The Extralegal Origins of First Possession: Water Law during the California Gold Rush

I: Introduction

Everyone is familiar with the expression "first-come, first-served". This is not surprising as it appears everywhere in modern society and people generally abide by it, even if they do not always like it. Theatergoers typically do not butt ahead in line to obtain scarce tickets, even for popular first-run Broadway plays. During hunting season the first one to bag a deer gets to bring it home. Children calling "Dibs" on a quarter they find at the playground is often sufficient to keep other children from claiming it for their own. When a major league baseball slugger hits a milestone home run, the lucky fan who grabs it first gets to keep it or sell it to the highest bidder. But far from being confined to these homely examples, first-come, first-served appears in both common and statutory law as a legal principle governing the initial acquisition of, and resolution of disputes over, property rights to a remarkably wide range of economic resources including land, hard-rock minerals, water rights, wild game, oil and natural gas, and the electromagnetic spectrum, and has even appeared in tort and nuisance law.[1] As a legal doctrine first possession is controversial among economists, many of who have debated its efficiency properties. And most maddening of all, no one seems to know where it came from.[2]

It is a common presumption that economic forces play a powerful role in shaping institutional rules of the game such as first possession, even if economists cannot always agree on the ultimate efficiency of those rules.[3] Testing hypotheses regarding the origins and determinants of first possession is extremely difficult, however, because there are typically numerous complica-

[1] See Anderson and Hill(1990), Lueck(1995), Wittman(1980), Kanazawa(2004).

[2] It does not appear even to be derived from any particular legal tradition, appearing in English common law, civil law, Islamic law, and traditional African law. See Lueck(1995), p. 394.

ting factors in any given institutional setting. Court rulings are notoriously difficult to interpret because judges take many factors besides economic ones into consideration including prior rulings, constitutional and statutory enactments, informal norms and customs, and in the case of resources such as water, climatic conditions.[4] The economic origins of norms and customs, increasingly stressed by legal scholars in recent studies, are often even murkier because of the absence of a paper trail.[5] Statutes and constitutional provisions present interpretive difficulties as well, because the dynamics of interest group politics imperfectly reflect economic forces and can give rise to outcomes with a wide variety of efficiency properties.[6] All of which means that empirical inquiries based upon these institutional sources are likely to be subject to interpretive ambiguity regarding the driving forces behind the development of first possession.

The circumstances of the California Gold Rush of the 1850's provide a natural experiment in which to investigate the economic origins of first possession. It is well known that first possession emerged from the Gold Rush as a rule for determining who enjoyed the legal right to water resources, and subsequently became the fundamental basis for the system of appropriative law that governs water rights throughout the western United States. Most studies of the origins of California water law in the Gold Rush emphasize the role of the state courts in fashioning and applying the rule of first possession to resolve disputes involving water.[7] Often overlooked is the fact that first possession also originated in a vast network of extralegal camps and districts com-

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[3] A voluminous literature emphasizes the importance of economic factors in shaping institutions. For good general treatments, see North(1990), Eggertson(1990).

[4] Climatic influences on the development of western water law have been emphasized, for example, by Bakken(1985), Dunbar(1985).

[5] The importance of informal norms has been most comprehensively treated by Ellickson (1991). For other representative studies, see Macauley(1963), Palay(1984), Hoffman and Spitzer (1985), West(1997).

[6] Some economists such as Becker(1983) have strongly emphasized the economic pres-sures that drive political outcomes and tend to eliminate interest group inefficiencies. Others, however, have emphasized the transactions costs inherent in the political process, leading to political outcomes that may bear little resemblance to efficient ones. See, for example, Dixit(1996), Twight(2002).

[7] See, for example, Dunbar(1983), Pisani(1984), Hundley(1992).

prised of miners who democratically selected their own rules largely unencumbered by controlling legal institutions.[8] The fact that these rules were devised outside of any official system of law provides a unique opportunity to examine the economic origins of first possession without having to worry about whether judges were interested in promoting the efficient use of resources or instead if they were simply articulating their own idiosyncratic views, promoting other objectives such as equity, or abiding by long-established precedent.[9]

In the next session, I provide a brief discussion of the scholarly debate over the efficiency properties of first possession and develop a simple model of surface water use that yields testable predictions regarding the adoption of first possession water rights. In Section III, I turn to a discussion of the emergence of mining camps and districts as the fundamental basis for local government during the California Gold Rush. The discussion also examines a dataset of mining codes and characterizes some broad patterns of institutional rules contained therein. These codes derive from several sources, including U.S. Census documents, Heckendorn & Wilson's Miners & Businessmen's Directory for Tuolumne County, newspaper stories, county histories, and superior court cases from Placer County.[10] Section IV describes the role played by water in mining during the Gold Rush. Section V examines and characterizes the particular provisions in the miners' codes relating to water use, and documents a striking pattern of heterogeneity in the miners' codes provisions that pertained to first possession. Section VI applies our model to interpret the adoption of the principle of first possession in the miners' codes while also explaining the variations in the provisions across the codes. Section VII concludes.

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[8] Shinn(1948) provides the classic study of the mining camps. For more recent research on the camps, see McCurdy(1976), Pisani(1991). Umbeck(1977, 1981) has modeled the creation and rule-making of the mining camps as occurring within an institutional vacuum. See also Clay and Wright(Forthcoming).

[9] Whether, and the extent to which, the common law is efficient has been much debated among legal scholars. Proponents of efficiency include Rubin(1977), Priest(1977), and Posner(1986). In an important survey article, Cooter and Rubinfeld(1989), take a more agnostic view of the tendencies of the common law toward efficiency. See especially pp. 1091-93.

