

Drought, settler law, and the Los Angeles Aqueduct: The shifting political ecology of water scarcity in California's eastern Sierra Nevada

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Abstract

This article examines how drought intersects with long-standing issues of ecological degradation and social inequity caused by water extraction. I focus on the case of the Los Angeles Aqueduct and its ongoing impacts on communities and ecosystems in the Owens and Mono Basins in the Eastern Sierra region of California. Drawing on ethnographic and policy research, I show how environmental law addressed some of these impacts but reinforced others, perpetuating a settler colonial approach to water management that marginalizes Indigenous communities and naturalizes environmental degradation. Drought has further exacerbated and obscured these issues of degradation and inequity, as Los Angeles has increasingly contested its environmental mitigation obligations and doubled down on the extractive approach that resulted in the need for mitigation in the first place. This research builds upon insights from political ecology and critical legal studies, underscoring how drought exacerbates existing water scarcity but also obscures the role of settler colonial legal frameworks and extractive practices in producing it.

Keywords: drought, political ecology of water, settler colonialism, environmental law, California

Resume

Cet article examine comment la sécheresse recoupe les problèmes de longue date de dégradation écologique et d'inéquité sociale causés par l'extraction de l'eau. Je me concentre sur le cas de l'aqueduc de Los Angeles et de ses impacts continus sur les communautés et les écosystèmes des bassins Owens et Mono, dans la région orientale de la Sierra en Californie. En m'appuyant sur des recherches ethnographiques et politiques, je montre

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comment le droit de l'environnement a abordé certains de ces impacts mais en a renforcé d'autres, perpétuant une approche coloniale de la gestion de l'eau qui marginalise les communautés autochtones et naturalise la dégradation de l'environnement. La sécheresse a encore exacerbé et obscurci ces problèmes de dégradation et d'iniquité, alors que Los Angeles a de plus en plus contesté ses obligations en matière d'atténuation environnementale et a redoublé d'efforts sur l'approche extractive qui a entraîné la nécessité d'une atténuation en premier lieu. Cette recherche s'appuie sur des connaissances issues de l'écologie politique et d'études juridiques critiques, soulignant comment la sécheresse exacerbe la pénurie d'eau existante, mais obscurcit également le rôle des cadres juridiques coloniaux et des pratiques d'extraction dans la production de cette eau.

Mots-clés: sécheresse, écologie politique de l'eau, colonialisme de peuplement, droit de l'environnement, Californie

Resumen

Este artículo examina cómo la sequía se cruza con problemas de degradación ecológica y desigualdad social causados por la extracción de agua. Me concentro en el caso del Acueducto de Los Ángeles y sus impactos continuos en las comunidades y ecosistemas en las cuencas Owens y Mono en la región de la Sierra Oriental de California. Basándome en investigaciones etnográficas y políticas, muestro cómo el derecho ambiental abordó algunos de estos impactos pero reforzó otros, perpetuando un enfoque colonial para la gestión del agua que margina a las comunidades indígenas y naturaliza la degradación ambiental. La sequía ha exacerbado y oscurecido aún más estos problemas de degradación e inequidad, a medida que Los Ángeles ha cuestionado cada vez más sus obligaciones de mitigación ambiental y ha redoblado el enfoque extractivo que resultó en la necesidad de mitigación en primer lugar. Esta investigación se basa en conocimientos de la ecología política y estudios legales críticos, subrayando cómo la sequía exacerba la escasez de agua existente pero también oscurece el papel de los marcos legales coloniales y las prácticas extractivas en su producción.

Palabras clave: sequía, ecología política del agua, colonialismo, derecho ambiental, California

1. Introduction

In 2015, the Los Angeles Aqueduct ran dry for the first time in a century (Morin, 2015), making headlines as a poignant symbol of the drought that racked the state of California and much of the Western United States. It was the height of what would become known as the Great California Drought of 2012-2017 (Pompeii, 2020; Boxall, 2017), with record low snowpack in the Sierra Nevada (Margulis *et al.*, 2016) and the driest conditions in more than a thousand years (Griffin & Anchukaitis, 2014). But the source of water shortage for Los Angeles was not merely climatic. It was also the result of environmental mitigation requirements, physically embodied by the temporary dam that was placed in the aqueduct in order to use what little water was available to provide baseline flows in Owens River and control dust off the dry bed of Owens Lake.

Drawing on political ecology and critical legal studies, this article examines how the impacts of drought intersect with longstanding impacts of water extraction and the environmental regulations intended to address them. Since the 1970s, environmental law has restricted Los Angeles's water exports and provided some protections for ecosystems and communities in the Owens and Mono Basins. But it has also reinforced a settler colonial approach to water management that has marginalized Indigenous communities and normalized a level of environmental degradation as baseline. Based on policy analysis and ethnographic research, I show how environmental law naturalized a landscape that had been profoundly reshaped by water extraction and constrained the terms of debate within narrow legal and scientific frameworks.

I argue that drought has exacerbated these underlying issues of degradation and inequity while also obscuring Los Angeles's role in producing them. City officials have used drought as a justification for contesting the baseline environmental protections, even as local communities argue they are not doing enough. Faced by the dual pressures of drought and environmental mitigation requirements, the Los Angeles Department of Water and Power (LADWP) has doubled down on its efforts to squeeze more water from the region, further entrenching the extractive approach that resulted in the need for mitigation in the first place. However, this has not gone unchallenged, and Indigenous communities have been at the forefront of a growing chorus calling for a new approach.

2. Conceptual framework

This research builds upon a rich body of literature about the political ecology of water scarcity, paired with insights from critical legal studies about the role of settler colonial legal frameworks in producing and sustaining underlying inequities in access to water and decision-making power. Political ecology offers an approach for considering the very real physical and ecological implications of water scarcity, while also interrogating the discourses about its root causes (Acuña & Tironi, 2022; Holleman, 2016; Mehta, 2007, 2003; Akhter, 2003; Aguilera-Klink *et al.*, 2000). Scholars have highlighted the fact that, in many cases, water scarcity is socially produced, an outcome of water management practices (Aguilera-Klink *et al.*, 2000; Kaika, 2003). Yet, it is often discussed as a natural or purely climatic phenomenon (Mehta, 2003; Aguilera-Klink *et al.*, 2000), such that "its anthropogenic dimensions are whitewashed" (Mehta, 2007, p. 654).

Political ecologists have shown how drought conditions can function to both exacerbate and obscure socially-produced water scarcity. Lower-than-average precipitation and runoff make it more difficult to meet human demands and maintain healthy ecosystems. However, it can also distract from the longstanding practices of overallocation and over-extraction that make these systems vulnerable to drought (Acuña & Tironi, 2022; Holleman, 2016; Kaika, 2005). Discussions of drought are often dominated by "number narratives" that ignore these social dimensions (Brooks, 2017). Naturalizing discourses about scarcity are also often strategically deployed to justify specific management decisions, lending legitimacy to controversial water projects (Mehta, 2007; Kaika, 2003), marginalizing local knowledge systems (Mehta, 2003), and further entrenching racial disparities in access to water (Correia, 2022). In addition, a growing number of scholars have highlighted the settler colonial and racialized dimensions of scarcity that have long been obscured by naturalizing discourses (Correia, 2022; Acuña & Tironi, 2022; Curley, 2021b; Holleman, 2016). For example, Holleman (2016) reinterprets the Dust Bowl as a socio-ecological disaster produced by settler colonialism and imperialism. Claire and Surprise (2021) argue that California is trying to address water scarcity and degradation with the same settler colonial approach to water policy that produced those issues in the first place, undermining efforts to address historical injustices faced by Indigenous communities.

