Displaced Territories

In 1969 Michael Heizer conceived and constructed displaced / replaced mass. This piece excavated three large holes in a dry lake bed in Nevada; in which three boulders were placed, each weighing the same as the excavated material. This piece created a dialogue of not only the mass of different materials, but also of the movement and transformation of that material—an act of displacement. The piece also raised the question of where the excavated material went, for there is no displacement without replacement. Our landscape has evolved and is defined by displacement / replacement at various scales. Heizer's example foreshadows the anthropogeomorphological condition we currently find ourselves in; a by-product landscape created by industrialized sorting regimes.

BRADFORD WATSON
Montana State University

SEAN BURKHOLDER
University at Buffalo, SUNY

This paper will discuss the process of Displacement / Sorting / Replacement in relation to two very different contexts. The first being Butte Montana, a city inseparably tied to ore extraction and characterized by the resultant landscapes of mining operations. The other being the Great Lakes Basin of the United States, an evolving terrain tethered to industrialization, development, and climate change. While quite different in many ways, both of these locations owe their present conditions in some part to anthropologic sorting processes that have produced entirely novel territories.

CONTEXT

Butte is located in western Montana at approximately 5,538 ft above sea level and surround by the Continental Divide to the East, West and South. It is a cold and harsh climate with very little precipitation, less than 13 inches per year, because of its distance from the Rocky Mountain summits to the West. Butte is located along the Northern Rocky fault lines which displaced the primary veins located within homogeneous granite which mineralized and were then again displaced. This process created the complex and unique condition of minerals that extend deep into the earth.[1] Within this incredible movement created by the faults are over 130 minerals that exist in the Butte ore deposits.[2] The Butte quartz monzonite is the host rock for copper and gold veining which cross the district in an east-west manner. These veins, which stretch over 12,000 feet and have vertical continuity of over 4,500 feet include the Emma, 1

2

Figure 1: Berkeley and Continetal open pit mines, Butte, Montana.

Figure 2: Great Lakes basin, *Nasa Earth Observatory.*

Anaconda-Original, Syndicate, Badger-State and Alice-Rainbow and have mining widths from 5 to 50 feet. The scale of resources available within the 25 square mile area of the Butte Mining District have yet to be exceeded and allows Butte to still be called the "Richest Hill on Earth."[3] It is this richness and depth of resources that contributed to the complex network of shaft mines extending over a mile deep to reach the ore. Approximately 49 miles of vertical shafts and 10,000 miles of horizontal shafts exist under the Butte Hill as miners followed the veins of valuable materials prior to the conversion to open pit mining.[4] It was the existence of this vast mineral resource, in this particular place of the intermountain west in the late 1800s that set the stage for Butte's uncharacteristic interactions between the massive industrialized sorting of the landscape and a growing metropolis.