II. Economics of First Possession of Surface Water

The principle of first possession awards a property right to the claimant who is first in time to take a set of institutionally prescribed steps in order to perfect the right. Depending upon the circumstances and the economic resource involved, these steps can be as simple as grabbing a baseball and as complex as making major investments in land development or water diversion facilities. Most economists are familiar with the argument that awarding a secure property right to a resource encourages efficient levels of investment in the resource by permitting the claimant to fully appropriate the future stream of rents associated with the investment.[11] The difficulty in applying this argument to first possession is that any available rents can be dissipated in an initial resource-wasting race to establish the property right in the first place.[12] Some economists have argued, however, that the amount of rent dissipation can be and often is limited under a number of circumstances. These include situations where claimants vary with respect to the cost of making a claim[13], and where claimants are able to develop cooperative institutional arrangements that reduce the intensity of the first possession race for the resource.[14]

When dealing with water resources, the first possession story is complicated by the fact that water development and use may generate significant impacts on third-parties, particularly in arid regions such as the western United States. Perhaps the most obvious example of this is the development and exportation of water from a river basin, which reduces the amount of water in the basin for the remaining users. However, even intra-basin diversions of water from surface

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[10] For more extended discussions of the miners' codes, see Umbeck(1981), Clay and Wright(forthcoming).

[11] One caveat to this statement is the possibility that a first possession regime can lead to inefficiencies due to an unequal assumption of risk among first- and subsequent claimants. See Burness and Quirk(1979, 1980).

[12] The scholarly literature documenting this possibility is extensive and ancient. See, for example, Gordon(1954), Cheung(1970), Libecap and Wiggins(1984), Anderson and Hill(1990).

[13] The possibility that claimant heterogeneity could limit rent dissipation has been explored by a number of economists. See, for example, Harris and Vickers(1985), Suen(1989), Lueck(1995).

[14] See, for example, Libecap and Wiggins(1984), Ostrom(1990).

waterways deprive downstream claimants of water because recharge of the tapped waterways through runoff, percolation, and venting of wastewaters may be incomplete. When recharge does occur, a distinction must be drawn between diversions of surface water and consumption of surface water, where consumption equals diversion minus the amount that returns to the waterway. As it turns out, the extent to which water use is consumptive is a key consideration because it determines the relative costs and benefits of defining individualized water rights with attributes such as first possession.[15]

To see this, consider the use and reuse of surface water as conceptualized in the following simple model.[16] Consider a river with flow of X acre-feet (per time unit) at its headwaters, and for simplicity assume no flow additions occur downstream either through tributaries or precipitation. Water claimants are located along, not necessarily physically adjacent to, the river (See Figure 1). Each claimant takes water from the river and a portion of that water returns to the river in recharge. Denote the amount of water diverted by claimant i as W_i and the fraction of that water that returns to the river as R_i, $R_i \varepsilon (0, 1)$. These so-called recharge coefficients R_i can vary across claimants, and the smaller is R_i, the more consumptive of the river is claimant i. Then, denoting claimants in numerical order starting with one for the claimant closest to the headwaters, as water use occurs the amount of water in the river diminishes as you move downstream. Generally speaking, in this model the amount of water present in the river just downstream of claimant j is:

$$X_j = X - \Sigma W_i(1 - R_i) \qquad (1)$$

Notice that the smaller are the upstream recharge coefficients R_i, the smaller is X_j. In the extreme case where $R_i = 1$, water use by claimant i can be said to have no effect on the river. In

[15] Rose(1990).

this case, that use of water would for all intents and purposes take on the character of a pure public good. At the other extreme where $R_i = 0$, water use by a claimant completely excludes a downstream claimant from using that water, in which case the use of that water from the river can be thought of as a pure private good. Intermediate values of R_i imply, of course, intermediate degrees of "publicness" of uses of the river.[17]

The extent of the public good nature of water influences the magnitudes of the costs and benefits derived from defining water rights on an individualized basis. When water use is largely a public good, the benefits of defining individualized rights are small relative to the costs and we will tend to observe the creation of rights that accrue to the entire affected group. Any congestion effects that result from use will tend to be addressed through mutual limitations on those group rights, particularly when transactions costs are high. Carol Rose (1990) has, for example, documented that these predictions were borne out in the early evolution of water rights in the eastern United States, which came to be based upon riparian law.[18] These limitations can include restrictions on out-of-basin transfers when the costs of defining property rights to the recharge are high (as they typically are).[19] However, the benefits of defining individualized rights are high relative to costs when recharge flows are low and water use is largely a private good. In this case, rights attributes will tend to emerge that support individualized use of water, including the right to divert and to enjoy reasonable security in those diversions.[20] First possession, with the security it gives to individual investments in water diversions, would be one of those attributes predicted to emerge.

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[16] For other applications of this model, see Hartman and Seastone(1970), Johnson, Gisser and Werner(1981), and Kanazawa(1991).

[17] This model ignores possible reductions in water quality that occur as water is used and reused. While generally important and directly relevant in the case of the Gold Rush, incorpora-ting water quality effects does not fundamentally change the results of the model. See Kanazawa (1991).

[18] Rose(1990).

[19] See, for example, Lueck(1995), p. 430.

