

The National Park Service (NPS) provides the following comments regarding the report published by the National Academies under contract with NPS: *Shellfish Mariculture in Drakes Estero, Point Reyes National Seashore, California*. Advance Copy Provided May 1, 2009. Contract No. C8074080026. NPS identifies errors of fact and logic, inappropriate references to law and regulation, and misuse of style. NPS requests that the Ocean Studies Board take the necessary steps to remedy these flaws in the report.

MATTERS OF FACT AND SCIENTIFIC INFERENCE

Past presence of Olympia oyster (*Ostrea lurida*). A strongly featured and widely reported finding of the report is that NPS has ignored the past presence and ecological role of native oysters, specifically *Ostrea lurida*, in Drakes Estero. For example, “Perhaps the ecologically most significant modifications of Drakes Estero follow from the local human over-exploitation and functional extinction of the native Olympia oyster population” (p.16). NPS can find in the literature cited in the report no specific documentation for the claim that Olympia oysters were present in any meaningful numbers within historic and recent prehistoric time in Drakes Estero and so finds the claim entirely speculative. Archaeological studies of middens in the vicinity of the estero suggest that oysters were not much utilized by the inhabitants at the time, which may indicate that, at most, oysters were rare and local.

The report’s later discussion about the potential for the non-native oyster to become established in Drakes Estero (p. 39) suggests that “there appears to be limited natural hard substrate within the estero, present mostly at Bull Point, but it is possible that there is enough to support a small population” and that “given the high flushing rate in the mariculture lease areas in Drakes Estero, it is uncertain whether larvae would be retained in the estero in sufficient numbers to sustain a viable adult population.” Later on the same page, the report states “the combination of factors such as shellfish culture locations within the Estero, hydrography of the system (short residence time), and the lack of suitable natural habitat for settlement (as opposed to habitat associated with oyster culture) might mitigate against the successful establishment of the Pacific oysters in Drakes Estero.” This discussion leads the reader to conclude that the estero probably does not have a large area of habitat suitable for oysters of any species, which conclusion seems to directly contradict the unsubstantiated statement that “the Olympia oyster, *Ostrea lurida*, was a former constituent of Drakes Estero of some appreciable but unquantifiable abundance” (p 16).

Ecological substitution by Pacific oyster (*Crassostrea gigas*). The unsubstantiated inference that the native oyster once existed—perhaps abundantly—in Drakes Estero and then was extirpated by human action leads to an also unsubstantiated speculation that “the oyster re-introduction and enhancement through mariculture (albeit not the native oyster) represents a form of restoration of historic functionality of the estero” (p.18). NPS likewise finds to be speculative the reference to the historic baseline in the following statement in the report: “Oysters provide many ecosystem services, so the return of oysters to Drakes Estero through commercial mariculture could enhance the ecosystem by restoring some historic baseline functions” (p. 2). Similarly, NPS finds no substantive documentation in the report to support the report’s following conclusion regarding past abundance and subsequent extirpation: “...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” (p. 2). NPS finds that the report fails to establish what was the past ecological role of the native oyster in Drakes Estero, and then compounds this error by suggesting that NPS fails to acknowledge an ecological substitution function of the contemporary commercial oyster operation for a past function that available evidence suggests did not exist.

Impacts of mariculture activity on harbor seals. On page 32, the report says the following: “Becker et al. (2009) examined how oyster mariculture activities are related to both interannual changes in counts of seals at haul-out subsites closest to mariculture operations and also records of disturbance to hauled-out seals by culturists, using annual oyster production levels as a proxy for mariculture activity.” In the following paragraph, the report goes on to say: “However, the relationship between the 2008 projected harvest and 2008 seal counts deviates from the pattern of the 11 previous years sufficiently as to call into question whether mariculture intensity would still be a statistically significant contributor to explaining patterns of seal use of upper-estero haul-outs had the analyses included the full 12 years of data (from 1997-2008).” Becker subsequently did re-compute the analysis to include 2008 data and found no significant change in the correlation, information that can be provided to the Ocean Studies Board.

