

Restoring the Past: Environmental History and Oysters at Point Reyes National Seashore

Timothy Babalis

SINCE ITS INCEPTION MORE THAN 40 YEARS AGO, environmental history has matured into a respected, if somewhat nebulous, discipline in academic circles but has so far received less attention within public land management agencies such as the National Park Service.¹ This is unfortunate, because environmental history can provide information of great practical interest to resource managers as well as offering a valuable perspective on management practices. The singular characteristic which distinguishes environmental history from other historical methodologies is the acknowledgement that history happens in places. Like geographers, whose field is closely related, environmental historians consider the spatial dimension of history to be just as important as its temporal. As a result, the physical environment is one of environmental history's principal subjects, along with the usual human actors, political events, and cultural expressions of traditional history. But environmental history also acknowledges the active capacity of the environment to influence and form human history, as well as being the place where that history unfolds. Environmental historians study the reciprocal relationship between human societies and the physical environments they inhabit. As one prominent environmental historian has written, "When I use the term 'environmental history,' I mean specifically the history of the consequences of human actions on the environment and the reciprocal consequences of an altered nature for human society."²

While most environmental historians agree on this basic formula, the field quickly diverges in a bewildering number of directions and becomes increasingly difficult to categorize or define. As some observers have remarked, this may be proof of the field's inherent vitality and its broad relevance to many different historical subjects.³ But the diversity also makes it necessary to begin any discussion of environmental history by indicating precisely how the term is to be used. In the following example, I propose how environmental history might be applied to the needs and purposes of the National Park Service (and possibly other public land management agencies). Owing to the pragmatic orientation of these needs, I emphasize an approach which begins with the analysis of physical conditions and change over time—the approach used by historical ecologists—and proceed from there to a broader

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analysis of historical context and cultural significance. This hierarchy of analysis was suggested by environmental historian Donald Worster in an article first published in 1990. “Before one can write environmental history,” Worster observed, “one must first understand nature itself—specifically, nature as it was organized and functioning in past time.” Only then does one move to other levels of historical analysis, focusing next on “productive technology as it interacts with the environment,” and finally on the “more intangible, purely mental type of encounter in which perceptions, ideologies, ethics, laws, and myths have become part of an individual’s or group’s dialogue with nature.”⁴

Worster’s idea has gotten little attention over the intervening decades (perhaps because it would require ecologists and historians to work together), but it remains a useful proposal and seems especially relevant to the needs of public resource managers, who must evaluate the significance of the natural and cultural resources in their care and implement appropriate management protocols. Traditional historical methodologies typically address only the cultural resources of a park; for example, the cannonballs and earthworks associated with a historic battle which took place on the site. But, construed with this emphasis on the land and its natural conditions, environmental history would have to consider the much broader context of the relationship between this hypothetical battle and the physical environment in which it was fought. Why did the battle occur here and not twenty miles further down the road? What advantages did the landscape provide one army versus the other? And how did the battle affect this landscape over time, perhaps guiding future development patterns that would influence how the natural environment would later be utilized and managed?

Although the American West has seen plenty of violence, there are relatively few traditional battlefields (compared with the East), and the emphasis among environmental historians here is therefore not the same. Western historians are more likely to be concerned with such issues as our relationship to the natural environment, Euroamerican relations with indigenous peoples and cultures, and above all resource development, which has been one of the defining themes of the West in American history.⁵ Historians have explored this theme through topical studies of mineral extraction, the development of agricultural and pastoral economies, and even urbanization. Environmental history in the West has grown up looking at questions of how the exploitation of natural resources and of the landscapes managed by indigenous cultures has altered the physical environment, and how this changing environment has in turn influenced the modern communities which have grown up within it. The American West has provided an unusually accessible field for studying these questions because of the comparatively recent arrival of Euroamerican settlers and the extensive documentation available to describe their impact. In California, the agricultural history of the Point Reyes Peninsula in western Marin County represents one of the better illustrations of this process, because of the relative continuity in land use practice since the earliest permanent occupation by Euroamerican settlers in the 1850s. This legacy has been preserved in some measure by the National Park Service, which acquired much of Point Reyes from descendents of the original agriculturalists and now maintains substantial portions of the rural landscape and its traditional economy through leases to dairy farmers and beef cattle ranchers. While this arrangement has had critics on every side, few dispute the fact that West

Marin's rural economy could not have survived into the present without the compromises associated with federal intervention.

Early in the 20th century, when Point Reyes was still a remote, working landscape of farmers and dairymen, Charley Johnson settled on Drakes Estero, where he began working for the Coast Oyster Company. Drakes Estero, or estuary, comprises about 2,300 acres of tidal water at the heart of the Point Reyes Peninsula. The main body of the Estero flows into Drakes Bay to the south, while its upper reach divides into five smaller bays, arranged like the fingers and thumb of an open hand. The longest of these—the middle finger of the hand—is Schooner Bay, which takes its name from the cargo vessels which used to load butter and hogs here for shipment to San Francisco. At the head of this bay, not far from where Schooner Creek drains into the Estero, the Coast Oyster Company established an oyster growing and packing operation in 1932, which it called Drakes Bay Oyster Company (Figure 1). Oysters were raised on wooden racks in the tidal waters, then harvested and packed in a small cannery at the shoreline facility. The oysters grown here were not native but a variety known as the Pacific oyster (*Crassostrea gigas*), which had been introduced to the United States from Japan a few years earlier by scientists from the U.S. Fisheries Service (predecessor of the National Marine Fisheries Service) and the California Division of Fish and Game (predecessor of the California Department of Fish and Game). These agencies provided technical assistance to private oystermen, encouraging them to grow the exotic oys-

Figure 1. Drakes Estero from the head of Schooner Bay. Drakes Bay Oyster Company is visible to the left at the bottom corner of the bay. Photo by author, 2010.



ters in several promising locations along the Pacific coast in the hope that they might be able to rejuvenate the now-moribund West Coast oyster industry.⁶ The experiment proved successful at Drakes Estero (as well as other locations), and Coast Oyster Company prospered. So, apparently, did Charley Johnson, who in 1957 bought out his employers and took over the Drakes Bay Oyster Company, which he renamed the Johnson Oyster Company.