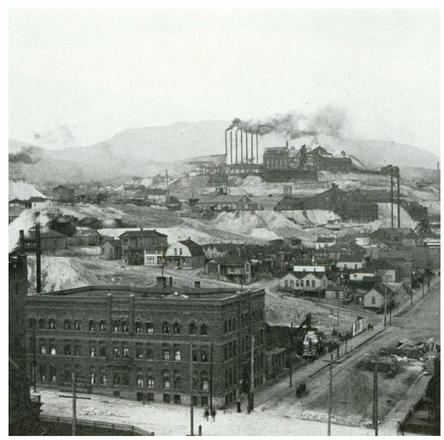
The Great Lakes Basin is a 200,000 sq mile watershed that spans between the United States and Canada. It contains 5,400 cubic miles of freshwater and serves as the primary water source and disposal site for over 33 million people. Its geologic history differs from that of Butte, as it was formed primarily through the process of glaciation and mass erosion This process created what geologist refer to as "the Lost Interval". This interval was the period of time -- about 300 million years actually -- from the Paleozoic Era to the Quaternary Period where no geologic records are available and one finds Pleistocene sediments sitting directly upon Paleozoic Bedrock.[5] This is due to an uplifting of the basin that began in the late Pennsylvanian period and allowed for the somewhat concentric geologic pattern that characterizes the basin. This uplift allowed for 300 million years of successional erosion before the glaciers did the final process of cutting and deposition to create the Lakes that we know today. The lakes range tremendously in character and composition. Lake Superior has an average depth of 483 feet (147 meters) with a maximum of 1332 feet (406 meters). Its old, Precambrian geology and low levels of development keep its 2,900 cubic miles of water clear, cold, oligotrophic and so nutrient free that mollusks have difficulty building shells within it. On the other end is lake Erie, the most biologically rich of the lakes, its average depth is only 62 feet (19 meters). Lake Erie is warm, and eutrophic. Its eastern basin hardly reaches 200 feet and it is the only Great Lake to sit entirely perched above sea level. The surrounding landscape of Lake Erie is highly silted and composed of heavy urbanization and agriculture. These conditions have led it to several points of environmental collapse. The situation of Lake Erie today is no less dire, with algae blooms, hypoxia and invasive species all still pressing concerns. Due to the high level of development, heavy sediment loading and extremely shallow depths, the anthropological process of dredging has become absolutely necessary in order to maintain the well established shipping industry; an industry that served as the economic backbone of the country for over a century. The need to dredge is a financial one, as there is a very direct relationship between the draft of ships and the efficiency of shipping. For example, a study for the Houston Ship Channel looking the economic impacts of reduced maintenance dredging showed that if the port's channel depth had been decreased by 1 foot in 2009, the negative impacts would have exceeded $75 million dollars.[6] This dredging constitutes a tremendous process of material displacement and replacement that engages about three million cubic yards of material annually within the Basin, and while it is not ore that is being extracted, the process of displacement / replacement occurring through dredging is entirely driven by economics.

These two regions, Butte Montana and The Great Lakes Basin have other similarities beyond their displaced / replaced terrains. The extraction of metals, copper in particular, has shaped the history of both places significantly. The southern shore of Lake Superior was likely the nation's very first copper region and historically one of its most productive. Here, the relationship between copper and iron was strong and the speculation of the two went hand in hand. In Butte mining began with gold, but quickly shifted to copper as the country's growth and need for electricity fueled a round-the-clock extraction employing approximately 18,000 in mining operations at its peak; producing 30% of the nations copper in 1920. The boom in the Great Lakes region occurred in the 1840s and was aided by the construction of the Ohio and Erie Canals. The expansion of the West and the discovery of ore deposits such as those in Butte quickly overshadowed the copper production within the Basin. However iron to this day remains a valuable commodity for the region with 13 million tons leaving Duluth Minnesota each year.[7] It was the iron from the Superior region, meeting with the coal from Pennsylvania and Ohio in Cleveland that fueled the United States steel industry.[8] Both of these regions were also inextricably linked to the war efforts in the production of the arsenal required to support the military efforts. The ore body in Butte was so significant that martial law was declared in 1914 to force miners, developing the first unions in the country and striking for safe working conditions following the worst hard rock mining disaster (168 men died in the Granite Mountain fire in the Speculator Mine, June 8th 1917), back into the mines. Martial law lasted for seven years, the longest period of military occupation in the U.S. since the Reconstruction Era, further evidencing the priority of extraction over the people or place.

METHODOLOGIES - HISTORIC AND PRESENT DAY

Mining on the Butte Hill began in the 1860s with the minimal displacement of material by placer miners working in streambeds. It quickly grew in scale from small individual shaft mines, dug with a shovel and bucket to the explosive removal of an entire mountain to quench the world's thirst for copper. From the moment material is dislodged from its parent mass, decisions must be made as to where it will go. A value is placed on the removed material that determines feasibility and the degree of displacement. Rock containing precious metals is moved great distances for processing while the residual material is deemed waste rock and discarded expending the least possible effort (see figure 3). These valuable metals – primarily copper, molybdenum and lead – are the materials exported from the region, and constitute only 0.5-2% of the total material removed from the earth. The remaining 99% was and continues to be dumped, spread and washed over the landscape in various ways.