Building upon this work, I draw insights from critical legal studies and Indigenous studies to interrogate the role of law in both producing and sustaining these issues of water scarcity and inequity. Settler colonialism is ingrained within water and environmental laws in the U.S., contributing to ongoing forms of Indigenous dispossession as tribal interests continue to be subordinated to public and private interests (Middleton Manning, 2018; Krakoff, 2013; Tsosie, 2003; Espeland, 1998). This is particularly apparent in the historical disregard for tribal water rights in water allocation and infrastructure development such that Tribes now often have to agree to a smaller allocation in order to gain access to water (Curley, 2021a, b, 2019; McCool, 2002; Burton, 1991). But the underlying system of overallocation and extraction of water also has broader impacts on the water and territories that Indigenous communities hold sacred (McGregor, 2015). All of this is part of the system of ecological domination that Whyte (2018) argues lies at the heart of settler colonialism.

The Los Angeles Aqueduct is a physical representation of this system of ecological domination and the ways that water scarcity is mobilized to legitimize and sustain it. It is a system built upon settler colonial land and water laws that enabled Los Angeles to claim more than 95% of the private land and water rights in the Owens and Mono Basins, reroute the flow of rivers and streams, and transform the landscape through intensive groundwater pumping (Borgias, 2024). And while changes in water and environmental law later introduced some restrictions upon the city's water exports (Cantor, 2016), they also reinforced the underlying system of extraction. Drought has both exacerbated and obscured conditions of water scarcity and inequity produced by this system, particularly as it has spurred Los Angeles to double down on exports in the wake of these restrictions.

3. Methods

This article draws on three years of in-depth fieldwork conducted in the Owens and Mono Basins (Figure 1) from 2017 to 2020, pairing ethnographic methods with legal and policy analysis (Halliday & Schmidt, 2009). I conducted an extensive review of legal and policy documents regarding historical and contemporary water management in the Eastern Sierra. This included LADWP's annual operations plans for the Owens Valley, the

City of Los Angeles's Urban Water Management Plans, and the many governing documents and reports associated with the Long Term Water Agreement between Inyo County and Los Angeles. These documents provide a rich source of information about how water management and governance is structured, how goals and expectations are defined, how progress is measured and discussed, and how data are analyzed and presented.

Ethnographic methods included semi-structured interviews and participant observation of water management meetings. I conducted 70 semi-structured interviews with a broad range of actors involved in water issues, including local and city water officials, agency staff, environmentalists, Indigenous leaders and activists, and ranchers. Tribal member involvement in the project was authorized by the Tribal Councils of the Bishop, Big Pine, and Lone Pine Paiute-Shoshone Tribes and facilitated through collaborations with the Owen Valley Indian Water Commission. Participant observation of water management meetings provided additional insight into the relationships among these different actors and their diverse perspectives on water issues. Of particular importance to this article were meetings of the LADWP Board of Water and Power Commissioners, the Inyo County Water Commission, and the Inyo-L.A. Standing Committee.

I utilized NVivo Qualitative Analysis Software to conduct thematic coding of interview transcripts, field notes, and other documents as part of an overarching narrative analysis (DeLyser *et al.*, 2010). Of particular relevance to this article were themes of drought, climate change, water scarcity, environmental degradation, inequity, law, settler colonialism, and power. Tracing these themes through the history of the Los Angeles Aqueduct allowed me to situate current water conflicts within a broader historical context and to identify fulcrums of change over time.

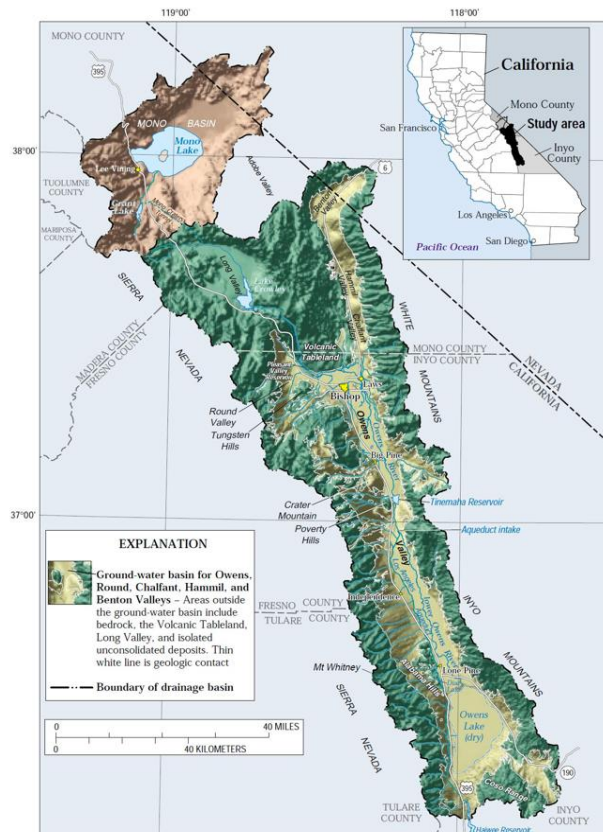


Figure 1: Map of Owens and Mono Basins (USGS)

4. The aqueduct system: From scarcity to surplus and back again

Drought played a critical role in the development and expansion of the Los Angeles Aqueduct System during the first half of the 20th century. Los Angeles water officials repeatedly used drought and the threat of water shortage to rally public support for development of this system, sometimes even manipulating data to heighten the sense of fear and urgency (Kahrl, 1983; Hundley, 2001). This created something of a vicious cycle, in which scarcity justified water import, imported water fueled growth, growth led to new threats of shortage, and shortage justified additional water import.

When voters first approved plans for the Los Angeles Aqueduct in 1905, the idea was to divert water that was considered surplus to the needs of the agricultural users in the northern part of the Owens Basin. City agents had already quietly bought up more than 80,000 acres (32,000 ha) of private land with water rights along the Lower Owens River to quell the potential for legal challenges (Sauder, 1994, p. 116). The city filed for all the remaining water rights in the Owens Basin, forestalling adverse claims and claiming the full flow of the Owens River downstream of the agricultural areas surrounding Bishop and Big Pine (Kahrl, 1983, p. 130).

The Los Angeles Aqueduct quadrupled the city's water supply when it became operational in 1913, providing far more water than was needed for urban use (Kahrl, 1983; Libecap, 2009). But the city's population grew five-fold from 1900 to 1920 (Kahrl, 1983, p. 230), quickly outpacing projections. Assessments of the city's water supply began to shift from abundance back to scarcity.

To meet the growing demand for water, Los Angeles began to divert Owens Valley groundwater as well as surface water. It started by drilling wells into the confined aquifer and diverting the pressurized artesian flows without having to use pumps (Kahrl, 1983, p. 255). City water officials initially saw local flood irrigated agriculture as synergistic with city exports, recharging the aquifer with surface water that could later be recovered from wells and diverted (Kahrl, 1983). But that notion faded by 1925, as the city's population had doubled again in a period of just five years (Kahrl, 1983, p. 259) and drought cut Owens Valley stream flows to about half of normal.

City water officials began to buy up the remaining agricultural lands upstream of the Aqueduct to increase their water rights. They also expanded their system of wells, equipping them with electric pumps to extract and export more groundwater. And they began to develop plans to extend the aqueduct north to divert streamflow from the Mono Basin through what would be called the Mono Craters Tunnel.

By 1933, Los Angeles had acquired 95 percent of the farmlands in Owens Valley, along with 85 percent of the town properties, which it had purchased to put an end to the growing demands for reparations as lands dried up and the local economy began to collapse (Kahrl, 1983, p. 314). With facilitation from the United States Indian Service (now Bureau of Indian Affairs), Los Angeles also purchased more than 4,400 acres (1781 ha) of allotment lands owned by Indigenous families and negotiated a land exchange that consolidated the Indigenous population onto three small reservations (Borgias, 2020, 2024). However, water rights were excluded from that exchange at the last moment, leaving the new reservations reliant on Los Angeles for irrigation supply. Los Angeles retained the rights to the groundwater beneath the reservations, while the Tribes retained rights to water beneath the traded lands that they had no ability to access. This laid the foundation for later disputes over tribal water rights, which the Owens Valley Indian Water Commission has been working to resolve since the 1990s (Red Owl, 2021; Borgias 2024).