III. Mining Districts and the California Gold Rush

When gold was discovered at Sutter's Mill in 1848, California was a sparsely populated, largely pastoral, economically underdeveloped frontier region. The Mexican War had just ended and California was not yet a state, lacking the legal and administrative structure of government that was yet to be set in place. Most of the gold was located in remote areas in the foothills of the Sierra Nevadas or northern California on totally undeveloped public land belonging to the federal government. The federal government, far from aggressively asserting its claims to the gold, instead stood back and did little to interfere with the prosecution of mining on the federal domain. This anarchic state of affairs meant that as miners spread out over the public domain, they lacked formal, credible enforcement mechanisms to resolve disputes and allocate and maintain rights to claims. In response to this legal vacuum, some took matters into their own hands and violent confrontations that ended in bloodshed occurred with some regularity. The larger response, however, was for miners to band together into cooperative miners' associations, or *mining camps*, which established rules for acquiring and maintaining claims, and resolving the inevitable disputes that arose.[21] Many mining camps were formed in California during the early Gold Rush years.[22]

The very first camps created in 1848 in the immediate aftermath of the initial discovery tended to be loose associations of small numbers of miners who happened to be in the same area and possessing not much in common except their quest for golden riches. Miners in these first camps apparently devised little in the way of governmental or legal mechanisms for resolving

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[20] Ibid. See also Rose(1990).

[21] See Shinn(1948); Umbeck(1977, 1981).

[22] Shinn(1948) estimates that at the height of the Gold Rush, there were probably more than five hundred such associations in California.

disputes and allocating and maintaining property rights to claims and available water supplies.[23] However, with the first major wave of prospective miners that poured into the mining regions in 1849, mining localities began to experience growing congestion and competition among miners anxious to stake claims and extract the gold. As the potential for conflicts grew, so did the need for orderly mechanisms for assigning claims and resolving disputes. In the absence of effective governmental authority, miners took it upon themselves to sit down and devise miners' codes, which contained rules governing the local prosecution of mining. In a display of frontier democracy, every locality devised its own code, which applied either to an individual camp or its later more formal counterpart, the mining district. The rules embodied in these codes pertained to various aspects of mining including permissible claim sizes, claim acquisition and retention, dispute resolution, prohibitions against foreign miners, and in some cases, water rights.

The rules established by the mining camps governing the relative rights of members deserve a closer look, as they would exert a major influence over later rulings of the state courts. The following discussion is based upon codes I have collected for 128 gold mining camps spanning the period from 1850 to 1867. The vast majority of these camps were located in thirteen counties in the Sierra Nevadas, where gold mining was most heavily undertaken during this period, with by far the largest number – 41 – in Nevada County. In addition, a significant number of camps, eleven altogether, were located in two counties in northern California: Trinity and Siskiyou Counties. It should be emphasized that this is not a comprehensive list of all of the mining camps that existed during this period, but only the ones for which miners' codes are available.[24]

Of the 128 codes, thirty-one govern quartz mining exclusively. All of the remaining codes cover placer mining in its various forms, including mining in riverbeds, riverbanks, ra-

[23] See, for example, Shinn(1948), p. 117.
[24] For a comprehensive list of mining camps, see Gudde(1975).

vines, gulches, flats and hills. In some cases, the code distinguishes between surface diggings and deep diggings, depending upon how deep below the surface is being worked. In other cases, a distinction is made between "wet" and "dry" diggings, which roughly corresponds to claims adjacent and non-adjacent to water. Some codes are extremely brief, providing little or no guidance on fundamental issues such as how water rights are defined or how disputes over claims are resolved. Others contain considerably more detail. The more complex placer codes tend to contain both general provisions that apply broadly to various forms of mining, and specific provisions that apply more narrowly.

Though these rules varied from locality to locality, it is possible to characterize certain general patterns. Simple or complex, virtually all codes mandate some maximum claim size, which may vary depending upon the type of claim. Broadly speaking, the approach taken by mining codes adopted in the camps imposed a number of limitations on the rights of miners to acquire and work their claims. A miner was typically entitled to only one claim and claims could not exceed a certain maximum size, which in some camps was quite small, particularly early on. The rules also commonly specified a minimum work requirement that miners had to satisfy or forfeit their claims. For example, in 1852 the Springfield District in Tuolumne County required miners to work their claims at least one day out of three during the mining season. In some cases, codes would go further and specify what work needed to be done. For example, in 1853 the Jamestown District was requiring miners to dig a ditch on their claim "one foot wide and one foot deep" within three days of locating their claim.[25]

It is also noteworthy that the codes created in the miners' camps also underwent something of an evolution over time, paralleling certain changes that were occurring in the mining industry. This evolution occurred both as new camps were created and as existing camps period-

ically revised their codes. One important development was a tendency for the permissible size of a claim to increase over time. Claim sizes were probably permitted to grow as gold fever subsided, immigration slowed, and some miners moved into other pursuits, all of which relieved the pressure on miners' camps to provide claims to members. In addition, as claims became less productive over time, larger claim size became necessary to enable miners to make a living. In at least one instance, for example, a miners' camp permitted a larger claim on ground that had previously been mined.

It perhaps seems natural that the mining camps would impose these sorts of limitations on miners, as they seem crafted to spread the wealth around, which probably greatly assisted miners in achieving cooperation. However, the interpretation of these provisions has been a subject of controversy among economic historians. Umbeck (1977, 1981) interpreted them as defining clear property rights to claims, and as a natural outcome of a situation where miners possessed comparable capabilities in wielding force. Clay and Wright (forthcoming) have placed a very different interpretation on many of the provisions observed in miners' codes, arguing that rather than firming up property rights, their purpose was to facilitate orderly transfers of rights under what were essentially open access conditions for gold seekers. Recently Zerbe and Anderson (2000) have emphasized norms of fairness among miners during the early Gold Rush. The recent research has tended to be based on the notion that miners operated under a veil of ignorance regarding their position, which places provisions such as first possession in a very different light from the traditional view.[26] Under the new view, first possession is seen not as an entry barrier that permits the earliest miners to capture rents but rather, a mechanism that simply firms up the rights of miners as they move from place to place.

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[25] Heckendorn and Wilson(1856), pp. 55(*Jamestown*), 65(*Springfield*).
[26] Zerbe and Anderson(2001), Clay and Wright(forthcoming). See also McDowell (2002).

