mullholland, she told him so. After she had left, a subordinate came into his office and found hm staring at the wall. "By God," Mullholland reportedly said, "that woman is the only one who has brains enough to see where this is going."[74]

This was not an engineer or politician. Austin was simply an experienced observer facing a man who had fooled everyone. Her work is that of someone who had spent much of her life engaged with the landscapes Los Angeles and the Central Valley sought to fix, and the people who managed to live in them nonetheless.

> Austin had moved to the eastern slopes of the Sierras in 1891, where she would publish what became her most successful work, a collection of essays titled *Land of Little Rain*, about how life – among the plants, animals, American and Paiute settlements – functions in the arid fringes of the Great Basin.[75] She was an astute watcher of the landscape she occupied; someone who aspired to describe the land for what it was, rather than seeking to make any normative judgements about it; "You see in me a mere recorder, for I know what is best for you: you shall blow out this bubble from your own breath."[76]

In *Land of Little Rain*, Austin does not describe encounters with the Central Valley, and as a result many of the details cannot be extended to that region.

Nevertheless, her descriptions of existence in what is an actively hostile landscape, of ecological and anthropological coping mechanisms, and of cultural resilience paint a striking picture. If they can be true in as hostile a climate as Death Valley, they can surely be true elsewhere.

She begins her first essay by immediately dismantling the mythology of the American settlement and taming of the landscape:

> Ute, Paiute, Mojave and Shoshone inhabit its frontiers, and as far into the heart of it as a man dare go. Not the law, but the land sets the limit. Desert is the name it wears upon the maps [...] Desert is a loose term to indicate land that supports no man; whether the land can be bitted and broken to that purpose is not proven. Void of life it never is, however dry the air and villainous the soil.

She asserts, "The desert floras shame us with their cheerful adaptations to the seasonal limitations. [...] One hopes the land may breed like qualities in her human offspring, not tritely to "try," but to do."[77] This is a landscape where, despite the inhospitable conditions, life manages to thrive, just not in the way it does elsewhere. In describing the land of the Shoshone people she states "The manner of the country makes the usage of life there, and the land will not be lived in except in its own fashion."[78] Later, she states that "Men have their season on the mesa as much as plants and four-footed things, and one is not like to meet them out of their time."[79]

Austin engages directly with the problem of irrigation in *Other Water Borders*, which begins "It is the proper destiny of every considerable stream in the west to become an irrigating ditch."[80] Unlike much of her environment she suggests "it is difficult to come into intimate relations with appropriated waters; like very busy people they have no time to reveal themselves."[81] Relating a local tale of a water rights conflict caused by a "short water crop," she ends writing "Some of the water-right difficulties are more squalid than this, some more tragic; but unless you have known them you cannot very well know what the water thinks as is slips past the gardens and in the long slow sweeps of the canal."[82]

She avoids romanticizing nature, recognizing that even the cruel, viscerally unpleasant life in the desert play essential roles in the natural cycle; speaking of rabbits at a spring, she says, "... the bobcat drops down upon them from the black rock, and the red fox picks them up returning in the dark. By day the hawk and eagle overshadow them, and the coyote has all times and seasons for his own."[83] Her essay *The Scavengers* is describes the behaviours of carrion birds and beasts; she says, "the increase of wild creatures is in proportion to the things they feed upon; the more carrion the more buzzards."[84] She insinuates the presence of carrion and death into nature, noting "The hawk follows the badger, the coyote the carrion crow, and from their aerial stations the buzzards watch each other."[85] Austin ends insisting scavenging is "the great economy

of nature, but with it all there is not sufficient account taken of the works of man. There is no scavenger that eats tin cans, and no wild thing leaves a like disfigurement on the forest floor.[86]

The passage of time within the landscape is also a focus within her essays. She says of the Paiute system of time:

> They have no stamp of heathen gods nor great ones, not any succession of moons ... but count forward and back by the progress of the season; the time of taboose, before the trout begin to leap, the end of the pinion harvest, about the beginning of deep snows. So they get nearer the sense of the season, which runs early or late according as the rains for forward or delayed.[87]

Austin is an advocate of careful, thorough observation; she listens and watches and thereby learns. In *My Neighbour's Field,* she describes the history and life of a field near her: "It is interesting to watch this retaking of old ground by the wild plants, banished by human use."[88] She goes on to describe its subtle, seasonal shifts in the floral and faunal occupation over a year. In *The Mesa Trail*, she notes that in this landscape "a foot-pace carries one too slowly past the units.... It takes a day's journey to give a note of variety to the country,"[89] while in *Nurslings of the Sky* she notes when waiting in a canyon before a large snowstorm, you can hear "the noise of the creek rises insistently and falls off a full note like a child abashed by sudden silence in the room.... This changing of the stream-tone following tardily the changes of the sun on melting snows is most meaningful of wood notes."[90]

All told, Austin's primary concern is the state of things, the way the land *is.* The living things, human and otherwise, that manage these difficult landscapes the best are the ones who live by the limitations of the land itself, and for her the best way to come to understand the limitations and excesses of a land is to closely, carefully immerse yourself in its nature.

Aside from the fact that Mary Hunter Austin's work post-dated the development of local irrigation projects like those in the Central Valley, the fact remains that the world depicted by her writings is so fundamentally at odds to the environment desired by the reclamationists. The environment she is describing – one of hardship, of unavoidable aridity, one where success means changing the terms of the game – is the exact situation that reclamation eliminates. Such a deviation from eastern American agricultural expectations never stood a chance.

AGRICULTURE AND WATER

Modesto and Turlock's contemporary irrigation infrastructure is straightforward: they share both Don Pedro Reservoir and, downstream from that, La Grange Reservoir. Don Pedro is for water storage and La Grange, once for storage, is now the point of departure for the MID and TID distribution

systems, the form of *laterals*, slow canals snaking through the landscapes around Modesto and Turlock.

The result of this work is clear: active, productive agricultural land. Geographer Daniel Grant, writing in 2015, explains that this transformation "buffered the new inhabitants from wet and dry periods, thus creating the illusion of 'normal' climatic variation."[91] The Central Valley had solved its problem of inconsistency and unpredictability via infrastructure that allowed it to simulate a different climate on grand scale.

All this water brings vast economic benefit to the region: Stanislaus County's 2017 Crop Report states that the total value of all commodities grown that year, including the two irrigation districts in question, is over $3.6 billion. Roughly 29% of that value, just under $1.1 billion, is almonds, Stanislaus County's most valuable agricultural crop, for which the region's farmers have devoted 188,000 acres. [92]

Almonds have become an icon of the water problems borne by California agriculture. Mother Jones made a splash in 2014 with an article asserting that an individual almond requires 1.1 gallons of water, or 4.2 liters, to produce.[93] This was controversial, not for any inaccuracy but because, apparently, it did not tell the almond farmers' story. Writing in the LA Times, journalist Robin Abcarian illustrates the frustrations the demonization of almonds in general, and that factoid in particular (a "profoundly misleading answer," she writes) have caused almond farmers. "People need to understand that everything you eat takes water," says farmer Jenny Holtermann, who runs a blog under the name Almond Girl Jenny. Farmer Greg Wegis insists that the 4.2 liters quantity is inaccurate because the almond's byproducts (a hull and a shell) have valuable agricultural and industrial use.[94]

I feel that Wegis and Abcarian are both being disingenuous; regardless of the byproducts the same amount of water is required, and the byproducts are side-results of the almond production process, whose use in cattle feed, for instance, only dates back a handful of decades.[95] Neither of these responses addresses the matter at hand: why grow an immense amount of a very thirsty crop in a very dry climate at all? Why not grow something more drought-resistant?

You might believe almonds were hardier was reading the press after the value of almonds skyrocketed from $735 million in 2012, to $1.13 billion in 2013,[96] to $1.41 billion in 2014,[97] three years into the drought. At the time, a Modesto Bee's editorial stated:

> "Agriculture is the biggest industry in Stanislaus County, and last year it was bigger than ever. [...] We exported 133 commodities to 102 nations and every state in America. We are the *world* leader in almond production (at least for now)." [98]

Despite planting 20,000 more acres of almond trees since 2014, the value of almonds fell several hundred million through the rest of the drought, with a low point of $930 million by 2016.[99]

Growing thirsty crops is not new for California. Despite being lower in value than almonds, alfalfa was once one of the most significant crops in the state: the 1960 Stanislaus County crop report lists 66,000 acres devoted to alfalfa, while only 6000 acres contained almonds.[100] Some suggest that the reason alfalfa is grown in California is to support the dairy industry, as alfalfa hay is good for cattle feed.[101] While I have no doubt this is literally true, demand is not the best explanation why California should end up spending significant effort growing extremely thirsty crops: the simple truth is that the water is incredibly cheap, because the water is subsidized.

Cheap water is a counterintuitive result of the act of reclamation; if you are building a large-scale water project, you might expect the water to cost more than non-reclamation water. Reisner, discussing the management of the Colorado River, explains why it occurred there:

> What all this meant – to the taxpayers, anyway – was that the overwhelming share of the cost of any so-called self-financing project in the upper Colorado basin would end up being subsidized by them. [...] The irrigators' ability to pay for the water so pitiful that to demand that they repay the taxpayers' investment in forty years [...] would be to lead them into certain bankruptcy. [...] But to imagine Congress booting farmers off Reclamation projects because they couldn't meet their payment obligations was unthinkable. The taxpayers would have to bail them out, even if bailing them out meant a long-term bill of billions and billions of dollars. [102]

We've also seen this in Modesto. In an article about a lawsuit on this very topic from 2016, the Modesto Bee states:

> It's no secret that MID uses revenue from residential electrical customers to subsidize water rates for farmers. Farmers pay only 17 percent of their actual water delivery costs, meaning the electric ratepayers pony up the remaining 83 percent.[103]

It isn't limited to irrigation districts in the Central Valley. A 2004 report from the Environmental Working Group outlined taxpayer-funded federal water subsidies to farms within the Central Valley Project, to the tune of $416 million a year, primarily to established, wealthy farms.[104]

So, what *do* farmers pay in Modesto? In 2018, the almond farmer watering their fields with a cumulative quantity of 3 acre-feet, a common agricultural unit of water referring to the quantity required to submerge an acre of land a foot deep, would be subject to a $44/acre fixed charge, a Tier 1 $2/acre-foot fee for the first 24 inches of water, and a tier 2 $5/acre-foot for the next 12 inches. In total, Modesto almond farmers pay $53 per acre per year, and in exchange

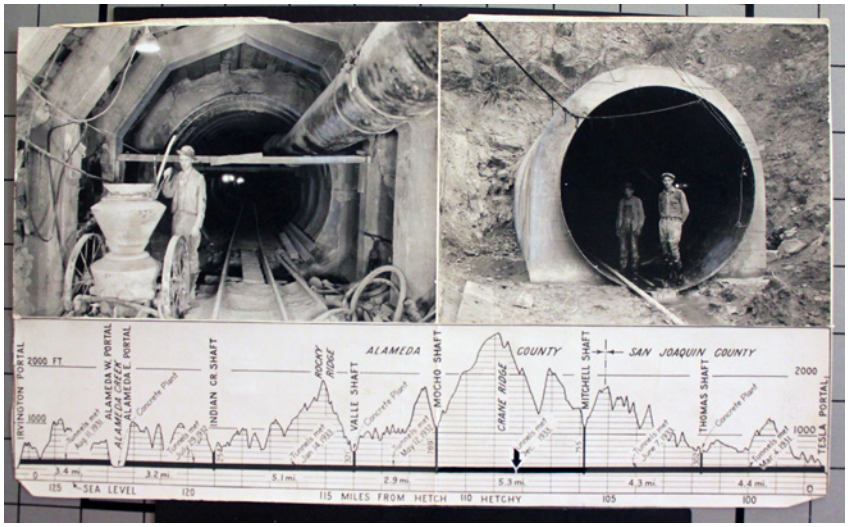

Figure 3.7
Construction of the Coastal Tunnel, with chart of elevations and shafts.

receive 3.7 million liters of water per acre per year, 3700 cubic meters worth.[105] This is a high rate for Modesto; the same farmer in 2015, during the drought, would have paid only $44/acre for the same quantities.[106]

Putting this water pricing into perspective is tricky. The fee systems in eastern regions tends to work differently, and we do not have to worry about depleting local aquifers or using up seasonal flows with nearly the same frequency. Nevertheless, recognizing that farmers only pay 17% of the actual water costs, we can calculate that the actual cost for water is $311 per acre. If you do not have to carry the costs of reclamation, why worry about drought resistance?

To make almonds and alfalfa practical in the Central Valley, all you need is to continuously bail out the farmers.

THE FUTURE

The land where the Hetch Hetchy Aqueduct was built in the 1930s was, by that point, well-established as an agricultural landscape so imbalanced it cannot be worked without constant subsidization. If farmers shouldered the actual cost of water themselves, it would become too expensive; without water, the agricultural industry dies, and the landscape is no longer continuously normalized. The welfare system that enables farmers to profit handsomely during a drought is, I believe, the linchpin of the perpetuation of reclamation's agricultural work.

There is currently a class action lawsuit against the Modesto Irrigation

District, looking to correct the "illegal tax" on hydroelectric customers; whether it will prove sufficient to make a change to the system is unclear.[107] Elsewhere, as local journalist Jeff Jardine points out, the irrigation district had recently moved to suppress solar power – out of fear, he suggests, that it could cut into the same hydroelectricity sales used to fund farmers.[108] The system also faces both the direct and indirect threats posed by ongoing drought, and burgeoning climate change, which stand to make the entire system considerably more fragile, if not fall apart entirely. California's fourth climate change assessment predicts that given their expected temperature increase by 2050, certain Central Valley regions could face "water shortages up to 16%."[109]

As with Golden Gate Park, there are moves towards the diversification of water sources, like systems using recycled water,[110] as well as moves towards more efficient forms of irrigation than the inundation method I saw at use in the summer of 2017.[111] These methods are perfectly sensible; they may also never be enough to counteract the problem of pursuing agriculture in a climate unsuited to it.

As a result, I propose we seriously consider the collapse of agriculture in Modesto and Turlock as it currently exists.

POSSIBILITIES

It is unsettling to speak of the failure of any agricultural system or major industry, least of all one as productive as the Central Valley. I won't deny that such a loss would inevitably have significant consequences, other than to point out the reclaimed landscape carries its own consequences. The fact that it is the status quo should not suffice for maintaining a broken system.

There is a tendency to fear famine at the loss of arable land. California produces an immense amount of the nation's food, after all, but as Brian Palmer, writing pre-drought for Slate, explains, while California's loss of agricultural output would have significant impacts if it happened suddenly, the country would be able to eventually pivot towards production in other areas.[112] These regions lack the Central Valley's fertile soil, but I would suggest the potential for the distribution of production across many regions is a benefit for the resiliency of America's food system that may outweigh the benefits of a fertile, arid region.

I believe radically declaiming the agricultural landscape in the Central Valley will have two major consequences, however, and they are not pretty. The first, I think, is that the act would involve putting a cap on the population that the region can hold, both in terms of economics and in terms of local food production, which is an unsettling and unfamiliar concept; we tend not to think about landscapes in terms of their carrying capacity. The second is that that carrying capacity may well be lower than what the region currently manages; the region may not be able to support its current population and

economy without reclamation. This is an extremely bitter pill, but we are increasingly faced with the prospect of these situations under climate change; some landscapes cannot hold us much longer.

There are several possible consequences of this. The U.S. Department of Agriculture routinely will pay farmers to allow their land to run fallow to restore sensitive landscapes, some of which never should have been plowed, with the end goal of restoring fragile and rare landscapes, reducing soil erosion and improving overall ecological health.[113] The long-term possibility of restoring landscapes as reserves or ecological parklands also presents the prospect of encouraging ecological tourism to the region.

Finally, I do not think the process of declamation would result in an entirely unusable land. After all, it was occupied for thousands of years by the Yokut, the Miwok, and others, who managed to work the landscape without overwhelming it. Moreover, the pre-American landscape featured large populations of ruminants, like the tule elk, mule deer, and pronghorn antelope,[114] which were nearly driven to extinction. There is a role in the native grassland ecologies for ruminants like the tule elk,[115] which may also come to fruition as ranchers experiment with arid-appropriate cattle.[116] Dr. Sarah Taber, a crop consultant and agricultural food safety expert, has suggested that arid regions traditionally benefitted from the cultivation of ruminants due to a lack of digestible plant life otherwise, when we once were limited to local food cultivation.[117]

There are absolutely opportunities in the post-reclamation Central Valley; it simply cannot look like it does today. The farm will not die, but either we choose to explore different avenues, or we will be forced to. The Hetch Hetchy Aqueduct runs continuously through former grassland, long broken up and radically transformed; we can stitch it together again, field by field.

At this juncture, looking at the prospect of a declaimed landscape, we may take inspiration from some of the writings of Mary Hunter Austin, and her interactions with the landscape she loved.

The Land in its Own Fashion
Just because we can alter the landscape does not mean it is efficient, productive, or right to do so in the long run. We should take a path of less resistance, engaging with the landscape on its functional terms.

A Day's Journey
The Central Valley is not immediately comprehensible over a short period of exposure, but over long distances, subtle changes reveal themselves.

Relations with Appropriated Waters
The water once came and went with the seasons, with the weather; the landscape was prepared for it. We should be, too.

Nearer to the Sense of the Season
Reclamation is founded in the elimination of local variation, difference, flukes; the winter rains coming later or the spring melt coming too early. Declamation expects us to prepare for this.

This Retaking of Old Grounds
The process of landscape restoration and management is perpetual and ongoing. Do not hide it; it is a part of the landscape now.

With Your Own Breath
A landscape maintained, reserved, and used, to be seen, experienced, and understood.

iv. Cathedrals

Hetch Hetchy Valley was once wide and deep with a flat, open meadow floor, run through by a meandering glacial river. It was occupied for perhaps 3,500 years; [118] though there is ambiguity around this number, there is even further ambiguity around the identity of the residents. The confusion is between the Mono Lake Paiute, of the east slopes of the Sierra Nevada, and the Central Miwoks, of the western foothills. Both were present in the valley at some point – C. F. Hoffman, a topographer with the California Geological Survey in 1868, refers to "disputed grounds" occupied by the Paiute, having driven the Miwoks out.[119] Meanwhile, Robert W. Righter's *The Battle Over Hetch Hetchy*, a history of the valley, barely references the Paiute and refers to the Central Miwok as valley inhabitants forced out by gold rush activities in the 1850s.[120] Elsewhere, this confusion boils over into controversy: some modern Paiutes feel the official Yosemite history is inaccurately skewed in the favour of Miwoks.[121] It is a difficult question, one I am not prepared to answer.

Nevertheless, for thousands of years Hetch Hetchy Valley was a seasonal refuge, hunting grounds, and an orchard. The valley was likely occupied only seasonally, from summer to late fall; residents' diets would have consisted of acorns from the large California black oaks throughout the valley, along with edible grasses and the bounty of fishing and hunting in the meadows of the valley. [122] Like the Northern Yokut, the residents of Hetch Hetchy Valley were actively engaged in the management and stewardship of their land, primarily

Figure 3.8
The site of O'Shaughnessy Dam at the west end of Hetch Hetchy Valley, prior to construction.

with fire. Jack Lundy, a descendant of regional Miwok and Paiute, described the burning to M. Kat Anderson in her accounting of Indigenous California land management, *Tending the Wild:*

> "They would burn in the late fall, about October or November, because the onset of rains and snows would help extinguish the fires. They always burned from the bottom of the slope [...] and always with the wind."[123]

The burning cleared undergrowth, which likely improved the overall health and size of black oaks and encouraged the growth of meadowland, a source of edible grasses and ideal conditions for hunting. If the land was not burned, the meadow would undergo succession, eventually filling in with pine trees, as Yosemite did when it fell under National Park management.[124]

The first recorded westerners in Hetch Hetchy were Joseph and Nathan Screech, prospectors who came upon the valley in the 1850s. The story they told suggested the indigenous peoples freely granted them the land, which is almost certainly a lie; however, they would go on to lay the first western claim for its use, opening the door to what would become a popular site for grazing sheep by the 1860s.[125] When Hetch Hetchy was folded into the new Yosemite National Park in 1890, the many private land holdings of Hetch Hetchy Valley

were grandfathered in.[126]

THE CITY

The forces that drove San Francisco to dream of great cities, the same forces that made the desert bloom, turned their sights towards the "hinterlands". After the Gold Rush, the Spring Valley Water Company, a private supplier of water, began developing a monopoly over water – by 1890, they built Crystal Springs Reservoir south of San Francisco, radically increasing their power over the city.[127] Schemes to establish a public water supply via water from the Sierra Nevada date back to 1865 and involved multiple possible sources,[128] with Hetch Hetchy Valley identified as a possible reservoir location in at least 1882 and 1888, [129]but it wasn't until the late 1890s that San Francisco began to definitively set their sights on Hetch Hetchy.

James Phelan was elected mayor of San Francisco in 1896 on a wave of anti-corruption support that extended to his view of the Spring Valley Water Company.[130] He was a wealthy real estate investor who had grand designs for San Francisco: in 1896 he reportedly said, "On a map of the world, the great bay and harbor opening onto 76,000,000 miles of ocean was stamped by the hand of fate and destined for Empire."[131] Phelan ordered city engineer Carl E. Grunsky to study a number of potential water sites, including Hetch Hetchy. John Warfield Simpson, in *Dam! Water, Power, Politics, and Preservation in Hetch Hetchy and Yosemite*, describes what happened next:

Grunsky's study of Hetch Hetchy and alternative sources didn't take long. He delivered a progress report to the board of supervisors on August 12, 1901, with the expected result. Three sites on the upper Tuolumne were the clear preference: the Hetch Hetchy Valley and sites on two tributaries [...] The thirteen other alternatives received little serious consideration in the cursory study.[132]

Hetch Hetchy Valley, by virtue of its clean water, its tight opening, and its general elevation, was inevitably seen as the best choice. What was disregarded in this reckoning was the difficulty its isolation might present, the challenge posed by the transportation and distribution of the water and power, and the fact that it was an area of stunning natural beauty within an existing national park.[133] Phelan had no interest in half-measures or compromises; he wished to secure the best water source for the city, and that was Hetch Hetchy.