Between Los Angeles's sweeping acquisitions of land and water rights in the Owens Valley and its diversions of water from the Mono Basin starting in 1941, the city had amassed rights to more water than the Aqueduct System could carry. From 1936 to 1958, Los Angeles did not pump any groundwater and was still able to provide water for local irrigation and recreational uses (Los Angeles and Inyo County, 1990, p. 102). However, this apparent surplus of water began to draw the attention of lawmakers engaged in state water planning.

In 1959, the legislature instructed the Department of Water Resources to investigate "how the water Los Angeles had left behind could be more efficiently applied to the economic development of the valley" (Kahrl 1983, p. 406). The State Water Resources Control Board refused to renew the city's water rights filings in the Mono Basin until LADWP could prove that it had the ability to put them to use (Phillips, 1963). LADWP's Chief Engineer at the time, wrote:

Because of the pressure put on us to use this water or let someone else use it, as well as the pressure by local people to use this water for their benefit, alleging that we are not making the most beneficial use of it, our position is becoming untenable (Phillips, 1963, p. 6).

In 1963, LADWP announced plans to add a second barrel to the Aqueduct, increasing its capacity by 200,000 acre-feet (247 million m³), with Phillips urging that "failure to build a Second Barrel and build it now, may well result in final loss of this additional water" (Phillips, 1963, p. 9). The 137-mile-long (220 km) pipeline, which became known as the Second Aqueduct, was constructed throughout the late 1960s at a cost of \$89 million dollars. It would increase the capacity of the Aqueduct system by 40%, making it possible to export as much as 570,000 acre-feet (703 million m³) per year. In anticipation of this added capacity, the city cut the amount of irrigated acreage in Owens Valley by almost half to free up more water for export (Los Angeles and Inyo County, 1990, p. 104).

With the completion of the Second Aqueduct in 1970, Los Angeles demonstrated the full breadth of its right to export water from Owens and Mono Basins. Its diversions from the Mono Basin jumped from approximately 56,000 acre-feet (69 million m³) per year prior to 1970 to an average of 82,000 acre-feet (101 million m³) per year between 1970 and 1989, peaking at 140,756 acre-feet (174 million m³) in 1979 (LADWP, 2019, p. 227). Its groundwater pumping in the Owens Basin skyrocketed from about 35,000 acre-feet (43 million m³) in 1970 to about 173,000 acre-feet (213 million m³) in 1972, when the city announced that this intensified pumping regime would be permanent (ICWD, 2019).

The impacts were immediate and dramatic. Springs and wetlands dried up throughout the Owens Basin and vegetation began to die off (Los Angeles and Inyo County, 1990). Water levels at Mono Lake, which had already dropped 30 feet (9m) since the 1940s, began to decline precipitously, as they had at Owens Lake half a century earlier (Hart, 1996). However, societal values and legal principles were shifting to account for environmental impacts that had previously been ignored.

5. Restricting exports under environmental law

Throughout the 1970s and 1980s, Los Angeles faced dozens of environmental lawsuits regarding the impacts caused by its water extraction and export from the Owens and Mono Basins. The litigation targeted not only the impacts of the recent intensification of those activities with the Second Aqueduct, but also long-standing impacts posed by dry lakes and streambeds. By the 1990s, the city's exports had been significantly constrained (Figure 2).

In the Mono Basin, the city's water rights licenses were amended by the State Water Resources Control Board in 1994 to comply with the public trust doctrine at Mono Lake and to release flows for fish under Fish and Game Code 5937 (Hart, 1996). Los Angeles's exports of water from the Mono Basin are now conditioned upon the level of Mono Lake, limited to 16,000 acre-feet (20 million m³) per year until it reaches the target level of 6,391 feet (1,948m) above mean sea level. Exports drop to 4,500 acre-feet (5.5 million m³) if the lake level falls below 6,380 feet (1944m *ibid*). In the Owens Valley, decades of lawsuits filed by Inyo County and environmental groups under the California Environmental Quality Act (CEQA) resulted in restrictions on groundwater pumping, as well as "compensatory mitigation" for past impacts to seeps and springs (Los Angeles & Inyo County, 1991). This included revegetation projects, water supply for recreational areas and fish hatcheries, and releases of a minimum flow into the Lower Owens River, which had been dry since 1913. Finally, at Owens Lake, Los Angeles was held responsible for controlling dust emissions off the dry lakebed in accordance with the Clean Air Act (Cone, 1999).

LADWP was slow to comply with the new environmental requirements that had suddenly erased all the 'surplus' water that the Second Aqueduct had been built to capture. One retired official stated:

It seems to me terribly unfair that something this fundamental to people, this vital to people, on this large a scale, is thwarted by a new societal thinking, by a new sociology influencing the courts (Phillips, 1995, pp. 7-8).

Throughout the late 1990s and early 2000s, the city faced another barrage of lawsuits due to their failure to comply with the new requirements. After a judge imposed hefty fines for delayed implementation, LADWP finally began using shallow flooding to control dust on Owens Lake in 2001 (Cone, 1999). In a lawsuit filed in 2003, environmental groups accused Los Angeles of deliberately delaying the implementation of the Lower Owens River Project (Sahagun, 2005), citing public statements made by Los Angeles officials to show that it was the city's "institutional policy to violate court orders and to violate the law because it was cheaper and more economical for them" (Interview 1/17/2019). Only after the judge imposed sanctions, restricting pumping and threatening a permanent ban on using the Second Aqueduct, did Los Angeles begin releasing the full base flows into the Lower Owens River in late 2006 (Sahagun & Silverstein, 2006).

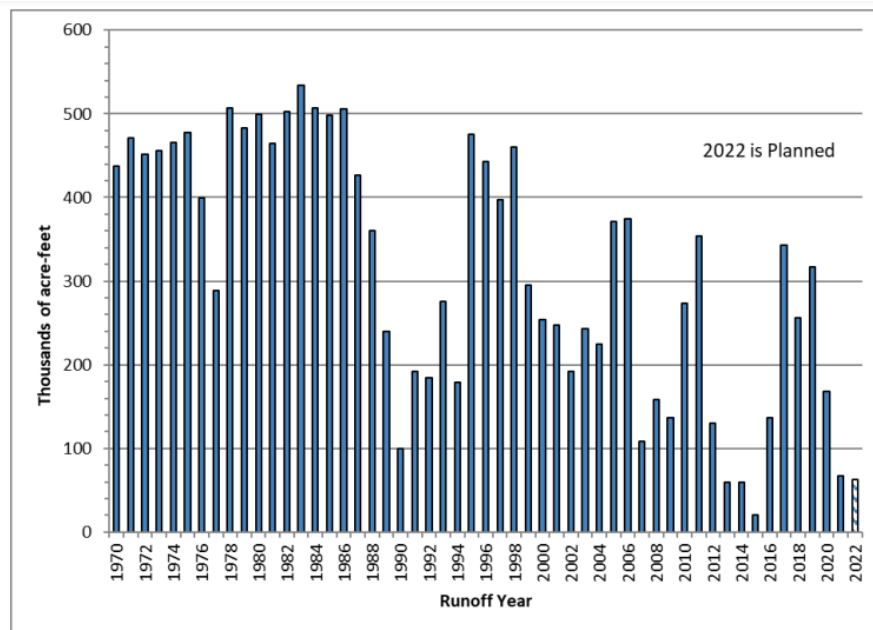


Figure 2: LADWP's water exports from the Eastern Sierra (LADWP, 2022, p. 46)

As Los Angeles has been required to meet these environmental obligations in Owens and Mono Basins, the city has seen its water exports from the Eastern Sierra decline by nearly 50%,² effectively reversing the sharp increase in exports that it had initiated in the 1960s. However, environmental litigation and mitigation did not reverse all the impacts of that intensified extraction, particularly those from groundwater pumping. LADWP's underlying approach to its operations in the Eastern Sierra remained unchanged, as one retired LADWP official explained:

It was still "put every drop of water that you are legally entitled to into that aqueduct." [...] There's projects you've got a legal obligation to provide with water. [...] So, we did that and shipped everything else to Los Angeles. That was the mandate. (Interview 12/12/2018)

² After increasing from approximately 320,000 acre-feet (395 million m³) per year during the 1945-1970 period to 464,000 acre-feet (572 million m³) per year during 1970-1989, LADWP's average water exports dropped to an average of 249,000 acre-feet (307 million m³) per year after 1990 (LADWP, 2020, Fig. 2.13).