In the Great Lakes Basin the vast majority of the dredging operations occur in the shallow western Basin of Lake Erie. Lake Erie in general accounts for a disproportionate 66% of all dredging activity within the Basin itself. The process of dredging is simple; pull sediment from the shipping channel and move it somewhere else deemed to not be in the way. Where they go depends highly on what they contain, thus the material is evaluated and sorted based on content. Non-polluted sediment is simply hauled to the closest possible location where it will not interrupt shipping and dumped in the open water (assuming state regulations permit this). More polluted material is general placed in large confined disposal facilities (CDF). These facilities range in shape and size but can exceed 500 acres and are situated as islands, peninsulas or on-shore soil dumps. The 58 acre half-circle at the mouth of the Black River in Lorain, Ohio



3

4

Figure 3: Butte in 1900, *Butte-Silver Bow Public Library.*

Figure 4: Black River CDF in Lorain, Ohio, *Above All Ohio.*

is a characteristic example of a CDF (see figure 4). The removal of the sediment from the channels is financially motivated, just like the extraction of ore from the earth. However, as large geographic operations, these economically-driven processes have unplanned spatial, social and ecological implications as they are focused on the act of displacement and not the results of replacement.

IMPACT ON URBAN CONDITION INCLUDING ECOLOGIES AND INHABITANTS

Cities and industrial processes are generally connected geographically. Until land-use based zoning became commonplace, they were in many cases inseparable. This tenuous relationship has generated a century of battles between the residents of the city and the industries that support them. These battles have led to a range of practices and policies such as zoning, containment, environmental quality and protection regulations. In many cases it is not the industry alone that generates these new residual landscapes but the policies regulating them that initiate their production. For example the placement of dredged material into containment facilities is required for most contaminated sediments. These landscapes are not the objectives of the process, as it is the containment that is required. Because the processes of dredging are clearly financially motivated, the movement of material is generally kept to a minimum, meaning that ideally the material would remain as close to the excavation site as possible. We see this in Butte as well, with waste-rock dumps located adjacent to the mines that removed them. We also know that industry and residents generally have some level of adjacency, thus the landscapes that these industries produce tend to exist in close proximity to large populations of people.

Butte is a displaced / replaced terrain at an immense scale where people and industry entwined. For over a century this landscape has been extracted, sorted and deposited. This large scale extractive process has created a landscape significantly defined by displacement and subsequent replacement. While this or some similar process of sorting is common in most mining operations, many are located in somewhat uninhabited landscapes where industry is not also a place for dwelling. In Butte however, this process resulted in the displacement of a community founded around and governed by a geologic condition. The sorting of waste on the Butte Hill can be seen in the massive reduction of the mountains for the Berkeley and Continental pits and the subsequent growth of the impoundment of the Yankee Doodle Tailings Pond. It also exists in a more nuanced condition where terrains have been raised, gulches have been filled in and new development occurs above the displaced material with no acknowledgment of the previous terrain or the waste (see figures 5 and 6). Similar to the efficiencies associated with dredging, mine dumps and the subsequent reclamation work are financially driven. Given the scale of contaminated waste on the Hill, in excess of 660 million metric tons of waste rock, the 2006 Environmental Protection Agency Record of Decision for the Butte Priority Soils Operable Unit defined the majority of reclamation efforts to be a Waste Left In Place approach. This approach has resulted in an 18” thick cover of dirt over a regraded terrain to reduce erosion of the cap in the most economical method.

The interest in both of these places however is not in the materials themselves but in the landscapes that were and are still being created through the processes of extracting, sorting, transporting and replacing them. These landscapes are geographic by-products of various industries that, intended or not, have social, ecological, and economic implications. It is our position that there is a need for new methodologies of mapping and documenting these displaced territories to

5

6

Figure 5: Missoula Gulch in 1885, *Butte-Silver Bow Public Library.*

Figure 6: Former Missoula Gulch area filled in with mine waste, present day.

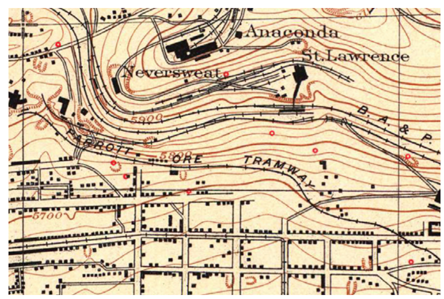
uncover some of the more latent relationships between these elements. This mapping is an effort to discover new forms of interpretation, experience and occupation within these territories, providing agency for the occupants of the resultant landscape. Holistically mapping these places gives value to them as specific territories that can be occupied, providing a tangible understanding of the displacement / replacement similar to Heizer's boulders in the desert.