Even as Johnson was negotiating to purchase Drakes Bay Oyster Company, the National Park Service and local environmentalists were discussing ways to protect Point Reyes under some form of park designation.⁷ On September 13, 1962, Point Reyes National Seashore was formally established by Public Law 87-657. Though its legislative boundaries included most of the peninsula (including all of Drakes Estero), the Park Service would not have enough money to purchase most of these lands for another eight years, when a subsequent appropriations bill was passed in 1970 (P.L. 91-223). Two years later, Charley Johnson sold the Johnson Oyster Company to the Park Service, but not wanting to abandon the business, he negotiated a reservation of use and occupancy (RUO) for the land on which his packing facilities stood, and a special use permit (SUP) for his growing and harvesting operation in the Estero. His reserved right was good for forty years—or until 2012—at which time it could theoretically be succeeded by a new lease, provided this did not conflict with existing Park Service regulations.⁸ However, this right was abrogated in 1976 by the Phillip Burton Wilderness Act (P.L. 94-567), which designated 25,370 acres at Point Reyes as formal wilderness area, and 8,003 acres as potential wilderness. The latter, which included Drakes Estero, would become full wilderness once existing non-conforming uses were removed. Among these were the Johnson family's commercial oyster operation. Since Congress enjoined the Park Service to “steadily continue to remove all obstacles to the eventual conversion of these lands and waters to wilderness status,” any extension of the Johnson family's lease would be legally impossible.⁹ (This was later confirmed by the Department of the Interior's Solicitor's Office.¹⁰)

After this sale, the Johnson family continued raising oysters on Drakes Estero for another three decades, with Charley Johnson eventually passing the family business on to his son Tom. Under the second generation, however, finances were poorly managed and the operation deteriorated. Inadequate maintenance eventually resulted in numerous code violations, forcing the state to issue a cease-and-desist order. Lacking the means to do anything else, in 2004 Tom Johnson finally threw in the towel with only eight years left on the family's lease. But rather than shut the farm down, Tom sold it to his neighbor, beef cattle rancher Kevin Lunny. This sale was welcomed by staff at the national seashore, who believed that Lunny would be able to do a better job running the oyster farm, given his stronger financial situation and solid reputation for responsible management. Lunny was informed of the limitations on the lease and was even provided a copy of the solicitor's legal opinion. He also was told of the state's cease-and-desist order and promised to improve facilities in order to resolve these violations. The sale was consummated in January 2005, and Kevin Lunny became the new proprietor of the oyster farm, which he rechristened the Drakes Bay Oyster Company after its original name from 1932.¹¹

Within a year of taking over the oyster farm, Lunny began to indicate that he wanted to continue the operation indefinitely, despite his earlier assurances to the Park Service that he

had accepted the legislatively mandated closure in 2012. For the most part, Lunny's interest in continuing the oyster operation was expressed informally through the local media and third-party supporters, rather than directly to the Park Service.¹² The survival of the Drakes Bay Oyster Company became a popular concern throughout West Marin for a variety of reasons. On the one hand, the business provided important economic benefits through the jobs it created—it employed 30 full-time laborers—and the tourism it attracted. Even more important, however, was its appeal on a philosophical and moral level to advocates of sustainable, organic food production, who represent a significant constituency in this predominantly rural community. They pointed out that oyster production requires no artificial feed, fertilizers, or chemicals, and little cultivation.¹³ It is also very efficient, with Drakes Bay Oyster Company producing approximately 500,000 pounds of oyster meat each year on only 150 acres of tidal water bottoms. Lunny estimates that the equivalent amount of grass-fed beef protein would require 30,000 acres of pasture to raise. He also points out that his oysters are sold locally, so they contribute relatively little to carbon output and energy consumption resulting from motorized transportation.¹⁴ Another important reason for community support was loyalty to the Lunny family, whose association with the Point Reyes Peninsula predates the park by several generations. This created a natural alliance between Lunny and other local ranchers, some of whom were already frustrated with the national seashore and feared that the Park Service was hostile to their interests. The failure to communicate directly probably contributed to this background of misunderstandings and the subsequent intensification of feelings.

The ensuing debate over whether Drakes Bay Oyster Company should be allowed to remain after 2012 largely ignored the legal dimension of this question and focused instead on the ecological impacts of oyster farming on Drakes Estero, even though the solicitor's office had already clearly established that the lease could not be extended without congressional intervention. National seashore staff inadvertently helped steer the controversy in this direction by insisting that the oyster farm was causing damage to the natural environment in order to justify the pending closure of the operation on more than just legal grounds. Both the national seashore and supporters of Drakes Bay Oyster Company turned to science to defend their respective opinions, often drawing contradictory conclusions from the same body of evidence. This precedent was established as early as May 2005, when a park-sponsored assessment of Drakes Estero was published by researchers from the University of California at Davis.¹⁵ Although many of the findings were ambiguous or inconclusive, supporters of the oyster farm interpreted the report to mean that oyster cultivation posed little or no adverse effect on the estero ecosystem, while national seashore staff interpreted the report to mean nearly the opposite. In an ill-conceived attempt to resolve this confusion, the park published an informational brochure on its public web site, providing basic facts about the natural environment of the estero as well as detailed assertions of the negative impacts of oyster farming.¹⁶ These ranged from disturbance of marine mammals to introduction of exotic species.