The debate over the correct interpretation of the miners' codes has obvious implications for the issue of rent dissipation raised earlier. Indeed, the very term "gold rush" conjures up images of potentially resource-wasting races for rights to mine gold. Adherents of the traditional view of Umbeck would minimize the dangers of rent dissipation, which would be combated by cooperative agreements among miners to limit entry and define secure property rights to mining claims. The recent studies by Clay and Wright and McDowell (2002), however, revive concerns that significant rent dissipation may have occurred in the rush for riches. Under the latter view mining camps did not limit, but rather facilitated, entry in a world where mining was transient and cooperation was not propagated through repeated play. Some evidence suggests, however, a more complex picture in which some mining localities took on permanence in relatively short order[27] and solitary placer mining sometimes quickly gave way to larger, more heavily capital-intensive mining operations.[28] Under the latter conditions, mining camps are more likely to resemble entities such as claims clubs and cattlemen's associations that limited entry in other frontier contexts[29], thus making a rent-dissipating race for property rights much less likely.

IV. The Importance of Water in Mining

Water was a crucial factor input in the gold production process, though the role it played evolved dramatically within a very short period of time. In placer mining, one of the two main branches of gold mining, the essential function of water was to facilitate the separation of gold from the otherwise worthless rocks, earth, and gravel containing it.[30] Early placer mining was dominated by the use of labor-intensive techniques such as *panning* and *rockers* and *cradles*, which were used to extract the gold by miners situated at or near sources of surface water. Mi-

[27] See Paul(1947), p. 74; Mann(1982).
[28] See, for example, Jung(1999), pp. 56-62; Greenland(2000), pp. 48-58.
[29] Bogue(1958); Anderson and Hill(2004), pp. 163-66.

ners quickly progressed, however, to using more heavily capital- and water-intensive techniques. An important development occurred in the mid-1850's, with the invention of *hydraulic mining*.[31] Under this method, water was directed through hoses in high-pressure jets against gold-bearing hillsides. The water and materials would wash down and be directed into sluice boxes to extract the gold. Hydraulic mining used a great deal of water but steadily grew in popularity because it permitted miners to process large amounts of material quickly and eventually became a common method of mining throughout the gold mining regions.

As gold production became increasingly water-intensive, it became increasingly important to deal with the water left over at the end of the process after gold separation had occurred. Miners typically disposed of the water by directing it into *tail races* placed below the gold separating mechanisms, from where it flowed into the nearest gulch or ravine, or back into the stream from which it was taken. This meant that in many cases, the water could be used and reused by miners situated downstream. However, the water was often degraded in quality by use because the tailwaters would contain additional debris, which caused problems for downstream miners through silt deposition, which clogged ditches, damaged equipment, and in some cases completely submerged downstream claims.

As mining technologies evolved over time, so did the manner in which water was procured by miners. Under the early methods of mining requiring little water, it was a simple matter for miners to meet their own water needs. Most of the initial strikes occurred on or near rivers and streams at wet diggings, which was thus where panning and rocker-and-cradle mining large-

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[30] The other main branch was quartz mining, which employed quite different gold extraction methods.

[31] Edward Mattheson is widely credited with the invention of hydraulic mining in 1853, though it apparently took awhile for it to enjoy widespread use. See, for example, Paul(1947); May(1970). The first mention of hydraulic mining in the Alta Californian occurred in June 1853, and described it as "A new method of mining in hill diggings … as novel as it is efficient." (Alta Californian, 6/7/53), which is consistent with the histories.

ly took place, with miners simply taking and using what little water they needed.[32] When strikes occurred at dry diggings physically removed from surface water sources, initially miners simply hauled their earth to the nearest source of water, mostly using backpacks, carts, or animal power. It was not long, however, before miners conceived of the idea of bringing water to the dry diggings. For example, ditches were being completed as early as March 1850 in Nevada County and as early as fall of 1850 in Tuolumne County.[33] In February 1851, a miner in Sonora described a plan to build a ditch to bring water to various claims in Tuolumne County:

> "A plan of great merit for bringing water into the dry diggings has been designed by Thomas Frazer, a skilful miner of Yankee Hill Diggings. He proposes to take the water from a creek that is a tributary of the Stanislaus, seven miles from Pinelog Crossing. The creek has sufficient elevation if the water is carried in canal along the sides of the hills, parallel with the Stanislaus, to carry it over a gap at the crossing. It will then have sufficient elevation to take it to the heads of all the gulches. It would supply all the following diggings with water, viz: Yankee Hill, Columbia, Shaw's Flat and Humbug, and many other without name."[34]

Early canals were small affairs: at most a few miles and incapable of conveying large amounts of water.[35] It was not long, however, before much longer and more massive ditch projects began to be undertaken. In May 1852, the Sacramento Union reported that the 45-mile-long Bear River and Auburn Canal was about to be completed in Placer County: it was eventually completed in November.[36] That same month, the Union reported the progress of another substantial ditch project in El Dorado County, estimated to cost $100,000 to construct.[37] By August, the Sonora Herald was announcing the near-completion by the Tuolumne County Water Compa-

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[32] When strikes were made in the beds of rivers, a quite different technological problem was presented by water, which often involved diverting it around the strike site through wooden flumes, which was heavily capital-intensive. Such river mining companies are not considered in this study.

[33] Thompson & West(1970), p. 171; Alta Californian, 8/4/52.

[34] Alta Californian, 2/8/51.

[35] Alta Californian, 2/8/51, 7/11/51.

[36] Alta Californian, 5/23/52, 11/13/52.