Over time, that mandate would become increasingly apparent in LADWP's approach to mitigation throughout the region. While the city's legal obligations at Mono Lake and Owens Lake were fairly rigid—tied to lake levels and emissions standards, respectively—those governing groundwater pumping in Owens Valley left more room for interpretation and contestation. In the next section, I show how the new groundwater management regime addressed some environmental and social injustices but reinforced others. It added protections against new impacts, but accepted degraded conditions as the baseline that they would be measured against. It required mitigation for some of the impacts of historic pumping but made much of that mitigation reliant on continued pumping. It added new forms of accountability to county and environmental interests but marginalized Tribes from decision-making.

6. Groundwater management and mitigation: Reinforcing impacts and inequities

Intensive groundwater pumping had already transformed the Owens Valley by the time wells began to be turned off in 1990 under the terms of the Long Term Water Agreement (LTWA) between Inyo County and Los Angeles. During the litigation of the 1970s and 1980s, the court had imposed a pumping limit of 108,000 acre-feet (133 million m³) per year and temporarily allowed more than 150,000 acre-feet (185 million m³) during the drought of 1976. Those supposedly restrained levels were far in excess of the 75,000 acre-feet (92 million m³) what the USGS would later define as the annual sustained yield (Danskin, 1998). Groundwater dependent vegetation suffered as a result, with significant losses in alkali scrub and meadow habitat (Griepentrog & Groeneveld, 1981; Elmore *et al.*, 2006).

The LTWA sought to put an end to the declines in groundwater-dependent vegetation and to maintain what was left.³ It prohibited total pumping in excess of total recharge over a 20-year period, and it established a system of vegetation monitoring to guard against decreases in live plant cover, as well as changes in vegetation type, such as from grassland or meadow (Type C) to scrub (Type B) or from scrub to non-groundwater-dependent vegetation (Type A). However, the baseline vegetation conditions that new impacts would be measured against were from a 1984-1987 inventory that reflected the impacts of intensive pumping (Danskin 1998, p. 122). An ecologist who worked on the vegetation inventory recalled realizing that "that 'B' is a screwed-up meadow. In fact, some of the 'A's were too. They were just so far gone" (Interview 11/18/2018). As pointed out by Walton (1993), "The principle of the agreement is that things should not get worse; but the standard against which getting worse will be measured [...] is itself retrograde" (p. 285).

But things did get worse, and maintaining the already-degraded baseline conditions would prove a challenge due to Los Angeles's continued groundwater extraction paired with frequent drought. During the drought years of 1987 and 1988, Los Angeles pumped more than 200,000 acre-feet (247 million m³), followed by 150,000 acre-feet (185 million m³) in 1989 (LADWP, 2020). In 1990, the new "ON/OFF" provisions of the LTWA went into effect, shutting off wells in areas where soil moisture levels were found to be below the needs of nearby vegetation. But the intensive pumping in the preceding years had caused the water table to drop below the root zone of the vegetation in many areas. And, while turning pumps off helped prevent the water table from dropping further, the drought conditions through 1992 meant that there was little runoff to help it recover to the root zone.

Vegetation began to recover after Los Angeles further reduced its pumping under a Drought Recovery Policy established with Inyo County in 1992. But some areas never recovered to baseline conditions, such as in the Blackrock area, where alkali meadow has steadily been replaced by scrub (see Figure 3). A former county water department employee recalled:

³ The stated goal of the LTWA is to avoid "decreases and changes in vegetation" and "to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County" (Los Angeles and Inyo County 1991, 10). It prohibits pumping groundwater in excess of recharge and requires individual wells to be shut off if soil moisture levels, measured on July 1st and October 1st of each year, are found to be below the needs of nearby vegetation.

You could see a big bounce back in vegetation cover where the water table had recovered, and in the places where it hadn't, despite the big wet years of '93 and '95 and '98, it was still not looking good. So, this was like the smoking gun for the water table. (Interview 11/18/2018)

Based on these results, Inyo County and environmental groups argued for managing pumping based on depth to water (DTW) rather than soil moisture to ensure that pumps were turned off *before* the water table dropped below the root zone of vegetation. But LADWP opposed this idea, hiring a consultant who found "no simple direct relationship between DTW and vegetation cover" since its effects could not be isolated from other "confounding factors" (McLendon, 2005, p. 2). After years of disputes, management remained unchanged, with a former county employee recalling that "pretty soon they just wore Inyo County down and they just stopped talking about it" (Interview 11/18/2018).



Figure 3: Blackrock 94 transect TS2 in 1998 and 2007. Source: Inyo County, 2011, pp. 14-15

Local residents recalled their frustration at seeing the pumping debates end in stalemate while vegetation continued to decline. One rancher stated:

They can say what they want. They're still drying up Inyo County. [...] In the eighties and clear into the nineties, there was green meadows that are now dead. (Interview 6/11/2018)

A Tribal representative pointed out that much of the debate has become centered on trying to prove these impacts rather than avoid them:

The Long Term Water Agreement was really designed to avoid impacts and yet the conversation is not about avoidance, but "did we impact?" And so what DWP gets then is a green light to say, "I can pump and, until you show me that my pumping has caused this, I'm going to continue to pump." [...] So, we've taken away the avoidance factor from that entirely. (Interview 4/19/19)

Tribal leaders and activists have also raised concerns about the way the LTWA paradoxically allows Los Angeles to pump groundwater to mitigate the past impacts of pumping. For example, at the site of several springs dried up by pumping, LADWP pumps groundwater into ponds to sustain waterfowl habitat (Los Angeles & Inyo County, 1990, p. 198). It has pumped as much as 33,000 acre-feet (41 million m³) per year to sustain fish hatcheries at Blackrock and Fish Springs, far exceeding the roughly 24,000 acre-feet (30 million m³) that naturally flowed from the springs prior to 1970.⁴ This pumping constitutes a significant source of drawdown in the water table, and a source of water export for Los Angeles. But it is exempted from the ON/OFF provisions of the LTWA due to being considered a local use.⁵

While representatives of the Paiute and Shoshone Tribes have been vocal about the need to address these issues, they do not have any formal legal standing or decision-making power in relation to the LTWA. In the 1990s, they were invited to submit a brief as a friend of the court to help assess whether concerns about habitat, mitigation, and tribal rights⁶ had been adequately addressed in the Environmental Impact Report for the LTWA. But they were required to withdraw that brief in order to enter into negotiations with Los Angeles over tribal water rights. The other friends of the court -Owens Valley Committee, the Sierra Club, the State Lands Commission, and the California Department of Fish & Wildlife- signed a Memorandum of Understanding with LADWP and Inyo County in 1997 that gave them the ability to assess and enforce the implementation of mitigation projects, additional studies, and land management and habitat conservation plans. Meanwhile, the Tribes ultimately came away with neither a water rights settlement nor formal legal standing as a signatory to the MOU.