In response to these assertions as well as to alleged harassment (“disparate treatment”) from the park administration, Lunny requested an investigation of Point Reyes National Seashore by the Department of the Interior's Office of the Inspector General (OIG). At about

the same time, senior park staff met with members of the county board of supervisors who, after an acrimonious hearing, agreed to invite California Senator Diane Feinstein to mediate the dispute. The OIG report was completed one year later (in July 2008).¹⁷ While it dismissed the allegations of disparate treatment, it acknowledged that the scientific evidence which the park had presented was exaggerated and, in some instances, misrepresented. At the urging of Senator Feinstein, a further investigation was therefore commissioned by the National Research Council (NRC) of the National Academy of Sciences to study the scientific basis of the dispute. This report, which was published in 2009, brought together much of the known information about oyster mariculture and was generally supportive of the practice, but it also proved unable to resolve the fundamental question, from a scientific point of view, of whether oyster farming should be continued on Drakes Estero (an additional study is currently being conducted by the Marine Mammal Commission).¹⁸ In part, this failure was owing to the fact that science alone cannot resolve what is fundamentally a matter of policy and law. Understanding this, Senator Feinstein subsequently proposed legislative action that would allow Drakes Bay Oyster Company to negotiate a new lease after 2012. When critics challenged this action in Congress, a compromise was reached which gave the final decision to the secretary of the interior. At the time of this writing, the secretary has yet to make his decision.

Where does environmental history enter this story? In early 2006, scarcely a year after taking over the Johnson family lease, Kevin Lunny became involved with a local effort to restore the native Olympia oyster (*Ostrea lurida*) to San Francisco Bay, an unrelated estuarine system about fifty miles south of Drakes Estero. This effort was one among several that were being encouraged and financially supported by the National Oceanic and Atmospheric Administration (NOAA), as well as other restoration specialists from academic institutions and the aquaculture industry.¹⁹ Lunny eventually contributed about \$10,000 worth of resources and services to assist this project. In return, he became personally interested in the idea of native oyster restoration and volunteered to host similar experiments at his own lease on Drakes Estero. With the encouragement of marine biologists working on San Francisco Bay, Lunny began to wonder if his own operation, though he raised exotic Pacific oysters (*C. gigas* rather than *O. lurida*, which is native to the Pacific coast from California to British Columbia), might actually replicate conditions that many believed had existed on the estero prior to historic disturbances in the mid-19th century. The idea that native oysters had once been common in Drakes Estero was based largely on an unsubstantiated comment from an article published in the *Journal of Shellfish Research* ten years earlier.²⁰ Although Lunny may have understood that this restoration scenario was only conjectural, he wanted to test its validity by reintroducing large numbers of *O. lurida* into the estero to see if they would take. At the time, only trace quantities of this species were thought to be present here, and national seashore administrative staff refused Lunny's request, reasoning that this evidence was not sufficient to support his theory. (The Park Service may also have been unwilling to endorse any long-term experiments which would extend beyond 2012.²¹) Although Lunny respected the Park Service's decision, he continued to believe that his own mariculture operation was ecologically restorative and might even be consistent with the wilderness values which the Park Service was mandated to protect after 2012. This suggested a powerful argument in

favor of continuing the commercial oyster operation beyond its scheduled expiration, but for the time being, the question of native oysters remained little more than a side issue in the larger debate over preserving Drakes Bay Oyster Company.²²

When the National Research Council published its report in 2009 on the ecological impacts of oyster farming on Drakes Estero, it concluded that there was insufficient evidence to show that the effects were negative. This was hardly surprising. But the NRC also asserted that *O. lurida* had once represented a significant component of the estero ecosystem before being extirpated by historic overharvesting. While the NRC carefully avoided making any specific recommendation about whether the commercial oyster operation should be allowed to continue, it did conclude that the presence of exotic Pacific oysters (*C. gigas*) might replicate historic baseline conditions and provide the same or similar ecosystem services that native populations of Olympia oysters (*O. lurida*) might once have provided. In essence, the NRC supported Lunny's conjecture that modern oyster farming on the estero was equivalent to a restoration of natural processes (or that it could be made to be equivalent with appropriate management practices). This moved the issue of restoration to the center of the debate, and in doing so elevated the importance of history—specifically environmental history—as a means of validating claims about baseline reference conditions. The conclusions drawn from the historical account could have potentially significant ecological as well as economic implications.

While the NRC claimed that the Park Service failed to acknowledge the past existence and subsequent extirpation of native Olympia oysters from Drakes Estero, the authors of the report themselves possessed little evidence to support these assertions.²³ In response, therefore, the Park Service initiated its own investigation into the past relationship between native oysters and Drakes Estero based on what could be learned from historical and archaeological evidence.²⁴ The archaeology that principally interested investigators were middens—garbage dumps—that were deposited by the indigenous Coast Miwok, often over thousands of years. Since much of the material in these middens is associated with food consumption—seashells and animal bones—archaeologists are able to draw important conclusions about the diet of a particular community and, by inference, what was available in the local environment where they lived. Moving vertically through the midden strata, researchers can also infer how this diet varied over time as the habitat changed or as individual resources were overexploited.

