



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
(CIVIL WORKS)
108 ARMY PENTAGON
WASHINGTON DC 20310-0108



October 22, 2003

Thomas R. Kitsos
Executive Director
U.S. Commission on Ocean Policy
1120 20th Street NW
Washington DC 20036

Dear Tom:

This is to request that the attached paper entitled, "Oceans Policy: Incentive-Based Economics" be posted on the general public comment section of the Commission's web site and made available to the Commissioners.

This document has been produced under the authority of the Deputy Assistant Secretary of the Army for Policy and Legislation, Office of the Assistant Secretary of the Army for Civil Works, and comprises official policy guidance of the Department of the Army.

We appreciate your consideration of this request. The Commission or the public may direct questions or inquiries on this document to me, as follows:

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Sincerely,

s/George S. Dunlop

George S. Dunlop
Deputy Assistant Secretary

Enclosure

OCEANS POLICY
INCENTIVE-BASED ECONOMICS

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INTRODUCTION AND EXECUTIVE SUMMARY

The Civil Works secretariat of the Department of the Army has significant responsibilities for water resources policy and works in collaboration with other departments and agencies to inform and develop policies and practices for the benefit of the American people and the Nation's water resources.

All Americans have a vested interest in restoring, improving and sustaining the quality and condition of ocean resources. The foundation for achieving these objectives is best built upon sound stewardship principles that have guided water resources policies for other water resources in the United States. As in these other waters, successful oceans policies will comprise an intricate web of biological sciences, social sciences, and environmental stewardship. An important element in devising the particular policies and practices for good oceans stewardship is to understand and appreciate how and why ocean resources have become so tragically stressed and compromised. The science of economics plays a vital role in this understanding because it identifies and evaluates the full range of positive as well as perverse incentives that drive human action. Oceans are a virtual "poster child" for the conglomeration of perverse incentives so adeptly described by the term phrase "Tragedy of the Commons."

It is essential that the study of the science of economics is recognized in consideration of oceans policy. Economics will contribute significantly to understanding how the Tragedy of the Commons came to afflict oceans, will help guide policy makers in ways to remove perverse incentives and other unintended consequences of past policies and will suggest practical approaches to providing positive incentives for oceans stewardship.

This document is a summary introduction to the role of incentive-based economics as it is relevant to oceans policies. It was prepared by Air Force Lieutenant Sean Ianacone, serving as an assistant in the Office of the Assistant Secretary of the Army for Civil Works. The report begins with a broad approach towards incentive-based economics, then focuses more intensely with each section on the role that the science of economics can have on informing good stewardship and sustainable practices that affect the oceans and the environment.

The first section introduces the underlying fundamentals of environmental economics as building blocks of efficient natural resource management. Section Two summarizes a history of the role property rights and positive incentives have had in sustainable development practices in the U.S. generally. Section Three outlines current applications of property rights and incentives on several environmental markets. Section Four describes the implications that property rights and incentives can have for oceans policy and ocean resources.

This report is provided to encourage and inform consideration of incentive-based economics in developing a stewardship-based approach to America's national oceans policies as is required in the Congressional Charter for the U.S. Commissions on Ocean Policy.

SECTION 1: SUMMARY OF INCENTIVE-BASED NATURAL RESOURCE ECONOMICS TERMINOLOGY

Source:

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AEC 445G: Introduction to Resource and Environmental Economics

Economic good: 1) it is desired for consumption, 2) scarce and 3) rival in consumption.

Market good: exerts ownership.

Ownership (property rights): 1) be completely specified, 2) transferable, 3) exclusive and 4) enforceable.

Common good: rival, non-exclusive and uncontrolled. Problem is specification and or enforcement of property rights.

Environmental economics: The study of why environmental problems exist and how they can be corrected.

Natural resource economics: The study of humanity's attempt to balance the preservation and use of the environment through time (sustainability), as well as the study of the allocation of scarce resources to competing ends through time. NR economics is concerned with renewable resources, a flow/cycle management approach.

The Role of Property Rights: 1) evolve from the institutions in which they are based, 2) an essential precondition to trade and 3) lead to markets that yield efficient resource allocation.