In briefly mentioning the distribution of seals in the estero, the report leaves the impression that seal choice of subsite may be influenced by disturbance but perhaps not by any other factors (e.g., report page 32). The report does not discuss whether seals use the various haul out locations of the estero differently, such as segregation by sex or by whether or not a female is nursing a pup. Although the report very usefully explores the influence of a motor boat on a possible decision by a seal of whether or not to haul out at a specific spot, it does not discuss above-water or below-water habitat factors that might influence a seal’s decision on where to haul out on any given low tide cycle. Any sex, age, or reproductive condition differences among seals that might influence use differences among the eight subsites monitored in the estero would warrant focused analyses that explore, among other questions, whether different groups of seals react differently to different types of disturbance when occupying different sites. In this context, the report usefully could add, on report page 31, a citation of the text in the 1988 M.S. thesis by Allen that reported that, at the time of Allen’s study, female seals tended during the breeding season to use the middle and upper sandbars more than Limantour Spit in the lower estero. Becker et al. 2009 also noted “Subsites in the middle-lower estero, which are generally closer or attached to the mainland, have historically suffered higher human disturbance rates when compared to the isolated island sandbars of the upper estero.” Similarly, although the report’s discussion of the Becker paper mentions that the subsite focus Becker used involved those subsites closest to the mariculture operations, the discussion does not explore what other factors, if any, Becker might also have used in constructing the parameters for his analysis. Moreover, although year to year variance in the current data may be large, over time analyses of this type may help park managers discover whether or not there are long term changes in reproductive success that eventually could lead to the population level consequences on which the report appropriately focuses.

Sedimentation and nutrient flow. The report’s discussion of inflow of sediments and nutrients into Drakes Estero and their ecological fates once in the estero is based on a well presented depiction of processes that occur generically but, as the report observes repeatedly, there is a relative absence of scientific information about the estero, itself, from which to assess how well the generic concepts apply to the specifics of the estero. For example, the report’s section on Historical Baselines and Human Modifications contains the quote (page 18) “it seems unlikely that surface nutrient inputs to Drakes Estero are of concern.” Section I.B. of the report (pages 21-22) contains statements that “there are few and limited studies of sedimentation and nutrient inputs in Drakes Estero,” that “sedimentation appeared to increase over the past 150 years,” that “it appeared that the estero was unlikely to experience excess nutrient loading from the watershed,” and that “there is low risk of eutrophication.” Section I.C. (page 22) repeats this last statement “hydrography of Drakes Estero, dominated by strong tidal flux (Anima, 1991; John Largier, unpublished data), appears to be sufficient to produce low risk of eutrophication in most of Drakes Estero.” In section I.D., the report (page 24) combines an abundance of process information with an extreme deficit of site specific information to conclude “although no specific study relating oysters to nutrient dynamics, sediment deposition, and water quality has been conducted in

Drakes Estero, it is reasonable to assume that processes identified here apply under similar conditions (i.e., oyster production levels, and hydrological flushing and water residence times).”

Note that, in the absence of having data for comparing the estero’s current water quality, nutrient inflow, sediment inflow, and effect of tidal dynamics to the natural condition that would have existed in the absence of human dominance over the Drakes Estero watershed, it is not possible to assess whether the activities of the nonnative oysters are contributing to restoring the ecological processes of the estero to a more natural condition or are introducing processes that are moving the estero away from the natural condition. The uncertainty created by this inability to compare existing conditions to the former natural conditions is a key question that must be resolved when making resource management decisions for a natural zone or wilderness area of a unit of the National Park System. Because of the report’s repeated reference to beneficial effects of oysters for various biogeochemical functions, the tone of the report seems to lean toward assuming that the role of the nonnative species is more one of moving the condition of the estero toward the natural condition, rather than the reverse. The reader is left with this inference even though there is no presentation of evidence that either the current condition in fact is different from the natural condition or that the presumed role of the nonnative species is in fact returning the estero from an altered condition to the natural condition rather than moving the estero from a natural condition to an altered condition. In reality, the presence and functioning of an exotic species in a natural area preserve generally create a situation that moves the current condition away from the natural condition and so are not beneficial to the purpose of the preserve.

Spatial relationship of ranching to Drakes Estero. On page 18, the report states: “Cattle ranching takes place on all of the lands abutting the estero, probably modifying the composition and appearance of terrestrial vegetation....” This is not entirely correct. NPS responded in a February 27, 2009 electronic message to Susan Roberts regarding materials provided by the Ocean Studies Board which NPS was asked to review. The NPS response included the statement: “Page 4. Drakes Estero is not surrounded by cattle lands; the section east of Limantour Estero is full designated wilderness and the section between Limantour and Drakes Estero is undeveloped backcountry with one ranch. The ranch areas within the Drakes Estero watershed are to the southwest, west, and north of Drakes Estero. Limantour Estero is a California marine reserve and designated wilderness.”).

