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TOXIC LEGACIES OF SLICKENS IN CALIFORNIA: A MOBILE HERITAGE OF HYDRAULIC MINING DEBRIS

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Introduction: critical pedagogies of the toxic

Toxic is often discursively positioned in opposition to purity. It signals infiltration, boundary crossing and a disturbing of the natural order of the world. Toxic presents itself as a problem to be solved, a deviance to be put right. Toxic's origins from ancient Greek and Byzantine medical literature refer to a poison causing death or serious debilitation. This negative valance is reinforced in its use in the couplet 'toxic waste' – an abjection managed through containment and isolation, and through its use as a prefix in 'toxic masculinity'. Toxic is clearly something to be avoided.

This chapter argues, that notwithstanding its often-tragic consequences, the toxic can be generative and productive. Toxic can disrupt prevailing patterns of thought embedded in heritage and conservation that secure 'nature' and 'culture' in binary opposition. This mission of purification (Latour 1993) finds expression in all sorts of conservation-related endeavours from early notions of wilderness (Cronon 1996), wildlife photography (Franklin 2006) to early approaches underpinning the designation of World Heritage Sites as 'natural', 'cultural' or 'mixed' (ICOMOS 2005). Although many operations within UNESCO have subsequently sought to undermine this binary (Cultural landscapes, Geoparks) examples of untouched nature are much more likely to be championed compared to sites with an overt human presence deemed more conducive to excavation, development, or the dumping of waste (Kuletz 2016). Toxic troubles those boundaries, mixing categories, mutating and reorganising bodies in harmful ways at the edge of our scientific understanding. Toxic points to the disruptive agency of matter (Bennett 2010). It confronts us with a post-human 'geontology' (Povinelli 2016) and disturbs the linear temporality of heritage as a generational 'passing on' where inheritance aligns with essentialism and entitlement (Landzelius 2003).

The toxic is useful in critical pedagogy (Freire 2020; Giroux 2010) prompting learning about social justice and uneven exposures to harm. Work within industrial archaeology and environmental interpretation (Hardesty 2001; ICOMOS with Heyes 2004) has made use of this potential, as has the eco-anarchist petro-photography of Richard Misratch and Kate Orff (Scott 2019). In the context of post-Chernobyl Ukraine, Petryna (2009, 2013) tracks the emergence of new populations of sufferers of radiation exposure who participate in a ‘biological citizenship’ to secure welfare payments. Pezzullo in *Toxic Tourism*, examines ‘toxically assaulted’ communities ‘turning to tours as a tactic of resistance’ (2009, 11). Inspired by these two projects, this chapter focuses on Malakoff Diggins State Historic Park near Nevada City, California and site of what once was the largest hydraulic gold mine in the world, to explore how mercury contamination, as a form of mobile toxic heritage, intersects with other forms of heritage in California to prompt questions about environmental and social justice (Figure 1.1).

There are important benefits to understanding local consequences of global industrial processes as toxic heritage because western capitalism has been so effective in screening those consequences from our imagination. In his review for the journal *Public Historian*, industrial archaeologist Donald Hardesty speculates on the ways hazardous landscapes could instead be managed as a warning: ‘The power of toxic waste as a real artefact in its original setting should not be overlooked as a way of conveying to visitors the impact of industrial technologies upon workplaces, communities, and landscapes’ (2001, 20).

Remediation, in this sense, is erasure hiding more profound dysfunctions, especially when done superficially. Nowhere is this more expertly outlined than in



FIGURE 1.1 Picture of the view of Malakoff Diggins taken from the overlook of chute hill campground at Malakoff Diggins State Historic Park, Photograph by the author.

Shiloh Krupar's research (2011, 2012) on Rocky Flats plutonium factory near Denver Colorado or 'Rocky Flats National Wildlife Refuge' to give its more recent title. Krupar deploys the toxic as a metaphor to critique the mixing of nature and culture within contemporary industrial capitalism invoking a novel vocabulary of transnatural ethics, mutant ecologies (Masco 2004), queer ecologies (Mortimer-Sandilands 2005) and alien still-life.