San Francisco was emboldened by John Wesley Powell's 1899-1900 U.S. Geological Survey report, a survey gauging the suitability of various western rivers for damming, in which Powell wrote that a reservoir in Hetch Hetchy could easily supply enough water for San Francisco. It must be noted that Powell was almost certainly not making a recommendation, but a simple factual statement, as he went on to emphasize the beauty and uniqueness of the valley, stating plainly that the site should only be flooded as a last resort.[134] According to William Hammond Hall, the first Superintendent of Golden Gate Park and

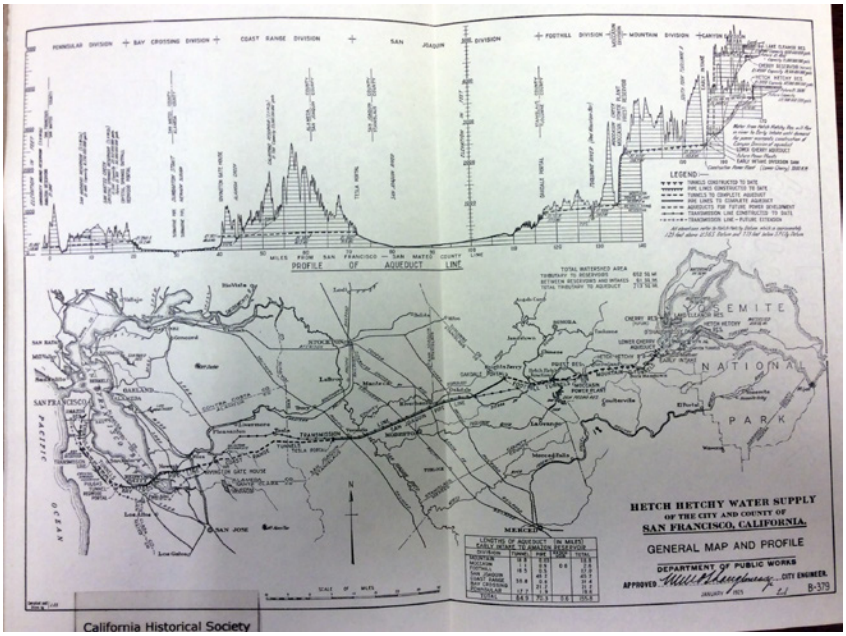

Figure 3.9
1925 map of the Hetch Hetchy System

a one-time member of Powell's Irrigation Survey of the Western States, Powell would never approve using this valley for water storage until it was absolutely needed, which he expected would be in the distant future.[135] Unfortunately, Powell's misgivings were insufficient to dissuade San Francisco.

Ironically, Yosemite's grandfathered land holdings had made it easier for San Francisco to obtain land within the bounds of the national park;[136] it is with these holdings that the city applied for water rights under Phelan's name, to keep these claims secret from the Spring Valley Water Company. In 1901, Congress approved the Right-Of-Way Act, a controversial and, at the time, disliked piece of legislation that allowed right of way for infrastructural elements, like aqueducts, in California's parks and federal reservations. This act was almost certainly the result of Phelan's active campaigning among members of Congress.[137] However, even these advances were not enough to enable them to gain a permit for construction from the Secretary of the Interior at the time, Ethan Hitchcock, who was unconvinced of San Francisco's proposed reservoir and skeptical of their persistent claims that by turning the valley into a montane lake, they could improve upon its existing beauty.[138]

Fortunately for the city, 1906 brought two changes. Ethan Hitchcock retired and was replaced by James Garfield, a close friend of conservationist

Gifford Pinchot's and ally to the cause. Meanwhile, on April 18th, a devastating earthquake shook San Francisco, causing a destructive fire in its wake. Their infrastructure having suffered damage in the quake, the Spring Valley Water Company failed to contain the fire, which burned for four days. In 1908, ostensibly provoked by this failure of private enterprise, the new Secretary of the Interior granted San Francisco's permit,[139] and the broader debate had begun: the country's first debate on preservation, a debate San Francisco would eventually win with the passage of the Raker Act in 1913.[140]

JOHN MUIR

Born in Scotland in 1838, John Muir grew up in Wisconsin; he would remain in the Midwest until his wanderlust took him around the Americas to California by 1868 where, later that year, he would cross the Central Valley and enter Yosemite for the first time. Muir's writing and activism, borne of his time in the region, had long-lasting effects: he founded the Sierra Club in 1892;[141] he was the first to propose the glacial origins of Yosemite;[142] and his campaign to prevent further damage to montane meadows from sheep grazing led eventually to the development of Yosemite National Park.[143]

Muir's approach to nature was highly transcendentalist. In his essay *Radical Transcendentalism: Emerson, Muir and the Experience of Nature*, scholar James Brannon identifies transcendentalist themes Muir shared with Ralph Waldo Emerson, like "nature is refreshing and uplifting," and "the unity of all." There is an essential distinction, however: Emerson's ideal experience with nature can be described by his notion of the "transparent eyeball," a purely visual observer who walks, barely present, through the landscape,[144] while Muir's relationship with the landscape is a fully physical experience, an outright immersion. He writes of climbing up in trees during storms, or of crawling right out to the edge of Yosemite Falls to see the view;[145] to Muir, placing his body within Nature is of essential importance to witnessing it. Considering his influence in the early preservationist movement, and his popular writings, it is not hard to see where many of Muir's values have become the de facto value system behind the North American wilderness experience so clearly typified by the National Park System.

Muir first visited Hetch Hetchy Valley on a solo expedition in 1871. The final chapter of *The Yosemite*, devoted to the valley, describes the features and waterfalls with clear affection:

> Imagine yourself in Hetch Hetchy on a sunny day in June, standing waist-deep in grass and flowers (as I have often stood), while the great pines sway dreamily with scarcely perceptible motion. [146]

He was fascinated by this smaller version of Yosemite Valley, and he makes it abundantly clear that he views the landscape as an Eden, untouched

Figure 3.10
Hetch Hetchy valley floor, before inundation, in 1911. The foreground features stacked lumber, likely a result of clear-cutting.

and untainted: "it is a grand landscape garden, one of Nature's rarest and most precious mountain temples."[147] Hetch Hetchy was difficult to visit, unlike Yosemite Valley, which was by this time already well-developed. Nevertheless, Hetch Hetchy Valley soon became a popular site for communal camping; the Sierra Club began hosting annual fundraising camping trips in Hetch Hetchy in 1901.[148]

After describing the valley in *The Yosemite*, Muir critiques San Francisco's planned inundation. He outlines several faulty arguments in favour of the reservoir, noting correctly that suitable water is available elsewhere, in less scenic locations; he even predicts, quite accurately, the "bathtub ring" that marks the edge of the reservoir today.[149] He finishes the essay, "Dam Hetch Hetchy! As well dam for water-tanks the people's cathedrals and churches, for no holier temple has ever been consecrated by man!"[150] Muir and the Sierra Club campaigned for years to save the valley, successfully establishing it as the first real North American environmental controversy and drawing support from all over the country before the Raker Act was signed.

The reason why the movement failed to save Hetch Hetchy is complicated. Muir was unfairly criticized as standing in the way of progress,[151] but he was also in the way a city that was looking to get out from under the thumb of a monopolistic water supplier.[152] Grunsky, the San Francisco City Engineer, acknowledged that while San Francisco didn't want to do as such, damming Lake Eleanor would supply more enough water for the Bay Area until the year 2000;[153] yet as Righter points out:

> Muir may have lost an opportunity to save his valley when he failed to explore fully [the] view that San Francisco would be willing to develop first the Lake Eleanor site, leaving the Hetch Hetchy Valley for a later date, perhaps 50 years hence.[154]

Where usually the reclamation process is accepted as a necessity, with only small, easily disregarded objections, the Hetch Hetchy dam and reservoir

were recognized by many as problematic and undesirable. It appears to me that Muir's loss is likely the result of some bad decisions and some bad luck; as a result, I am not interested in dissecting why Muir's campaign failed.

Understanding what he was proposing, and why, is much more illuminating. The story told is usually that the fight over the valley was between development and nature, between civilization and wildness, which is how Roderick Nash characterised it in his 1967 book *Wilderness and the American Mind*.[155] With the cast of characters involved, it is easy to extend this ideological fight into the realm of *preservation* versus *conservation:* Muir is a quintessential preservationist, fighting to allow nature to remain inviolate; meanwhile, Muir's former colleague Gifford Pinchot, who, as Chief of the United States Forestry Service,[156] helped San Francisco's reservoir project along, is the father of conservationism, the ideology of utilitarian landscape management suggesting land should be preserved to be used responsibly. These definitions of preservation and conservation – the protection of nature from use, versus the proper use of nature – come directly from the National Park Service themselves.[157]

However, as Righter takes pains to outline, the apparent narrative of "civilization versus wilderness" in the Hetch Hetchy conflict, while perhaps more relevant to today's sensibilities around preservation, has no basis in the historical record. It would be inaccurate to suggest the fight was performed for nature's sake; there is nothing in Muir's writing, or in the writings of other Sierra Club campaigners, to suggest that they wanted the valley to remain "wilderness." The truth is quite the contrary: they wanted to ensure development within the valley. One of the foundations of the Sierra Club's case for Hetch Hetchy was the argument in favour of touristic development. They drew parallels between Europe's established tourism industry and what Hetch Hetchy could support by investing in "campgrounds, hotels and conveniences" within the valley, even recommending a large circular road linking Yosemite, Tuolumne Meadows, and Hetch Hetchy. [158] Muir himself, in an 1896 letter, wished to build a road through Hetch Hetchy so that the valley "will be seen and known by countless thousands."[159]

It is difficult to reconcile these beliefs with the definition of preservationism used previously. I would argue that the only way to understand Muir's preservationism is to recognize that it is founded on his transcendentalist ideals, which hold that the physical experience of nature is essential: it is refreshing, energizing, spiritual, a necessary retreat from urban life. In this sense, the proposals to develop the valley are entirely sensible from a utilitarian point of view: the nature that can heal us should be used to heal as many as possible. The major difference between Muir's view and Pinchot's is less that one is about the use of nature and one is about saving it – they are both concerned with the potential use of nature to humanity – rather that one of them needs the nature to remain more intact than the other. When Muir writes, "as well

dam for water-tanks the people's cathedrals and churches," it reflects his own view of Nature and its fundamental utility for people.

It is important to note, then, that Muir never appeared to understand the nature for which he fought. He barely wrote about native occupants in Hetch Hetchy, and nothing in his writing suggests that he knew the open valley floor he loved was the result of indigenous land management practices. If he had been successful in fending off San Francisco and implementing the development he wanted to see in the valley, Hetch Hetchy might today be slowly refilling with brush and pine trees. This is not unprecedented: the lack of fire in Yosemite Valley has resulted in the progressive ecological succession of Big Meadow, which was only kept open through native management; according to M. Kat Anderson, Yosemite National Park's own interpretive signs refer to the filling in of Big Meadow without any mention of the native groups that kept it open in the first place.[160]

This, in many ways, is part of Muir's legacy, which reaches beyond the shore of the flooded Hetch Hetchy and has actively influenced land management elsewhere.

O'SHAUGHNESSY DAM

The grant that had been provided by Interior Secretary Garfield was issued under the pretense that San Francisco was to develop Lake Eleanor first, only to develop Hetch Hetchy at such a time that it became needed by the district.[161] Not long after, the city of San Francisco had a change of heart: examining the official timeline of events reveals that construction on the river bypass tunnel for O'Shaughnessy Dam began in 1915,[162] the construction of Lake Eleanor began in 1917,[163] and construction on O'Shaughnessy Dam began in August, 1919.[164] There is a section in *Water and Power*, the official history of the Hetch Hetchy Water System, that addresses this alteration:

> San Francisco's original plan was to divert only 60 million gallons of water per day from the Tuolumne to serve the City's purposes until well into the 21st Century. However, upon advice of the Board of Army Engineers [aka the Army Corps of Engineers] in 1913, San Francisco found itself assuming leadership for providing the needs of the entire East Bay, requiring ultimate development of the Tuolumne River to produce 400 million gallons of water per day.

But by the 1920s, the East Bay had already developed their own source of water via a different river and had no need for San Francisco's leadership. The city decided, then, to keep their water system at the maximum they had proposed previously, allowing them "to meet the ever-increasing requests for additional water from [their] own citizens and also from the mushrooming suburban areas and industrial complexes in a 50-mile radius south and east of the city."[165] San Francisco used regional needs as a justification for maximizing

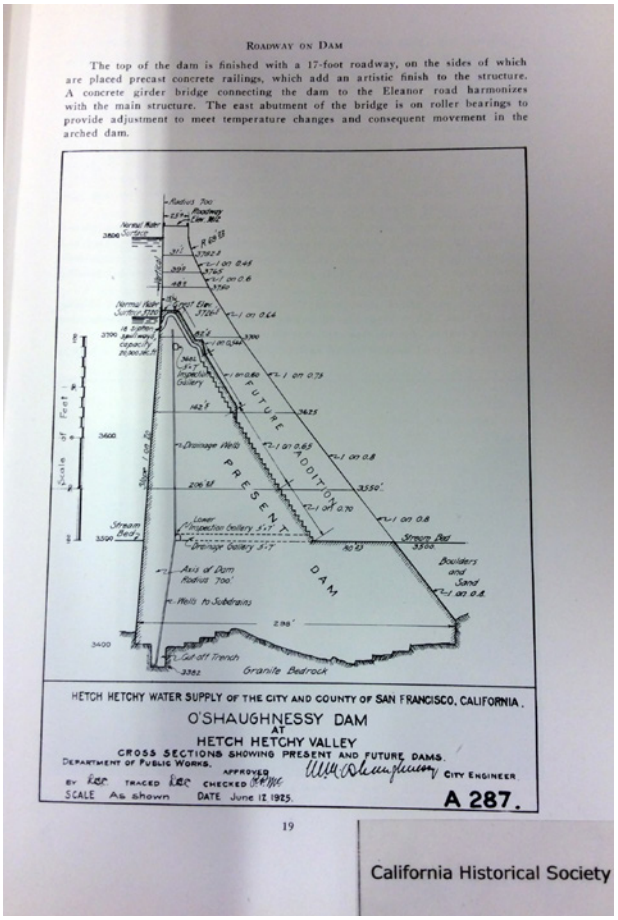

Figure 3.11
O'Shaughnessy Dam cross-section.

their potential water takings from the river, and then used the lack of regional needs to justify using the maximum water takings from the river.

This is what resulted when the doctrine of riparian rights was imported to the newly settled west; there is no room for prudence when someone might take the water you don't use. Indeed, in making their water claim, San Francisco was already beholden to the water rights of Turlock and Modesto, located downriver from them, and San Francisco's primary obligation towards those two irrigation districts requires them to ensure that the Central Valley water claims are met before their own takings are accounted for.

O'Shaughnessy Dam's construction was completed in 1923 to a height of

about 68 meters with a striking terraced design intended to allow for eventual expansion of the dam, which arrived barely fifteen years later, bringing the final height to just under 100 meters and increasing the capacity to 360,000 acre-feet. The dam was filled and has remained filled ever since; water first arrived through the aqueduct to the waiting crowd at an early iteration of the Pulgas Water Temple on October 24th, 1932, at 10:12 AM.[166] It is an infrastructural spectacle, a cathedral of water and power hundreds of kilometers from the city it serves.

Opposition to the dam has been virtually continuous since the day it was completed. The Sierra Club would continue to protest the state of the valley, producing *Two Yosemites*, a documentary, in 1955; advocating for studying the removal of O'Shaughnessy rather than restoring it in 1970. In the late 80s, under President Reagan, Interior Secretary Don Hodel voiced support for investigating the removal of the Dam and the restoration of the valley, leading the Sierra Club to develop a Hetch Hetchy Task Force; this group splits from the Sierra Club, becoming the non-profit organization Restore Hetch Hetchy in 1999. In the past few decades, Restore Hetch Hetchy has been involved in a series of lawsuits, and seen both 21st century Republican presidencies endorse or explore the possibility of removing the dam and restoring the valley.[167]

There is an understandable resistance towards these campaigns in the Bay Area; a 2012 referendum calling for a study on the restoration of Hetch Hetchy was defeated with 77% of voters against.[168] Usually the arguments against the elimination of the dam amount to insisting the water is too high in quality to give up, the hydropower generated is irreplaceable, that without the reservoir the city would be at a greater risk of drought,[169] not all of which is supported by evidence. But there is an undercurrent to these arguments that goes beyond a question of true or false. For instance, during Hodel's tenure as Interior Secretary, then-mayor of San Francisco appeared in an LA Times article:

> The mayor said Hetch Hetchy water, noted for its high quality and smooth taste, is a "birthright" of San Franciscans. [...] Feinstein said, "All this is for an expanded campground? . . . It's dumb, dumb, dumb."[170]

Something in this quote reminds me of the inscription on the Pulgas Water Temple:

> I give waters in the wilderness and rivers in the desert, to give drink to my people.

The full quote, from Isaiah 43:20 in the King James Bible, is "The beast of the field shall honour me, the dragons and the owls: because I give waters in the wilderness, and rivers in the desert, to give drink to my people, my chosen."[171] My people, my chosen, for whom water is a "birthright."

I think it's important to foreground the fact that the Hetch Hetchy

System is a modern, man-made piece of infrastructure, the product of a series of decisions and policies developed over the past 150 years; it is neither the birthright of the residents of San Francisco nor a gift God granted to his chosen people. It is not ordained, innate, natural, or fated. We should not look back on the decisions we make as a culture as though they are self-evident, as though they were the only way forward. To do so only serves to justify unjustifiable actions to ourselves, to assure us we did what was best and have nothing to answer for.

The Hetch Hetchy System is by no means the best system: it is the competitive subdivision of a river with little capacity for consideration of the overall health and management of the watershed. Making disparate, segmented claims of a river ensures the river can only be managed, at best, in a disparate, segmented manner. Decisions at the top of the river have consequences at the bottom: increased takings from the upper Tuolumne have significantly decreased flow into the San Joaquin – the Tuolumne releases 25% of its potential unimpeded flow at its confluence[172] – and as a result, without high freshwater flows to push back, salt water from the bay creeps in further, risking freshwater habitat and threatening communities who source their freshwater from the San Joaquin.[173] The currently-proposed solution for this problem is extremely controversial among farmers: a 40% flow minimum for three major San Joaquin tributaries, proposed by the State Water Board, which still remains to be voted on.[174] This is the only possibility for holistic management of the watershed; the rest is granular management and granular problem-solving. Even with the possibility of a solution from the State Water Board in this case, we are just applying patches.

THE FUTURE

San Francisco wants you to believe that the Hetch Hetchy System is necessary. It is not; it is merely what already exists. In a paper published in the Journal of the American Water Resources Association titled *Reassembling Hetch Hetchy: Water Supply without O'Shaughnessy Dam*, authors Sarah E. Null and Jay R. Lund, a Doctoral Student and Professor, respectively, at the University of California-Davis, perform a study of the hydrological impact on the Hetch Hetchy System if O'Shaughnessy Dam were to be eliminated. Ignoring, for the purposes of their study, political and institutional constraints, their models found that getting rid of O'Shaughnessy Dam and having a tie-in to the existing Don Pedro Reservoir would not result in any lost water. It would be costly, because it would be the end of their filtration avoidance and they would lose most hydroelectric energy generation, but it would not cost them water.

The truth is that the system, exactly the way it is right now, has not cost San Francisco much until recently, when they undertook the $4.8 billion Water System Improvement Program, giving a necessary update to an infra-

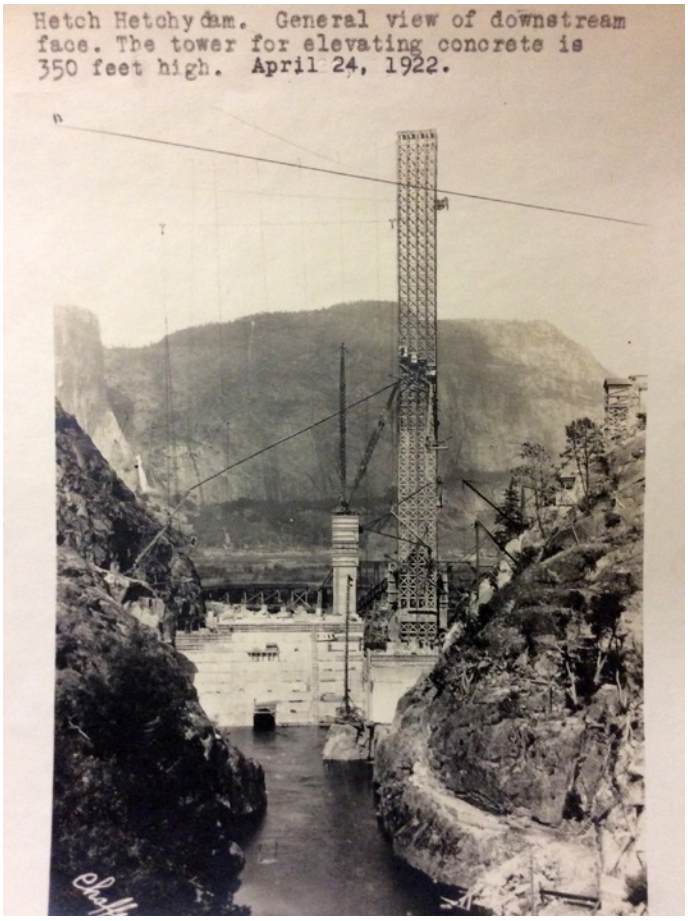

Figure 3.12
O'Shaughnessy Dam under construction, 1922.

structural system which spans three active seismic faults and which had been, in some areas, untouched for 90 years.[175] Other than recent spending and the initial building, though, San Francisco hasn't had to invest heavily: For over a hundred years, San Francisco has been paying a rent to the federal government for Hetch Hetchy of only $30,000 per year – an amount unchanged since it was originally instituted in Raker Act, in 1913. [176] If you live in San Francisco, that's less than you can expect to pay in rent for a 1 bedroom apartment.[177] In 2012, when state representative Devin Nunes proposed raising this rent to $34 million annually, the San Francisco Public Utilities Commission responded that, actually, the $30,000 rent is good, because they are also on the hook for

"$5 million a year to reimburse the federal government for security, trail maintenance, water monitoring and other services around the reservoir."[178] Much as I am loathe to agree with Devin Nunes, that $5 million quite plainly does not accounts for the cost of the maintenance of the land. While Nunes' proposal failed, he is not the first to bring up this matter, and I doubt he will be the last. It is patently absurd that San Francisco's fees for the reservoir have not increased in over a century.