Error in Figure 6. Fig. 6 (p.15) appears to have an incorrect statement of units for the Y-axis. The Y-axis is reported to be “pounds in hundreds,” which can be understood to mean that the numbers given in the scale are to be multiplied by 100 to obtain the actual value of the shucked weight at any point in time. If this understanding is correct, then the number “800” on the scale translates into “80,000” pounds actual weight, which is not consistent with the number presented on page 15 of the text that shows that the high value for the harvest was “769,590 lb in 1995.”

LEGAL AND REGULATORY MISINTERPRETATIONS

Seal disturbance. The report discusses harbor seal behavioral responses to disturbance on report pages 31-32 in a way that focuses mostly on the effect of such responses on fitness of individual seals or changes in the size of the seal population. The report does not address the statutory and regulatory environment within which NPS operates – specifically, while the report offers a web address for National Marine Fisheries Service guidance regarding seal and sea lion protective measures, the report does not inform the reader of the legal definition of harassment (a form of the statutorily prohibited take) that NPS must enforce:

Level B Harassment means any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding,

or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

Nor does the report provide the details found in the National Marine Fisheries Service guidance:

Pinnipeds (seals and sea lions) are also protected under the MMPA and should not be disturbed by humans or by dogs accompanying them. Pinnipeds on land (haul-out areas) are especially sensitive to human and vessel disturbance. Intentional or negligent actions by persons, their pets, or the vessels/aircraft that they are operating in the vicinity of pinniped haul-outs that cause the pinnipeds to flee can be MMPA violations.

1. People/vessels should not intentionally approach pinnipeds hauled-out on land any closer than 100 yards.

2. The following reactions by the pinnipeds may indicate disturbance and should be avoided:

- a number of animals raise their heads;
- a few animals hurriedly enter the water;
- a number of animals move closer to the water;
- increased vocalizations by sea lions.

The head alert is a disruption of the behavioral pattern of sleeping, resting, or nursing and is specifically recognized in the cited guidance: “a number of animals raise their heads.” The report usefully discusses the various factors that could affect seal behavior and observes that no data have been collected for many of these factors. However, the report does not address the situation that whenever mariculturist or any other human activity causes unauthorized Level B harassment, the human activity is causing inappropriate disturbance to the seals and constitutes a resource condition to which NPS legally must respond.

Reservation of Use and Occupancy (RUO). The report uses the term “RUO” many times. In some cases, the mention of the term is associated with citing the Department of the Interior Solicitor’s opinion or the Department’s Office of the Inspector General report statements that the RUO is a legal instrument that is not subject to extension and that the NPS has no authority to extend the RUO and also has no legal discretion to issue a new authorizing instrument regarding the mariculture operation. The Committee report also discusses the relationship of the State permit to the RUO and mentions that the state lease is subject to the RUO and that the RUO expires in 2012. In its Appendix A, the Committee report states, in part, “... the National Park Service does not renew or extend expired RUOs.” In other cases, however, the Committee report discusses the concept of extending the RUO or issuing a new RUO. The Committee report’s intensive discussions of the RUO are outside the professional expertise of the Committee and outside the Committee’s charge. NPS finds these discussions contrary to NPS procedures identified in Director’s Orders 25 and 53 and inappropriate for the report (see attachment for excerpts from these Director’s Orders).

Wilderness. There are 80 occurrences in the report other than references to the document “A Sheltered Wilderness” that include the word “wilderness.” Of these, 18 deal with the economic or existence value of wilderness, ten occur in citations to titles in the economic literature, six examine mariculture as a non-conforming use in wilderness, and one discusses how mariculture “... may affect negatively the wilderness experience and the aesthetic value ...” (page 48). There seems to be no analysis of what information the scientific literature can shed on understanding, with respect to the four statutory qualities of wilderness, either the current condition of those qualities in Drakes Estero or, with the one exception relating to visitor experience, observed or possible effects of the mariculture activity on those four qualities.

The 2008 document by Landres, et al. (see attachment for citation) identifies and provides information that the report usefully could analyze with respect to the four statutory qualities of wilderness:

- **Untrammeled** — The Wilderness Act states that wilderness is “an area where the earth and its community of life are untrammeled by man,” and “generally appears to have been affected primarily by the forces of nature.” In short, wilderness is essentially unhindered and free from modern human control or manipulation. This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness.
- **Natural** — The Wilderness Act states that wilderness is “protected and managed so as to preserve its natural conditions.” In short, wilderness ecological systems are substantially free from the effects of modern civilization. This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.
- **Undeveloped** — The Wilderness Act states that wilderness is “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation,” “where man himself is a visitor who does not remain” and “with the imprint of man’s work substantially unnoticeable.” This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people’s ability to occupy or modify the environment.
- **Solitude or a primitive and unconfined type of recreation** — The Wilderness Act states that wilderness has “outstanding opportunities for solitude or a primitive and unconfined type of recreation.” This quality is about the opportunity for people to experience wilderness; it is not directly about visitor experiences per se. This quality is degraded by settings that reduce these opportunities, such as visitor encounters, signs of modern civilization, recreation facilities, and management restrictions on visitor behavior.