Examples of this type of evidence could once be found in enormous shellmounds on San Francisco Bay, especially along the eastern shoreline between San Leandro and Richmond. Most of these middens were destroyed by modern development after World War II, but extensive archaeological investigations were made prior to these events during the first half of the 20th century. This research demonstrated that *O. lurida* comprised an important part of the Native American diet in the distant past, since shells of this species were common in the lowest strata of many of the shellmounds, which originate as early as 5700 BP (years before the present time).²⁵ Interestingly, these shells decline substantially toward the upper strata of the same shellmounds, largely disappearing by a point corresponding to approximately 2000 BP, which suggests that *O. lurida* became increasingly rare in San Francisco Bay during the recent two millennia. This could be explained either by overharvesting or by natural fluctuations in habitat conditions (changes in water temperature, relative salinity, or

bottom sedimentation, all of which strongly affect oyster viability).²⁶ At a very minimum, this evidence shows that *O. lurida* are native to San Francisco Bay—they are still found in small quantities today—though the archaeological data also suggest that significant changes in the relative abundance have occurred over time. (Further investigation might reveal important nuances in areal distribution as well.)

Investigation of archaeological sites on Drakes Estero provides similar information about the past composition of the resource base utilized by Native American inhabitants (in this case, the Coast Miwok). One of the more significant differences between San Francisco Bay and Drakes Estero revealed by this evidence is the near-absence of any oyster shells in the latter location. Seventeen documented midden sites are located on Drakes Estero. Those that have been dated are estimated to have originated at least 2,000 years ago, and possibly earlier. Oyster shells have been found at only three of these sites. The first (site number CA-MRN-296) lies nearly adjacent to the Drakes Bay Oyster Company's main facility, and numerous exotic oyster shells (primarily *C. gigas*) from the commercial operation have been deposited on top of the heavily disturbed midden. Surface reconnaissance suggests that these are the dominant constituent of the deposit, but extensive subsurface excavations have not been made to determine whether *O. lurida* shells may exist in lower strata. (Recent investigations, the results of which have not yet been published, have confirmed the existence of relatively small quantities of native *O. lurida* shells here but have also shown that none of these fragments are of recent origin, the youngest dating from earlier than 1100 BP.) At another site (CA-MRN-242), small quantities of *O. lurida* shells were positively identified by at least two archaeologists in previous surveys, but both investigators also noted that the midden had been disturbed by a small shack and associated agricultural activities dating from the early historic period, possibly compromising the reliability of the evidence. (More recent investigations have confirmed the identity of *O. lurida* shells sampled from this site but found that none date from later than 1400 BP.) Native oyster shells were also identified at the third site (CA-MRN-230), which appears undisturbed, but the quantity of shells recovered here was less than 1% of the total weight of the sampled midden contents. (No samples from this site have yet been dated.) The apparent paucity of oyster shells on Drakes Estero cannot be attributed simply to the dietary preference of the indigenous Coast Miwok, since other locations more conducive to oysters show abundant evidence of oysters shells in prehistoric middens (for example, on San Francisco Bay), but instead suggest that oysters never constituted a significant element of the local environment, at least not within the past 1,000 years.²⁷ This conclusion is supported by ethnographic sources, which appear to corroborate the archaeological evidence. In interviews conducted during the early 1930s by anthropologist Isabel Kelly, Coast Miwok elder Tom Smith related that shellfish were traditionally significant sources of food for his people but also noted that oysters were not among the species typically gathered because they were not locally abundant. According to Smith's testimony, mussels and various types of clams were far more common and consequently more important to the Coast Miwok.²⁸

The predominant species represented in the Drakes Estero middens are clams, especially the California butter clam (*Saxidomus nuttalli*) and Pacific gaper (*Tresus nuttalli*). This is to be expected, because both species are associated with soft-bottomed environments like

Drakes Estero, while *O. lurida* requires a hard substrate on which to grow. Drakes Estero was formed approximately 8,000 years ago when rising seas drowned a late Pleistocene river drainage. The floor and surrounding shoreline is now comprised almost entirely of soft sediment—sand and mud—which has been deposited over the subsequent millennia. The original river channel, which sits on bedrock, lies between 10 and 35 meters (nearly 100 feet) below the estero floor. Apart from the artificial racks that have been constructed to support the commercial oyster operation, there is very little hard substrate or exposed rock within Drakes Estero today. By contrast, San Francisco Bay possesses a much wider variety of habitats, including many areas where rocky outcrops can be found protruding into the water. Deep core samples taken by scientists at various locations around Drakes Estero have found no evidence of oysters within the depositional strata.²⁹

Historical records provide another source of information about the past composition of the estero ecosystem, though history has more to say about the forces that may have changed this environment than about the environment itself. Among the claims made by the NRC report was that historical overharvesting had extirpated a native population of *O. lurida* in Drakes Estero. While archaeological and physical evidence suggests that no such population existed, historical evidence corroborates this conclusion by its absence: there is no documented evidence that any significant harvest of native oysters ever took place in Drakes Estero during the early historic period. By 1851, only three years after the beginning of the mass immigration of gold miners to California, local oystermen in San Francisco were trying to satisfy the burgeoning demand for oysters, which far outstripped the supply found in the bay, by importing native oysters (i.e., *O. lurida*) from Shoalwater Bay (now Willapa Bay), Washington, more than 750 miles to the north, the implication being that no closer source of marketable oysters existed (Figure 2). This is confirmed in the memoirs of one of the largest and most successful of the early oystermen, John Stillwell Morgan, who surveyed the entire Pacific coast over the next decade and found no sizeable oyster populations closer to San Francisco than Washington to the north and Baja California to the south.³⁰ (The Baja population was a separate species, *Ostrea conchaphila*, which proved difficult to transport and could not be commercially developed for the San Francisco market.)