[37] Alta Californian, 5/28/52.

ny of a large ditch capable of serving 500 to 1000 long toms, all year round.[38] The massiveness of this undertaking is suggested by the following description:

> "(The Tuolumne Canal) must have originated with men of gigantic energy and enterprise, for few persons would have ever made the attempt to construct a flume for miles on the side of a precipitous rock, where a single misstep would send them a thousand feet into the ravine below… Five miles from the dam is a bridge, 30 feet high and 800 feet long, that conveys the water across a ravine; and a few rods farther on, a tunnel, 300 feet long, 4 by 6 feet, arched and well-supported, conveys the water to a deep ditch, winding and turning on the side hills, to a distance fifteen miles from the dam. Here a natural ravine, crossed at right angles at the bottom by Five Mile Creek, takes the water, and by a flume ten miles long, the creek is tapped and the water carried direct to Columbia. From here a ditch has been constructed, ten miles in length, that takes the waste water to the various diggings below."[39]

Ditch construction continued at a furious pace for several years. By 1855 there were sixteen ditch companies in Calaveras County alone, with an assessed value of $638,300, and forty-four ditch companies in Nevada County, with an assessed value of $345,900.[40] By 1856, the Mountain Democrat was listing twenty working canals in El Dorado county, one of which, the Eureka Canal, was 247 miles in length and had cost $700,000 to build.[41] The following year, the State Register reported that there was 4,405 miles of mining canals and ditches in the state, constructed at a cost of nearly $12 million.[42] By 1859, Governor Weller was announcing in his annual message to the legislature that total ditch mileage in the state had attained 5,726 miles, having cost $13.5 million to construct.[43]

V. Water Provisions in the Miners' Codes

The importance of water as a factor input into gold production was reflected in many provisions in the miners' codes that governed water use. Some codes, for example, varied claim si-

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[38] Alta Californian, 8/4/52.
[39] Alta Californian, 8/23/52.
[40] Alta Californian, 10/1/55, 10/10/55.
[41] Alta Californian, 4/29/56.
[42] Alta Californian, 5/26/57.

zes depending either upon whether or not water was available, or whether or not it needed to be purchased. The code of Lower Calaveritas (1857) permitted surface claims to be larger if they were "above the reach of Water" from ditch companies.[44] New York City Diggings (1853) permitted claims to be larger if miners had to purchase water than if it were simply available in the local gulch.[45] In at least one case, miners lacking water to work their claims were permitted to claim and work "any unoccupied ground and hold the same as though he held no other claim" until water became available to work their original claim.[46] It is apparent that these miners believed that mining was much less profitable when water was either not available or only available from external sources.

The importance of water is also reflected in provisions for work requirements, which were commonly made contingent upon the availability of water to work the claims, and claims were typically not forfeited if water was not available. The code of Montezuma District (1852?), for example, required claims to be worked one day in three, but only when water could be obtained.[47] Similarly, the code of Jamestown District required work to commence within six days of when water was available.[48] Similar provisions are contained in the codes of Poverty Hill, Yorktown and Chili Camp (1851), Springfield (1852), Brushy Canyon (1853), New York City Diggings (1853), Shaw's Flat (1855), Wisconsin Hill (1855), Oro Fino Diggings (1855), Irish Hill (1857), and Plymouth (1863).[49] In other cases, codes stipulated that miners could

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[43] Journal of the Senate, 10th session(1859), p. 38. See also Alta Californian, 1/6/59.
[44] U.S. Mining Laws and Regulations(1885), p. 298.
[45] Herrick v. Davis, Placer County District Court Case # 37(1853).
[46] *Warren Hill*(1853): U.S. Mining Laws and Regulations(1885), p. 280.
[47] Heckendorn and Wilson(1856), p. 81.
[48] Ibid., p. 55.
[49] Heckendorn and Wilson(1856), p. 61(*Shaw's Flat*); p. 65(*Springfield*); p. 87(*Poverty Hill, Yorktown and Chili Camp*); U.S. Mining Laws and Regulations(1885), p. 288(*Oro Fino*); p. 309(*Plymouth*). *Brushy Canyon*: Rice v. Emmons, Placer County District Court Case #103(1855). *New York City Diggings*: Herrick v. Davis, Placer County District Court Case #37(1853). *Wisconsin Hill*: Ricketts v. Tubbs, Placer County District Court Case #123(1855). *Irish Hill Mining District* Mining Laws(1857), Bancroft Library.

maintain their claims during the dry season by recording them with the District Recorder.[50] Other districts, such as Jackass Gulch (1852), Warren Hill (1853), Ohio Flat (1858), and Odd Fellows (1864), went further and based forfeiture on some notion of "sufficiency" of water, typically specifying that claims would not be forfeited if the amount of available water was insufficient to work them.[51] Still others were quite specific regarding what was required for "sufficiency", which varied depending upon what the dominant technology for gold production happened to be at the time. The code of Garote (185?) stated that sufficiency meant enough water to "work a (long) tom".[52] Bodie District (1860) required "sufficient water to work with a long tom or rocker", while Smith's Flat (1855) stipulated that a "sluice-head" was sufficient to work a claim.[53]

Another interesting variation on the work requirement provisions regarding water use were some that required claims to be worked only if water was available to miners at certain prices. The work requirements of Columbia (1856), for example, needed to be satisfied within three days after water could "be procured at the usual rates".[54] Ohio Flat (1856) specified that claims would be forfeited if not worked within ten days after water was available at a "reasonable" price.[55] Claims in Saw Mill Flat (1854) were not forfeited if they could not be worked to the advantage of the owner either because water was unavailable or too expensive.[56] The sug-

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[50] *Forbestown*(1863): U.S. Mining Laws and Regulations(1885), p. 313, *Odd Fellows District*(1864): U.S. Mining Laws and Regulations(1885), p. 291.