MAPPING AS AGENCY

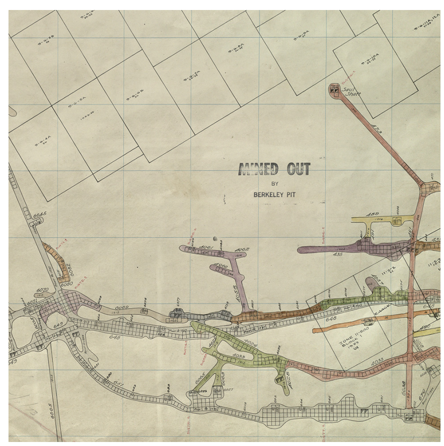
Mapping, by its nature, records what is of value to the maker. The innocent map does not exist. In addition to indexing the valuable, the process of mapping also projects value on that place. It provides a specific understanding of what is recorded, as it is a requirement of commodification. Thus the map contains a projective agency for a geographically specific place. Landscape Architect James Corner probably states this best:

> "...its agency (mapping) lies in neither reproduction nor imposition but rather in uncovering realities previously unseen or unimagined, even across seemingly exhausted grounds. Thus mapping unfolds potential; it re-makes territory over and over again, each time with new and diverse consequences."[9]

The relationships between these residual landscapes, the processes that created them and the surrounding urban residents has historically been minimized for obvious political, financial, and safety reasons. This segregation allows each to develop independently and in ignorance of the other. It also curtails any possibly synergies between them. The process of mapping these relationships gives us the opportunity to explore futures and conditions that have never been considered. These maps create their own context and value systems in which to work and possess the ability to highlight new physical and experiential possibilities.



7



8

Maps document and produce value; they illustrate what is important to the author in a way that attempts to convince others of this importance. In many cases, we swallow maps as factual documents, even though most are highly subjective, assumptive, and rhetorical. Many maps have been produced for the landscapes we are discussing. In Butte the city's development on the surface was documented through traditional maps while the growth of the shaft mines were catalogued in the massive volumes of hand drawn records collected in the Stope Books by the Anaconda Mining Company. Both the traditional surface maps of the City of Butte (Sanborn, Property and Topographic maps, see figure 7) and the Stope Books (detailed accounts of the underground workings, see figure 8) are an incredibly detailed account of the growth and shape of Butte above and below ground. These maps pursue a clear agenda of value. However, there is little documentation of the massive amounts of waste rock replaced back onto the city, rock that has profoundly shaped this urban landscape, once the precious metals were displaced for use around the world. These two elevationally separated operations had significant implications to one another, yet they were seldom considered as a coupled system. It was as if punching through the crust of the earth completely erased all forms of context.

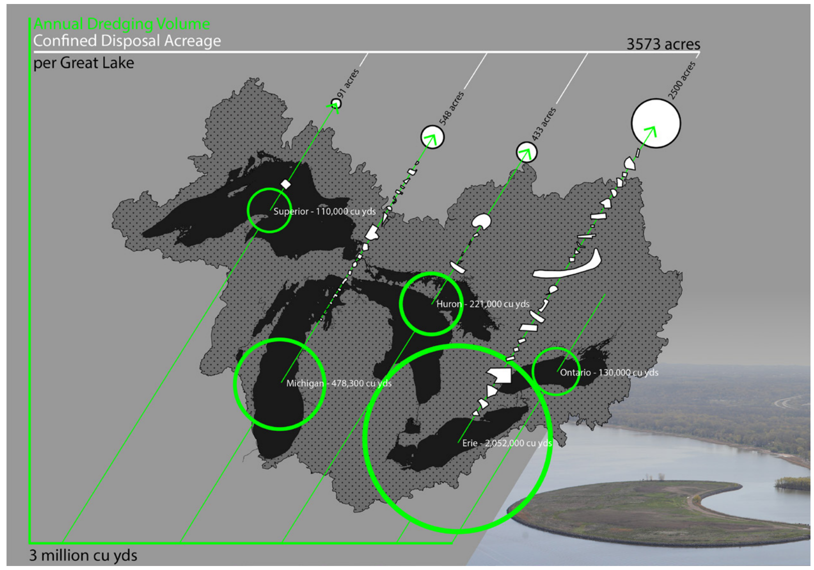
In the Great Lakes Basin, the desire to document the depth of shipping channels has generated a series of highly detailed maps. These maps clearly illustrate the value associated with draft depth, thus can financially justify their production. The shipping channel in Lorain, Ohio evidences this condition (USACE Maintenance Maps) where the before and after dredge conditions of the