Externalities: A cost that does not enter into the conventional arithmetic that determines how we use our resources; arise from poorly specified property rights; an action or activity that results in changes in satisfaction that are not exclusively ours.

Fixing Externalities: 1) Decentralized policies: allow individuals involved to work out the solution. 2) Command and control: policies implemented and enforced by

government that are based on social assumptions. 3) Incentive-based control: taxes or marketable permits/quotas (established property rights) that create incentives to reduce negative impacts.

Renewable resources: A resource with a natural replenishment rate that augments its own stock (or biomass) at a non-negligible rate. Although replenish-able, excess extraction can result in extinction; renewable resource then becomes an exhaustible resource. Storage of resource can smooth out cyclical imbalances of supply and demand.

Concept of Maximum Sustained Yield (MSY): MSY is a steady state that occurs unless biological conditions change. Harvests occur during the rate of greatest natural growth, resulting in opportunity for optimal revenues; hence, concept has dominated biological resource management for decades. Resource management at MSY results in resource management policies that are very disruptive to the resource and the resource extraction industry.

The Renewable Resource as Production Process: The process is based on the perspective of a firm harvesting a natural resource. The Focus is to maximize the operating profits of the harvesting industry. The production process attempts to achieve an optimal path of resource extraction that provides a smooth flow of income to the extraction industry, while managing and harvesting the resource in a biologically non-disruptive and sustainable manner.

- 1) Harvesting industry is regulated; regulatory authority has perfect knowledge of the biology of the resource and the harvesting technologies.

- 2) The regulatory authority has costless control of catch and or harvesting efforts.

- 3) The regulatory authority is charged with managing the resource, setting the rate of harvest, and determining the number of eligible firms such that firm profits are maximized across all of the firm's of the industry (i.e. industry profits are maximized).

SECTION 2: PROPERTY RIGHTS AS THE BASIS FOR INCENTIVES IN THE HISTORY OF ECONOMICS

“Government has no other end but the preservation of property” (Locke [1690] 1991, 329). John Locke’s contention was that property and property rights existed well before government, and were actually the result of property and the need to protect the owners’ rights. Locke believed strongly that there is common land that we are all entitled to, and the specifics and exceptions are elaborated in section 27 of *The Second Treatise* ([1690] 1991, 287):

“Though the earth, and all inferior Creatures be common to all Men, yet every Man has a Property in his own Person. This no body has any Right to but himself. The Labour of His Body, and the Work of his Hands, we may say, are properly his. Whatsoever then, he removes out of the State that Nature Hath Provided, and left it in, he hath mixed his Labour with, and joined to it something that is his own, and thereby makes it his Property. It being by him removed from the common state Nature placed it in, hath by his labour something annexed to it, that excludes the Common right of other men.”

Locke clarifies the commonality in respect to the rest of humankind, “For this labour being the unquestionable Property of the Labourer, no Man but he can have a right to what that is once joyned to, at least where there is enough, and as good left in common for others” (Locke [1690] 1991, 288).

Jan Narveson responds to those who feel giving ownership of previously common property will not make ‘others’ worse off, rather ownership of the land gives the owner incentive to: “transform what is less useful into what is more so, thus increasing

resources...And secondly, what he 'deprives' others of isn't a 'good'. It is merely a chunk of the material world, awaiting someone who will turn it to good use" (Narveson 1991, 13).

Adam Smith's work was based on the value of economics as a science, rather than a philosophy as was Locke's contention. Smith's, *The Wealth of Nations*, was a benchmark for economics and would prove useful centuries later. Smith agreed with Locke on several points, such as ownership creates incentives for all owners. "A more striking Lockean sentiment appears in Smith's moral championship of the rights of employees and employers to produce mutually agreed upon labor contracts. To hinder a man from employing his labor howsoever he desires without injury to his neighbor" (West 2001, 6). Smith states, circa 1776, this is an injury against the "most sacred property. The property which every man has in his own labour, as it is the original foundation of all other property, so it is the most sacred and inviolable" (Smith [1776] 1976a, I. xc, 12, 138).