Interpretive center. Text regarding the use of the oyster farm as an interpretive facility (page 60) is inaccurate and inappropriate. The intent of this overall section of the report is to review how NPS science affected NPS decision making regarding the future of the RUO. The NPS acknowledges that the past owner had an interest in this endeavor, but a center was never approved through a public process. It seems inappropriate for the Committee to be promoting an interpretive center without reviewing the entire context of the park and its 1980 General Management Plan.

STYLE

Title. The title provided for this report, *Shellfish Mariculture in Drakes Estero, Point Reyes National Seashore, California*, misrepresents the contracted purpose of this first report, which purpose is to address five specific questions:

- What is the body of scientific studies on the impact of the oyster farm on Drakes Estero, and what have they shown?
- What effects can be directly demonstrated by research conducted in Drakes Estero itself?
- What effects can reasonably be inferred from research conducted in similar ecosystems?
- What conclusions can be drawn from the body of scientific studies, and how do they compare with what the NPS presented to the public? Have these conclusions affected NPS decision making?
- What are the most important subjects for future research to better understand the ecological consequences of anthropogenic influences on the Estero, so as to inform NPS decision making?

A title should be selected that more accurately represents the contractual charge to assess the scientific basis for NPS presentations, to assess what *effects can be demonstrated by or inferred from research*, and to assess how NPS may have represented the body of scientific studies.

Misuse of terminology. The report uses the terms “naturalize” and “naturalization” several times (e.g., page 39) with respect to the establishment of non-native species, such as Pacific oyster. The National Park Service Management Policies 2006 offers two types of status for a species – native or exotic (see section 4.4.1.3). While the Committee’s report provides a workable definition of nonnative species (section VI.A), this definition is not sufficiently comprehensive for addressing a natural zone within a unit of the National Park System. Under the NPS definition of exotic species, the concept of “naturalized” is not an appropriate consideration for a natural area preserve and especially is not appropriate for a unit of the National Park System.

The report likewise uses the word “beneficial” and similar value choice terms in a variety of places. For example, on page 2: “Overall, the report gave an interpretation of the science that exaggerated the negative and overlooked potentially beneficial effects of the oyster culture operation.” Aside from suggesting a species substitution that is not appropriate to a natural area preserve, the report almost throughout ignores the broader national park context of Drakes Estero, in which anthropogenically-induced changes are not only not beneficial, they are undesirable by law and by policy.

Use of the word “enhance” (p. 28) in the phrase “enhance diversity and abundance” likely would be accepted by proponents of a mariculture value system and would be disagreed to by proponents of a natural condition or wilderness setting value system, since the fundamental purpose of natural areas and wilderness is to have no human-caused alteration of natural conditions. Such a construction as this example is inappropriate in a science assessment, the purpose of which is to focus on what actually is, not on what might be a preferred (value-driven) outcome.

Department of government. The report uses both “Department of Interior” and “Department of the Interior” in a number of locations. Only the latter is correct.

NPS Management Policies. The report appropriately quotes a sentence from *NPS Management Policies 2006* but does not include Management Policies 2006 in the “References” section. The report does include a reference to “2006c Management Plan,” which appears to be a garbled attempt to cite Management Policies.

Citation errors. The text box on report pages 34-35 cites the following references that do not occur in the References section: Allen 1980, Allen et al. 1989, Fancher 1979, Grigg et al. 2002, Hester et al. 2004, Risebrough 1978, and Stewart and Yochem 1984. Because these citations do not appear in the References section, the reader will assume that the Committee did not actually review these reports. On the other hand, the References section contains at least two citations that do not appear to be identified in the text of the report: Nunes, P. 2002; Shecter, M. et al. 1998.

GENERAL CONCLUSIONS.

Citation errors, other inaccuracies, and internal contradictions should be corrected before the final document is published. Because internally contradictory statements or concepts introduced in one area of the report tend to reappear in other areas of the report, care will need to be taken to rectify the contradictions in all places where they occur in the report, not only in the specific places mentioned in these comments.