Figure 7: Detail of the "Weed Map" from the *Butte Special Folio #38* published by the United States Department of the Interior in 1897.

Figure 8: Detail from Sheet 101 from Stope Book M 29 Vol 2 created by Anaconda Minning Company, *Butte-Silver Bow Public Archives.*

canal bottom are rigorously documented. NOAA and the USACE generate these maps to communicate "project depths" and navigation channel locations, but the deposition of the material removed from these channels is seldom mapped with any level of accuracy and in most cases these deposit landscapes are simple outlines, not even showing the planimetric extents of the material itself. Once again the replacement of material is without context.

9



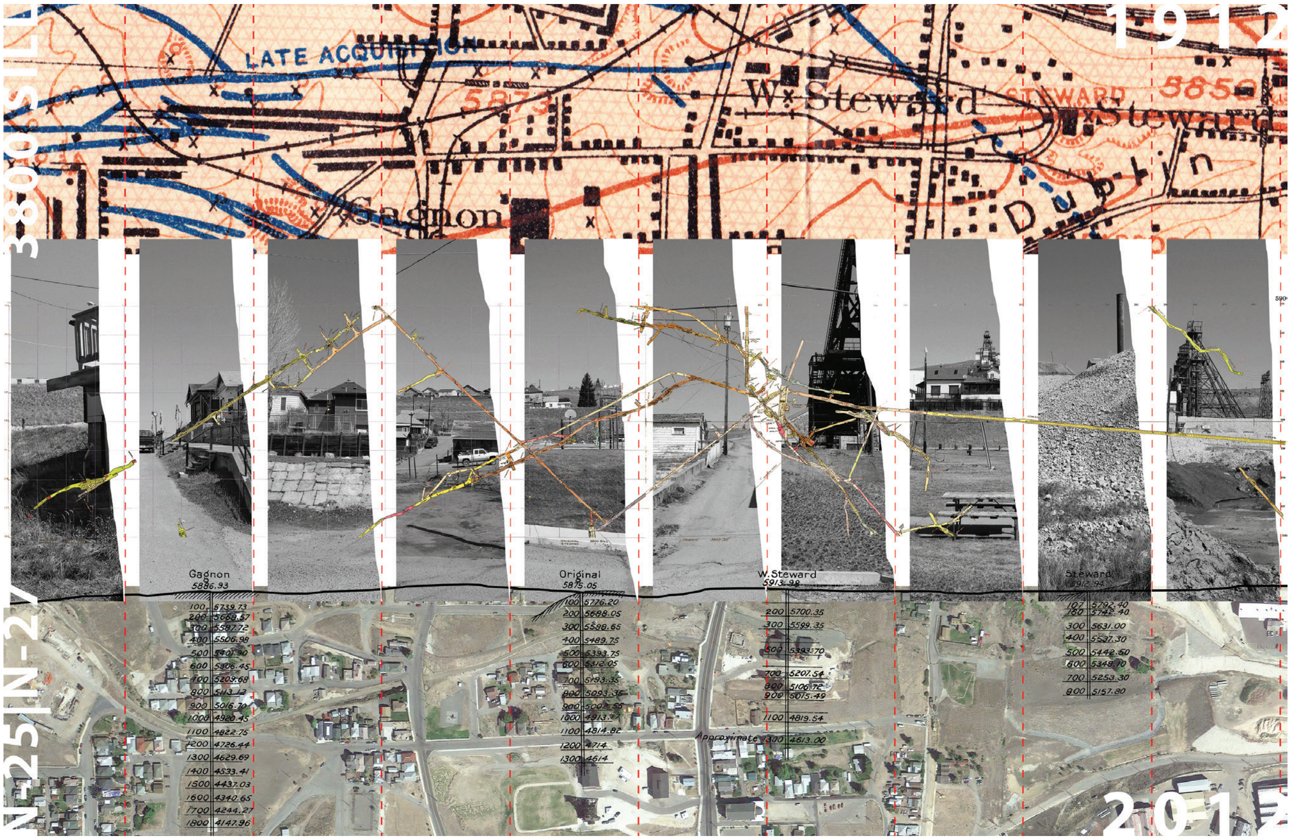
PROJECTIVE ALTERNATIVE FUTURES

Mapping becomes a process of connecting the dots, aligning geographically-related information, excavating spatial and social conditions and so on, with some form of agenda in mind. Our agenda is simply to uncover relationships within these extraction / deposition landscapes that have yet to be recorded, due to their perceived lack of value. In Butte, the relationship between housing, both historical and more recent, and the placement of material from the mining process has never been considered. Many residents likely do no even know the extent to which the landscape has changed under and around them. These two elements, housing and waste rock, have grown up together like brother

10

Figure 9: Annual Dredging Volume of the Great Lakes, United States of America: *Burkholder, S.*

Figure 10: Mapping of the Missoula Gulch Transect: *Watson, B.*



11

and sister, yet they have never really spoken to one another. There is limited comprehension of the finer grain ecological impacts of this new layer of deep rock deposited on the surface, capped with a thin layer of dirt, as the Pit is more ever present, both visually and subconsciously within the community.

The disposal facilities within the Great Lakes Basin have quickly become hotspots of ecological activity. Generally full of nutrient-rich soil, these landscapes are almost instantly overrun with opportunistic plants and animals. The ecological value of these places is seldom leveraged due to their designation as waste landscapes. These landscapes, close to the city centers and teeming with ecological activity have the capacity to improve the lives of residents through new forms of landscape experience and education, however they are seldom mapped and valued in a way that indicates this potential.