Adam Smith believed that the role of government was to protect what others had worked to make valuable, which they had done so based on the incentive that their labors would be protected. "It is only under the shelter of the civil magistrate that the owner of that valuable property, which is acquired by the labour of many years...can sleep a single night in security" (Smith [1776] 1976a, 710). Smith furthered this by citing the repercussions associated with the lack of policy enforcement:

"When the law does not enforce the performance of contracts, it puts all borrowers nearly upon the same footing with bankrupts or people of doubtful credit in better regulated countries. The uncertainty of recovering his money makes the lender exact the same usurious interest which is usually required from bankrupts."
(Smith [1776] 1976a, 112)

Frank Knight agreed with Adam Smith and John Locke regarding the value of incentives. Frank Knight argued against the imposition of a government corrective tax to offset external costs associated with a regionally superior highway. Knight felt strongly that the incentive factor had been overlooked, and consequently called for a user toll to be required for travel on the highway. The toll would be equivalent to the proposed tax; however the user possessed the discretion as to whether or not they paid the toll. The incentive was a more efficient journey on a smoother road with less congestion, which through payment the user owned the right to utilize.

Edwin Chadwick attested that ineffective regulation could lead to “conditions of competition which create inevitable waste and insecurity of property, which raise prices and check improvement, which engender fraud and violence, and subject the public to irresponsible monopolies of the worst sort” (quoted in Crain and Ekelund 1976, 152).

Michael De Alessi references political motives; “Government employees with authority to manage government owned resources...do not bear the economic consequences of their decisions. Accordingly, they have incentive to take into account only in so far as they generate political pressures, bribes, or personal utility” (De Alessi).

Vernon Smith recently was awarded the 2002 Nobel Prize in Economics, “for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms.” (Reason 2002) Smith feels strongly about the use of property rights in the history of humankind and the current need for additional implementation.

Chapter 9 of Terry Anderson and Randy Simmons’ book, *The Political Economy of Customs and Culture*, is partially comprised of Vernon Smith’s popular essay, “Humankind in Prehistory: Economy, Ecology, and Institutions.” Smith states that similarities among late-Pleistocene and aboriginal peoples suggests the application of property rights as far back as

2.5 million years ago, during which time humankind was making stone tools. Vernon Smith emphasizes John Locke's contention that property rights existed well before the formation of government or state: "They bought political stability in stateless societies, and a property right environment that facilitated specialization and ordinary exchange" (V. Smith 1975). Smith explains that the respective property rights ranged from "private goods such as land, fishing sites and livestock, and cemetery plots, but also public goods such as crests, names, dances, rituals and trade routes" (V. Smith 1975). Vernon Smith makes a valuable point as to how property rights existed without a form of government. "How is it possible that property rights and exchange could exist prior to the advent of the state and of central enforcement? The answer is to be found in reciprocity, mutual dependence, and state-like forms of control achieved through broadened kinship ties and outright purchase of political stability" (V. Smith 1975). The native tribes depended heavily, if not solely, on the environment for the sustainability of tribal life. "Thus tribal property rights, though not always private and transferable, encouraged resource stewardship" (V. Smith 1975).

Vernon Smith and experimental economics asks and defines "how the performance of a market is influenced by its rules" (V. Smith 2002). Experimental economics focuses heavily on "the importance of institutions-the rules and regulation of markets and systems of exchange" (Reason 2002). Smith replied to this statement during a 2002 interview, "a lot of market conventions and property rights come from norms that emerge through people's interactions. Often the state comes along later and codifies them" (V. Smith 2002). Property rights protect the producers' and consumers' interests. "Of course, not every transaction is local or face-to-face. That's why you need more formal markets and property rights...Property Rights and markets extend the gains from trade to strangers ensuring payment or delivery" (V. Smith 2002)

Experimental economics focuses on policy as well: (1) to “come up with markets mechanisms that can be applied where they’ve never been used before,” (V. Smith 2002) (2) to test them in a controlled environment, (3) to make the appropriate changes, (4) to “bring in the people who will actually be using the system...they put the design elements in, and then we run experiments with them. When they’re comfortable...we go out in the world with it” (V. Smith 2002).