2017 revealed another faultline in California's reclamation systems. As the last drought came to an end, and the snows and rains returned in force, Oroville Dam, north of Sacramento, filled up so quickly on February 7th that it could not be drained through standard means and they had to make use of the main spillway to ensure the water would not overtop the earthen dam. Almost immediately, the concrete spillway began to catastrophically erode. Fears that excessive erosion of the spillway would damage the dam itself led to the use of the auxiliary dam, which also began to erode; 188,000 people were evacuated from low-lying areas before the rains let up and disaster was avoided. Further news revealed the dam had not been properly maintained in the years since its construction; by 2018, the cost of repairs has exceeded $1.1 billion, and the situation has since spurred a handful of lawsuits.[179]

As outlined in the introduction to this section, this is what happens to these complex systems: it fails in one place, then many places, then everywhere. Some estimates put thousands of dams at similar risk due to lack of funds for proper upkeep, and as they age the situation overall will only worsen.[180] The more pieces of infrastructure you have, the more that can fail, and the more you must watch out for.

Hetch Hetchy is a stable piece of infrastructure because, viewed in isolation, on San Francisco's terms, it is an extremely convenient piece of infrastructure. It is also a redundant dam, a physical manifestation of San Francisco's irreconcilable water claim, and, because of a series of political machinations, an extremely affordable water source.

While there is always the possibility of Hetch Hetchy being drained as the result of a Restore Hetch Hetchy lawsuit, these results are unpredictable. Let us instead imagine its destabilization along these identifiable trajectories. As the climate shifts, the region will experience more fires, more drought, and more periods of intense seasonal rainfall. Forest fires, like the 2013 Rim Fire or the 2018 Ferguson Fire, which also threatened Yosemite, will force the diversification of uncompromised water sources, which will require expanded water filtration, undermining the value of Hetch Hetchy as a pristine water source. Drought will force the diversification of water sources and it could lead to a revocation of existing legal systems around water rights and the imposition of top-down water management, as we are beginning to see imposed by the state. Water scarcity may also increase the political pressure on Congress to alter

the SFPUC's rent to Yosemite National Park, as set out in the Raker Act, to reflect a hundred years of interest and begin to approximate actual land value. Intense rainfall periods will add additional stress onto infrastructure like O'Shaughnessy Dam and New Don Pedro Dam, increasing maintenance costs beyond what has historically been expected.

Taken separately, no one of these developments would undermine Hetch Hetchy, but taken together they introduce significant stress in a system that – by design – has avoided it thus far. Reclamation systems work well under ideal conditions but fail outside of them: it does not matter how many dams you have if the river runs dry. This situation presents expensive water, high maintenance costs, and necessary filtration processes, all of which conspire to render the Hetch Hetchy Reservoir significantly less practical than the alternative proposed by Null and Lund.

POSSIBILITIES

O'Shaughnessy Dam is likely too massive to be fully demolished. It is built of cyclopean concrete – concrete interspersed with massive boulders[181] – and the full demolition would likely damage the surrounding environment. Luckily, all that is needed to restore the valley is for the river to flow freely, meaning we can retain most of the dam and minimize surrounding impact. The dam itself visibly contains interior spaces and corridors; while the nature of these interior spaces is not publicly documented, we can project based on existing doorways, windows, and skylights. Moreover, maintaining and further leveraging the dam, rather than obliterating it in favour of a pristine nature, allows us to retain markers of this passage in the history of the valley, which should not be forgotten.

Restore Hetch Hetchy has developed a proposal for the restoration of the valley. They note that the same natural low turbidity that attracted San Francisco to the valley's water has ensured that the valley floor has gained very little sediment in the decades of inundation; even the original course of the river has remained underneath the water, easing the potential problems posed by restoration.[182] Their plan takes a decidedly un-Muirish approach: "Yosemite was developed according to 19th and 20th century conceptions of public access to wilderness," they write. "Today, no-one wants to see lines of cars or hotels spread along a monumental valley within a National Park." They wish for a park that "protects its wilderness character while maximizing opportunities for access to visitors with any sense of adventure." *Any sense of adventure* is a phrase I take to refer to the sorts of visitors who do not need significant infrastructure to support their visit to the park – certainly not the sorts of visitors who made Yosemite the fifth-most-visited National Park in 2017. [183] Fittingly, RHH proposes no specific park infrastructure, instead choosing to focus their attention on the ecological restoration of the valley.

As much as I didn't enjoy the experience of finding parking spots in Yosemite Valley, I must take Muir's side on this matter: if we are going to the trouble of restoring a long-lost valley at great expense, it is only reasonable that we allow it to be experienced by as many people as possible. Limiting access to the valley only to those able and willing to seek out backcountry experiences is not only limiting in terms of experience, but also demographically, seeing as a U.S. Forestry Service study of the demographics of backcountry visitors determined they were 95% white.[184] The design of Yosemite Valley is certainly inadequate for the number of visitors they receive, but that is by no means an indictment of the visitors themselves. Developing Hetch Hetchy to allow for significant numbers of visitors interested in both backcountry and day-visit experiences, without actively impacting the restoration of the valley, is a worthy goal.

We cannot take Muir's approach entirely, however, because Muir's preservationism is a limited one. First, it neglects to consider what Aldo Leopold, the father of wildlife ecology, deems the *land ethic*, the theoretical system that looks to treat land, and all it contains, with recognition of its own autonomy and rights.[185] Second, it fundamentally misunderstood the anthropogenic qualities of the landscape, believing the man-made garden to be a fully natural occurrence, which we know it was not. Any re-occupation of the landscape should consider the management processes that shaped the landscape into the pleasure-garden Muir fought to preserve, because they, too, are a part of the ecological history of the valley.

How we approach the restoration of this valley that we are to occupy once more, then, is not borne out of Muir's words, but out of the questions his thoughts and impact leave us with today.

Who is the valley for?

Muir wanted to preserve the valley for tourists while Restore Hetch Hetchy proposes to leave the valley for adventurous backpackers. Our answer is not so simple: Hetch Hetchy is for visitors, the lost landscape itself, and the forgotten occupants who shaped it; it is not for all these equally.

How do we bring people into nature?

Muir proposed roads, hotels, and campgrounds in Hetch Hetchy, much like Yosemite Valley. However, this infrastructure in Yosemite is built on some of the most scenic and ecologically sensitive parts of the valley. Rather than give up on infrastructure, we will keep the infrastructure off the valley floor.

How do we preserve the visible and invisible histories of reclamationist occupation?

Muir dreaded the coming inundation. We will build on what it leaves behind: the dam, modified to allow the river to flow freely, will be re-occupied and re-used both as novel park infrastructure and as a memorial to the act of reclamation that once held this valley; elsewhere we will mark the now-lost reservoir edge through ephemeral means.

What role can native land management strategies play in the shaping of the landscape?

Muir never understood how human hands had shaped the ecology of the valley. The management of this land has been a part its occupation since before the first Americans arrived, and should continue. The valley, properly managed, will serve to preserve the actions and knowledge that produced it.

v. Fail State, San Francisco.

The fault lines of the reclamation system are designed into the system itself: the intersection of physical infrastructural failures with the unforeseen, but not unforeseeable consequences of the policy framework behind reclamation – water rights, water subsidies, and water use – collectively push us into a state of failure, a total collapse of the reclamation system. The fact that these systemic inadequacies amount to an innate inability to adjust to altered conditions are what will bring us to a radically altered future.

This projected failure is not the product of ideology. Nor is it the result of any single disaster of climate or ecology, which have not yet bested San Francisco, though may at some future date. Instead, it is a failure projected outwards from within the coding of the system: the very decision to create a permanent hydrological infrastructure to "fix" an ecology precludes a certain capacity to react to changes. In an environment where the very presence of water, the baseline against which the reclamation system is built, is highly variable, the only way the system can sustain itself is through the deployment of more and more complex infrastructural and legal systems.

Meanwhile, the notion that we might change how we live, change the policies undergirding reclamation, change what we expect from the landscape, change our fundamental relationship with the climates and ecologies we live amongst to free us from our reliance on the reclamationist system is not considered, and cannot be considered so long as reclamation remains the default

Figure 3.13
The opening of the water channel at Pulgas Water Temple in 1936.

system of land management. To suggest such a thing would require us to collectively acknowledge that we do not have this situation under control, that we are not the masters of a land God granted us, that we may be at the whims of a cruel and uncaring environment – the very fears that reclamation has always sought to keep away. We want everything to remain precisely as it always was, even if that state is senseless and mere decades old. To face this difficult landscape head-on, to change the way we live in the face of conditions we have little control over, is to render reclamation obsolete.

The failure of this system need not result from a singular drought or flood, nor do we need catastrophe. Rather, cumulative changes in context and condition apply continuing pressure to the system until it is no longer rational or reasonable to perpetuate it are sufficient to break reclamation.

This hypothetical whole-system failure presents the opportunity to reimagine California's relationship between water and land occupation through the design of three declaimed landscapes, to follow.

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In all the dryer regions of the world in which men have been living in a condition approaching that of civilization, it has, from time immemorial, been customary to plan buildings and grounds with a view to pleasure, in a manner looking to four classes of results. These are:

first, to leave little naked ground, such as would be covered with turf in regions of humid climate, fully exposed to view near the eye;

second, to have objects in the foreground of dwellings and of frequented places and ways, arranged in such a manner that it is comparatively easy to so apply water to them that they may be kept clean, fresh and in nice order;

third, to have these foreground objects to arranged that other objects coming into view beyond them will be at such a distance that effects of drought and dust upon them will not be disagreeably evident;

fourth, that a picturesquely intimate association of natural and artificial objects may be secured, as, for example, by the mantling of walls, fences, gateways, verandas, balconies and pavilions with a foliage of vines, and by growing upon them plants that need little moisture, such as Agaves, Yuccas, Cacti, Sedums and Houseleeks. These, sometimes growing with obvious art, as decorations in vases and pots; sometimes naturally, in crannies and cavities of rocks and stone work.

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4.

Occupying new ecologies and old infrastructures.

landscape fictions

i. Parched Ground and Thirsty Land

These are the forces and ecologies that once occupied Golden Gate Park, and may occupy it once more, when the water runs out:

Before there was Golden Gate Park, there was sand, an immense dune field stretching several miles inland from Ocean Beach. There are only a handful of similar dune fields remaining along the North Coast of California: the Tomales Dunes, north of San Francisco, feature large inland dune fields but poor foredune conditions;[1] the Lanphere Dunes, even further north, have been successfully restored since the 1980s, but consist of foredunes and stable hind dunes, without a deep dune field;[2] Fort Funston, located south of San Francisco along Ocean Beach, is a former military base that has since been reclaimed and partially submerged by the dune landscape it occupies, but is an incomplete dune system that is, I think, in the process of eroding.

Coastal dune systems follow a straightforward mechanism, without which the dunes will slowly fail.: particles of sand wash up on a beach, and when they dry wind blows them inland. Plants, washed-up seaweed, or other pieces of beach detritus resting above the high-water mark anchor the blowing sand, which allows more plants to grow, anchoring more sand and creating a feedback loop that results in the development of a foredune.[3] Many solutions for dune restoration begin, alongside the replanting of native dune species, with the use of open-slatted sand fences, which limit access to fragile dune landscapes and help to, if installed properly, reduce sand movement and can

Figure 4.1
A road at Fort Funston.

help encourage this development on a shorter timescale; the sand fences slowly collect sand until they are buried, at which point a new sand fence is placed higher and further inland until it, too, is buried. [4]

Foredunes, also sometimes called beach ridges, are fragile landscapes that nevertheless form the backbone to a healthy dune system. Their precise morphology comes from the plants themselves: the foredune at Tomales Dunes results from the invasive European beachgrass, which holds onto sand well enough to form a tall, steep dune which eventually starves the hind dunes, [5] while native Californian species, where they still occur, form a series of gentle, low mounds.[6] In some regions, the foredune complex is followed by increasing-

Figure 4.2
Battery Davis, Fort Funston.

ly stable dunes, but in San Francisco, as in the Tomales Dunes, what followed was the dune field, a constantly shifting landscape fed by sand from the beach without sufficient water to spur collective stabilization.

At the rear of the dune field, where precipitation was perhaps a little likelier and the soil already a little steadier, we would likely see the emergence of coastal scrub landscapes, dominated by sagebrush and coyote bush, and eventually the coast live oak that we know of today.[7] I don't know where the dune field once ended, and in fact I'm not convinced that such details would even have merited mapping in the 19th century; luckily, the city has released regional "plant community" data for local gardeners, mapping out the city's

Figure 4.3
Boardwalks and bunkers at Fort Funston.

distinct biomes to educate on appropriate planting in various regions (see figure 4.3).[8] Without better sources available to us, we can take advantage of this map to begin to infer the ecological conditions that would inform the landscape of Golden Gate Park post irrigation.

Human access across dunes is a difficult matter. Dune grasses hold the entire landscape together, so damage by pedestrian traffic or dog urine can harm a hind dune or ruin a foredune. However, barren sand dunes are comparatively inert, and dune hollows and sinks, sheltered from exposure, are less fragile. For Golden Gate Park to take the form of these long-lost biomes, interventions will be required.

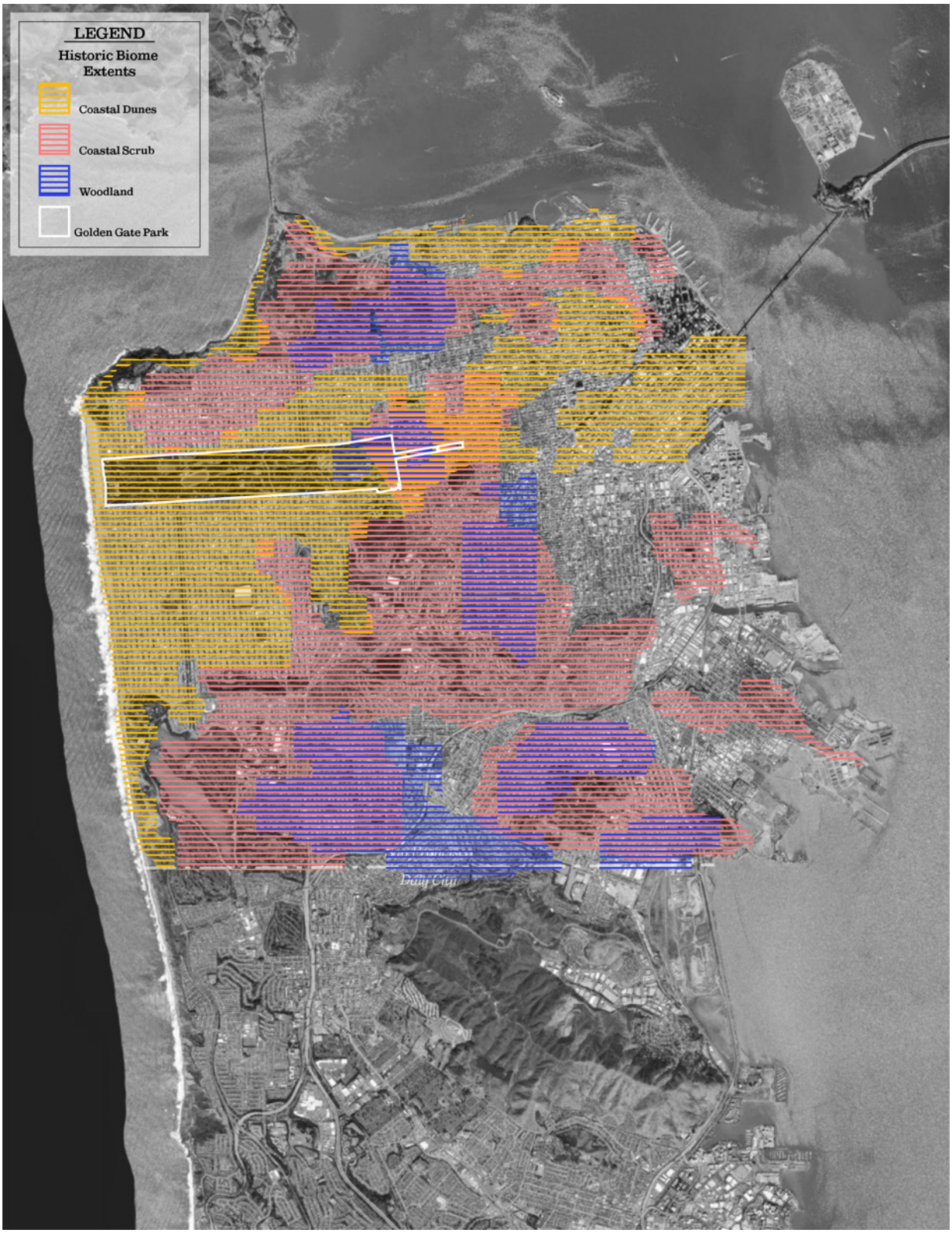


Figure 4.4
Several underlying native ecologies within San Francisco.

Unlike Olmsted, we cannot propose a park in a different, easier location; his proposed site has long been developed. Thus, it is on us to work with this climate and ecology, to work with straightforward maintenance and management strategies, without leveraging huge quantities of water to do so.

The declamation of Golden Gate Park begins with the elimination of the irrigation system that undergirds the park today and proposes the active restoration of Golden Gate Park into three distinct biomes: the oak forest that already exists is expanded, coastal scrub encompasses the museum district of the park up to Crossover Drive, and the remaining landscape is returned to a coastal dune system. This subdividing reflects and expands the underlying biomes of the site to better recognize the needs of the park itself: for instance, the region of the park with the most tourist-friendly attractions and therefore the most visitors in general adopts the coastal scrub not only because it is roughly in the "correct" location with the "correct" soil and humidity conditions, but because the district already lacks meadows and is frequently paved. This district is well-suited for using coastal scrub plantings as a floral backdrop to existing buildings, park amenities, and public spaces with minimal effort and maintenance; while it is likely that some of the scrub landscape will require irrigation, by using native plant species in a sensible location, we can be certain it will require far less water than is currently needed.

Rather than the careful preservation of programme elsewhere, the landscape west of Crossover Drive, currently home to some of the park's most peculiar and extravagant amenities like the equestrian ring and a golf course, is instead progressively restored to a dynamic sand dune system. To both recreate and contain a constantly shifting and drifting landscape, multiple pieces of infrastructure are proposed.

First, to properly enable a sand dune system, we need to allow sand to move freely inland. Sand tends to pile up at the north end of ocean beach, in the vicinity of Golden Gate Park;[9] if its path inland remains blocked by beachfront parking and the Great Highway, any dune system will be deprived of a perpetual supply of sand. To fix this, the Great Highway is lowered and buried under a grand terraced armature, the width of Golden Gate Park, which provides a persistent structure for the seeding and gestation of a new foredune while maintaining, through displacement, the previously privileged highway and beachfront parking. The terraced armature improves beachfront amenities and support active occupation of the dune by presenting exposed, planted terraces when lower levels of the dune are still developing, then providing structure for raised boardwalks once the dune has developed more fully.

The angular plan and rounded section of the dune armature is modelled off the low, hilly profile of the foredunes at Lanphere and aligned to the prevailing winds on the site, with the deepest angles of the armature hopefully seeding stable dune hollows across the foredune, through which trails will be laid.

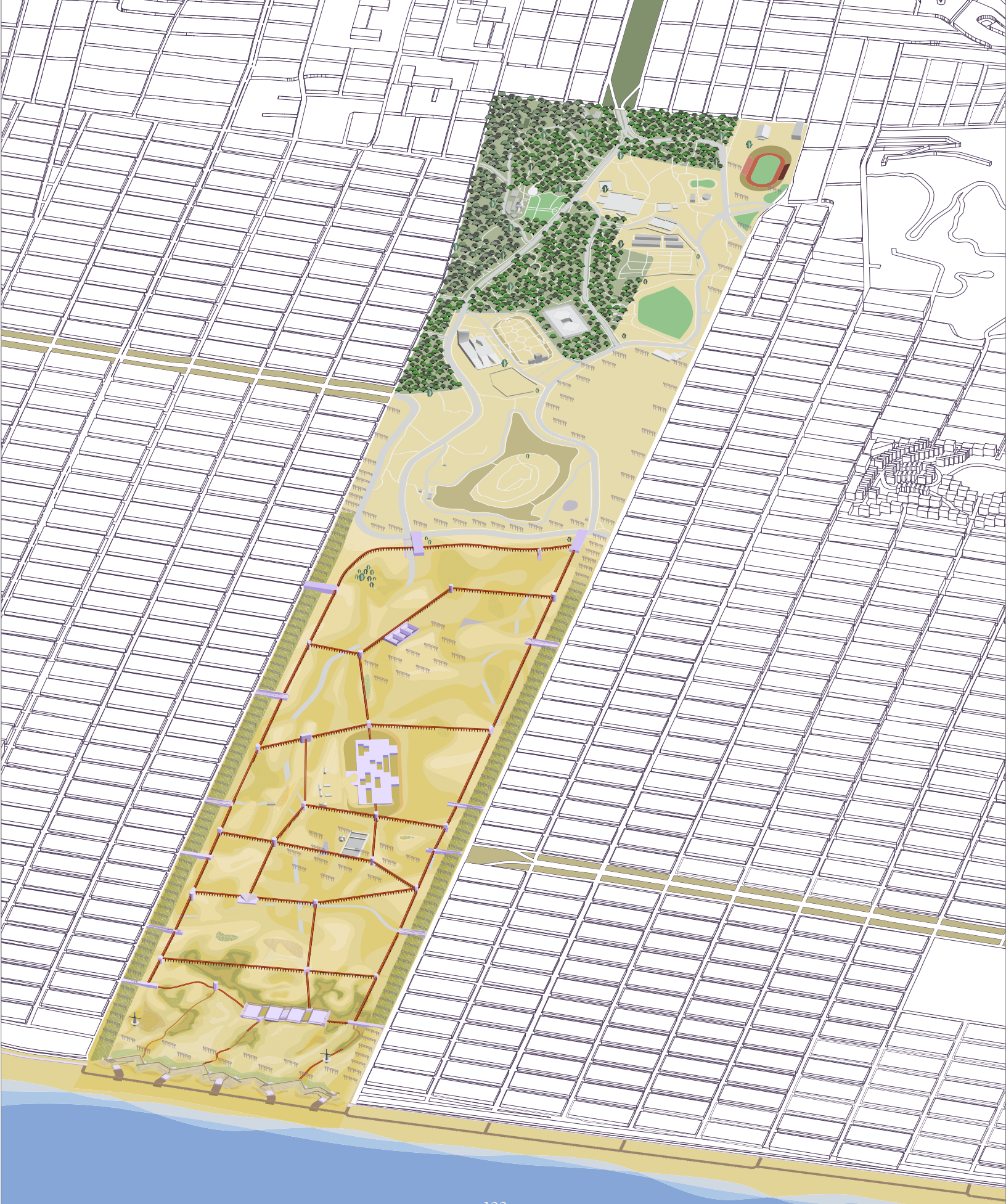
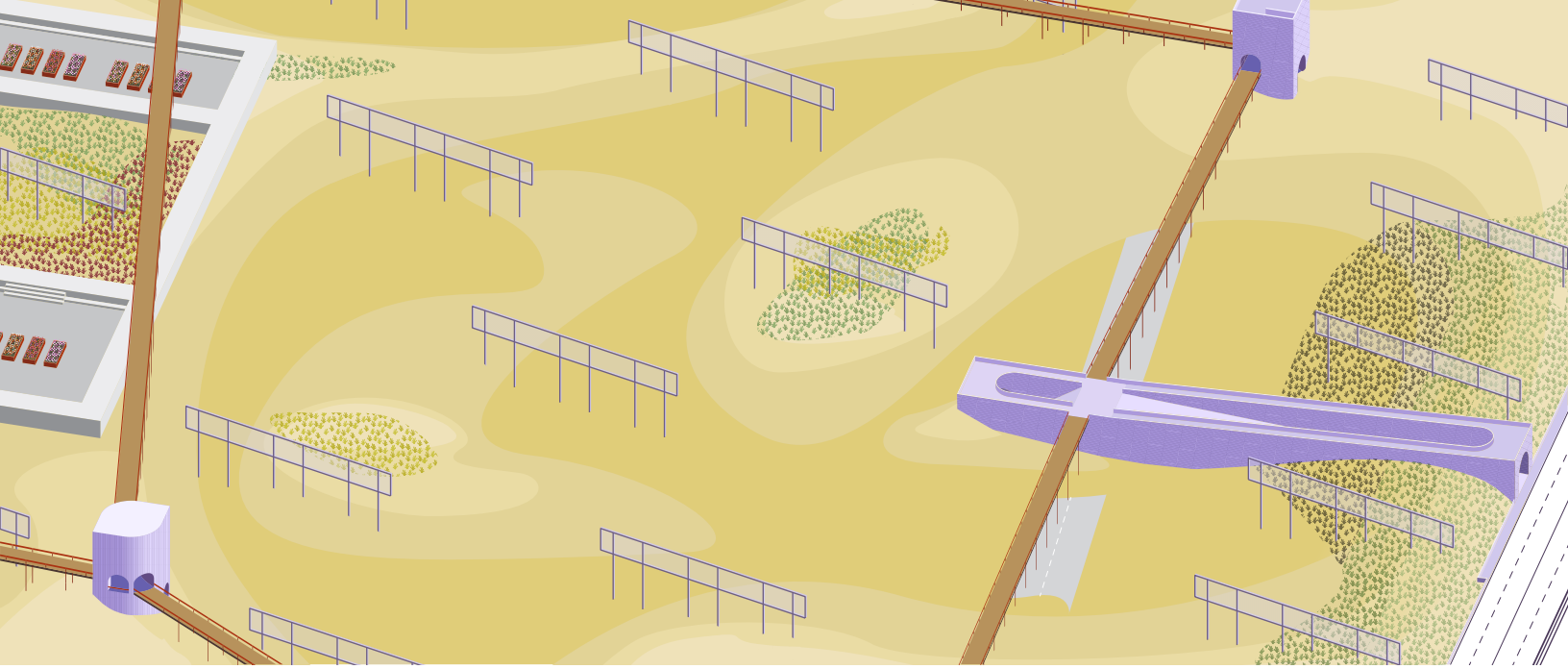