[51] Heckendorn and Wilson(1856), p. 80(*Jackass Gulch*). U.S. Mining Laws and Regulations(1885), p. 280(*Warren Hill*), p. 290(*Ohio Flat*), p. 291(*Odd Fellows*).

[52] Heckendorn and Wilson(1856), p. 81.

[53] U.S. Mining Laws and Regulations(1885), p. 284(*Smith's Flat*), p. 301(*Bodie*). See also *Oregon Gulch*(1855), U.S. Mining Laws and Regulations, p. 286. In some cases, district by-laws specified that claims were not forfeited if not worked on account of too much water. This latter category included districts such as Weaver Creek, Upper Yuba, and Rockwell Hill, where mining took place in the beds of rivers and creeks. See U.S. Mining Laws and Regulations(1885), p. 277(*Upper Yuba, Weaver Creek*), p. 337(*Rockwell Hill*).

[54] Heckendorn and Wilson(1856), p. 9. See also *Murphy's*(1857), U.S. Mining Laws and Regulations(1885), p. 297.

[55] U.S. Mining Laws and Regulations(1885), p. 289.

[56] Heckendorn and Wilson(1856), p. 76.

gestion in all these codes is that the workability of claims was contingent not simply upon whether water was available, but that the cost of water also mattered. The additional suggestion is that miners fully expected there to be times when ditch companies would charge prices for water that were not "usual" or "reasonable".

It is perhaps not surprising, then, that miners' codes often contained provisions that conferred special status upon miners within the locality when it came to water use, sometimes at the expense of ditch companies. Some codes, for example, singled out mining as the preferred use to which water could be put. Weaverville (1853) protected water claimants who constructed races to convey water and kept those races in good repair, "provided such water be used for mining purposes."[57] Others protected miners within the district from harmful diversions, possibly for other purposes. Little Humbug Creek (1856), for example, prohibited diversions of water from the creek "to the prejudice of the miners" working thereon.[58] Brown's Flat (185?) stipulated that all the water available in the local creek "shall be reserved for the use of miners in this precinct."[59] Others such as Brushy Canyon (1853) simply stipulated that water had to stay where it was, save possibly for any water surplus to the needs of the local community, and could not be taken out of the local watershed by ditch companies, who were derided as "nothing more than water carriers".[60] Finally, Columbia (1853) permitted diversions of surface water from "gold-bearing ravines", but only with the consent of parties working the ravines, and even then the water could be recalled by "any party interested".[61]

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[57] U.S. Mining Laws and Regulations(1885), p. 278.

[58] U.S. Mining Laws and Regulations(1885), p. 291. See also Maine Little Humbug Creek(1856), Ibid., p. 293.

[59] Heckendorn and Wilson(1856), p. 78. See also *Oregon Gulch*(1855), U.S. Mining Laws and Regulations(1885), p. 286.

[60] Rice v. Emmons, Placer County County Court Case #103(1855).

[61] Alta Californian, 10/12/53.

The notion that water rights should be based on first possession also appeared in the miners' codes, though with considerable variation across different camps. One way in which first possession appeared in governing relative rights was regarding companies whose dams backed water up on a company situated upstream. Here we definitely observe some variation in the extent to which relative rights were based upon first possession. In some cases, first possession is explicitly invoked, as in the case of Lower Humbug Creek (1855) which clearly awards property rights to the downstream company if it is there first:

> "When a claimant occupies a claim previously to the taking of the adjacent one next above, he shall be allowed the privilege of putting (sic) in a dam at the upper end of his Claim the subsequent claimant above if any being compelled to terminate his race at the head of the race below nor shall the backwater of the lower claim in such case be considered an incumbrance to the one above."[62]

However, the same is decidedly not the case when claimants arrive at the same time:

> "Where two or more adjacent claims are taken by different individuals at one and the same time the backwater of the lower claimant shall in no case be allowed to interfere with the other."[63]

Though not explicitly stated, the *a fortiori* suggestion is that downstream claimants who arrive later will also not enjoy the right to build a dam that interferes with an upstream operation. On the other hand, the by-laws of Little Humbug Creek (1856) are more ambiguous on the issue of temporal priority:

> "Resolved, that no miners or company of miners shall back water by a dam or otherwise upon the claim above them to the injury of the party holding the upper claim without their, the upper parties, consent."[64]

This provision seems to simply award the right to the upstream company, though it could also possibly be interpreted as basing this award on its being present first, in which case the ultimate

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[62] U.S. Mining Laws and Regulations(1885), p. 284. See also *Little Humbug Creek*(1856), Ibid., p. 291; *Maine Little Humbug Creek*(1856), Ibid., p. 293.

[63] U.S. Mining Laws and Regulations(1885), p. 284.

[64] Ibid., p. 291. See also *Maine Little Humbug Creek*(1856), Ibid., p 293.

basis for the right would be first possession. In any case, this provision is nowhere near as explicit as the previous one in defining the relative rights of newer versus older claimants.

More commonly, first possession entered into the codes either as a basis for acquiring water rights or for resolving disputes. Regarding acquisition, some codes were quite explicit that water rights were to be based upon first possession, though explicitly reserving this privilege only for miners. Jamestown (1853), for example, stipulated that:

> "Miners shall be entitled to the priority of water, according to the date and situation of the location of their claims."[65]

The code of Lovelock (1864) contained a similar relatively unconditional statement of first possession, however again making it clear that it was miners that enjoyed this right:

> "That the first location shall be entitled to the natural water which may accumulate in his claim, ravine or what not for mining purposes."[66]

Weaverville (1853) permitted race companies to obtain first possession rights to divert water to the capacity of their races that were, however, conditional on their leaving at least "four tomheads" of water in the local creeks "for the benefit of miners at present working or who may hereafter work" said creeks.[67]

Some districts, however, did not obviously base the acquisition of water rights on first possession. Hungry Creek Diggings (1857) simply stipulated that no one could construct a dam or other obstruction in the local creek "to the detriment or hinderence(sic) of any other individual or company".[68] Ohio Flat (1856, 1858) stated that water in the district "shall be governed by the

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[65] Heckendorn and Wilson(1856), p. 55.