SECTION 3: PROPERTY RIGHTS AND INCENTIVE IMPLICATIONS ON ENVIRONMENTAL MARKETS

Virginia Rockfish (Striped Bass) Individual Transferable Share Program (ITSP):
www.mrc.state.va.us/fr252.htm

- The purpose of the Rockfish ITSP is to provide for the continued sustained yield from the recovered striped bass stocks in Virginia and to limit growth of the number of commercial participants in this fishery.
- It is unlawful to engage in commercial rockfish harvesting without obtaining the necessary Commercial Fisherman's Registration License, appropriate gear license, and the special permit to harvest rockfish.
- Size limits must be observed, and all commercially harvested rockfish must be identified with a tamper evident sealed tag that has been approved and issued by the appropriate authority in the jurisdiction of capture.
- ITSP allows any permitted fisherman to transfer his quota shares (tags) to any commercially registered fisherman on a permanent or temporary basis, provided the transfer is documented on the proper form, notarized, and approved by the Commissioner.
- This regulation is not intended to create any property right in anyone, and the Commission reserves the right to change this regulation at any time it deems it necessary because of biological conditions.

Alabama Artificial Reef Program:
www.dcnr.state.al.us/mr/artificial_reefs.htm

- The program is a cooperative agreement between the U.S. Army Corps of Engineers and the Marine Resources Division of the Alabama Department of Conservation and Natural Resources.
- The Marine Resources Division's goal is to provide long-lived, locationally stable marine habitat that will support a complex reef community.
- The permit process inspects and reviews the proposed artificial reef materials and location. The program also enforces the deployment guidelines and float plan filing procedures.
- Approximately 1260 square miles of offshore waters are included in the artificial reef general permit areas of Alabama, the largest program of its kind in the U.S.

Energy Star:

www.energystar.gov

- Energy Star is a government-backed voluntary program helping businesses and individuals protect the environment through superior energy efficiency.
- In 1992, the EPA introduced program to identify and promote energy efficient products to reduce greenhouse gas emissions.
- In 2002, Americans, with the help of Energy Star, saved enough energy to power 10 million homes and avoid greenhouse gas emissions from 12 million cars - all while saving \$6 billion.

WasteWise:

www.epa.gov/wastewise

- WasteWise is a free, voluntary, EPA program through which organizations eliminate costly municipal solid waste, benefiting their bottom line and the environment.
- Waste reduction makes good business sense because it can save your organization money through reduced purchasing and waste disposal costs.
- In 2002, WasteWise has grown to more than 1,100 corporations, government agencies, universities, hospitals, and other organizations.

Acid Rain Program:

<http://www.epa.gov/airmarkets/arp/>

- The 1990 Clean Air Act places a limit (a cap) on the amount of sulfur dioxide (SO₂) that can be emitted annually.
- Sources of air pollution are allocated allowances, or "rights to pollute", based on their historic level of SO₂ emissions
- Allowances are a valuable and tradable commodity.
- Market-based program offers financial incentive to find the most cost-effective solution to reducing sulfur dioxide emissions; attainment of SO₂ limits has been achieved at lower costs than predicted.
- Current cost of eliminating SO₂ emissions averages about \$150 - \$200/ton. Environmental damage produced by one ton of SO₂ is estimated to be near \$4000.

Oregon Water Trust (OWT):

<http://www.owt.org/>

- OWT is a private, non-profit group that uses a voluntary, market based approach, to enhance stream flows by acquiring consumptive water rights to restore flow in rivers and streams of Oregon.
- OWT acquires water rights from property holders using a variety of incentives to convert their consumptive water rights to in-stream water rights with early priority dates, and uses existing laws and water markets to accomplish voluntary transfers.
- OWT's board of directors is a diverse group of: agricultural, environmental, legal and tribal perspectives, equally represented, which allows to openly and effectively address the concerns of rural Oregonians regarding their livelihoods and the conservation of aquatic resources.

Environmental Quality Incentives Program (EQIP):

<http://www.nrcs.usda.gov/programs/eqip/>

- Reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill), EQIP provides a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality.
- EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.
- These contracts provide incentive payments and cost-shares to implement conservation practices.

Container Recycling Institute (CRI):

www.container-recycling.org

- Founded in 1991, CRI is a nonprofit organization that studies and promotes policies and practices that shift the social and environmental costs associated with manufacturing, recycling, and disposal of container and packaging waste from government and taxpayers to producers and consumers.
- CRI recently reported that financial incentives are necessary to reach 80% recovery of beverage containers.
- Container deposit programs far outperform curbside recycling programs, as well as offset the costs of the recycling programs.