In his examination of a Belgium creosote yard made safe for visitors, Stefaan Hayes, coordinator of the Flemish Association of Industrial Archaeology, questions:

Is there a better way to illustrate that the soil grows leaner under the influence of unrestrained industrialization? Is there a better way to visualise the evolution in our environmental awareness, or to demonstrate the regenerating capacity of nature, than by means of authentic evidence? After all, the sterilised ground that is left behind after decontamination hardly lends itself to an enjoyable nature experience (2005, 49).

Notions of memorials to environmental damage or 'toxic ruin as classroom' have antecedents (Misrach and Misrach 1990; Hoskins and Whitehead 2013; Dixon et al. 2016). There is interest in establishing what might be called 'heritage sites of environmental conscience' that could include Three Mile Island in Pennsylvania, the Love Canal in New York, or Pripyat, Chernobyl. Done poorly, this presents the risk of aestheticizing industrial ruin as a visual spectacle for middle-class consumption where communities bearing health burdens of contamination are reduced to a component in the scene (Strangleman 2013; Wells 2018; Pohl 2021).

Photographer Richard Misrach avoids this by deploying toxic aesthetics to confront us with the effects of industry on our environments. His proposal for a new National Park designation at Bravo 20 – a 64 square-mile naval bombing range on public land in the Nevada Desert – chimes with a notion of toxic heritage as critical pedagogy.

His book *Bravo 20* makes the case:

Bravo 20 National Park would be a unique and powerful addition to our current park system. In these times of extraordinary environmental concern, it would serve as a permanent reminder of how military, government, corporate, and individual practices can harm the earth. In the spirit of Bull Run and the Vietnam Memorial, it would be a national acknowledgment of a complex and disturbing period in our history. Although we pay homage to, and protect, geologically spectacular landscapes such as Yosemite and the Grand Canyon, since the 1970s we have established other criteria for the creation of state and national parks, such as the inclusion of wetlands and urban recreation areas. A contemporary version of a Civil War battleground, Bravo 20 National Park would not only provide a graphic record of our treatment of less celebrated landscapes but also help deter their destruction in the future (1990, 95).

Plans include a visitor centre devoted to the history of military abuse in peacetime with displays and exhibits about radioactive experiments on residents and a gift shop selling maps of radioactive landfills and postcards, caps and bumper stickers embossed with images of mushroom clouds and bomb sites.

There is a productive tension between the toxic and conventional landscape aesthetics (Storm 2014). Hardesty notes: 'Certainly toxic waste or other hazardous sites are not pretty, but no one said that history has to be pretty' (2001, 24). Edward Burtynsky's photography, however, depicts beauty in scenes of environmental disaster in a troubling juxtaposition of content and form. A recent review of Burtynsky work captures this well:

The interesting paradox, though, is the epic allure he finds in such scenes. Looking at vertiginous quarries in Portugal ("inverted skyscrapers", he's called them) or green farmland somehow conjured out of the arid Texas plains, you don't always know whether to feel awe at the ingenuity by which such resources are extracted, or despair at whether the damage can ever be healed.

(Dixon 2022)

By the end of the 1860s, the landscapes emerging as a result of hydraulic mining in California were provoking similar emotional unease. Many scenes were captured by Carleton Watkins, a renowned photographer of the American West, whose mammoth prints of hydraulic mining operations were displayed in galleries alongside images of Yosemite Valley and the Columbia River. In 1868 one of the nation's leading journalists Samuel Bowles visited the Sierra mining districts on a trip across the continent describing the effects of hydraulic mining:

Tornado, flood, earthquake and volcano combined could hardly make greater havoc, spread wider ruin and wreck, than are to be seen everywhere in the track of the larger gold-washing operations. None of the interior streams of California, though naturally pure as crystal, escape the change to a thick yellow mud from this cause, early in their progress from the hills. The Sacramento River is worse than the Missouri. Many of the streams are turned out of their original channels, either directly for mining purposes, or in consequence of the great masses of soil and gravel that come down from the gold-washing above. Thousands of acres of fine land along their banks are ruined forever by the deposits of this character. A farmer may have his whole estate turned into a barren waste by a flood of sand and gravel from some hydraulic mining up stream; more, if a fine orchard or garden stands in the way of the working of a rich gulch or bank, orchard or garden must go. Then the tornout, dug-out, washed to pieces and then washed over side-hills, masses that have been or are being subjected to the hydraulics of the miners, are the very devil's chaos indeed. The country is full of them among the mining districts of the Sierra Nevada, and they are truly a terrible blot upon the face of Nature.