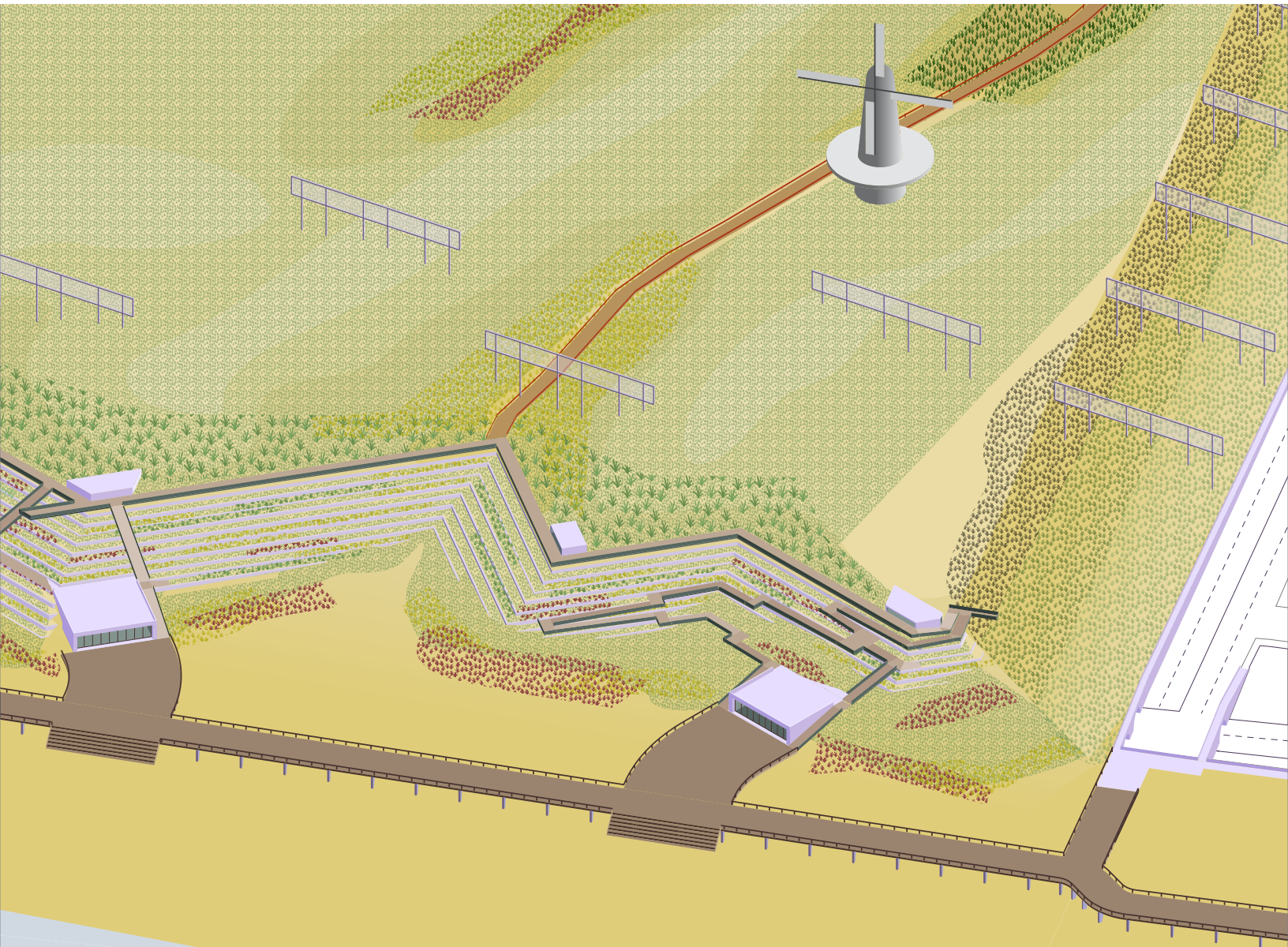
Figure 4.5 (Opposite)
The declaimed Golden Gate Park.

Figure 4.6 (Above)
Foredune and dunefield of Golden Gate Park.

Figure 4.7
Dunefield occupation and edges, and western edge of the new scrubland park.

Figure 4.8
The eastern edge of the park, containing expanded coast live oak forest and scrubland.





The second essential infrastructure is a softer one. Further inland, within the dune field, we allow the sand dunes to flow freely – because it is more effort to freeze them in perpetuity – but would like to prevent their encroachment on the borders of the park so they do not drift outwards across streets. In this case, the European beachgrass – that invasive species that forms tall, bunker-like dunes – becomes the basis for the park's edges, a soft and grow-able yet sturdy boundary that collects and holds any sands that drift towards the street until they can be collected and trucked off, either to seed the foredune or to supply sand to areas along Ocean Beach that may require it.

As European beachgrass will likely require some irrigation to mimic the humid coastlines it usually prefers, the stable bunkers play host to a network of fog harvesters. These large nets, which are also deployed in a less rigorous manner throughout the park as needed, collect water from San Francisco's notorious fog – a low impact, on-site water harvesting method that, depending on novel developments in net technology, could collect between 3 and 9 liters of water per square meter daily.[10] From an experiential standpoint, these ephemeral, overlapping planes would also declare the edges of the park to the rest of the city in much the same manner as the existing tree canopy does today.

With these infrastructures in place to support the recreation and necessary control of the dune field, an additional layer of park infrastructure enables us to encounter this novel urban landscape. Much of this infrastructure is directly inspired by the mix of leftover bunkers and purpose-built trails at Fort Funston, which encourage visitors to explore; in the Golden Gate Park dune field, the unstable landscape is peppered with solid volumes that resist and allow the drifts in turn, joined by thin walkways across the former wastes.

Entry to this half of Golden Gate Park is provided through the insertion of large concrete volumes across the edge bunker at existing park entrances; these volumes, which double as fog-water cisterns, mediating between the urban grid, the network of paths, and the sand below, contain lookout points or other stable programmes. Other volumes, positioned at junctions along the elevated walkways, contain necessary park amenities, like fountains and washrooms, and allow access to and from the sand while ensuring that park visitors retain spatial references in what may otherwise be a vast, open landscape. Some specific programme vessels are purpose-built to settle in among the dunes, like the theater and observation tower, while others, like the new Rose Garden, are conversions from former park amenities in the process of ruination.

It is a far cry from the dust-free promenade and pleasure grounds Olmsted proposed, but the declaimed Golden Gate Park still takes lessons from his work, engaging with the underlying forces and ecologies in a way he could never imagined in the nineteenth century to propose a novel means of approaching urban landscapes in the Outside Lands of San Francisco.

Figure 4.9 (Opposite top)
Edge and interior conditions of the central dunefield.

Figure 4.10 (Opposite bottom)
The foredune, containing subterranean roadway and parking.

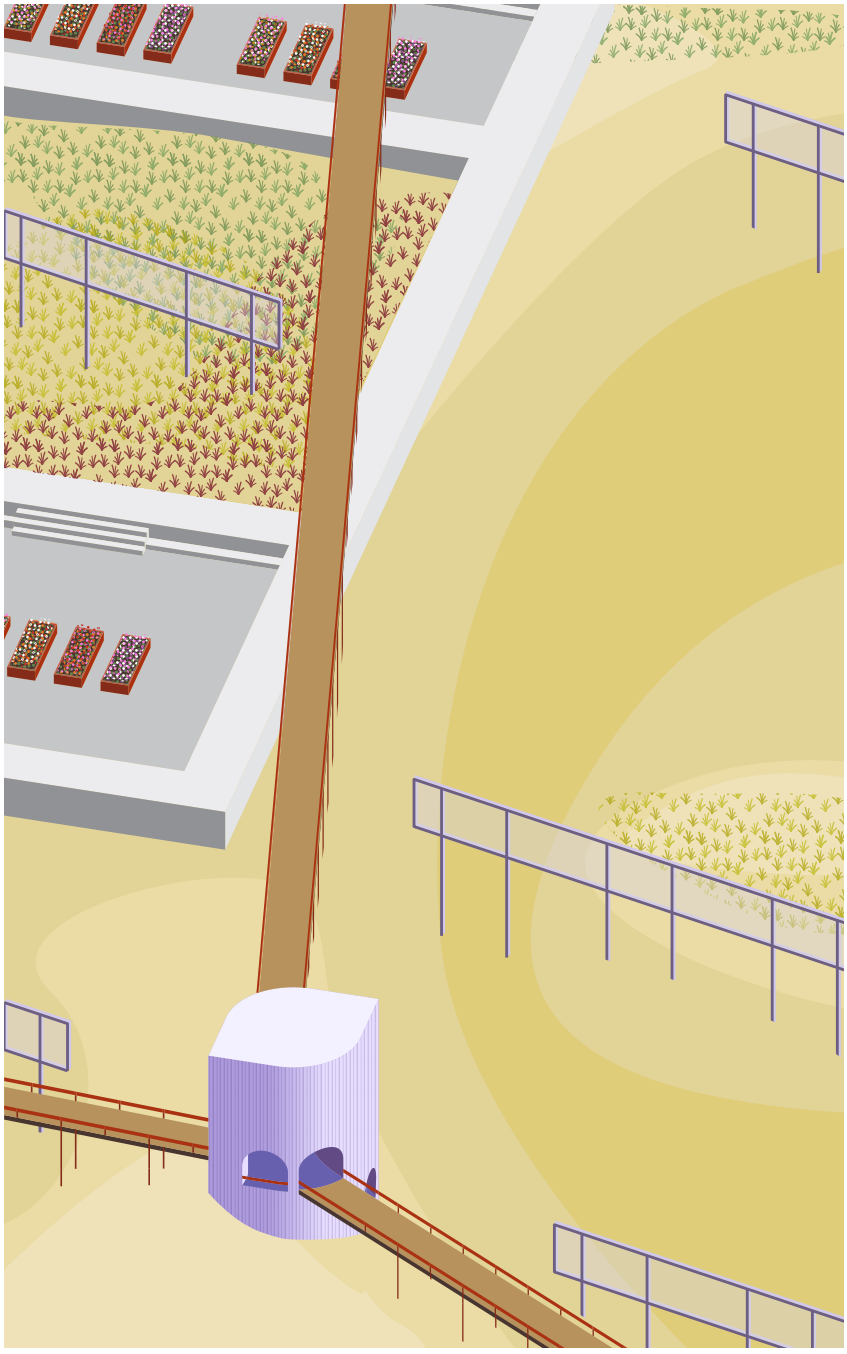


Figure 4.11
Detail of elevated walkway, pylon, and re-habilitated fly-fishing pools.

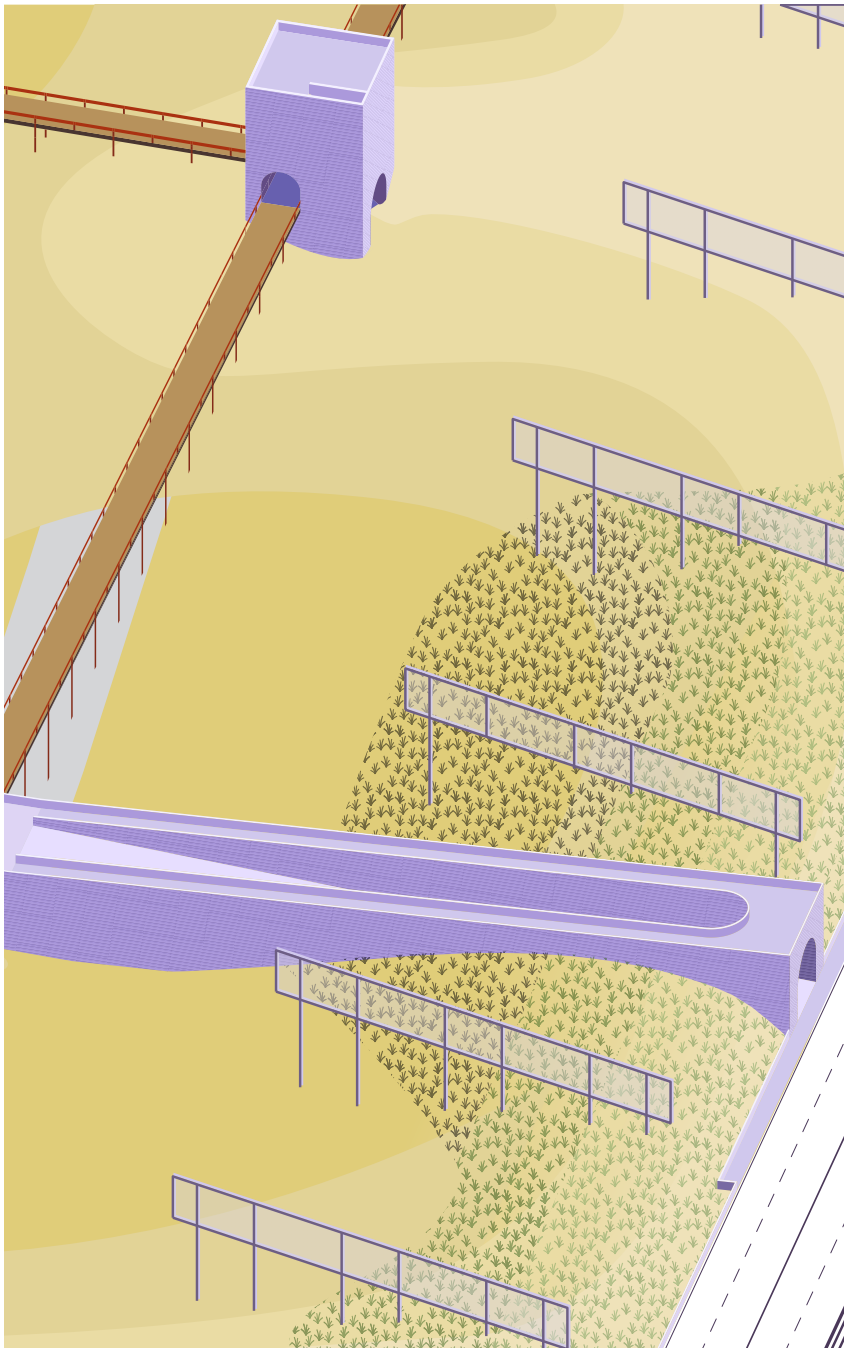


Figure 4.12
Detail of edge condition, showing european beachgrass dune, fog collector nets, and entrance bunker along street.

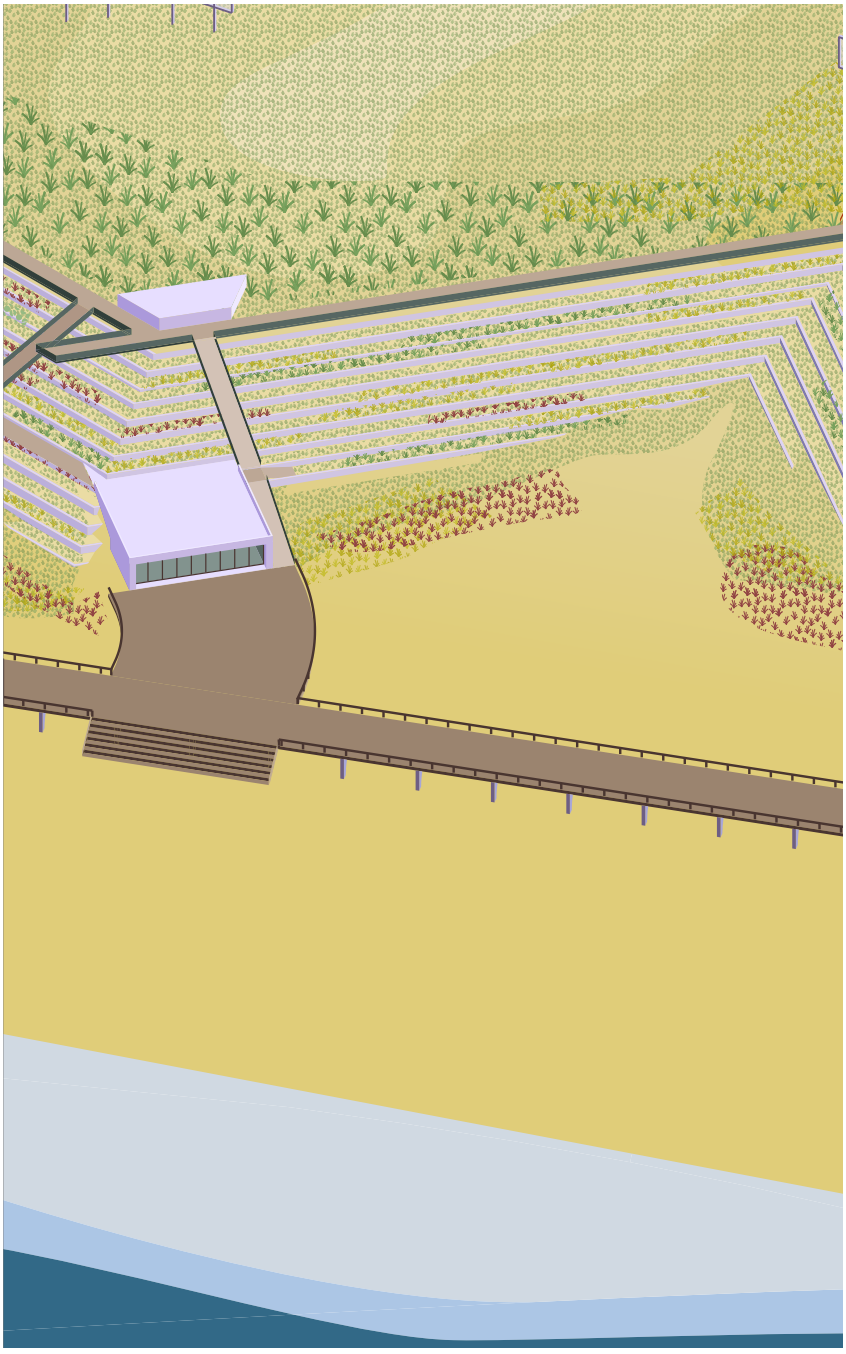


Figure 4.13
Detail of foredune condition.