In 2015, California Assembly Bill 52 (AB-52) mandated that Tribes be given an opportunity to consult on CEQA matters. However, CEQA is only invoked in regard to new projects such as infrastructure construction or major changes to operations. Tribal officials have criticized this narrow scope and used the AB-52 process to amplify broader concerns that fall outside of it. An official of the Big Pine Paiute Tribe described writing in each AB-52 consultation letter that, "each of these things you call a 'project' is part of a bigger project, which is the fact that you're still taking water from up here" (Interview 11/23/2018).

Paiute leaders and water activists regularly raise concerns about this bigger project of water extraction during public comment periods, pushing for further reductions in groundwater pumping. However, Los Angeles considers its pumping to be "extremely conservative" (2010 annual report, 12) and "environmentally sensitive" (LADWP, 2022, p. 273). It does so by comparing its pumping levels to the amount technically allowed under the provisions of the LTWA, which has exceeded 120,000 acre-feet (148 million m³) even in drought years (LADWP, 2022, p. 273).⁷ One Tribal representative explained their frustration with these arguments:

⁴ To mitigate the loss of about 8,000 acre-feet (9.9 million m³) of natural flow from Blackrock Springs, LADWP pumped 13,000 acre-feet (16 million m³) per year for the Blackrock Fish Hatchery until it was recently restricted to 8,000 acre-feet (9.9 million m³) by environmental litigation. The Big Pine Paiute Tribe has been calling for LADWP to reduce its pumping at Fish Springs Fish Hatchery, where it pumps about 20,000 acre-feet (25 million m³) of groundwater each year to mitigate the loss of a natural flow of about 16,300 acre-feet (20 million m³) per year.

⁵ LTWA exempted LADWP wells that pump water for local use or that are determined to not impact groundwater-dependent vegetation. Inyo County water officials estimate that these wells produce about 78% of the total output of LADWP wells, leaving less than a third of LADWP's groundwater pumping subject to restriction (Klusmire, 2006).

⁶ Tribal leaders had raised concerns about the potential for Los Angeles's groundwater pumping to impact not only the reservations but also their off-reservation water rights, which the EIR had erroneously stated had been transferred to Los Angeles in the 1939 land exchange (Los Angeles & Inyo County, 1990, p. 53).

⁷ In the current drought year of 2022-2023, the ON/OFF provisions of the LTWA would allow LADWP to pump as much as 192,112 acre-feet (237 million m³), but its planned pumping is just under 50,000 acre-feet (62 million m³) (LADWP, 2022).

Because they have some contract, it's like, "okay, so we have to abide by this, and we can pump more by this contract." But that's not the point! What about the impacts you're having? What about the desecration you're causing on this environment here, you know? What about the people that live up here? (Interview 3/2/2020)

However, they said they feel like their concerns often "fall on deaf ears" (*ibid*). In water meetings, I saw how comments like the one above were regularly dismissed as outside the purview of the legal and scientific frameworks that have come to dominate decision-making about groundwater.⁸

7. Drought: Exacerbating and obscuring long-standing impacts

Amid increasingly frequent drought and climate change impacts, raising concerns about Los Angeles's underlying system of extraction has become more urgent but also more difficult. Drought conditions exacerbate the ongoing environmental and social impacts of Los Angeles's extraction of water from the Eastern Sierra. But drought also obscures the social production of those impacts. Los Angeles increasingly cites it as a justification for contesting and cutting back its obligations to leave water for local and environmental uses.

The drought of 2011-2017 was the first time that Los Angeles faced the full implications of its environmental obligations under conditions of extremely low runoff. As discussed in the introduction, this new reality was symbolized by the temporary dam placed in the aqueduct in 2015, ceasing exports and diverting all available flow for dust control and other environmental requirements (Morin, 2015). For Los Angeles water officials, the story was one of drought exacerbated by environmental mitigation requirements. LADWP's 2015 Urban Water Management Plan explained:

The impact to LAA water supplies due to varying hydrology in the Eastern Sierra Nevada is exacerbated by requirements to release water for environmental enhancement projects in the Mono Basin and Owens Valley. (LADWP, 2015, p. 35)

LADWP started including a table in their annual Owens Valley operations plans (Figure 4) that shows Owens Valley exports dropping into the negative during drought years since 2012, stating that in-valley uses exceeded local runoff and pumping such that they had to use "imported water" from Long Valley (which is part of the Owens Basin) and from Mono Basin (LADWP, 2022, p. 44). However, this broad assessment belies the complexity of in-valley uses and exports. The majority of the in-valley uses included in this calculation have been in place since at least 1945, including uses for "Indian land, private lands, conveyance losses, recharge, evaporation, and operational releases" (p. 72).⁹ Uses required by the LTWA make up about a third of the total, adding just 14,000 acre-feet (17 million m³) beyond the amount of water historically provided for irrigation, recreation, and habitat before 1970. The main source of increased in-valley use has been from shallow flooding to mitigate dust on Owens Lake, requiring 50-70,000 acre-feet (62-86 million m³) per year since 2007 (ICWD, 2019).

⁸ For example, during an Inyo County Water Commission meeting on May 29, 2018, I observed a public comment to this effect be met with the response, "that's not what we are discussing," and others were merely ignored and followed by "let's move on to the next agenda item."

⁹ These uses are not broken down in the report. But at least some of this water, particularly the recharge and operational releases, is recovered by pumping in subsequent years.

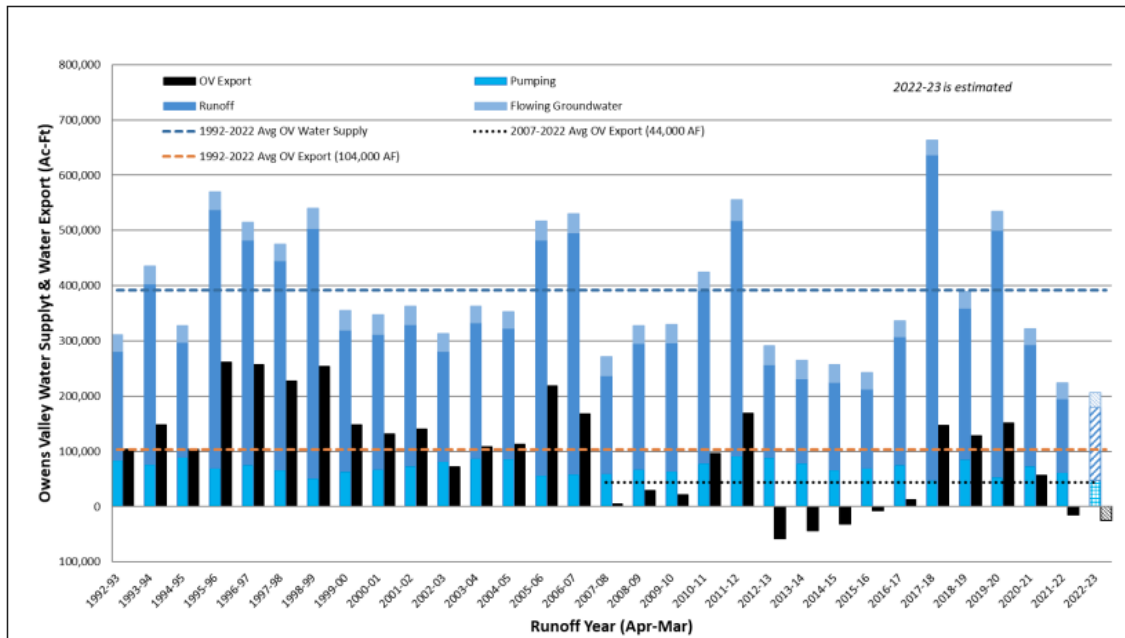


Figure 4: "Owens Valley Water Supply and Export" table published by LADWP (2022, p. 44).