Morgan never mentions Drakes Estero, though he could hardly have missed the place in his survey, since it lies only 50 miles north of San Francisco. Nevertheless, the NRC investigators inferred that the Shoalwater Bay trade was initiated in response to the exhaustion of local resources. They based this assertion on a theoretical model which was developed to explain the extension of the East Coast oyster industry to increasingly distant sources as local supplies of native oysters were overharvested and depleted.

But in the East, this process was associated with a well-established industry and occurred over a period of nearly two centuries (from the beginning of the fishery in the mid-17th century to its initial collapse in the early 19th century).³¹ In the West, the hypothetical exhaustion of local oyster sources would have had to occur within the space of only three years (from 1849 to 1851). Moreover, there is no documented evidence that an organized industry for harvesting or cultivating oysters existed during this brief time. Morgan describes only informal foraging of a diminutive and unpalatable variety of *O. lurida* which was then found in San Francisco Bay. He judged the prospects for exploiting this resource to be

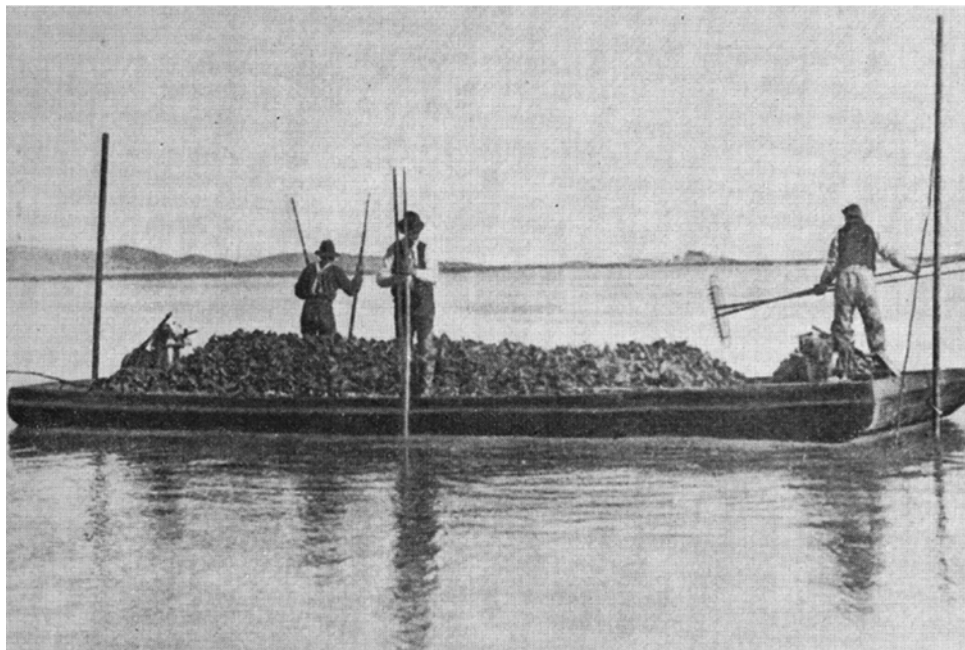


Figure 2. Harvesting oysters (probably *Crassostrea virginica* imported from the East) on San Francisco Bay in the late 19th century using long-handled tongs. Photo by Charles H. Townsend, 1893.

impractical and instead chose to import oysters from much further away at considerable cost. It would take nearly 40 years (until 1890) to exhaust the native Shoalwater Bay oyster beds which he and other California oystermen harvested for the San Francisco market. Had any significant population of oysters been concentrated in local waters, it seems improbable that they could have been overharvested in less than a tenth of that time. Even less likely is the possibility that a native population in Drakes Estero was also depleted during the same period but never documented in the historic records. After Morgan's initial survey from the 1850s, Drakes Estero would not be considered for oysters again until the early 1930s, when state and federal biologists visited the estero while searching for likely places to introduce the exotic Pacific oyster (*C. gigas*) for commercial cultivation. The investigators found no native oysters growing here at that time.³²

The conclusions that can be drawn from this analysis seem fairly obvious. Based on archaeological, ethnographic, and historical evidence, there is little reason to believe that any significant population of native oysters (*O. lurida*) ever existed in Drakes Estero. These findings are consistent with the physical character of the estero, which offers little natural habitat favorable to oysters. This is not the case with many other locations on the Pacific Coast, where habitat does exist, for example, within San Francisco Bay (or portions of it), in nearby Tomales Bay, and further north in places such as Willapa Bay (Shoalwater Bay), Washington. Estuarine systems along the Pacific Coast differ markedly in character from one another, with some providing oyster habitat and others not, usually because, like Drakes Estero, their shorelines and bottoms are too soft and support burrowing mollusks instead. Morgan,

for one, quickly learned how irregularly the native oyster was distributed up and down this coast. One of the more surprising problems of the NRC report is its tendency to overlook this natural variability and instead to generalize broadly about physical conditions throughout the entire Pacific region. The authors' claims about the past existence and subsequent extirpation of native oysters at Drakes Estero were based almost solely on such erroneous methods. For example, the report contains a photograph (Figure 3) of a native oyster reef in Nootka Sound, British Columbia (Canada), with an explanation that this scene represents what Drakes Estero might have looked like prior to historic disturbances.³³ But Nootka Sound lies more than a thousand miles to the north, and its environment is very different from that of Drakes Estero, as even a casual glance reveals.