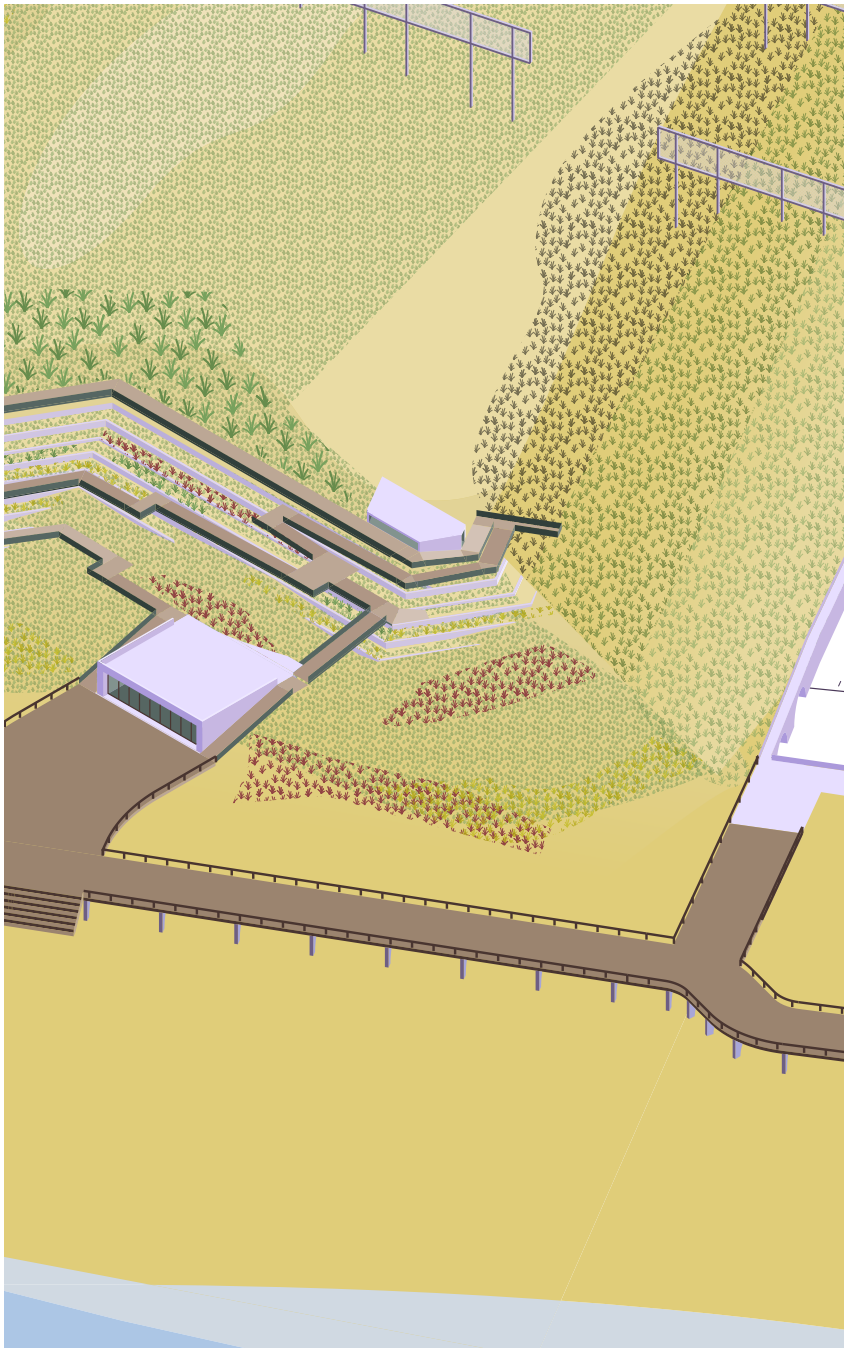


Figure 4.14
Detail of foredune condition and tunnel roadway entrance.

ii. The Jackals and the Owls Give Thanks

The landscape that preceded agricultural development in Stanislaus County was a remarkably rich grassland acted upon by multiple ecological forces at once. Nearly all these forces have been suppressed or outright eliminated as a part of the reclamation that the vast agricultural machine necessitated. To imagine a return to this landscape necessitates recognizing these three major forces shaping this great valley's grasslands: water, fire, and ruminants. While much of this original landscape has been lost, it remains remarkably well-preserved in several parks south of Turlock, which we had the pleasure of visiting.

Prior to damming, prior to Hetch Hetchy and New Don Pedro and all the little laterals, the flow of the Tuolumne, the Merced, and the San Joaquin would ebb and flow with the seasons. In the spring, the rivers would erupt over their banks in the spring, before receding over the course of the year. Closer to the river, this flooding would help to cultivate a riparian landscape of willows and other water-tolerant trees, which have survived without difficulty in the protected landscapes around rivers.

Further from the river, however, this sudden intrusion of water generates vernal pools, a remarkable, ephemeral biome consisting of shallow depressions in clayey, water-impermeable soils, many of which may be found in the excellent Great Valley Grasslands State Park. Once inundated in the spring, the primary loss of water occurs through slow evaporation; as this happens, brightly-coloured flowering plants begin to emerge. Over time, one species

Figure 4.15
The summertime remains of a vernal pool in Great Grasslands State Park, south of Turlock.

of flower is replaced by another, then another – a palette of wildflowers that changes throughout spring, until the landscape dries up for the year. Vernal pools are home for many small crustaceans, insects, and amphibians, as well as birds and waterfowl; however, it has been estimated that at least 90% of the Central Valley's original vernal pool landscape has been eliminated, largely because of agriculture.[11] While we visited these landscapes too late in summer to witness the wildflowers, the contours of the pools were still visible in places.

Meanwhile, at the San Luis National Wildlife Refuge, which consists of several sites not far from Great Valley Grasslands, park attendants informed us of the importance of fire and ruminant grazing in both the natural self-reg-

Figure 4.16
Marshlands and herons at San Luis National Wildlife Refuge.

ulation of these landscapes, and in the prevention and elimination of invasive species. While fire is easy enough to produce on their own, the native ruminants are a harder replacement. The pronghorn antelope was hunted until none remained in the Central Valley,[12] while the native tule elk can only be found on refuges, like San Luis, in relatively small numbers.[13] When they want to treat a landscape with grazing, park workers instead turn towards local ranchers, borrowing their cattle populations for short periods, which benefits everyone.

This may seem like a lot of work to restore a dull, flat landscape. Once you have spent enough time in the grasslands, however, you begin to notice subtle changes and differences from one area to another. Although Mary

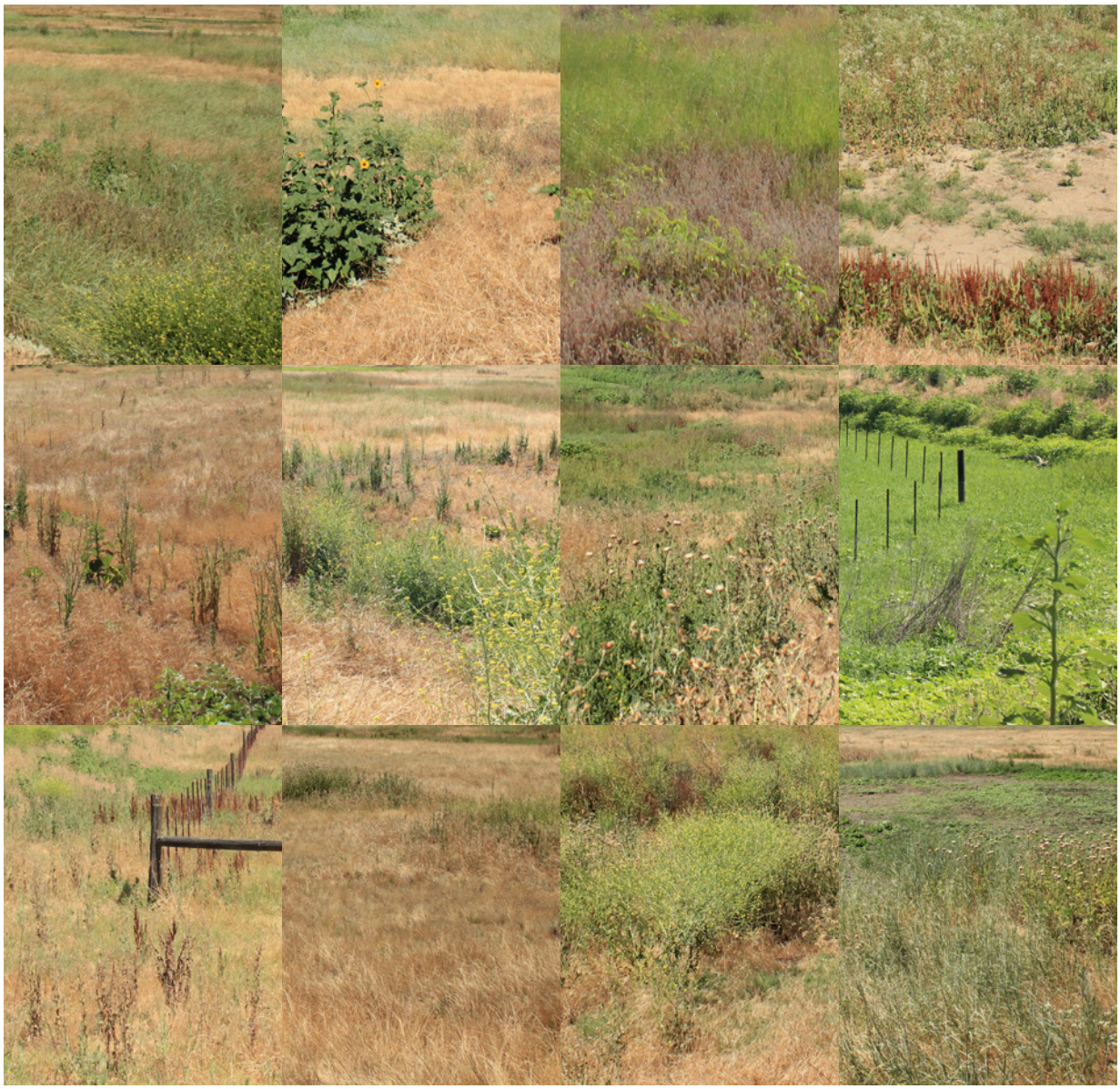


Figure 4.17
L to R, top to bottom, differing grassland conditions presented in order of occurrence during a walk at Great Valley Grasslands State Park

Hunter Austin was writing about a wildly different landscape, her advice that sometimes landscapes must be experienced across longer terms to be understood rings true here.

Even if we are to imagine the Central Valley agriculture boom coming to an end, however, it is difficult to conceive that we might readily let the rivers flow freely and naturally reintroduce the pronghorn antelope. As at San Luis Refuge, we will need to provide ecological support; luckily, we have the land and resources needed to do so.

Stanislaus County's agricultural industry, like many Central Valley reclamation projects, is built on the back of heavily subsidized water; when the subsidy falls through, so too does the industry. Without this defining force in the landscape, the terrain that water won will be lost once again.

In order to enable the gradual restoration of the Central Valley, the Hetch Hetchy Project right of way corridor between the Coastal Range through to New Don Pedro Reservoir is converted into a single park under continuous management. With landscapes and ecologies irrevocably altered, we must manually reintroduce the forces that once shaped the Central Valley, piece by piece, field by field, with the San Joaquin pipeline stitching it all together.

Considering, in our projections, the continued use of the San Joaquin pipelines, even after the draining of Hetch Hetchy Reservoir, the central spine of the New Stanislaus County Grasslands will always contain a source of water. As a result, this infrastructural strip becomes the ideal location for the restoration of the vernal pools: every few kilometers, where the slope and soil allow, a section of pipeline is exposed, and below it a segment of the right of way is sculpted into vernal pool landscapes. Thus, when spring rolls around and the rivers swell in their banks, pipeline water can be released, spawning artificial vernal pools to replace those eliminated by previous agricultural development. This has the effect of foregrounding the most endangered – and most attractive – ecologies within the broader grasslands network, ensuring that no matter how much development occurs along the corridor, the vernal pools are being restored wherever possible.

Laterals are to be converted or restored into naturalized streams, as applicable, and the landscapes around them to be restored into riparian landscapes of appropriate size, while existing creeks are to be expanded.

Government-sponsored buyback programmes for suburban properties along the central corridor encourages a thinning of sprawl within Modesto itself, while grants encourage the restoration of farmed land into native pasture. The result is an ever-widening ecological network, restored to suit underlying geologies, hydrologies, and topographies.

As the grassland network grows, the land will increasingly lack the presence of ruminants. For lack of the proper habitats suited entirely to tule elk and pronghorn antelope, the presence of grazing cattle will suffice. With support given to ranchers raising cattle in appropriate densities on native grasslands, the remaining population of Stanislaus County will hopefully be able to support a sustainable, smaller-scale cattle industry.

An additional layering on top of the restored ecology is the presence of a hiking trail along the central pipeline right of way, rendering the original infrastructure space legible and occupiable, and bringing backpackers alongside residents out into these newly, constantly restored landscapes, to watch the flowers bloom.

Figure 4.18 (opposite)
Axonometric of 3 declaimed sites along the corridor: bottom, the San Joaquin River; middle, Modesto; top, the edges of the foothills.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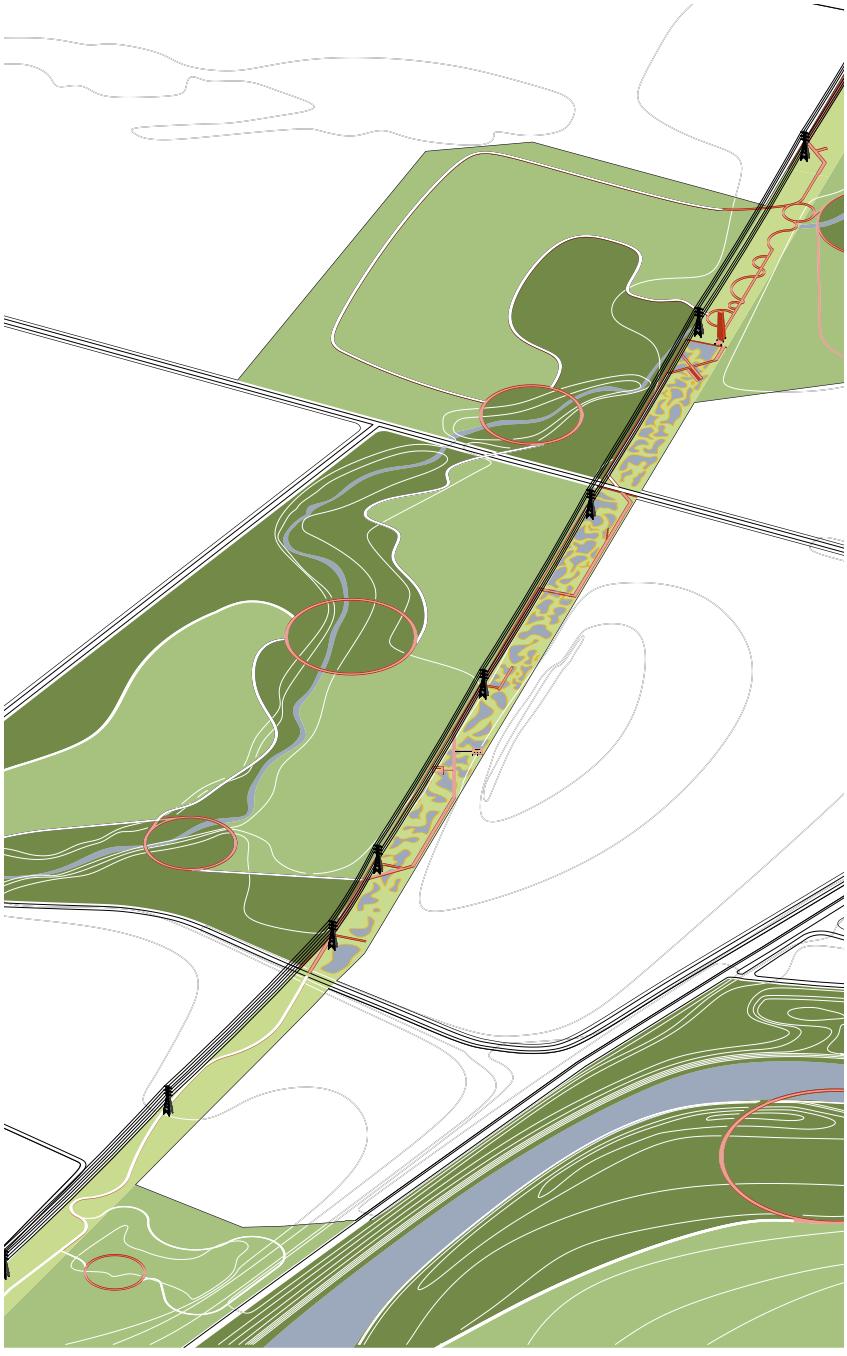


Figure 4.19
The San Joaquin condition, featuring vernal pools along the infrastructural corridor and riparian trail systems expanding the existing national reserve.

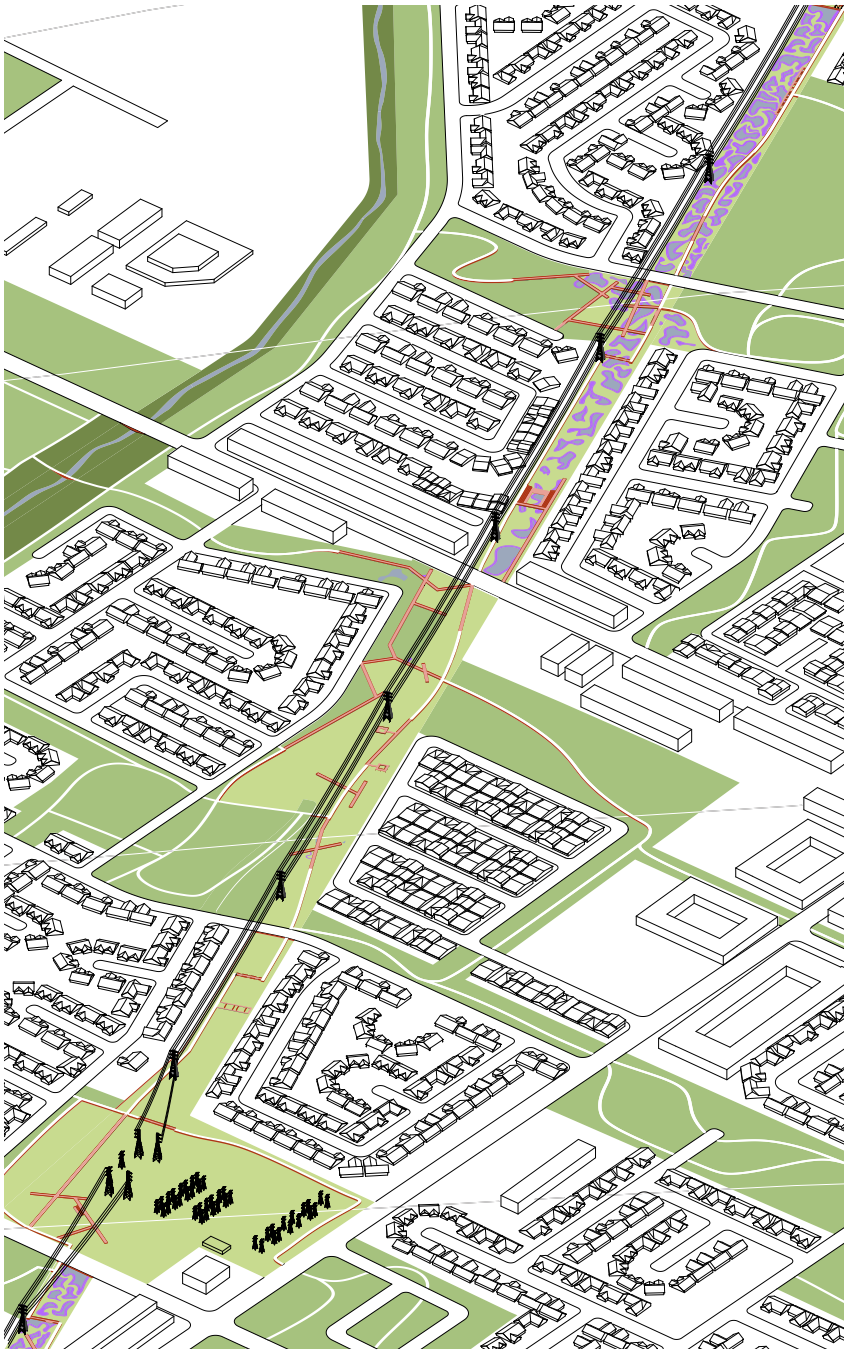


Figure 4.20
A segment of corridor passing through Modesto containing grasslands and vernal pools.

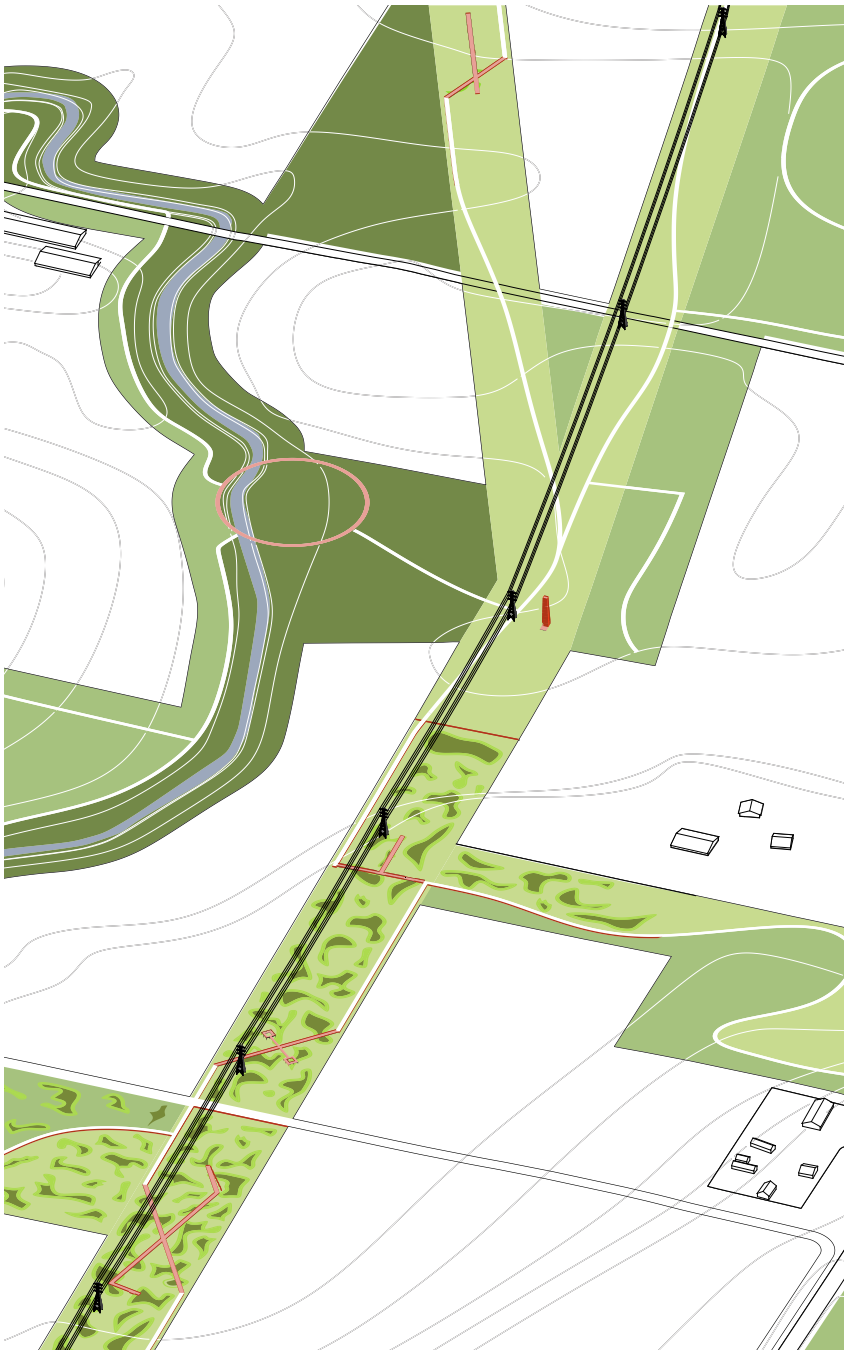


Figure 4.21
The end of the vernal pools and the beginning of the Sierra Nevada foothills.