(Bowles 1869, 422)

Slickens

Miners and farmers in the foothills of the Sierra Nevada in the late nineteenth century termed the hydraulic mining debris slickens. We might now understand this slickens as mobile toxic heritage; a material expression of an industrial past that shaped the social history of California precisely because of its capacity to migrate. Slickens is the extraction, processing, transport, use, discard and dispersal of thousands of tonnes of material that will remain hazardous for tens of thousands of years. Hydraulic mining began after the Gold Rush years as means to recover gold dust from fine-grained auriferous gravel and continued (with some regulation) through to the 1950s. Hydraulic mining required high-pressure jets of water gravity-fed by an extensive network of dams, ditches, and pipes as well as large quantities of liquid mercury, or quicksilver used to concentrate gold particles into an amalgam. The amalgam would be boiled leaving behind the gold. Much of the mercury escaped into the environment.

This letter from the state archives in Sacramento shows a request made in December 1889 from a hydraulic mining operator at North Bloomfield California (Figure 1.2).

Dear Sir, could you either lend or sell to us three tanks of quicksilver. We need it for immediate use. Should you be able to spare it, please send down by first staffing tomorrow. Yours truly R. McMurray. P.S if you can't spare three, send one or two.

(California Department of Parks and Recreation Archives,
Sacramento, California).

The amount of mercury in a standard thermometer is around one gram which is enough to contaminate a 20-acre lake. The total amount of mercury released in California in years spanning 1850 to 1981 was over 220 million pounds (Eagles-Smith C. A.). A 1905 study discovered minute particles of quicksilver floating on surface water as far as 20 miles downstream of mining operations (Bowie 1905, 313). Much of what escaped into the ecosystem converts to monomethyl mercury (MMHg), which is, according to a recent study on hydraulic mining sediment along the lower Yuba River, 'subsequently being taken up by aquatic migratory biota including algae, aquatic insects, bivalves, forage fish, salmonids, sportfish, and waterfowl throughout the geographical region downstream of hydraulic mining sites' (Nakamura et al. 2018, 2). Monomethyl mercury passes easily through the blood-brain barrier compromising child development, creating deformities, and other acute health problems (Mergler et al., 2007; Cristol et al., 2008).

Complaints about slickens during the hydraulic mining era, however, focussed on their damage to agriculture and transportation. In his ecological history of mining in California, Andrew Isenberg (2010) describes the late nineteenth-century conception of slickens as a problem to be overcome: 'Imperceptibly moving