Pinelands Development Credit Purchase Program:

<http://www.state.nj.us/pinelands/pdcrule.htm>

- Pinelands Development Credit Purchase Program is a transferable development rights program, which provides landowners in the Preservation Area District, Special Agricultural Production Area or the Agricultural Production Area with an additional beneficial use of their land without the risk of damaging the essential character of the Pinelands.
- An amendment to its regulations (the Comprehensive Management Plan) outlines the criteria to be utilized to implement a special program to purchase Pinelands Development Credits (PDCs).

Colorado Environmental Leadership Program (CELP):

<http://www.cdph.state.co.us/el/elp/elphom.asp>

- CELP is a statewide environmental recognition and reward program administered by the Colorado Department of Public Health and Environment's, Sustainability Program.
- CELP offers benefits and incentives to members that voluntarily go beyond compliance with state and federal regulations and are committed to continual environmental improvement.
- In exchange for the environmental commitment and superior environmental performance of leadership businesses and organizations, CELP provides benefits and incentives such as recognition, regulatory flexibility, public-private partnerships, networking and technical assistance to its environmental leaders.

The Delaware Coastal Zone Act Program (DCZAP):

<http://www.dnrec.state.de.us/development/cza/czbckgrd.htm>

- DCZAP is a coalition of industry, government, and community representatives jointly designed as a regulatory-based incentive program to protect the coastal zone from ecologically harmful development while maintaining the competitive position of the state's industries.
- Delaware regulations required establishing a technical advisory committee, comprised of interested members of the public and government representatives, to develop a list of goals for the coastal zone and a set of prioritized environmental indicators related to those goals.
- The Coastal Zone Amendment permitting process is the first of its kind, relying on the use of publicly developed environmental indicators to assess the condition of the environment and provide a basis for guiding beneficial investments and permitting decisions [Tulou, 1999].

SECTION 4: OCEANS POLICY ISSUES AND THE VALUE OF PROPERTY RIGHTS AND INCENTIVES

The current status on the ocean fisheries is over depletion; current fish stocks are recorded at 10% of their historic fish populations. This is the result of what Garrett Hardin termed “The Tragedy of the Commons,” “in which lack of ownership of jointly exploited fish stocks often leads to depletion of the stocks” (Leal 2000). This outcome is twofold: (1) the fishers do not own the fish stocks; therefore if they leave fish for reproduction, later harvests of those fish are susceptible to catch by other fishers (Leal 2000). (2) A fisher can gain all the benefits from catching as many fish as possible at only a fraction of the costs, because the costs are split among all the fishers (Leal 2000). The National Marine Fisheries Service reports that half of all U.S. fisheries, and a quarter of the major fish stocks around the globe, are in jeopardy of an abrupt, severe decline from which they may never recover (NCPA).

Government regulations on the fishing seasons and equipment have encouraged competition among fishers. This results in fishers investing capital in more and more technologically advanced equipment in order to compensate for the regulations and win the race to the fish stocks. Since “government regulators do not own the resource, they typically ignore the economic factors that a private resource owner must consider in order to sustain maximum profits year after year” (Leal 2000). Another problem associated with regulations is that fishermen have an economic interest in avoiding and evading them, both legally and illegally (NCPA).

To offset the economic harm fisherman experience due to the implications of regulations, the government provides subsidies to the fishers. These subsidies only make matters worse by contributing to the overcapitalization and overfishing practices.

Therefore, the fishers need an incentive to harvest efficiently in order to sustain the fish stocks and the fishing industry. Michael De Alessi states in Chapter 13 of Julian Morris’ novel, *Sustainable Development: Promoting Progress or Perpetuating Poverty*, decentralizing

control over the resources, effectively makes the users the owners of the resources.

“Resource users now have a proprietary interest in the resources they rely upon for their livelihood, so they have incentives to ensure that their resource increases in value over time, whilst bringing in a steady annual return” (De Alessi 2002). One alternative to creating incentives is through the use of applying property rights to the fish stocks or ocean areas that include the fish stocks. The property rights can be applied with the following tools: individual transferable quotas (ITQs), territorial use of rights in fisheries (TURFs) and marine protected areas (MPAs).