The report (page 58) takes the NPS documents the Committee reviewed to task for viewing the mariculture operation, together with ranching, to have degraded and altered the ecological function of the estero over the past several decades. At the same time, the report offers an unsubstantiated picture of a claimed beneficial effect of the mariculture operation for restoring to the estero ecological functions that the report assumed prevailed before the assumed overharvesting of the native oysters. The report views NPS documents as not acknowledging the historical baselines of the natural ecosystem while at the same time the report itself assumes from the process literature certain baseline conditions for the estero without offering site specific evidence that shows what those baseline conditions actually were. In the context of a specific natural area preserve and in an absence of site specific historical and modern data for that site, the NPS approach – that today’s conditions as likely as not represent past conditions – is a more appropriate and conservative starting point for management decision-making than the report’s approach – that today’s conditions represent a degradation from past conditions even though the past conditions can not be accurately described because data describing those conditions apparently do not exist. The report’s statement that an introduced, nonnative species is an acceptable surrogate for a presumed extirpated native species ignores NPS policies and specific park legislation that require maximizing natural processes and preservation of natural conditions through restoration of native species and natural processes and avoidance of introduction of nonnative species.

Overall, the report inadequately considers the appropriate application of its scientific findings to informing decisions about the natural resource meaning for a landscape that is included in the natural zone of a unit of the National Park System and that also is designated as potential wilderness. The report strays from its scientific foundation because it is unable to ground the valuable general scientific concepts the Committee synthesized from the broader scientific process literature to known site-specific conditions reported for Drakes Estero. Such straying is contrary to the caution the report itself expresses on page 64: “The ultimate decision to permit or prohibit a particular activity ... necessarily requires value judgments and tradeoffs that can be informed, but not resolved, by science.”

ATTACHMENT:

NPS Director's Orders

DIRECTOR'S ORDER #25: LAND PROTECTION

Effective Date: January 19, 2001

11.3 Reservation of Use and Occupancy. In certain instances, the NPS will allow a reservation of use and occupancy of property improved with a residence. This reservation will depend on the urgency of the park unit's need. A reservation for residential use only may be for a term of years (up to 25) or a life estate, on an area not exceeding 3 acres in size. Terms and conditions are standardized on a Service-wide basis. A reservation of use and occupancy will reduce the purchase cost to the government and may serve as a means to lessen the impact on the landowner. The Service will deduct 1 percent of the appraised value for each year reserved for a residential use reservation as defined above. For a life estate, the 1 percent of the appraised value per year deduction will be based on actuarial tables. The owner is requested to waive certain relocation benefits, such as replacement housing benefits, if a reservation is accepted.

Reservations of use and occupancy are a deeded interest in the real estate and can not be extended beyond the expiration date. Park managers should exercise great care in planning for the prompt removal of structures at the end of the reservation period. *Special Use Permits are not to be used to allow continued occupancy at the end of the expiration date except in hardship instances.* (See also Director's Order #53: Special Park Uses).

DIRECTOR'S ORDER #53: SPECIAL PARK USES

Effective Date: April 4, 2000

15. EXPIRED RESERVATIONS OF USE AND OCCUPANCY

Generally, the NPS, when it purchases properties, will remove any encumbering structures and restore the sites for park purposes. Superintendents may not extend use and occupancy reservations. However, they may either: (1) issue a lease (see Director's Order #38: Property Leasing), or (2) issue a SUP for temporary residency in an NPS structure at market rental rate, provided a determination has been made that:

- It is in the best interest of the park and the United States; and
- The use will not result in impairment or derogation of resources, values, and purposes for which the park was established; and
- One or more of the following criteria are met:
 - Specific legislative authority exists to allow temporary residency;
 - The NPS is unable to remove the structure for a significant period of time;
 - The structure has or may have historic significance that would be endangered if it were vacated;
 - Extreme environmental conditions temporarily prevent the occupant from vacating the structure; or
 - Termination of residency would create an undue hardship on the occupant and the structure has served as the occupant's primary residence.

The permittee will reimburse the park for all costs associated with issuing and managing the permit, and will be charged a fee for the use of the facility, resource, or property based upon comparable prices in the local market (fair market value). The SUP does not grant any interest in the land. (*See Reference Manual 53, Appendix 14.*)

Wilderness Character Monitoring Reference

Landres, Peter; Barns, Chris; Dennis, John G.; Devine, Tim; Geissler, Paul; McCasland, Curtis S.; Merigliano, Linda; Seastrand, Justin; Swain, Ralph. 2008. **Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System** Gen. Tech. Rep. RMRS-GTR-212. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.
<http://www.wilderness.net/WC/documents/Keeping%20it%20Wild%20Interagency%20Strategy%20GTR-212.pdf>