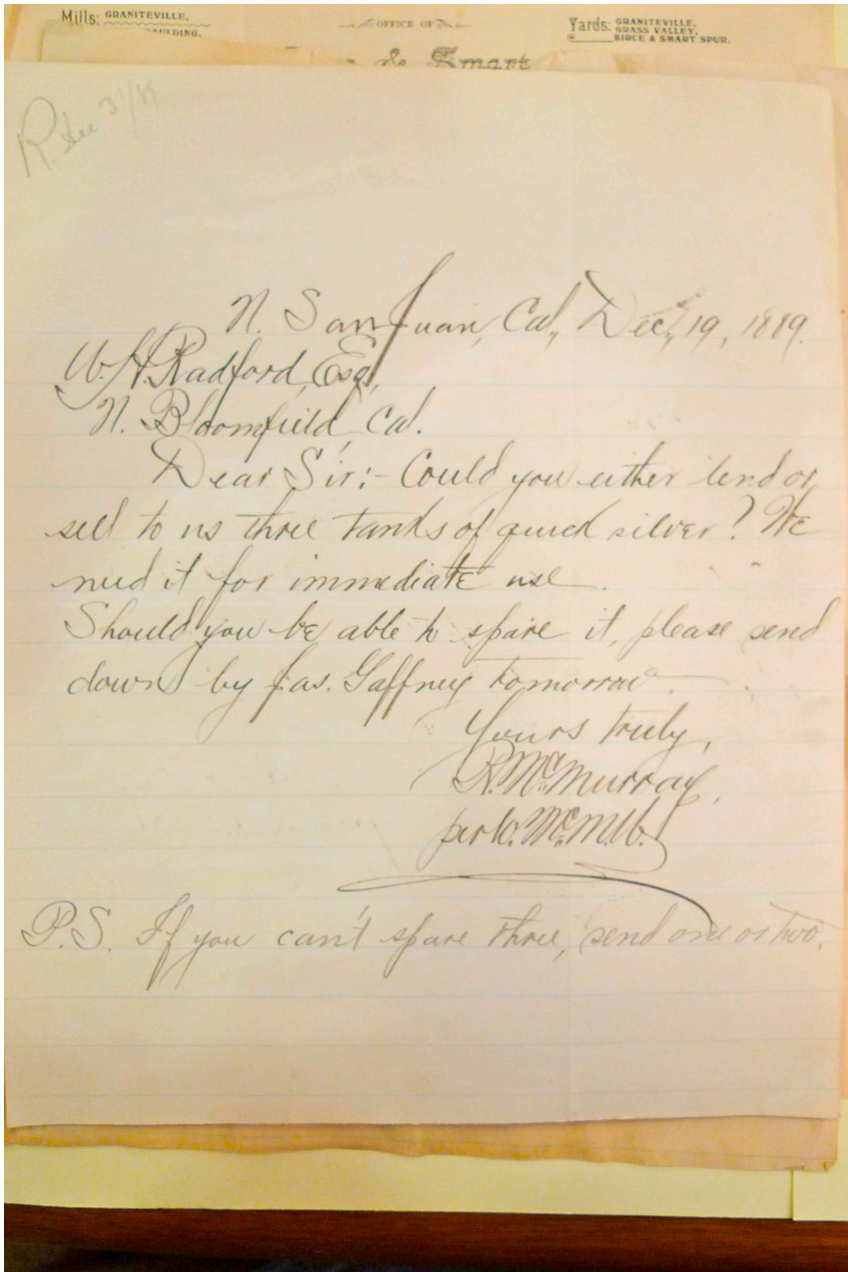


FIGURE 1.2 Picture of correspondence sent from North San Juan California on 19th December 1889 requesting quicksilver (metal mercury) for use in the hydraulic mining operations at Malakoff Diggins. Photograph by the author of item held within North Bloomfield Gravel Mining Company Records 1870–1903, California State Archives Sacramento.

downward, glacier-like in its inexorable spread, fanning out over increasingly broad areas of valley land and sliding down river-beds to obliterate their channels, this “moving avalanche” as George Ohleyer called it, created an insistent demand. The river system had to be reclaimed. The Sacramento had to be placed under government control (2010, 243–4).

In the now famous 225-page ruling against the North Bloomfield Gravel and Mining Company operating out of Malakoff Diggins Judge Lorenzo Sawyer described how: ‘the waters of the Yuba are so charged with debris that they are wholly unfit for watering stock, or for any of the uses, domestic or otherwise, to which water is usually applied without first being taken out of the stream and allowed to stand in some undisturbed place and settle’ (1884, 10). Sawyer imposed a permanent injunction on the dumping of mining waste providing a legal foundation for subsequent regulatory control by the newly formed California Debris Commission (Hagwood 1981; Mitchell 1994).

The 1893 Caminetti Act required vast amounts of waste to be impounded behind dams but these structures were often ineffective and ultimately made the enterprise of hydraulic mining in California unprofitable. A great deal of the mercury that is now problematic escaped and moved downstream along with thousands of tonnes of sand and gravel blocking streams, raising riverbeds, flooding farms and settlements all the way down the Sacramento valley (Figure 1.3).



FIGURE 1.3 Picture of political campaign poster supporting hydraulic mining against plans to regulate the industry in the 1880s. Photograph by the author taken in restored historic old town of North Bloomfield.

As Robert Kelly outlines in his book about the dispute, *Gold vs. Grain*, slickens prompted the ‘first successful attempt in modern American history to use the concept of general welfare to limit free capitalism’ (1959, 2) and marked a transfer of power and influence away from miners towards farmers and their rapidly expanding agricultural economy. Slickens is baked into the social, economic and environmental history of modern California and yet its presence in the collective memory remains faintly eclipsed by more dramatic sites and events within the history of hydraulic mining (the carved-out cliffs, the water cannons, abandoned towns, and rusted pipes and gullies across the San Juan ridge) that are more easily apprehended as ‘significant’ (Hoskins 2015, 2016, Scott 2017).