[66] U.S. Mining Laws and Regulations(1885), p. 318. See also the codes of *Con Cow* (1851), Ibid., p. 273; *Rich Gulch* (1852), Ibid., p. 273; *Centreville and Helltown* (1857), Ibid., p. 296; and *Hungry Creek Diggings* (1857), Ibid., p. 297 for similar statements of first possession acquisition rights.

[67] Ibid., p. 278.

[68] Ibid., p. 297.

usages in" the district, with no explicit reference to temporal priority.[69] According to the code of Upper Yuba (1852):

> "Resolved, That no Company shall monopolize a Stream of Water for Speculation or unnecessarily use it to the injury of others."[70]

These latter statements are obviously a far cry from any sort of unconditional first possession right.

Regarding the resolution of disputes over water, I could find only one district, Brown's Flat that explicitly mandated that first possession would be the controlling principle. Brown Flat (185?) simply stated: "In all disputes concerning water, priority of use shall have precedence."[71] The statement in the code of Ohio Flat (1856, 1858) to the effect that water "shall be governed by the usages in" the district, presumably included disputes over water and nowhere else in the Ohio Flat code was mentioned any notion of first possession rights.[72] Most codes that explicitly treated water disputes, however, created a system of arbitration in which water disputes would be resolved by a set of disinterested persons. This was true, for example, of Springfield (1852), Saw Mill Flat (1854), Brown's Flat (185?), Little Humbug Creek (1856) and Maine Little Humbug Creek (1856).[73]

VI. Toward Understanding the First Possession Water Provisions

In Section II we derived the prediction that the adoption of first possession should be correlated with the likely "publicness" of water use within a mining camp. Inspecting the miners' codes, one variable available to us is whether a particular district happens to comprise dry or wet diggings, or some combination of the two. Water used in wet diggings was typically not used in

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[69] Ibid., p. 289.
[70] Ibid., p. 277.
[71] Heckendorn and Wilson(1856), p. 78.
[72] U.S. Mining Laws and Regulations(1885), pp. 289, 290.

a way that physically consumed it. Panners, and miners using rockers and cradles, had little effect on the river and even when water was diverted for the purpose of river bed mining, it was generally not taken far: the wooden flumes typically turned the water back into the river just downstream of the diggings. Water taken to dry diggings, however, was transported from rivers and streams that were physically removed from, and sometimes quite distant from, the diggings. This water was often not turned back into river from which it was taken and when it was, was often laden with silt, dirt, and debris: all by-products of the gold separation process. Dry diggings were generally much more consumptive of surface waters, both in terms of reductions in quantity and degradations in quality. In terms of our model, miners in wet diggings tended to have larger recharge coefficients than their counterparts in dry diggings. Consequently, use of the water took on more of the character of a public good in wet diggings.

Table 1 summarizes the water provisions in the miners' codes regarding right acquisition and the exporting of water for those fifteen local districts whose codes addressed at least one of these issues. Column (2) reports the county in which the district was located. Columns (3) and (4) report the year the code was written and a rough characterization of the type of mining that occurred within the district. In some cases it is possible to characterize a particular district as essentially only wet or dry, though in many cases they were combinations of the two. In Table 1, the difference between "wet/dry" and "dry/wet" is that the apparent predominant form of diggings is listed first, based on information contained in the codes. When "wet" or "dry" is listed in parentheses with a question mark, the description of the district in its code provides insufficient evidence to know for sure whether the district includes that type of diggings. In column

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[73] Heckendorn and Wilson(1856), p. 65-66(*Springfield*), p. 76(*Saw Mill Flat*), p. 78(*Brown's Flat*). U.S. Mining Laws and Regulations(1885), p. 291(*Little Humbug Creek*), p. 293(*Maine Little Humbug Creek*).

(5), "FP" means that acquisition of water rights was explicitly based upon the principle of first possession in some form.

Regarding the acquisition of water rights, the evidence strongly suggests that it was the dry diggings that tended to adopt the principle of first possession. Every district that was exclusively "dry" adopted first possession, and every district that was exclusively "wet" did not. Among the districts that were combinations of both wet and dry diggings, the code of only one that definitely emphasized wet diggings – Hungry Creek – contained a first possession principle. This overall pattern is consistent with the theoretical predictions that appropriative rights would tend to emerge when water use was consumptive, while riparian rights would tend to emerge when water use was non-consumptive and therefore, took on the nature of a public good. The diversion of water to dry diggings, typically located away from the water source, would have resulted in much less recharge of, and therefore been much more consumptive of, the water source than water use in wet diggings. Miners in wet diggings probably envisioned little benefit to be gained from specifying first possession water rights.[74]

Further evidence is provided by the information in Table 1 on the provisions in the miners' codes for exportation of water reported in column (5). Notice that exportation of water was explicitly prohibited only in districts with wet diggings. The implication is that miners in these districts were particularly concerned with retaining water within the district, where the diggings were situated on or near the source of water. This finding is consistent with the conclusions of numerous scholars who note that restrictions on out-of-basin transfers from surface water sources may support more efficient use of water in the presence of significant return flows.[75] It is also

[74] Pisani(1991) attributes the rise of prior appropriation in the mining camps to technolo-gical advance and changes in the industrial organization of mining. This explanation is incom-plete because it does not consider the heterogeneity in mining water use practices discussed here.