One of the first tasks of environmental history, as this example from Point Reyes suggests, is to provide an accurate description and understanding of past conditions within a given place. On this basic level of analysis, environmental history adopts the methodology and objectives of historical ecology, an allied discipline which has developed primarily within the natural sciences, especially among restoration ecologists.³⁴ The value of historical ecology has already been demonstrated through many examples, which in most cases have been implemented in response to the practical needs of resource managers.³⁵ Historical ecology provides a valuable perspective on several important questions relating to Drakes Estero; for example, what is the environmental impact of commercial oyster farming? And should restoration of natural processes within the estero include the introduction of oysters (of any species)? The first question is much larger than the scope of the present discussion, encom-

Figure 3. Photograph of Nootka Sound, British Columbia, used by the NRC (Peterson et al. 2009) to indicate “conditions that may have prevailed at Drakes Estero prior to the mid-1800s.” Reproduced by permission of Michael Beck of The Nature Conservancy.



passing a number of other concerns such as the disturbance of marine mammals by oyster farm operators, introduction of exotic invasive species, and modification of natural sedimentation regimes, among others. But to the extent that the present mariculture operation claims to replicate the natural ecosystem services of a native oyster population, historical ecology can provide useful answers. The conclusions drawn from this analysis suggest that the commercial cultivation of oysters represents a significant modification of the estero ecology from conditions that likely prevailed prior to the historic period. This would be true even if the oysters being cultivated were the native *O. lurida*, as proprietor Kevin Lunny has tentatively proposed.

The second question can be addressed even more directly by historical ecology. The absence of any convincing evidence that a significant population of native oysters ever existed in Drakes Estero argues against their present or future introduction for restoration purposes. The National Park Service is required by policy to manage for natural conditions in proposed or designated wilderness areas, and to restore those conditions (if at all practical) when they have been disrupted by historic human activities. While historical ecology has little to say as to how policies are interpreted or applied, it does provide the information needed by resource managers to establish reference conditions for which these policies obligate them to manage. If Point Reyes National Seashore is to restore Drakes Estero to natural conditions, then it will have to remove the oysters that have been unnaturally introduced (barring any legislative decision which overrides park policy).

Historical ecology, however, represents only one facet of environmental history. Following the methodology suggested by Donald Worster, a more complete account would have to address at least two additional levels of analysis. After looking simply at the physical conditions of past times, the next level would address how the land (and water) have been used for productive purposes during successive historic periods. For example, during the late 19th and early 20th centuries, Drakes Estero was a working environment which was exploited for profit. Though the estero was not used at that time for maricultural purposes, it was employed as a transportation artery for goods raised on adjacent farms, providing access to San Francisco markets for schooners that carried valuable commodities like butter, cheese, and hogs. During the latter 20th century, Point Reyes began to be valued for its recreational opportunities, and local relationships to the land changed accordingly. People began coming to Point Reyes to enjoy its natural amenities, especially its apparent isolation from urban life. From these values came the impetus to establish the national seashore in 1962. In 1964, the Wilderness Act was passed, and 12 years later a substantial portion of Point Reyes National Seashore was designated a wilderness area (or potential wilderness) under the terms of this legislation. This represented a new stage in the evolution of recreational use of the environment and would produce, as events later proved, a conflict with prior forms of productive engagement. A few decades later, another type of relationship would emerge with the sustainable food production movement. This was closely allied with earlier economic relationships but included the novel, and ultimately very powerful, addition of the moral obligation to support ecologically responsible growing practices. Despite the shared ecological theme, this fundamentally agrarian ethic and the values represented by the Wilderness Act would come to loggerheads, with Drakes Estero at the center of the conflict.

A third and final level of analysis provided by environmental history would address how cultural values have affected and determined productive uses over time. In the present example, both wilderness and sustainable food production represent value systems as much as they do productive activities. These values emerged in other geographical contexts but now strongly influence land management decisions and practices at Point Reyes. At the same time, local contingencies here affect and occasionally modify these values; for example, our understanding of wilderness may not be the same as a result of the present controversy. Culture is related to the landscapes on which it is expressed, though the connection is not always direct or immediately obvious, and environmental history must address this more ephemeral dimension of human activity, because culture has significant implications for the ways that individual humans and human societies choose to interact with the land on which they live. In turn, the land can also shape human culture and contribute to the forms culture ultimately takes.

We do not yet have an adequate account of the controversy over oyster farming at Point Reyes, because so far all of these historical dimensions have yet to be fully addressed. The National Research Council's report, and the Park Service's response to it, have addressed only the dimension of historical ecology, the question of past physical conditions. But the history of productive human relationships with the land and of the cultural values that have supported these relationships remains to be written. A more complete historical account that incorporates these additional perspectives might contribute to a better understanding of the present controversy and help guide both the park and local community toward a resolution of their differences. While this will take far more than just history, any genuine effort toward a lasting solution must depend upon accurate historical knowledge. A well-conceived environmental history of Drakes Estero would give an account of the various systems of value which have recently come into conflict—each represents a particular understanding of what the land means and has grown out of a historical association with the land itself. By articulating these understandings and their respective foundations in the past, history can demonstrate the legitimacy of opposing points of view and provide a basis for mutual respect. This does not necessarily lead to agreement, but it at least identifies what each disputant believes to be fundamentally at stake. From this improved basis of understanding, a more productive discussion may result.