ITQs are a fairly new innovation to the fishing industries. ITQs are a specific percentage of the total allowable catch each season. The ITQs are spread evenly among the number of fishers. The exceptionality of the quotas is that they are transferable; the fishers can buy, sell, lease or trade the quotas to other fishers or new fishers entering the market. “An ITQ system is attractive for two main reasons. First, each quota holder faces the certainty that his or her share of the total allowable catch will not be taken by someone else. Second, because trading is allowed, quotas tend to end up in the hands of the most efficient fishers. Thus ITQs help reduce the cost of catching fish and enhance the quality of the fish delivered to markets” (Leal 2000).

ITQs correspond to the actual fish stocks; however, there are property rights that pertain to ownership of the ocean surface or floor. These property rights are the TURFs. TURFs can be applied to the shellfish and groundfish populations due to their non-migratory status. The value of these ownership rights has been illustrated through the comparison of the private oyster beds in Louisiana versus the public oyster beds in Mississippi from 1945 to 1970. The private bed fishers in Louisiana earned 297 percent more per year than the public bed fishers in Mississippi (Agnello and Donnelley 1975). This proves how property rights can improve resource allocation.

While ITQs and TURFs apply to the fishing industry, MPAs apply to the preservation of the fish and their habitats. The MPAs are specific marine areas that are designated for protection. These areas can be highly sensitive unique marine habitats or treasured natural sites. The MPAs are a public interest. Even though they prohibit fishing or development in the areas, they can provide a natural, completely undisturbed habitat that increases the productivity in surrounding waters.

Aquaculture also plays a very valuable role in the fisheries. “Aquaculture has the potential for increasing fish production while reducing pressure on wild stocks, but it also poses problems of pollution and escapement” (Leal 2000). Atlantic salmon farms and ranches face several problems ranging from breeding of the wild salmon with the small genetically pooled ranch salmon to conflicting interactions between commercial fishers and farm/ranch fishers. The key to minimizing these issues and the success of aquaculture will be the defining of secure property rights.

The National Center for Policy Analysis provides valuable proof of the capabilities of property rights. “Since the early 1980s, 17 countries have introduced property rights for managing their fisheries and, in each case, the condition of the fish stocks and the profits of their fishers have improved significantly” (NCPA). Property rights put into place in New Zealand caused the blue fin tuna to rebound from near collapse to complete recovery within a decade (NCPA). In Greenland and Iceland a million salmon a year are saved due to the implementation of property rights (NCPA).

When taking into account the ecosystem approach with the oceans one must pay close attention to the coasts and inland regions. The coastal wetlands are facing ever-increasing danger with the onslaught of coastal development and urban sprawl. Point source and non-point source pollution are occurring in ever-increasing amounts. “More than 60 percent of our coastal river and bays are moderately to severely degraded by nutrient runoff”

(PEW 2003). In addition, 11 million gallons of oil run off enters our waters, the equivalent of the Exxon Valdez every eight months (PEW 2003). Ultimately, this pollution will find its way to the oceans where it will degrade the protective reefs and barriers, fish stocks, and aquatic life.

There needs to be a “call to arms” of the public and private industries to aid in minimizing these harmful effects. The public should be aware of these factors and that change must be imminent in order to reverse the damage and restore the oceans. Stewardship is the key to the success of the oceans health. The public should be involved as much as possible in the planning and implementing of restorative programs. Through simple education and awareness the public will have an incentive to minimize the harmful effects through the use of everyday life implementations.

Habitat alteration is a harsh consequence as a result of fishing nets and other gear dragging along the ocean floor. Typical trawl fisheries in northern California and New England trawl the same section of sea bottom more than once per year on average (Friedlander et al., 1999; Auster et al., 1996). While, Bottom-dwelling invertebrates can take up to five years or more to recover from one pass of a net (Peterson and Estes, 2001).

“The Failure to conceive of the oceans as the largest component of our public domain, to be managed holistically for the greater public good in perpetuity, is perhaps the greatest flaw of U.S. ocean policy. (PEW 2003).

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