However, LADWP's response has been to reduce the amount of water used for mitigation, not just at Owens Lake, but throughout the Owens and Mono Basins. In addition to transitioning to less water-intensive dust control measures, LADWP is investigating the possibility of pumping brackish groundwater from beneath Owens Lake (Sahagun, 2019). But it is also tightening up on the provision of water for local and environmental uses in Owens Valley and Long Valley and contesting its obligations at Mono Lake, doubling down on the extractive approach that produced the need for mitigation in the first place.

In Owens Valley, LADWP has argued that any new or modified mitigation projects need to be 'water neutral,' supplied by groundwater or offset by "replacement" pumping (Murphy, 2018). For example, LADWP now pumps groundwater for several "regreening projects" to mitigate dust and improve aesthetics near the town of Big Pine, which has some of the lowest water tables in the valley. Valley residents continue to contest the notion that pumping can mitigate the impacts of pumping, likening it to "robbing Peter to pay Paul" (Standing Committee 5/31/2018). Meanwhile, 30 years after the mitigation requirements were established, 13 out of the 18 revegetation projects required under the LTWA were not meeting goals for vegetation cover (LADWP, 2022, p. 85).

LADWP has also tightened up on the provision of irrigation and stockwater to its ranch leases throughout the region. Ranchers in Inyo County are somewhat protected by the LTWA, which requires maintaining flood-irrigated meadow vegetation. However, those provisions do not apply to the 6,000 acres (2428 ha) of land the city leases to ranchers in Mono County. In 2018, LADWP sparked public outcry and opposition when it announced intentions to cut irrigation to those lands (Sahagun, 2021a). An LADWP official explained that he saw the change as long overdue:

When they should have probably made the change is probably 30 years ago when we lost the water out of Mono Basin. [...] There was surplus water. Well, it doesn't exist anymore. (Interview 8/14/2018)

Implementation of the change was halted by a lawsuit filed by Mono County and the Sierra Club that asserted the need to first do a CEQA assessment of its environmental impacts (Sahagun 2021b). On appeal, Los Angeles argued that it was not in fact going to implement waterless leases, and the judge ruled they would not have to do the CEQA review in that case (Sahagun, 2022). However, the question of how much water the city will provide in future years remains unclear, and the Keep Long Valley Green Coalition continues to call for a binding agreement to ensure baseline protections for meadow habitat (Weber, 2022).

LADWP officials have also called for reassessing their obligations at Mono Lake in light of climate change impacts. In an interview with the Los Angeles Times, an LADWP official argued that the city's diversions from the Mono Basin have "a very limited influence on Mono Lake's elevation" and that climate change was to blame for the low lake levels:

There is a trend of overall less water in the Eastern Sierra. Whether you call it prolonged drought or climate change, the water is not reliably there. (Richard Harasick, quoted in Sahagun, 2018)

However, the Mono Lake Committee has done modeling that shows that, if LADWP had stopped stream diversions in 2010, the lake would likely have remained above the 6,380-ft (1945m) trigger level despite the droughts (McQuilkin 2023). A Mono Lake Committee member commented that LADWP continues to approach climate change from the standpoint of "trying to maximize whatever was the flow of water that you felt was part of your reliable system, and trying to make sure that that remains unchanged" rather than accepting that it will likely mean less water is available for export because "more water will be needed to sustain healthy environments" (Interview 10/26/18).

Water activists in Owens Valley have made a similar argument in regard to the need to decrease or cease groundwater pumping in order to sustain healthy vegetation. Vegetation cover continues to decline below baseline levels during droughts (LADWP, 2022, p. 50). But one interviewee expressed frustration that drought often obscures the anthropogenic cause of water table decline, stating:

Drought alone does not lower the water table [...] So, this 'drought and pumping', 'drought and pumping' - no! Get rid of the drought part [laughs]. Because first of all, we can't even do anything about it [drought], but secondly, what we can manage is the pumping. (Interview 11/18/2018)

The role of LADWP's pumping in the desertification of the region was emphasized by the Bishop and Big Pine Paiute Tribes in their contributions to a recent Indicators of Climate Change Report (OEHHA, 2022). The Bishop Paiute Tribe wrote that "ongoing water export has intensified the effects of precipitation changes and drought caused by climate change in the Eastern Sierra" (3), contributing to "a loss of gathering areas and ceremonial locations, a reduction in traditional medicines and foods, impacts on culturally important fish species, and a loss of the Bishop Paiute's traditional waters" (Bishop Paiute Tribe, 2022, p. 6).

Meanwhile, the tribal water rights of the Bishop, Big Pine, and Lone Pine Paiute-Shoshone Tribes remain unresolved (Borgias 2024). Asked about the possibility of reopening negotiations of a water rights settlement, Los Angeles officials expressed some wariness about the idea of another obligation to leave yet more water in the valley. One LADWP official stated:

I think the department is willing to listen to it and look into it and so forth. But I mean...it's kinda like, you know, at what cost is that to the department to agree on that? (Interview 8/14/2018)

LADWP officials frame meeting community and ecosystem needs as an unreasonable cost to the city when it could perhaps more accurately be described as repayment of a debt that is long overdue. The Los Angeles Aqueduct System was built upon the taking of water from communities and ecosystems, and their continued subjugation is necessary to sustain that supply. Mitigation requirements under environmental law have only scratched the surface of the impacts this system has produced. However, even baseline targets for vegetation

cover and lake levels remain unmet. And while drought certainly exacerbates the situation, it also provides a convenient distraction from the underlying causes of water scarcity.

Indigenous leaders and activists have long called out the underlying system of settler colonial water extraction and demanded a different approach. They are calling for a seat at the table to bring Indigenous knowledge to bear decision-making, with one noting:

If we've got knowledge that has been handed down generation after generation and yet are not able to utilize that for helping this area make decisions that will last, then it's a travesty for those that are actually making decisions, because they're making decisions without a good, strong knowledge base of everybody that should be at the table. (Interview 3/25/2019)

Another emphasized the need for decision-making that transcends the narrow terms of settler law, noting, "when you have a system of laws that aren't based on the rules of nature, how can true justice be attained?" (Interview 4/19/2019).

8. Conclusions

Facing escalating water scarcity, the Los Angeles Department of Water and Power is doing everything it can to keep water flowing to the city from the Owens and Mono Basins. Historically, it dealt with scarcity and drought by buying up water rights, expanding the aqueduct system, reducing local uses, and increasing groundwater extraction. That impulse toward continuous expansion left a legacy of environmental and social impacts that have come back to haunt the city in the form of mitigation requirements. Yet, even as it faces the consequences of that extractive approach, LADWP seeks to further reduce the amount of water it leaves behind for local communities and ecosystems.

Ultimately, while the rules of the game have shifted around it, LADWP's approach has remained effectively the same: exporting every drop of water that it is legally entitled to. This reflects a settler colonial approach to water management that positions ecosystem health as a burden upon water exports rather than the other way around. And while environmental law is often framed as a challenge to this approach, it has also helped sustain it. It placed limits on extraction but did not question the underlying right to extract. It established protections for baseline conditions but naturalized a level of degradation within them. And it created new forms of accountability for some, while continuing to marginalize Indigenous communities.

The added pressure of drought threatens to obscure these underlying issues of degradation and inequity while lending legitimacy to Los Angeles's efforts to buttress its declining exports at any cost. LADWP has increasingly cited drought and climate change as a justification for its failure to meet mitigation goals and other environmental obligations. But Indigenous communities have long called attention to the underlying system of settler colonial water extraction that has produced this crisis of water scarcity. And they are joined by a growing number of people starting to question whether the aqueduct running dry during a drought is a crisis or a necessary outcome of protecting baseline ecosystem health.

As drought continues to make headlines across the Western U.S. and cities search for remedies to impending water shortage, this case offers some cautionary lessons. It demonstrates the consequences of continuing to respond to water scarcity with the same settler colonial and extractive approaches that produced it. Building upon previous political ecology studies, it underscores the tendency for drought to obscure these underlying causes of scarcity. It highlights the need to look beyond settler colonial law for the tools to build more equitable and sustainable forms of water governance.