Point Reyes provides only one example of how and why environmental history should be important to the National Park Service. But the questions and the controversy that have ensued over Drakes Estero are not unique. This model of environmental history offers practical benefits for other parks as well. The significance of restoration as a land management policy throughout the Park Service requires resource managers to utilize historical ecology, the most basic level of environmental history, as a means of understanding past environmental conditions. But environmental history can also contribute to an understanding of landscape change by describing the successive modes of productive relationship that have existed over time between humans and their environment. This level of analysis also identifies the various communities of people with historic relationships to the land and describes the character of those relationships. And finally, environmental history can identify the cultural values that are associated with particular modes of engagement. In doing so, it describes not

only how these values have expressed themselves through their impacts on the land, but also how the land has subsequently impressed itself on the people who made the impacts.

Endnotes

1. For representative discussions of the field, see Donald Worster et al., “Environmental History: A Roundtable,” *Journal of American History* 76 (1990): 1087–1147; William Cronon, ed., *Uncommon Ground: Rethinking the Human Place in Nature* (New York: W.W. Norton & Co., 1995); and Thomas R. Cox, “A Tale of Two Journals: Fifty Years of *Environmental History*—and Its Predecessors,” *Environmental History* 13, no. 1 (2008): 9–40.
2. Richard White, “Trashing the Trails,” in *Trails to a New Western History*, ed. Patricia Nelson Limerick, Clyde A. Milner, II, and Charles E. Rankin (Lawrence: University Press of Kansas, 1991).
3. Douglas R. Weiner, “A Death-Defying Attempt to Articulate a Coherent Definition of Environmental History,” *Environmental History* 10, no. 3 (2005): 404–420.
4. Donald Worster, “Transformations of the Earth,” reprinted in *The Wealth of Nature: Environmental History and the Ecological Imagination* (Oxford, UK: Oxford University Press, 1993).
5. For example, Patricia Nelson Limerick, *The Legacy of Conquest: The Unbroken Past of the American West* (New York: W.W. Norton, 1987); Earl Pomeroy, *The Pacific Slope: A History of California, Oregon, Washington, Idaho, Utah, and Nevada* (New York: Knopf, 1965), and many others.
6. Paul Bonnot, “The California Oyster Industry,” *California Fish and Game* 21, no. 1 (1935): 65–80; and Elinore M. Barrett, *The California Oyster Industry*, Fish Bulletin no. 123 (Sacramento, CA: The Resources Agency of California, 1963).
7. Paul Sadin, *Managing a Land in Motion: An Administrative History of Point Reyes National Seashore* (Point Reyes Station, CA: National Park Service, Point Reyes National Seashore, 2007).
8. Neal Desai, *Drakes Estero: Legal Analysis on Wilderness Designation* (Washington, DC: National Parks Conservation Association, n.d.).
9. House Committee on Interior and Insular Affairs, *Report to Accompany H.R. 8002*, 94th Cong., 2d sess., 1976, H. Rept. 94-1680.
10. Memorandum Opinion, Field Solicitor, San Francisco Field Office, to Superintendent, Point Reyes National Seashore, February 26, 2004.
11. Much of this information is based on the *Investigative Report* of the Office of the Inspector General (2008). See note 17 below.
12. Correspondence of Kevin Lunny and Nancy Lunny to Dr. Susan Roberts, Executive Director, Ocean Studies Board, National Academy of Sciences, February 11, 2009; and Peter Jamison, “Park Service to Close Oyster Farm,” *Point Reyes Light*, February 23, 2006.
13. “Save the Drakes Bay Oyster Farm,” Alliance for Local Sustainable Agriculture, accessed February 24, 2010, <http://www.alsamarin.org/dboc.htm>.
14. “What Drakes Bay Oyster Means to Our Community,” Drakes Bay Family Farms,

- accessed February 26, 2010, <http://drakesbayfamilyfarms.com/community.htm>.
15. D.L. Elliott-Fisk, S. Allen, A. Harbin, J. Wechsler, D. Schirokauer, and B. Becker, *Assessment of Oyster Farming in Drakes Estero, Point Reyes National Seashore: Final Report* (Point Reyes Station, CA: Point Reyes National Seashore, May 2005).
 16. Point Reyes National Seashore, "Drakes Estero: A Sheltered Wilderness Estuary," February 9, 2007; Much of the same information relating to the alleged impacts of the oyster company also appeared in the local newspaper: Sarah Allen, Jules Evens, and John Kelly, "An Irreplaceable Coastal Wilderness," *Point Reyes Light*, April 26, 2007.
 17. US Department of the Interior, *Investigative Report: Point Reyes National Seashore* (Washington, DC: US Department of the Interior, Office of Inspector General, 2008).
 18. Charles H. Peterson et al., *Shellfish Mariculture in Drakes Estero, Point Reyes National Seashore, California* (Washington, DC: National Academies Press, 2009).
 19. NOAA Restoration Center, "San Francisco Bay Oyster Restoration," February 23, 2004; Bud Abbot, "Indigenous Oyster Habitat Project," accessed May 21, 2009, <http://www.marinrodandgunclub.com/OysterHabitat02.htm>.
 20. Patrick Baker, "Review of Ecology and Fishery of the Olympia Oyster, *Ostrea lurida*, with Annotated Bibliography," *Journal of Shellfish Research* 14, no. 2 (1995): 501–518. Baker included Drakes Estero as one of the historic locations of *O. lurida* populations on the Pacific coast based on the comment made by Charley Johnson that this species was "common but not abundant" here. Johnson's observation comes more than sixty years after the introduction of oyster mariculture on the estero and is not corroborated by any other source.
 21. Sam Spiewak, "Largest Oyster Restoration in California: Lunny's Shells Clean S.F. Bay," *Point Reyes Light*, August 12, 2006; Carl Hall, "San Francisco Bay Shell Game for Oysters," *San Francisco Chronicle*, August 14, 2006; and Peter Jamison, "Native Oyster Research in Drakes Estero Will Not Go Forward," *Point Reyes Light*, May 25, 2006.
 22. Most discussion focused on whether the commercial operation had an adverse impact on marine mammals, which regularly use the estero sand bars for hauling out and pupping.
 23. The report states that the "NPS does not acknowledge the changing ecological baseline of Drakes Estero, in which native Olympia oysters probably played an important role in structuring the estuary's ecosystem for millennia until human exploitation eliminated them in the period from the mid 1800s to the early 1900s" (Peterson et al., *Shellfish Mariculture*, 3).
 24. Mark Rudo, "Little Archaeological Evidence of the Olympia Oyster (*Ostrea lurida*) at Drakes Estero, Point Reyes National Seashore, California," unpublished paper, National Park Service, Pacific West Regional Office, Oakland, CA, September 4, 2009; and Timothy Babalis, "Critical Review: A Historical Perspective on the National Research Council's Report 'Shellfish Mariculture in Drakes Estero,'" unpublished paper, National Park Service, Pacific West Regional Office, Oakland, CA, August 11, 2009.
 25. For example, at the West Berkeley shellmound (CA-ALA-307), *O. lurida* shell comprised 44.1% of the total quantity by weight of shells found in the lowest strata. The same species declined to approximately 10% in the uppermost strata. Robert E.