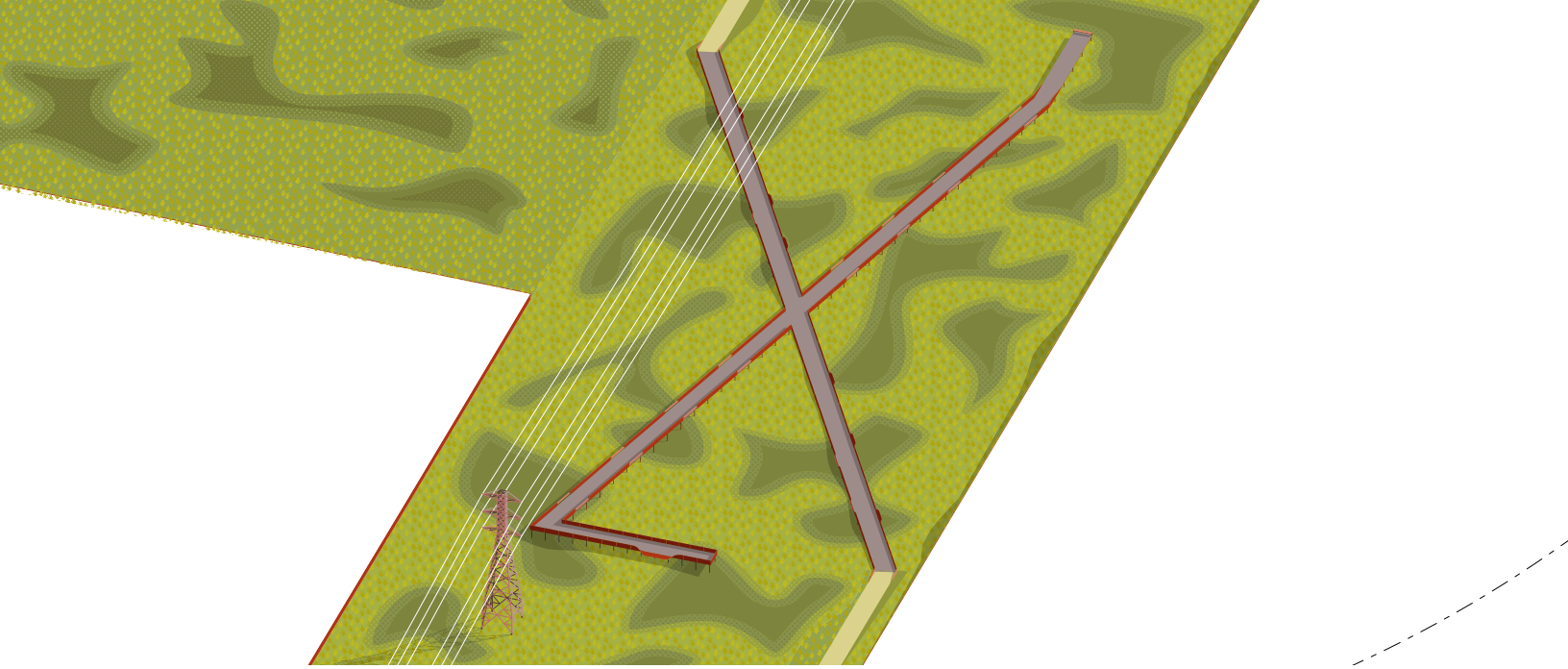
The occupation of these landscapes is directly inspired by the writings of Mary Hunter Austin. Where the idea of hiking a near-straight trail through flat grasslands for several days may seem deadening, the subtle changes of the landscape, and opportunities for unique encounters and slow observation within it would, I suspect, be remarkable, given the right conditions. As a result, the pedestrian-scale infrastructure seeks to facilitate and enable these Austinian interactions, exposures, and observations.

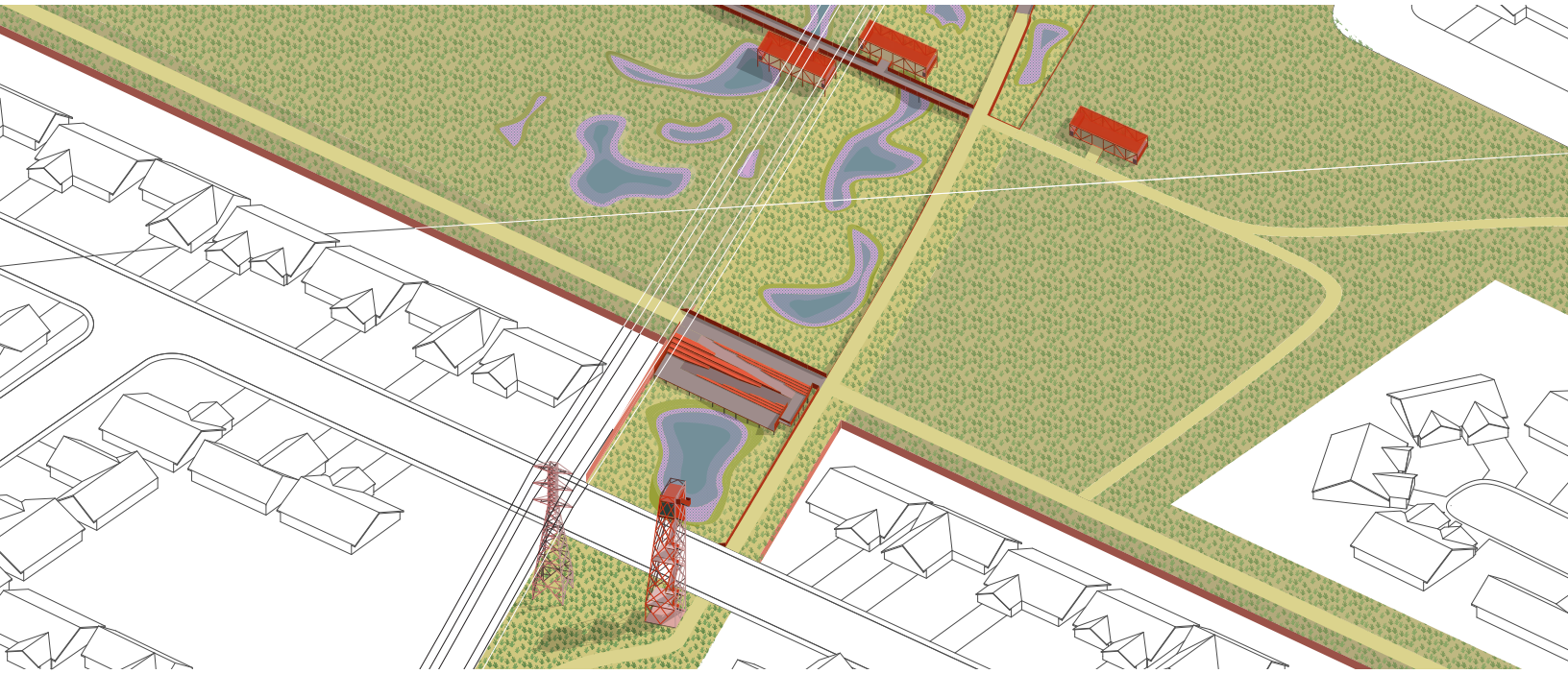
The entirety of the valley trail, from the edges of the Coastal Range to the shore of New Don Pedro Reservoir, is around 90 kilometers. With a relatively flat landscape, 15 kilometers a day would not be a difficult walk; as a result, every 15 kilometers features a bivouac sheltered camping pylon, whose profile and massing takes inspiration from the power pylons that line one side of the corridor. At the midpoint between every two camping pylons is a 30-meter-tall sightseeing tower, containing a small regional exhibition room and a series of lookout platforms; from the top of each tower, it will be possible to see both the last and next towers along the corridor.

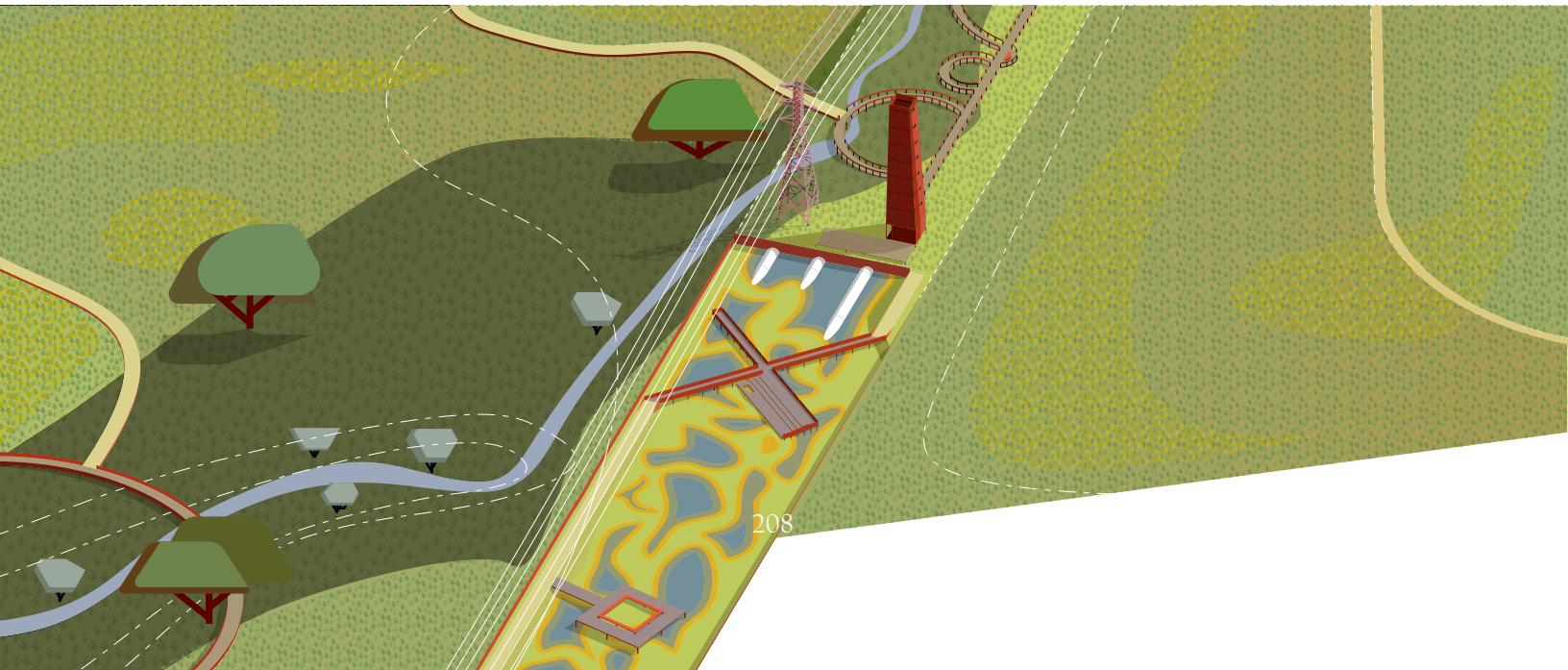
The designs at left demonstrate distinct responses to vernal pool landscapes across three different sites. In heavily rural locations, like those approaching the foothills, it is expected that the experience of the landscape will be predominantly solitary, and thus the elevated pathway features primarily small-scale interventions, like benches, to allow for the experience of the landscape in solitude.

Within Modesto, communal spaces, like barbeque pavilions and communal seating areas, are prioritized over small scale interventions, such that the ever-shifting landscape may begin to behave as a distinctive, memorable backdrop to life in the city. Finally, the third site, which falls into the expanded boundaries of the San Joaquin River National Wildlife Refuge, plays with communal installations designed explicitly for observation of the surrounding landscape.

In addition to the walkway language designed for the vernal pool systems, additional languages were developed for grasslands and riparian landscapes, in order to reflect the different experiential conditions those biomes present.







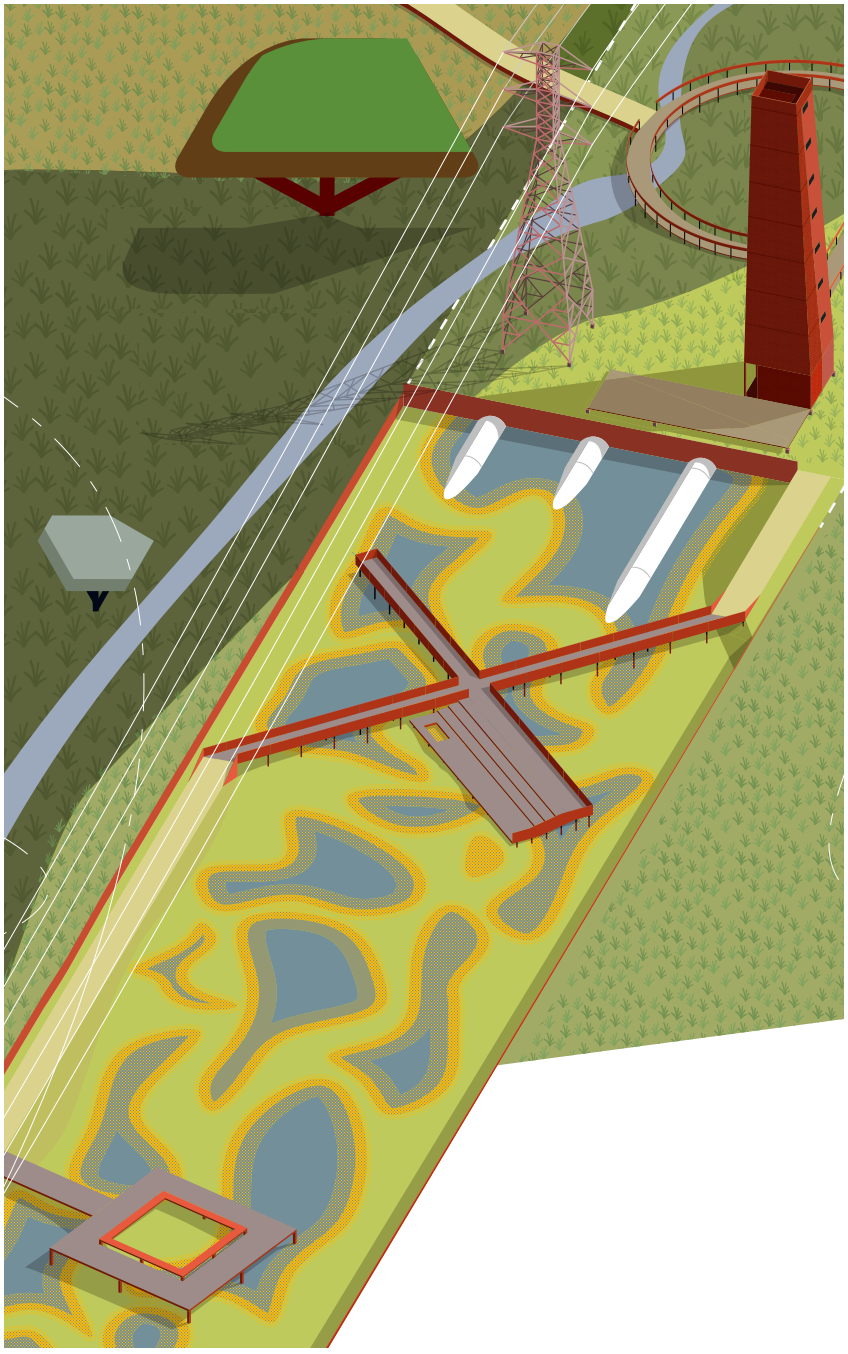


Figure 4.22 (opposite)
Three detail axonometrics highlighting landscape and architectural interventions in each of the three sites previously described.

Figure 4.23 (above)
Vernal pools, gathering spaces, and a bivouac tower in the San Joaquin corridor area.

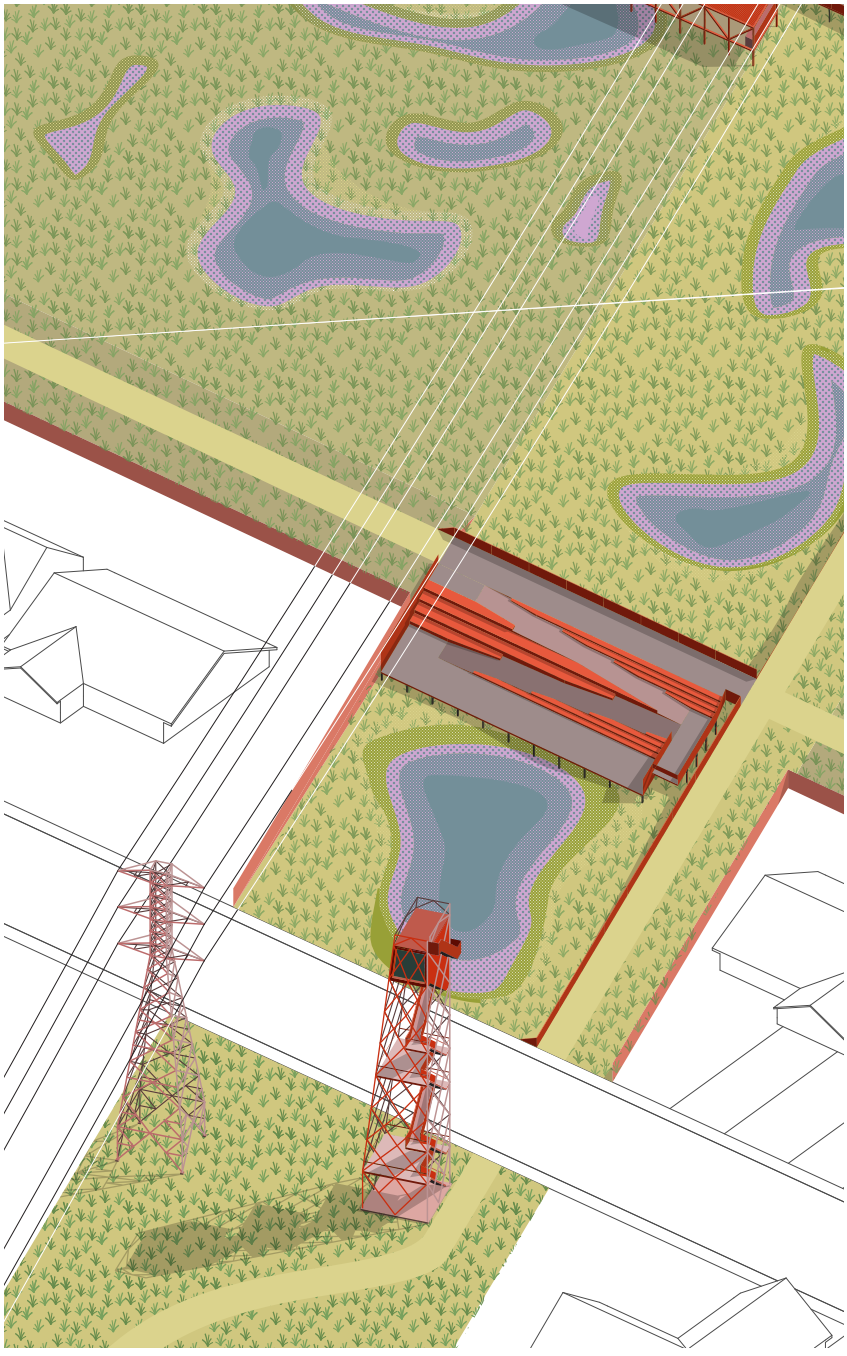


Figure 4.24
A lookout tower, vernal pools in a later stage of evaporation, and a public seating area in north Modesto..

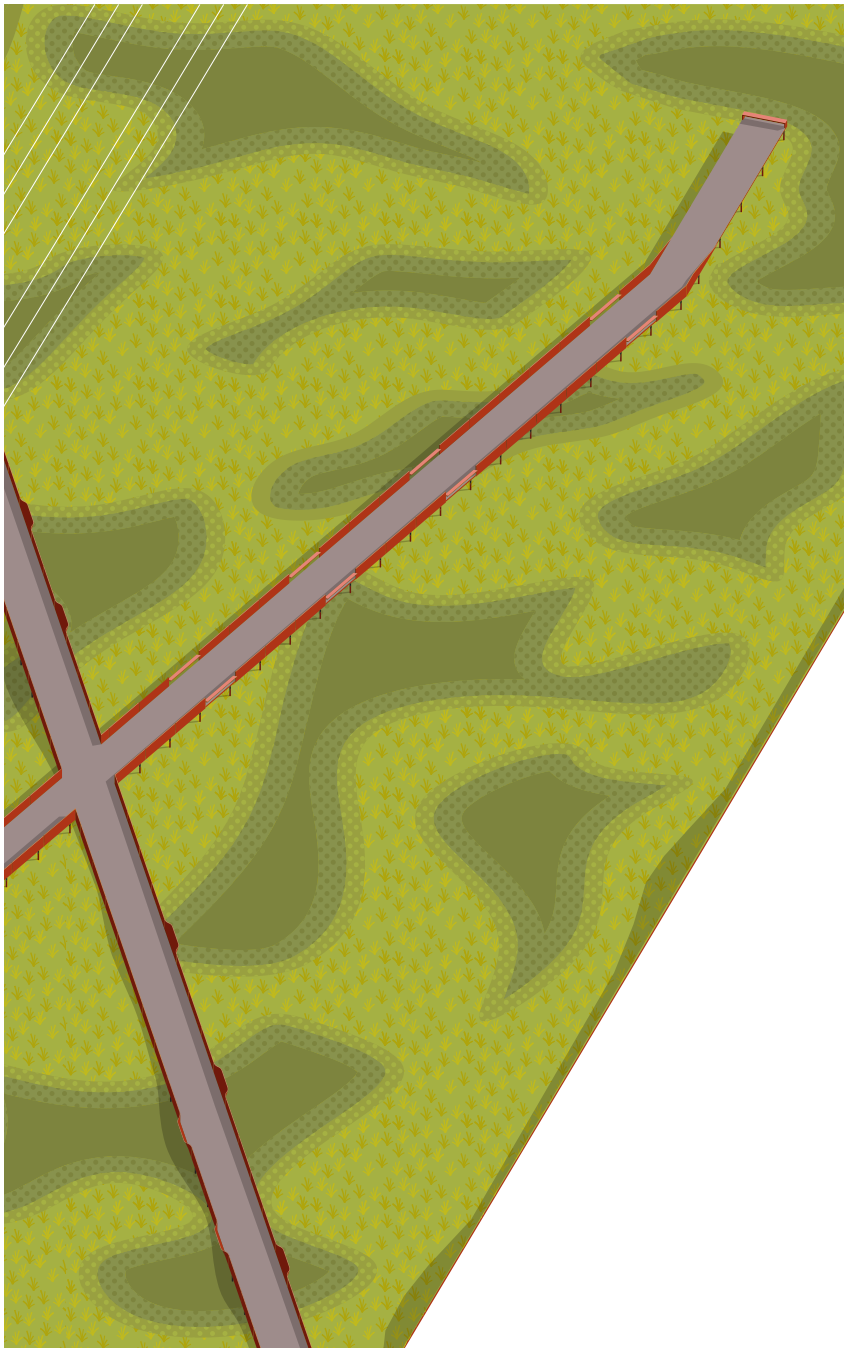


Figure 4.25
A slim, isolated section of corridor passes through dry vernal pools, with small-scale seating enabling isolated observation of the adjacent landscapes.

iii. We Will Open Rivers in the Heights

By the time our more reliable documentarians had arrived in Hetch Hetchy Valley, the Native Americans who had lived there did not any more. As such, not only do we not have a particularly clear window into their lifestyles, we also do not exactly know what the landscape looked like as it was lived in for thousands of years. The landscape that lives on in photographs, the landscape Albert Bierstadt painted – this was already changing. What we do have, however, are accounts of the landscape management techniques used by the people who once lived in this landscape, and along with an understanding of the underlying geology, we have enough to construct a model of the original valley floor, as it existed for the Native Americans who lived there.