References

- Acuña, V., & Tironi, M. (2022). Extractivist droughts: Indigenous hydrosocial endurance in Quillagua, Chile. *The Extractive Industries and Society*, 9, 101027. <https://doi.org/10.1016/j.exis.2021.101027>

- Aguilera-Klink, F., Pérez-Moriana, E., & Sánchez-García, J. (2000). The social construction of scarcity. The case of water in Tenerife (Canary Islands). *Ecological Economics*, 34(2), 233–245. [https://doi.org/10.1016/S0921-8009\(00\)00160-9](https://doi.org/10.1016/S0921-8009(00)00160-9)
- Akhter, M. (2017). The political ecology of the water scarcity/security nexus in the Indus basin: Decentering per capita water supply. In Z. Adeel & R. G. Wirsing (Eds.), *Imagining Indus: Overcoming water insecurity in the Indus basin* (pp. 21–33). Springer. https://doi.org/10.1007/978-3-319-32845-4_2
- Bishop Paiute Tribe. (2022). Impacts of climate change on the Bishop Paiute Tribe. In *OEHHA 2022 Indicators of Climate Change in California*. Pages VII-61-82. <https://oehha.ca.gov/media/epic/downloads/06bishoppaiute.pdf>
- Borgias, S. L. (2020). *Public interest, indigenous rights, and the Los Angeles Aqueduct*. PhD Dissertation. University of Arizona. <https://repository.arizona.edu/handle/10150/645756>
- Borgias, S. L. (2024). Denaturalizing dispossession in the political ecology of the American West: Reassessing the history of the Los Angeles Aqueduct and its implications for Indigenous land and water rights. *Annals of the American Association of Geographers*, 1–19. <https://doi.org/10.1080/24694452.2024.2332649>
- Boxall, B. (2017, January 11). Is the great California drought finally ending? *Los Angeles Times*. <https://www.latimes.com/local/california/la-me-storms-drought-20170111-story.html>
- Brooks, E. (2017). Number narratives: Abundance, scarcity, and sustainability in a California water world. *Science as Culture*, 26(1), 32–55. <https://doi.org/10.1080/09505431.2016.1223111>
- Burton, L. (1991). *American Indian water rights and the limits of law*. University Press of Kansas.
- Cantor, A. (2016). The public trust doctrine and critical legal geographies of water in California. *Geoforum*, 72, 49–57. <https://doi.org/10.1016/j.geoforum.2016.01.007>
- Claire, T., & Surprise, K. (2022). Moving the rain: Settler colonialism, the capitalist state, and the hydrologic rift in California's Central Valley. *Antipode*, 54(1), 153–173. <https://doi.org/10.1111/anti.12777>
- Correia, J. E. (2022). Between flood and drought: Environmental racism, settler waterscapes, and Indigenous water justice in South America's Chaco. *Annals of the American Association of Geographers*, 112(7), 1890–1910. <https://doi.org/10.1080/24694452.2022.2040351>
- Cone, M. (1999, August 18). Accord ends bitter Owens Valley dispute – but will dust settle? *Los Angeles Times*. <https://www.latimes.com/archives/la-xpm-1999-aug-18-mn-1291-story.html>
- Curley, A. (2019). "Our winters' rights": Challenging colonial water laws. *Global Environmental Politics*, 19(3), 57–76. https://doi.org/10.1162/glep_a_00515
- Curley, A. (2021a). Unsettling Indian water settlements: The Little Colorado River, the San Juan River, and colonial enclosures. *Antipode*, 53(3), 705–723. <https://doi.org/10.1111/anti.12535>
- Curley, A. (2021b). Infrastructures as colonial beachheads: The Central Arizona Project and the taking of Navajo resources. *Environment and Planning D: Society and Space*, 39(3), 387–404. <https://doi.org/10.1177/0263775821991537>
- Danskin, W. R. (1998). *Evaluation of the hydrologic system and selected water-management alternatives in the Owens Valley, California* (U.S. Geological Survey Water-Supply Paper 2370). U.S. Geological Survey. <https://doi.org/10.3133/wsp2370H>
- DeLyser, D., Herbert, S., Aitken, S., & Crang, M. (2010). *The SAGE handbook of qualitative geography*. Sage. <https://doi.org/10.4135/9780857021090>
- Elmore, A. J., Manning, S. J., Mustard, J. F., & Craine, J. M. (2006). Decline in alkali meadow vegetation cover in California: The effects of groundwater extraction and drought. *Journal of Applied Ecology*, 43(4), 770–779. <https://doi.org/10.1111/j.1365-2664.2006.01197.x>
- Espeland, W. N. (1998). *The struggle for water: Politics, rationality, and identity in the American Southwest*. University of Chicago Press.
- Griepentrog, T. E., & Groeneveld, D. P. (1981). *The Owens Valley management report*. Final report for Inyo County, Bishop, California, 272 p.

- Griffin, D., & Anchukaitis, K. J. (2014). How unusual is the 2012–2014 California drought? *Geophysical Research Letters*, 41(24), 9017–9023. <https://doi.org/10.1002/2014GL062433>
- Halliday, S., & Schmidt, P. D. (2009). *Conducting law and society research: Reflections on methods and practices*. Cambridge University Press.
- Hart, J. 1996. *Storm over Mono: The Mono Lake battle and the California water future*. University of California Press.
- Holleman, H. (2017). De-naturalizing ecological disaster: Colonialism, racism and the global Dust Bowl of the 1930s. *The Journal of Peasant Studies*, 44(1), 234–260. <https://doi.org/10.1080/03066150.2016.1195375>
- Hundley, N. (2001). *The great thirst: Californians and water – A history* (Revised edition). University of California Press.
- ICWD (Inyo County Water Department). (2011). *Analysis of conditions in vegetation parcel Blackrock 94*. Staff Report Prepared by the Inyo County Water Department. February 2, 2011. Accessed July 12, 2020. https://www.inyowater.org/wp-content/uploads/2014/05/Blackrock94_2009Analysis-Final.pdf
- ICWD. (2019). Master Table. Inyo County Water Department Website. Accessed July 1, 2020 https://www.inyowater.org/wp-content/uploads/2019/05/2019_master_table.pdf
- Kahrl, W. L. (1983). *Water and power: The conflict over Los Angeles water supply in the Owens Valley*. University of California Press.
- Kaika, M. (2003). Constructing scarcity and sensationalising water politics: 170 days that shook Athens. *Antipode*, 35(5), 919–954. <https://doi.org/10.1111/j.1467-8330.2003.00365.x>
- Kaika, M. (2005). The political ecology of water scarcity: The 1989–1991 Athenian drought. In N. Heynen, M. Kaika, & E. Swyngedouw (Eds.), *Urban political ecology and the politics of urban metabolism*. Routledge. <https://doi.org/10.4324/9780203027523>
- Klutmire, J. (2006, January 21). All’s not well with exempt wells. *Inyo Register*.
- Krakoff, S. (2013). *Settler colonialism and reclamation: Where American Indian law and natural resources law meet*. Social Science Research Network Scholarly Paper ID 2284197. <https://papers.ssrn.com/abstract=2284197>
- LADWP (Los Angeles Department of Water and Power). (2015). Urban water management plan. Los Angeles Department of Water and Power. Accessed July 1, 2020: <https://cawaterlibrary.net/wp-content/uploads/2019/09/UWMP-2015-pdf.pdf>
- LADWP. (2019). Compliance reporting in response to the State Water Resources Control Board order Nos. 98-05 and 98-07: Mono Basin operations, fisheries monitoring, stream monitoring, waterfowl habitat, & population monitoring. Los Angeles Department of Water and Power. May 2019. Accessed June 20, 2020: <http://www.monobasinresearch.org/images/ladwp19.pdf>
- LADWP. (2022). Annual Owens Valley Report. 273 pgs. LADWP. <https://www.inyowater.org/wp-content/uploads/2022/05/FINAL-2022-OWENS-VALLEY-REPORT.pdf>
- Libecap, G. D. (2009). Chinatown revisited: Owens Valley and Los Angeles – bargaining costs and fairness perceptions of the first major water rights exchange. *Journal of Law, Economics, and Organization*, 25(2), 311–338. <https://doi.org/10.1093/jleo/ewn006>
- Los Angeles and Inyo County. (1990). *Draft Environmental Impact report – Water from the Owens Valley to supply the second Los Angeles Aqueduct*. Vol I. 557 pgs. State Clearing House #89080705. <https://www.inyowater.org/wp-content/uploads/2017/08/91-EIR-Volume-I.pdf>
- Los Angeles and Inyo County. (1991). *Agreement between the County of Inyo and the City of Los Angeles and its Department of Water and Power on a long term groundwater management plan for Owens Valley and Inyo County*. https://www.inyowater.org/wp-content/uploads/legacy/Water_Resources/long_term_water_agreement.pdf