While slickens has been examined scientifically as a pollutant (Prokopovitch 1984; Alpers et al. 2005), its more ambiguous social-political relations are less well accounted for. In contrast to previous environmental histories that depict slickens as passive, animated always by something else (miners, rainfall, or gravity for example), we might think of this mobile toxic heritage following Hird’s conception of Canadian waste as a socio-material force that “occasions particular material and political mobilizations” (2017, 1). As an agent with the dynamic capacity to respond to its surroundings, to self-organise, form relationships and “participate” in environmental effects, slickens can guide us toward new ways of working with toxic heritage.

Making visible

A relatively unseen aspect of hydraulic mining heritage is its racial dimension. Environmentalist perspectives embraced by California State Parks and activist groups (e.g. the SierraFund) have only recently started working through critiques of white settler colonialism. Many natural, cultural and historical resources preserved to tell positive stories about California are in some way bound up with the state-sanctioned, indeed state-sponsored, extermination of indigenous peoples (Castillo 1998). The European appropriation of Native American land, taken for example, from thirteen thousand members of the Nisenan Tribe of Nevada County since the onset of the Gold Rush, is still marginal to better-funded initiatives conserving fish and wildlife (Hurtado 1988). It is only recently that indigenous activism has aligned with environmental activism in cultural and ecological reclamation (see for instance the Nisenan Cultural Reclamation Corridor in Nevada City and the California Heritage Indigenous Research Project).

The mercury used so liberally in hydraulic mining is often still visible in globules amongst the gravel in streams and creeks. Indeed, gold panning in the streams once popular on heritage tours and environmental living programmes at Malakoff Diggins State Historic Park is now prohibited along much of the local watercourse due to dangerous health risks of contamination and panning’s potential to mobilise yet more contamination downstream. Gold panning instead takes place in a separate experience staged as a pre-industrial romantic pioneer Gold Rush activity where contemporary participants seem oblivious to the hydraulic mining that came in its wake. Some of

this contradiction comes through in a diary entry I made while conducting fieldwork during one of the parks' annual 'Humbug Days'.

Saturday 11 June 2011, North Bloomfield, Malakoff Diggins State Historic Park, Lunchtime.

At the edge of a paddock next to Skidmore House a line of children and their parents walk in a circle with lengths of string dipping them periodically in a cast iron pot of molten wax. Candle making is a popular event at Humbug Day alongside the wagon rides, craft making and family games. None seem as popular though as the 8-foot steel trough full of muddy water and gravel that comprises the gold panning activity. A visiting docent is providing help to those that can fit their pan in the trough explaining that gold is much heavier than the minerals that make up the sand and gravel so when the water is shaken and swirled the grains and flakes of gold collect on the bottom of the pan – the lighter materials are winnowed off with the water left to escape over the rim. The docent tells me the panning has been very popular as usual and that it would be about time to “salt” the mix with the other half of her dust. She shows me a small ziploc plastic bag with gold flakes. Each year the Malakoff Diggins Park Association provide this experience to visitors because it is part of an essential elements of being a prospector and only by trying it yourself can you glimpse the kind of labour involved and the anticipatory sense of striking it rich. There have been many complaints sent to the parks administration over the years about restrictions on gold panning along Humbug Creek. The trough now provides visitors with that trip back in time. And this year, with gold prices being their highest ever the parks association paid \$2000 for the salting purchasing from a dredging operation lower downstream.

(Research Diary, entry by author)

As a tourist attraction that recruits the body to acquire a skill and bring a sense of excitement, panning for gold in troughs like that described above (although often without the gold) can be found all over the world: from Old Sacramento Waterfront, through to Nutty Jakes Gold Mine experience in Wales, UK, from the reassembled 'old town' at The Big Hole Experience in Kimberly South Africa to 'ShantyTown' Heritage Park in Greymouth New Zealand and GoldRushTown in Jindu Shandong Province China. In these tourist attractions, a very distinctive imagined geography of small-scale ramshackle towns with benign techniques for striking it rich obscures the longer and more harmful legacy of hydraulic mining and its future damaging effects.