Long before San Francisco claimed its birthright, a glacier-scoured lake along a river slowly filled up with sediment until the lake was just a river running through a flat-bottomed valley. Eventually, this valley developed meadowlands, and trees, including the incense cedar, white fir, ponderosa pine, and the occasional California black oak, started encroaching on the valley. Two factors limited this succession, however: first, the river seasonally spilled its banks, and the increased moisture altered where these creeping trees could and couldn't grow, leaving meadowland (and presumably some riparian tree species) intact; second, the buildup of brush led to forest fires, which cleared the ground level and destroy all but the largest trees.

Eventually, Native Americans came to occupy this landscape seasonally,

Figure 4.26
Detail of a painting of Hetch Hetchy Valley by Albert Bierstadt.

in the summer and fall, as the winter and spring are milder and dryer in the lowlands. They, like indigenous peoples throughout California, practiced land management techniques that mimic and replicate the natural processes to their advantage. In the summer, they hunted in the grasslands, harvested roots and tubers and acorns off living trees, and collected seeds from grasses, spreading more seeds as they went. In the fall, they set fires carefully, at the bottom of slopes and with consideration of the wind; because they set these fires relatively regularly, if not annually, there was significantly less brush than we might see today, and thus the fires were significantly less dangerous and destructive than we might expect. These fires helped to maintain meadowlands, improved

Figure 4.27
Yosemite Valley meadow, encroached upon by pines.

the health of black oaks, and limited the growth of new pine trees in the valley.

Yosemite National Park today takes a relatively hands-off approach to their land management in comparison; as I noted earlier, they treat the succession of their meadows as an inevitable quality of the meadowland itself. In *Tending the Wild*, Anderson quotes Maria Lebrado Yderte, a Miwok woman who returned to Yosemite decades after her tribe was driven out, looking at the landscape and stating, "Too dirty too much bushy," for the sheer lack of active management of the landscape had changed it so significantly.[14]

While we might question the expectation that a National Park would participate in the active management of landscapes they are seeking to protect

Figure 4.28
Yosemite Valley from above.

and fill with people, the reality is that the notion of an untouched wilderness, set aside for people to look at and play in, is a recent invention which, as we have seen, has many of its roots in John Muir's well-intentioned interpretation of landscapes like Hetch Hetchy, and it is not universal; as Anderson states, "contemporary Indians often use the word wilderness as a negative label for land that has not been taken care of by humans for a long time."[15]

In restoring the landscape of Hetch Hetchy, which has been treated so poorly for so long, why not engage the processes and principles that directly model the sort of positive, reactive, resilient relationships that contemporary land management has failed to achieve?

John Muir would have wanted to see the reservoir drained, and what is what we will do. What follows the draining, however, is when things get interesting.

Broadly speaking: in the process of restoration and renovation, we will separate the landscape, splitting the most fragile ecosystems from any and all touristic terrain. The level established by the dry regions of the park, those that are stable and currently occupied – will become the main strata of park development, leaving the valley floor open for the restoration and active management processes, adjacent to, but unoccupied by, visitors to the park.

Opponents of restoration point out the huge environmental damage that the full removal of the dam, an immense mass of cyclopean concrete, would cause, which is perfectly valid; it would also be an incredible waste of solid volume that could easily be reused. Thus, this dam, having lost its original purpose with the draining of the reservoir, gains a new life as the primary armature for future park densification. Its existing characteristics – its immensity, structural stability, height – are leveraged to improve the park's amenities within this corner of Yosemite, without applying additional stress to a restoring landscape. The occupation of this landscape by reclamationist interests is thereby not erased, but preserved, highlighted, even, as another layer of history to be recognized.

The valley floor, meanwhile, is to be restored and subsequently managed via a combination of National Park staff and indigenous expertise. The topography beneath the reservoir, largely unaffected by its hundred years under water, allows for the restoration process to begin quickly, with the planting of desired native species alongside the monitoring and removal of any invasive species. After several decades, as the valley floor reaches some semblance of stability, the valley floor is shaped primarily by traditional land management practices.

In this way, divergent notions about the occupation of natural landscapes, such as Muir's belief that the beautiful landscapes of Yosemite National Park should be preserved to be seen and experienced by as many as possible, versus the desire to restore and preserve both the landscape and the cultural practices that shaped it in the first place.

Figure 4.29 (opposite)
Axonometric view of the western region of the declaimed Hetch Hetchy valley, depicting controlled burns and the resulting landcapes.

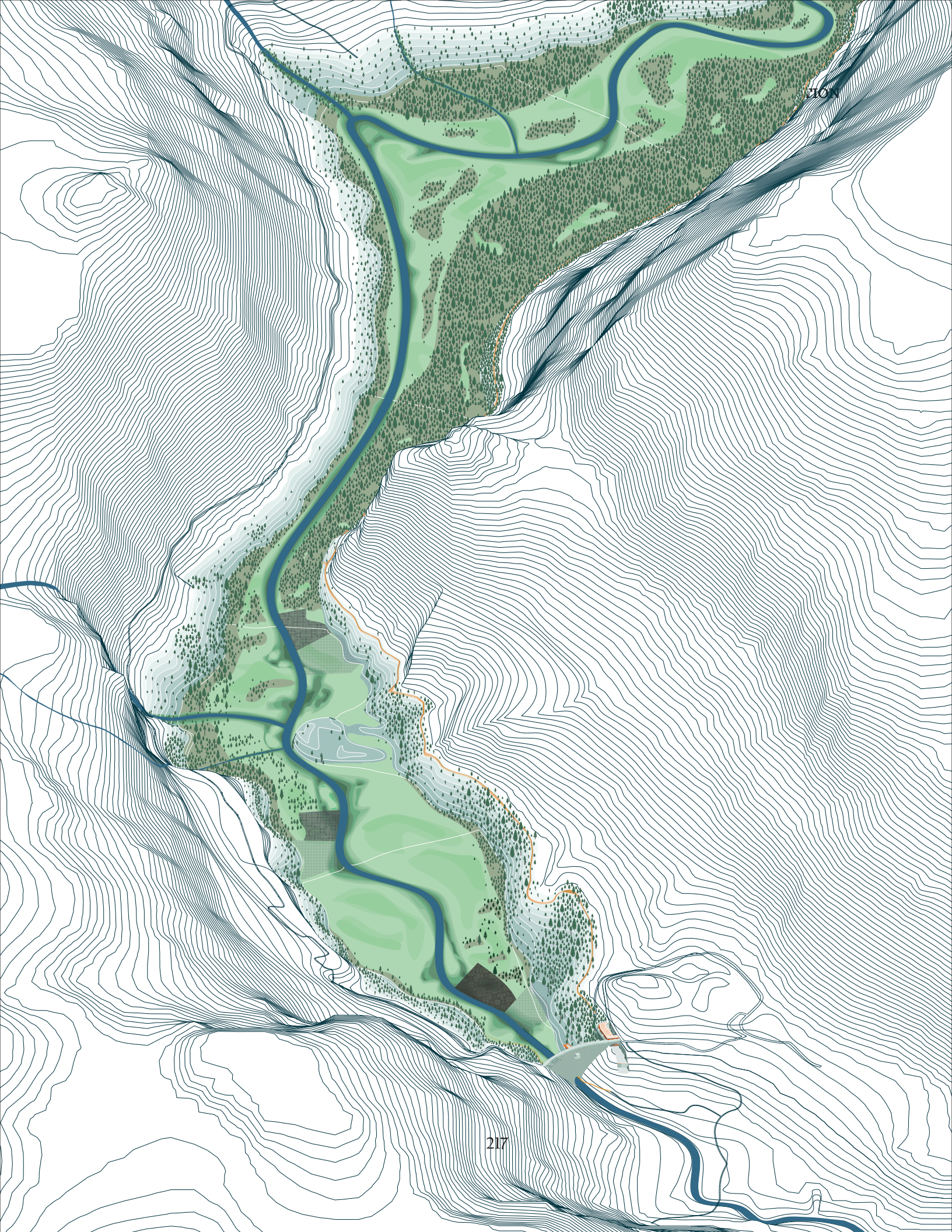


Figure 4.30
O'Shaughnessy Dam, with the Tuolumne River running beneath and the multitude of interventions surrounding it.

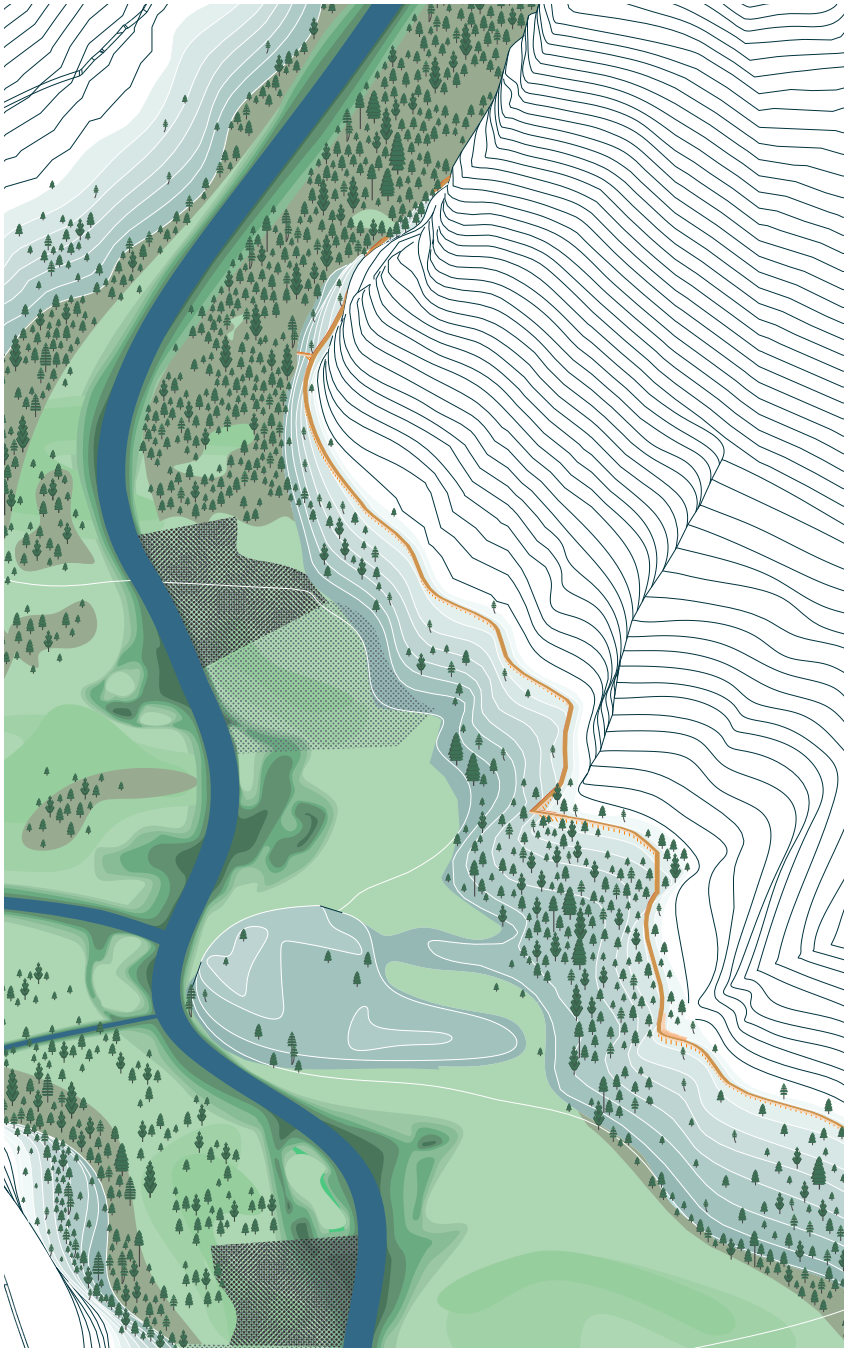
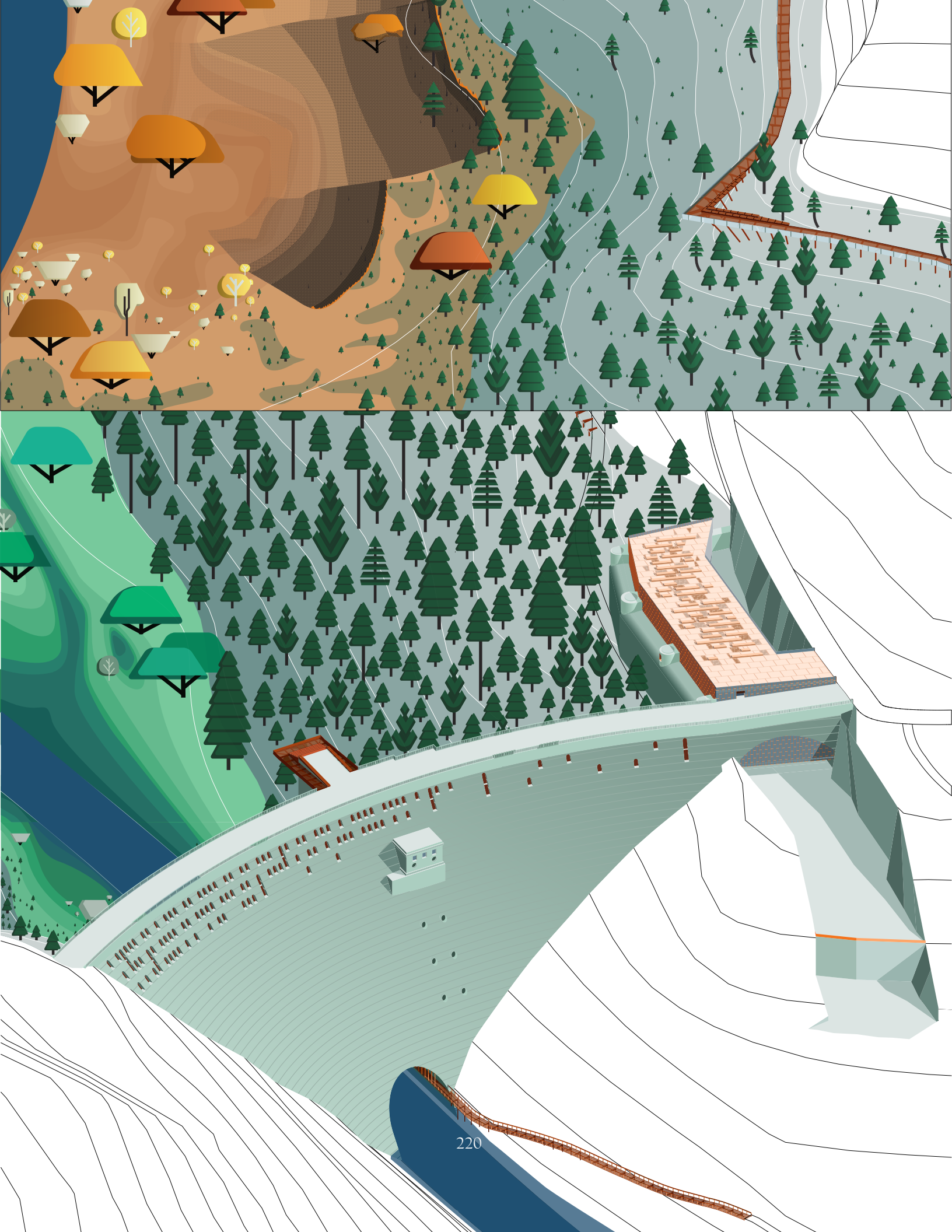


Figure 4.31
The valley floor, and the datum trail, which marks the historic high water mark of the reservoir along the southern valley wall.



The management of the land was obscure to Muir, but here the land-shaping is highlighted. Controlled burns, completed in different areas over time, become legible markers of the landscape's ongoing stewardship. Other agricultural practices, such as the harvesting of seeds and acorns from living plants, may also be implemented, as they may also have beneficial impacts on the ecology of the valley. In this way, the valley becomes a site of active experimentation and investigation, with the goal of deepening our knowledge of the efficacy of Native Californian land management practices.

The south edge of the valley is home to a "datum trail," a flat, elevated walkway built at the current high-water mark, which both increases the accessibility of the reservoir, providing a continuous vantage point high above the valley floor, and functions as a memorial of sorts of the so-called "bathtub line," the edge of the reservoir where, due to constantly shifting water levels, nothing could grow for a century. The outer façade of the datum trail is a lightly reflective stainless steel – an unexpected material choice for national parks, which tend to prefer wood or the earthy tones of weathering steel. Reflective steel panels, roughly at eye level, will reflect the surrounding landscape, allowing the walkway a measure of camouflage; to highlight the historic influence of reclamation on the valley, however, views from lower angles will instead show a thin reflection of the sky, cutting the mountainside in two and revealing the inundation's datum overhead.

The dam is modified ruthlessly, in three main ways: excavation, insertion, and addition.

First: the dam, consisting of unreinforced cyclopean concrete, is excavated. The biggest gesture is to carve a grand arch through which the restored river will flow; next the upper levers of the dam are carved into a series of rentable bivouacs, semi-sheltered campsites overlooking the valley or the canyon from within the infrastructure itself. The freedom afforded by the structure of the dam allows for a flexible, yet repetitive series of spaces, interspersed with unique moments. Further carving provides greater access throughout the dam, including to far lower levels deep within the concrete mass.

Second: a new visitor's center is inserted into the dam's obsolete spillway, allowing access to previously-inaccessible pieces of the infrastructure and creating a large new viewing platform via its roof deck. Within, the facility hosts a small museum, provides amenities and services to park visitors, and gives access to the inner dam facilities. Access out to the spillway channel also directs attention towards the canyon below the valley.

Finally, two major lookouts take advantage of the sturdy structure of the dam: one cantilevers off the top, revealing the stunning view documented by many before the dam was built; one lies suspended above the river, within the new arch at the base of the dam, bringing visitors to a remarkable vantage point near, but not touching, the new valley floor.

Figure 4.32 (opposite top)
The valley floor, in autumn, experiencing controlled burns.

Figure 4.33 (opposite bottom)
The adapted O'Shaughnessy Dam, bearing a number of interventions to support increased access within the declaimed valley.

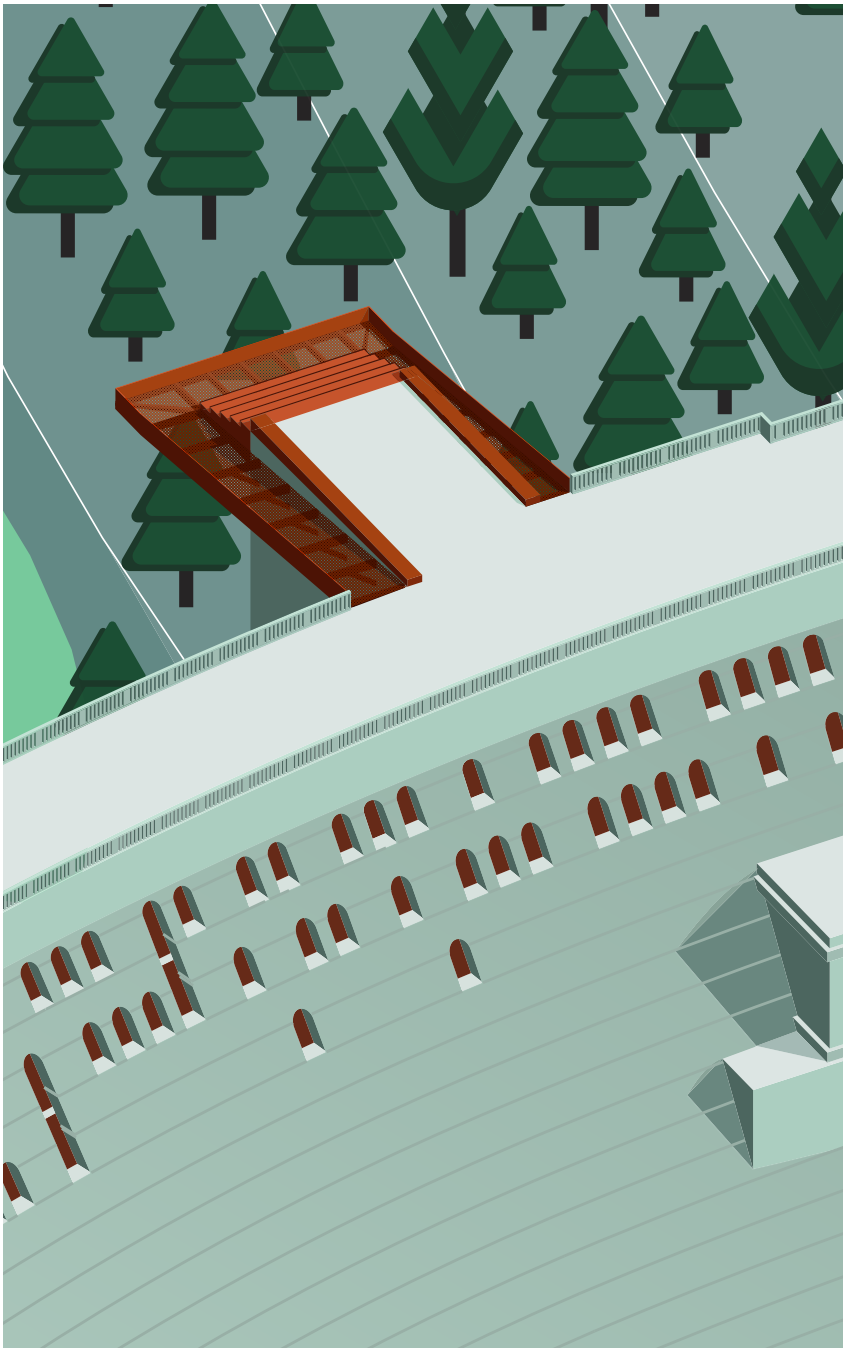


Figure 4.34 (above)
An axonometric detail depicting the modified, cantilevering lookout point, and the hollowed-out upper levels of the dam.
Figure 4.35 (opposite)
The visitor's center and museum, inserted into the existing spillway, and adding a large additional lookout atop the dam.