- Margulis, S. A., Cortés, G., Giroto, M., Huning, L. S., Li, D., & Durand, M. (2016). Characterizing the extreme 2015 snowpack deficit in the Sierra Nevada (USA) and the implications for drought recovery. *Geophysical Research Letters*, 43(12), 6341–6349. <https://doi.org/10.1002/2016GL068520>
- McCool, D. (2002). *Native waters: Contemporary Indian water settlements and the second treaty era*. University of Arizona Press.
- McGregor, D. (2015). Indigenous women, water justice and "Zaagidowin" (Love). *Canadian Woman Studies*, 30(2-3). <https://cws.journals.yorku.ca/index.php/cws/article/view/37455>
- McLendon, T. (2005). *Effect of depth to water on vegetation change in the Owens Valley*. MWH Consulting. Fort Collins, CO. Accessed December 2022. [http://water.nv.gov/hearings/past/Spring%20Valley%202006/exhibits/August 4th/SNWA/707.pdf](http://water.nv.gov/hearings/past/Spring%20Valley%202006/exhibits/August%204th/SNWA/707.pdf)
- McQuilkin, G. (2023, May 30). Mono Lake's exciting rise may well disappear. *Mono Lake Committee*. <https://www.monolake.org/today/mono-lakes-exciting-rise-may-well-disappear/>
- Mehta, L. (2003). Contexts and constructions of water scarcity. *Economic and Political Weekly*, 38(48), 5066–5072. <http://doi.org/10.2307/4414344>
- Mehta, L. (2007). Whose scarcity? Whose property? The case of water in western India. *Land Use Policy*, 24(4), 654–663. <https://doi.org/10.1016/j.landusepol.2006.05.009>
- Middleton Manning, B. R. (2018). *Upstream: Trust lands and power on the Feather River*. University of Arizona Press.
- Morin, M. (2015, May 14). L.A. getting no Owens Valley runoff for first time since 1913. *Los Angeles Times*. <https://www.latimes.com/local/lanow/la-me-ln-aqueduct-drought-20150514-story.html>
- Murphy, D. (2018, January 8). Lower Owens River Project drowning in tules. *Sierra Wave Media*. <https://sierrawave.net/lower-owens-river-project-drowning-tules/>
- Office of Environmental Health Hazard Assessment (OEHHHA). (2022). Indicators of change in California, Fourth Edition, California Environmental Protection Agency, OEHHHA. <https://oehha.ca.gov/media/downloads/climate-change/document/2022caindicatorsreport.pdf>
- Phillips, R. (1963). *Availability and utilization of Inyo-Mono water. Vol. 6 of a report on the feasibility of a Second Barrel to the Los Angeles Aqueduct*. Department of Water and Power, City of Los Angeles.
- Phillips, R. V. (1995). *Interview with Robert Phillips, former-general manager and chief engineer, Los Angeles Department of Water and Power*. Conducted by Steven Erie. June 1, 1995. Tape 2. Accessed June 1, 2020 on Water and Power Associates. [https://waterandpower.org/sitebuildercontent/sitebuilderfiles/Phillips Erie Interview Tape 2.pdf](https://waterandpower.org/sitebuildercontent/sitebuilderfiles/Phillips%20Erie%20Interview%20Tape%202.pdf)
- Pompeii, B. (2020). The social production of the great California Drought, 2012–2017. *Yearbook of the Association of Pacific Coast Geographers*, 82(82), 15–37. <https://doi.org/10.1353/pcg.2020.0002>
- Red Owl, T. (2021). Payahüünadü water story. In Miller, C. (Ed.) *Wading through the past: Infrastructure, indigeneity & the western water archives*. Claremont Colleges Library. <https://pressbooks.claremont.edu/westernwatersymposium/chapter/payahuunadu-water-story/>
- Sahagun, L. (2005, June 25). Judge threatens DWP sanctions over Owens River flow. *Los Angeles Times*. <https://www.latimes.com/archives/la-xpm-2005-jun-25-me-owens25-story.html>
- Sahagun, L. (2018, July 5). A changing climate at Mono Lake could mean more dust storms in the Eastern Sierra – Or less water for L.A. *Los Angeles Times*. <https://www.latimes.com/local/california/la-me-mono-lake-dust20180705-htlstory.html>
- Sahagun, L. (2019, December 28). Los Angeles may store water under an Owens Valley lake drained to fill its faucets. *Los Angeles Times*. <https://www.latimes.com/environment/story/2019-12-28/los-angeles-wants-to-store-water-under-the-sierra-nevada-lake-drained-to-serve-its-faucets>
- Sahagun, L. (2021a, January 30). Citing climate change, LADWP ends free water deal for Long Valley ranchers and sparks anger among conservationists. *Los Angeles Times*. <https://www.latimes.com/environment/story/2021-01-30/ladwp-ends-free-water-for-long-valley-ranchers-due-to-climate-change-but-imperils-sage-grouse-habitat-critics-say>

- Sahagun, L. (2021b, March 15). Judge rules against Los Angeles in Long Valley irrigation fight. *Los Angeles Times*. <https://www.latimes.com/environment/story/2021-03-15/judge-rules-against-los-angeles-in-ranch-irrigation-fight?eType=EmailBlastContent&eId=5515408e-bd79-4fa0-8cd9-d2a4f3193933>
- Sahagun, L. (2022, July 7). L.A. wins water battle with Mono County amid worsening drought. *Los Angeles Times*. <https://www.latimes.com/environment/story/2022-07-07/l-a-wins-water-battle-with-mono-county-amid-worsening-drought>
- Sahagun, L., & Silverstein, S. (2006, September 28). L.A. told again: Fix Owens River. *Los Angeles Times*. <https://www.latimes.com/archives/la-xpm-2006-sep-28-me-owens28-story.html>
- Sauder, R. A. (1994). *The lost frontier: Water diversion in the growth and destruction of Owens Valley agriculture*. University of Arizona Press.
- Tsosie, R. (2003). *The conflict between the 'Public Trust' and the 'Indian Trust' doctrines: Federal public land policy and Native nations*. SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1401472
- Walton, J. (1993). *Western times and water wars: State, culture, and rebellion in California*. University of California Press.
- Weber, A. (2022, July). Court overturns previous Long Valley win – But did the Eastern Sierra really lose? *Every last drop: Newsletter of the Keep Long Valley Green Coalition*. https://friendsoftheinyo.salsalabs.org/every-last-drop-july-2022?wvpId=57dbd9d9-50f7-4b45-86d7-cf19a0219e6e#new_tab
- Whyte, K. (2018). Settler colonialism, ecology, and environmental injustice. *Environment and Society*, 9(1), 125–144. <https://doi.org/10.3167/ares.2018.090109>