There is now widespread awareness that the mercury-laced heritage of hydraulic mining is part of ongoing environmental injustice. Studies have shown that the exposure to mercury contamination in California is socially uneven. The burden is most heavily felt by indigenous communities with Asians, Pacific Islanders and Native Americans having the highest prevalence of elevated blood mercury (Hightower et al. 2006, Nriagu et al. 2012). This toxic heritage works against not

just the bodies of California Indian Peoples but also the traditions and cultural practices that define them. Fish, an important vector for mercury to the human population, is an important dietary staple for indigenous communities and crucial in forging cultural and spiritual connections to the land. The indigenous people's advocacy group Cultural Survival has explained how California Indians are forced to regularly balance toxic exposure with traditions. Sherri Norris, a member of the Osage Nation who works with the International Indian Treaty Council in San Francisco describes the dilemma in regards to fishing traditions and solutions such as eating smaller fish lowers down the food chain that is safer: 'Some people may have to abstain,' 'I don't like saying this. It's a form of cultural genocide, when children are born with learning disabilities. But those of us that are alive today are the strongest of our people' (Cultural Survival 2022).

The California Indian Environmental Alliance (2009, 2013) and the Mercury Tribal Health Program have produced guidelines, factsheets and pamphlets that include the 'Mercury Health Toolkit'. This might be thought of as part of an emerging biological citizenship that secures new relations with the state on the basis of adverse health effects. In reference to radiation-exposed citizens of Ukraine in the 1990s Petryna terms this 'illness as a counterpolitics'. The parallels are chilling:

This dimension of illness as a counter politics suggests that sufferers are aware of the way politics know and do not know about their illnesses and that they are put in a role of having to use these politics to curb further deteriorations of their health, which they see as resulting, in part, from a collapsing state health system and loss of adequate legal protections.

(Petryna 2004, 262)

If it passes through Congress, The Comprehensive National Mercury Monitoring Act (S. 1345) introduced on 22 April 2021 by Sen. Susan Collins (R-ME) will go some way to establishing a new more comprehensive picture of hydraulic mining's toxic heritage. The Bill proposes to authorise ninety-five million dollars over three years to task a number of federal agencies to track and report on long-term changes to mercury concentrations in air, water, soil, fish and wildlife as well as establish an online database for mercury data. It makes no direct mention of indigenous peoples or Native American tribal concerns but it does focus research on 'human communities with highly exposed and vulnerable populations'. In an Arctic context, Houde et al. (2022) provide a model example of how indigenous communities might be included as researchers in monitoring programs that build relationships and draw on traditional environmental knowledge in a collaborative process. It may be that this form of biological citizenship can be established when engaging with a toxic heritage of all kinds. Contamination is an important component of ongoing racial injustice that ultimately cannot be hidden but might instead provide an instructive moment and a platform to galvanise support for reform (Figure 1.4).



FIGURE 1.4 Picture showing two wooden path-marker posts with painted yellow tops positioned amongst gravel and manzanita bushes on the Diggins Loop Trail at the Malakoff pit. The posts appear at different heights because of movement and burial by the sediment. The taller post is more recent. Photograph by the author.

Looking forward

Hydraulic mining's toxic heritage is distinctive compared with other industrial heritage due to the temporal extent of its toxic legacy. Scholars have engaged with nuclear waste and the peculiar dilemmas associated with interpreting its hazard for generations far in the future (Davis 1993; Holtorf and Hogberg 2021). The shelf life of hydraulic mining's toxic heritage is ten thousand years as deep reservoirs of mercury are disturbed by floods and tectonic movement and re-animated on their journey across California to the sea (Alpers et al 2005, Singer et al 2013). This lifespan is greater by orders of magnitude than the time frames typically dealt with in the heritage sector and presents a land management and ecosystem issue of bewildering complexity (Mergler et al., 2007; Cristol et al., 2008). In ten thousand years how will this toxic heritage of hydraulic mining be encountered and how will the people who created it, and those who fought to prevent it, be ultimately understood? We have no template for ethics that sustains for that long. In the meantime, we have to engage with the obscurities of the toxic and its capacity to disrupt and cause harm. Toxic heritage shines a light on social and environmental injustice and should become more central to our concerns.

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