All landscapes on this planet have value, yet cultural and social practices tend to color each differently. This valuation is typically done through the operation of mapping. We believe that maps or more specifically the process of mapping has significant agency for challenging this condition and provides a true liberation for devalued landscapes. With this liberation comes the opportunity for complete reconsideration as places of meaning, experience, and performance. This process of mapping seeks to provide opportunities for alternative futures of these resultant terrains, allowing them to become territories of value. It is speculated that this reconsideration will also generate a more general criticism of "objective" forms of analysis with regard to landscapes and particular land uses, thus permitting a more holistic, less polarizing view and understanding of the environments around us.

Figure 11: Mapping of the Woolman Street transect: *Watson, B.*

ENDNOTES

1. Weed, Walter Harvey. Geology and ore deposits of the Butte district, Montana. Washington: Government Printing Office, 1912.
2. Guilbert, John M.. Mineralogy of the Butte district, Montana,. Bozeman, Mont: [Anaconda Co.], 1964.
3. Czehura, Steve J. Butte, A World Class Ore Deposit. Butte, Mt: Montana Resources, LLP, 2006
4. Ted Duaime, Patrick Kennelly and Paul Thale. 100 Years of Underground Mining Map: Montana, 2004.
5. Holman, Alan J. Ancient Life of the Great Lakes Basin: Precambrian to Pleistocene. University of Michigan Press. 1995.
6. Center for Ports and Waterways. Direct economic effects of lack of maintenance dredging of the Houston Ship Channel. Prepared for the Port of Houston Authority, December, 2010.
7. USACE Waterborne Commerce Statistics Center. Part 3, Sheet 19. http://www.navigationdatacenter.us/wcsc/webpub12/Part3_Ports_tonsbycommCY2012.HTM. retrieved 5-1-2014
8. Ashworth, William. The Late Great Lakes: An Environmental History. Alfred A. Knopf, New York. 1986.
9. Corner, James. "The Agency of Mapping: Speculation, Critique and Invention" Chapter 10 in Mappings. Reaktion Books, 1999.