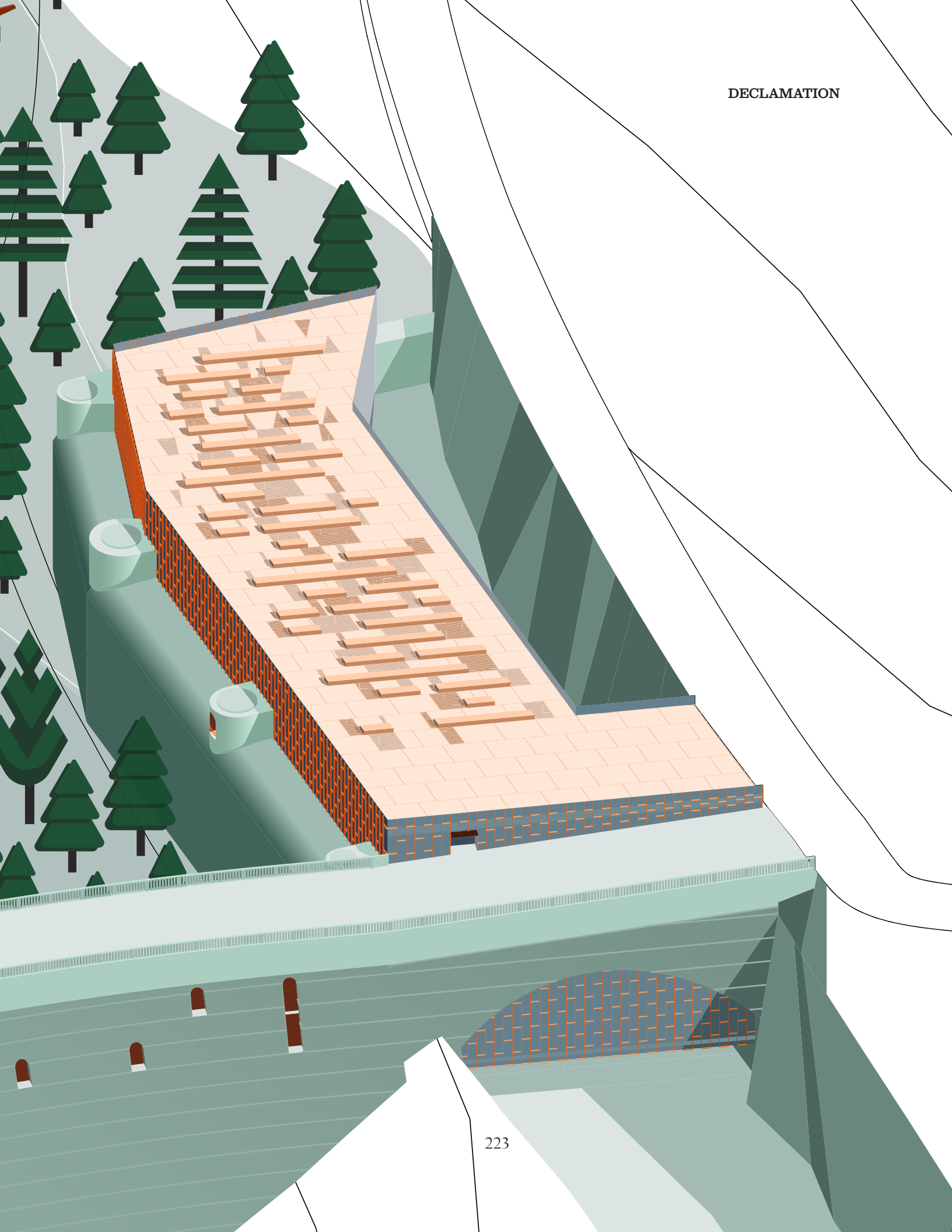


Figure 4.36
A moment of inflection along the datum trail, along with the trail's reflective guardrails.

Figure 4.37
Different zones experiencing burning at different rates.

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5.

Conclusion

Reclamation is a mercurial word. To reclaim is to re-obtain, to re-assert a right that been allowed to lapse. Even in the landscape, reclamation can refer to land created through filling in bodies of water, the process of resisting or reversing desertification, or the act of rehabilitating a damaged, post-industrial landscape. In our case, it is the act of taking a landscape that appears to be useless and uninhabitable – an unproductive landscape, a wasteland, an affront to our act of settlement – and 'fixing' it. It never belonged to us before, we never had a right to it, but it was ours to fix nonetheless, at great cost.

This thesis is an attempt to reckon with the consequences of reclamation, particularly when those consequences are not obvious, and to subsequently propose alternatives to this fundamental premise of American settlement. Through the methodologies used, including site visits, archival research, and design, the final project, in the form of maps, photography, essays, and three radical re-interpretations of existing sites, reveals reclamation's obscured context in order to react to it. In doing so, it provides a roadmap for investigating the possibility of a declamation, an undoing, a release of our exclusive right to the land.

The infrastructures that have defined our relationship with land will not remain stable forever as the world shifts around them. When we can no longer rely on them, we will be forced to re-evaluate our relationship with the land we live in, and it is my hope that we choose to undo some of the mistakes we have made and begin to repair our relationship with the land we occupy.

The methodology of this thesis required a considerable amount of historic research and synthesis; I firmly believe this is required to properly contextualize to the landscapes in question. After all, reclamation inherently hides its work as much as it celebrates it; the inundation, the dams, the pipelines and power stations and the cost of it all lie far from the water temples built in their celebration and the cities they provide with water and power. This distance, paired with the relative illegibility of the infrastructure itself, is enough to render the fact of San Francisco's water unimpeachable, as though there is no reason to seriously question a piece of infrastructure that risks growing increasingly unsustainable, costly, and complex. The work has already been done, the costs have already been paid, and, most importantly, it works just fine right now.

Reclamation is so grounded in faulty assumptions, politically convenient lies, and greed that in developing the Hetch Hetchy System, San Francisco has planted the seed of its own collapse. Barring only the most exceptional of circumstances, there are two end-states for reclamation projects like this one throughout history: they are taken apart and we learn to live without them, or they fail. Yet even given the stakes, I cannot conceive of any way that we might come to intervene within this system today, knowing what I know about the

system and its politics.

Thus, I would argue, it remains necessary to interrogate both the history and final physical manifestations of this system. So long as the Hetch Hetchy Water System continues to present as unproblematic, it resists, by design, any real questioning; breaking everything down to understand the future failures encoded in its design is the most practical way of beginning to imagine what these landscapes could become, once it becomes necessary to abandon the system that currently support them.

This thesis' goal was to build an understanding of the scenarios in which these complex systems of reclamation may one day become untenable. While I did not investigate systems of reclamation outside of the Hetch Hetchy system, I still believe that interrogating complex infrastructures presents a fundamentally sensible way of coming to identify and explore opportunities for radically distinct land management well before those systems fail. If political will does not allow for change to happen now, we must plan for the scenarios of infrastructural failure in which change will be forced upon us.

That the design proposals sought to engage the suppressed landscapes of each site posed a problem: how can we be certain how these landscapes functioned in the first place, when they were often poorly-understood at the time of their destruction? The way I attempted to answer that question, both through an admittedly cursory examination of scientific sources and similar conditions existing elsewhere, carries inherent limitations. There is obviously to be no replacement for actual scientific surveys of the sites, which would have been well outside of the capabilities of this thesis.

Nevertheless, these designs are not intended as ends in themselves, but responses to those contextual models I created. They were intended to be reactive towards developing site conditions; the rules that they follow might be readily altered in the face of emergent conditions on the ground. Fragility, or to be more precise, a lack of flexibility and resiliency is, after all, the main failure of reclamation, and I would be remiss to allow it again.

Not long after the start of this thesis, Governor Jerry Brown officially declared California's drought to be over; the snowpacks had been replenished, the dams were refilling and the outlook for the year was good.[1]

When I began to write this thesis, I was convinced that the infrastructural failures I was projecting were far off. When we're talking about the potential impacts of climate change, we don't often consider drastic changes wrought next year, or in six months. Although strict timelines were not mentioned in the thesis, I thought it reasonable to imagine that we might be talking about a scale upwards of a decade before we started seeing the kind of infrastructural failures I was proposing. Adding to this approach was, again, the obscurity of it

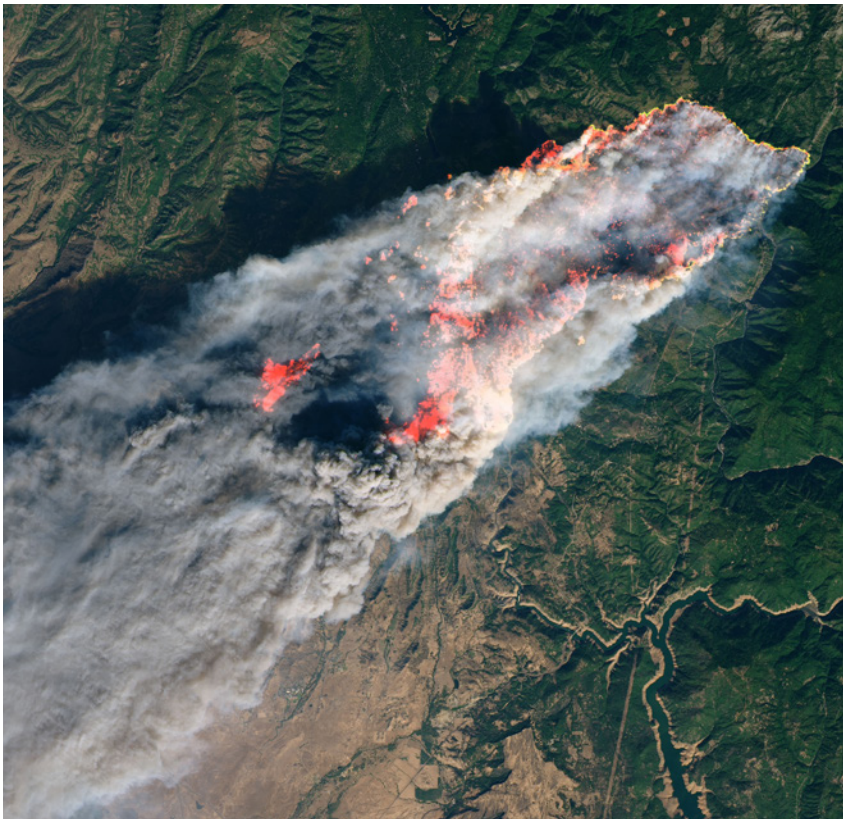


Figure 5.1
Landsat 8 captured an image of the very early stages of the Camp Fire on the morning of November 8th; at this point, Paradise was already on fire.

all: the challenge of my thesis has always been not only to solve a problem, but to identify the situation as problematic before attempting to address it.

As a result, I approached these designs as intentionally exaggerated provocations, actively proposing radically distinct and novel landscapes to better highlight the gulf between the long-suppressed ecologies and the currently reclaimed landscape. Presenting these relatively extreme landscape fictions was a way of addressing a problem that did not feel remotely immediate; to have followed up my bombastic claims of failure and slow, irrevocable disaster in the face of changing conditions with austere, reserved landscape designs would have felt like a missed opportunity.

But I am no longer convinced that the systemic failures I spent the thesis projecting are so far away as I thought at the beginning.

As I write this conclusion, both the Camp Fire, which devastated commu-

nities near Chico in Northern California, and the Woolsley Fire, which caused significant damage west of Los Angeles, have been almost entirely contained.[2] While time will reveal the full scope of damage, it is already clear that these two fires, both of which started on the same day, have been immensely damaging: the Camp Fire alone is the most deadly and costly fire in California, and has, to date, killed at least 84 people, and destroyed the town of Paradise, severely damaging surrounding regions. [3] While the cause of the Camp Fire is undoubtedly complex, the most basic facts remain: following an unexpectedly dry autumn, after a five-year drought, as climate change increasingly manifests, in regions where residents and officials have not built their homes or infrastructures with fires in mind, in a culture that does not properly manage their landscapes, that a disaster might lead to such a massive failure as this becomes quite plausible.

Failures of the magnitude that I was proposing are real, and they are happening now. The Camp Fire is a failure of forest management, of transportation infrastructure, of emergency infrastructure, and of power infrastructure, and the results are horrifying: smoke from the Camp Fire led to nearly three weeks of toxic air conditions within the Bay Area, where residents were unable to safely leave their homes without respirator masks.[4] The population of Paradise was, at the time the town was destroyed, over 26,000;[5] virtually all of these people are now homeless. This is a humanitarian crisis.

My thesis was founded on the assumption that these sorts of failures would not be occurring for some time, that we might have some sort of slow descent into infrastructural obsolescence; this no longer appears to be a reasonable assumption. Now the thesis carries, for me, a new tension: the landscape fictions I proposed were designed for some future failure, and I am not sure they reflect the appropriate sense of urgency that these new developments present. These failures are real, and I don't believe they are going away.

California's statewide drought was declared to be over in 2017. In a chart prepared by the U.S. Drought Monitor, we can witness this period, beginning not long after the start of the year, when the state experienced a precipitous drop in drought in a very short time. But that level of drought never falls fully to zero, as some moderate drought persists throughout the year. And once more, by the start of 2018, these levels began to rise.[6]

Today over three quarters of California's land, and 96% of its population, is experiencing varying degrees of drought. What is not in drought is abnormally dry; there is no land in California that is not touched, in some way, by the absence of water.

Reclamation is a claim, via water, over a landscape. How much longer California will successfully maintain its claim in conditions of near-perpetual drought, I simply cannot say.

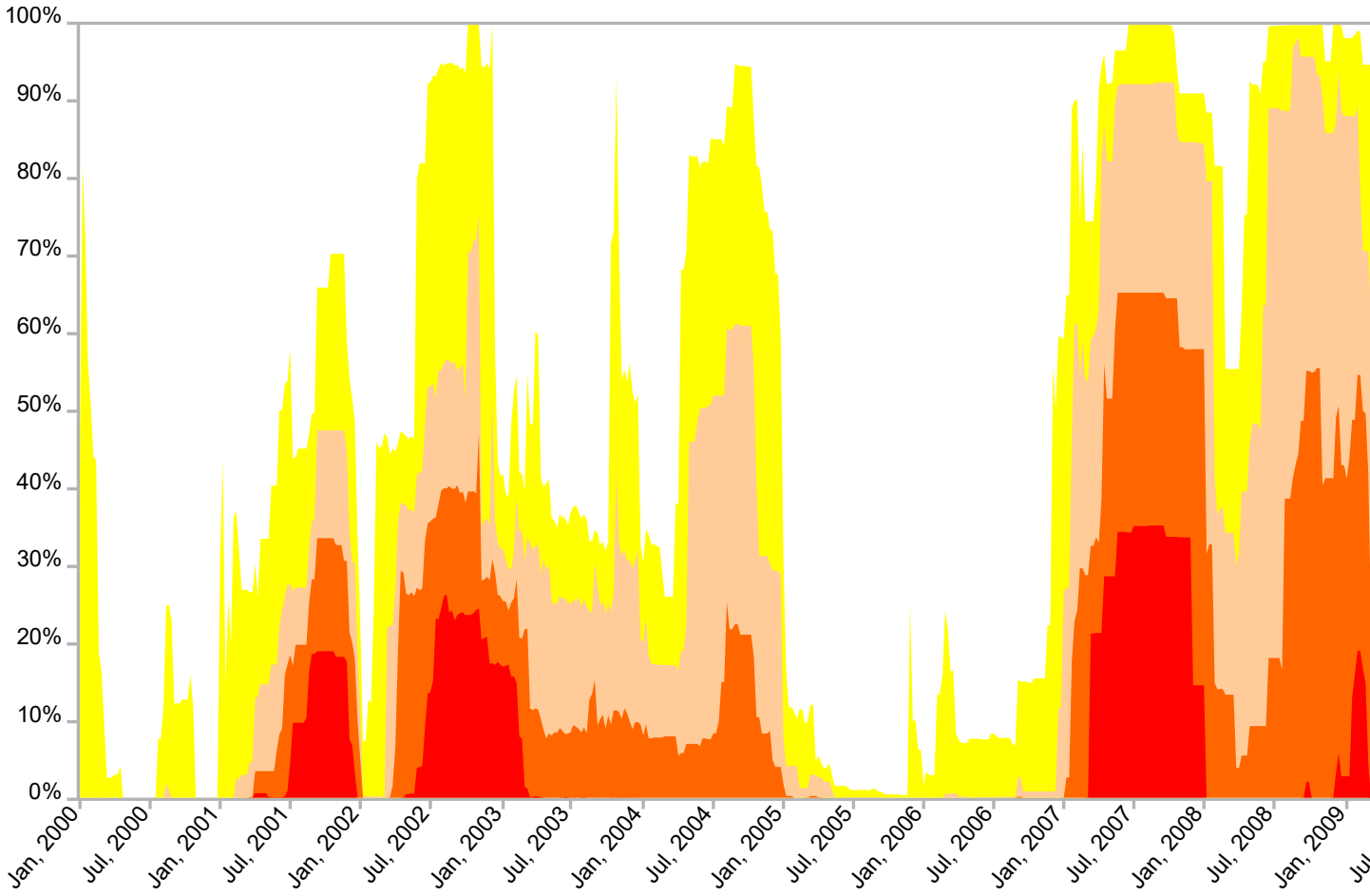
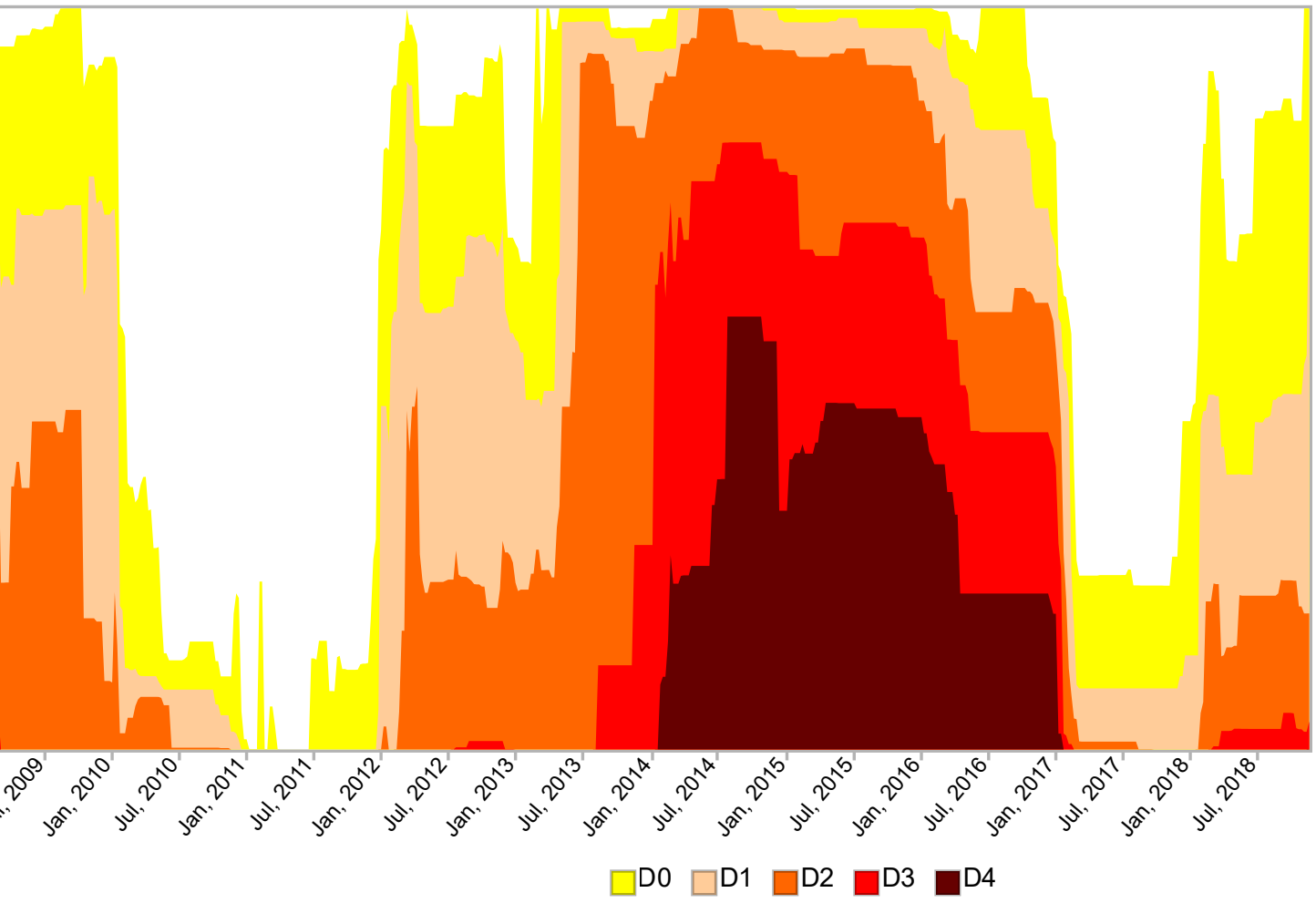


Figure 5.2
Graph prepared by U.S. Drought Monitor, documenting percentage area of California experiencing drought conditions ranging from *Abnormally Dry*, D0, to *Exceptional Drought*, D4, since 2000.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D0
D1
D2
D3
D4

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