- Greengo, "Molluscan Species in California Shell Middens," *Reports of the University of California Archaeological Survey* 13 (December 10, 1951). On the dating of the San Francisco shellmounds, see B. Lynn Ingram, "Differences in Radiocarbon Age Between Shell and Charcoal from a Holocene Shellmound in Northern California," *Quaternary Research* 49 (1998): 102–110; and Kent Lightfoot, "Cultural Construction of Coastal Landscapes: A Middle Holocene Perspective from San Francisco Bay," in *Archaeology of the California Coast during the Middle Holocene*, ed. Jon Erlandson and Michael Glassow (Berkeley: University of California, Institute of Archaeology, 1997).
26. On the possibility of overharvesting, see Jack Broughton, "Widening Diet Breadth, Declining Foraging Efficiency, and Prehistoric Harvest Pressure: Ichthyofaunal Evidence from the Emeryville Shellmound, California," *Antiquity* 71 (1997): 845–862. On changes in relative salinity and water temperature, see Jack Meyer, "An Overview of Geoarcheological Research Issues," in *Archaeological Research Issues for the Point Reyes National Seashore—Golden Gate National Recreation Area*, ed. Suzanne Stewart and Adrian Praetzellis (Rohnert Park, CA: Sonoma State University, 2003), I:6; and B. Lynn Ingram and Donald J. DePaolo, "A 4300 Year Strontium Isotope Record of Estuarine Paleosalinity in San Francisco Bay, California," *Earth and Planetary Science Letters* 119 (1993): 103–119. Since the shellmounds show a corresponding increase in species associated with soft-bottomed environments, increased sedimentation of the bay habitat is a likely explanation (Greengo, "Molluscan Species").
27. This overview is taken from Mark Rudo, "Little Archaeological Evidence."
28. Mary E.T. Collier and Sylvia Barker Thalman, eds., *Interviews with Tom Smith and Maria Copa: Isabel Kelly's Ethnographic Notes on the Coast Miwok Indians of Marin and Southern Sonoma Counties, California* (San Rafael, CA: Miwok Archaeological Preserve of Marin, 1991).
29. Roberto J. Anima, *Pollution Studies of Drakes Estero and Abbotts Lagoon, Point Reyes National Seashore, California, USA* (Point Reyes Station, CA: National Park Service, Point Reyes National Seashore, 1990).
30. David R. Sessions, "John Stillwell Morgan Dictation and Biographical Sketch," typescript, 1888, Bancroft Library, Berkeley, CA.
31. Michael X. Kirby, "Fishing Down the Coast: Historical Expansion and Collapse of Oyster Fisheries Along Continental Margins," *PNAS* 101, no. 35 (2004): 13096–13099.
32. Paul Bonnot, *California Oyster Industry*.
33. Peterson et al., *Shellfish Mariculture*, 20.
34. Thomas W. Swetnam, Craig D. Allen, and Julio L. Betancourt, "Applied Historical Ecology: Using the Past to Manage for the Future," *Ecological Applications* 9, no. 4 (1999): 1189–1206; Dave Egan and Evelyn A. Howell, eds., *The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems* (Washington, DC: Island Press, 2005).
35. Some examples include: Eric D. Stein et al., *Historical Ecology and Landscape Change of the San Gabriel River and Floodplain*, Southern California Coastal Water Research Project (SCCWRP) Technical Report no. 499, February 2007; Robin Grossinger et al., *South Santa Clara Valley Historical Ecology Study* (Oakland, CA: San Francisco

Estuary Institute, 2008); and Brian D. Collins, David R. Montgomery, and Amir J. Sheikh, "Reconstructing the Historical Riverine Landscape of the Puget Lowland," in *Restoration of Puget Sound Rivers*, ed. David R. Montgomery et al. (Seattle: University of Washington Press, 2003). The National Park Service study of Drakes Estero was not cartographically focused, as these examples are, but its principal purpose was also to provide knowledge about past physical conditions.

Timothy Babalis, Fort Vancouver National Historic Site, 612 East Reserve Street, Vancouver, Washington 98661; timothy_babalis@nps.gov