[75] See, for example, Meyers and Posner(1971), Epstein(1985), Gould(1989), Lueck(1995).

consistent with other studies such as Kanazawa (2003) that have concluded that 19th-century water institutions were crafted at least in part to maximize rents from water use within the watershed.[76]

VII. Conclusions

The principle of first possession is widely used as a method for the initial acquisition of property rights, yet its economic origins and efficiency properties continue to be a source of scholarly disagreement. Previous empirical research on first possession has focused by and large on court rulings, which are not always subject to clear-cut interpretation. This paper has adopted the strategy of examining the emergence of first possession from an initial institutional vacuum – the California Gold Rush – and has provided evidence that the adoption of first possession in the mining camps occurred selectively, depending upon the relative costs and benefits of defining individualized water rights. It was in the "dry diggings" that such first possession rights emerged, where water use was consumptive and the first halting moves were made to deal with the scarcity that resulted. This finding suggests that the creation of water rights institutions in California was importantly influenced by the need for security of diversion of water from its sources for use elsewhere. The observed pattern of adoption of first possession is thus consistent with an efficiency story, though not conclusive because of the possibility of rent dissipation. I have argued that contrary to the conclusions of some recent studies, the mining camps may well have been able to limit rent dissipation under certain conditions. However, the issue remains an open one.

It should be mentioned that the principle of first possession water rights later became the basis for much of water law in California and throughout most of the American West. What is not clear is whether mining camp law was responsible for the general adoption of first possession

[76] Kanazawa(2003).

by the western courts or indeed, precisely what its role in fact was. Much evidence suggests that in handing down rulings on mining disputes, the early California courts deferred to the principles embodied in the mining codes. Historians have, however, differed on precisely how powerful their influence on the courts was. Early writers such as Shinn (1948) and Paul (1947) argued that mining camp law was extremely important in shaping subsequent juristic thinking. More recently, McCurdy (1976) has played down its importance, emphasizing the departures of the early California courts from the mining codes. Future research will examine the process whereby the mining code provisions were subsequently integrated into the formal body of the common law of western water rights.

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Figure 1: Water Use in a Stylized River

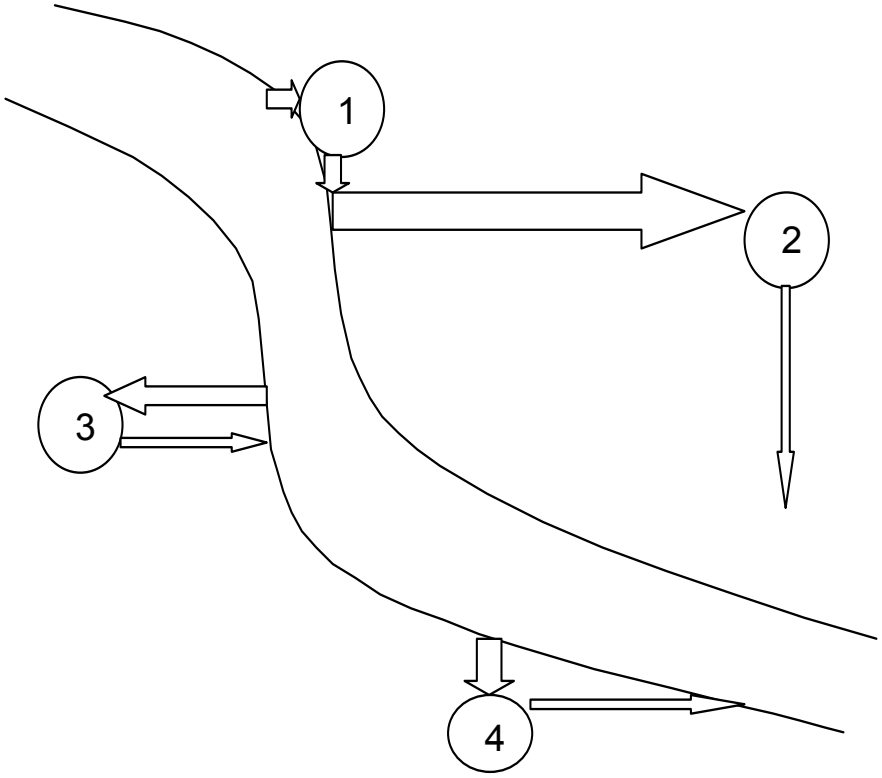

Table 1: Water Provisions in Miners' Codes

District	County	Year	Diggings	Right Acquisition	Exportations Permitted?
Con Cow	Butte	1851	Dry	FP	No Provision
Rich Gulch	Butte	1852	Dry	FP	No Provision
Springfield	Tuolumne	1852	Wet/Dry	None	No Provision
Upper Yuba	Yuba	1852	Wet	None	Monopolization Not Permitted
Jamestown	Tuolumne	1853	Dry	FP	No Provision
Weaverville	Trinity	1853	Dry	FP	No Provision
Saw Mill Flat	Tuolumne	1854	Wet/Dry	None	No Provision
Columbia	Tuolumne	1856	Wet/Dry	None	Not Allowed
Little Humbug Creek	Siskiyou	1856	Wet	None	Not Allowed
Maine Little Humbug Creek	Siskiyou	1856	Wet	None	Not Allowed
Hungry Creek	Siskiyou	1857	Wet/(Dry?)	FP	Not Allowed
Centerville & Helltown	Butte	1857	Wet/Dry	None	Not Allowed
Ohio Flat	Yuba	1858	Wet/Dry	None	No Provision
Brown's Flat	Tuolumne	185?	Wet/Dry	FP	No Provision
Lovelock	Butte	1864	Dry/(Wet?)	FP	No Provision

Definitions

Wet: Ravine, gulch, bank, bar, riverbed.
Dry: Hill, flat, ridge.