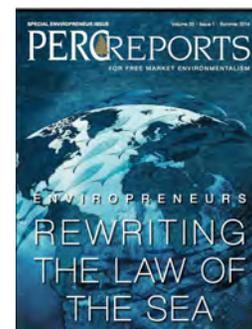
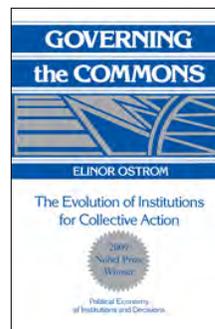
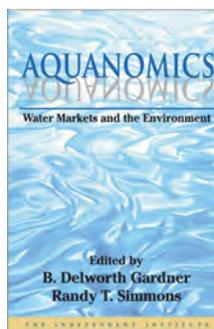
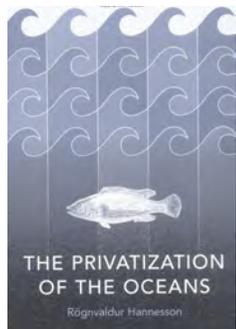
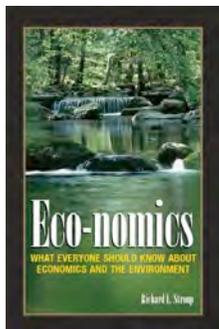


The Economics of Ocean Exploration and Development

Study Guide for the 2014-15 NFL Debate topic

Mackinac Center Debate Workshops Topic Study Guide, September, 2014



West Coast Bottom Fisheries Were in Trouble, But Now Booming

The *Seattle Times* front-page article "Eat up! These bottom fish make a dramatic recovery on West Coast" (Sept. 2, 2014) offers a catch shares success story. Bottom fisheries were in trouble:

Most were managed using massive quota systems that encouraged a race among fishermen to catch everything they could, regardless of markets. Fishermen often scooped up species they weren't targeting and ended up tossing away many fish that weren't salable.

But then regulators set aside some areas and switched to a catch shares system that gives fishermen a property right in their traditional share of the total catch each year. But in the mid- to late 2000s, the Pacific Fishery Management Council, which oversees West Coast commercial fishing, began closing many ecologically sensitive areas to fishing.

Seafood Watch recommendations

The Monterey Bay Aquarium's popular Seafood Watch consumer guide upgraded recommendations on nearly two dozen previously overfished West Coast species, saying regulators and fishermen have made great strides toward their recovery. Here are some of them:

ROCKFISH		RECOMMENDATION	
SPECIES	FISHING METHOD	OLD	NEW
Aurora rockfish	Bottom trawling	Avoid	Best
Blackgill rockfish	Bottom trawling, bottom longline	Avoid	Good
Canary rockfish	Bottom trawling	Avoid	Good
Chillipepper rockfish	Bottom trawling	Avoid	Good
Darkblotched rockfish	Bottom trawling	Avoid	Good
Longspine thornyhead	Bottom trawling, bottom longline	Avoid	Best
Pacific Ocean perch	Bottom trawling	Avoid	Good
Redbanded rockfish	Bottom longline	Avoid	Good
Rougeye rockfish	Bottom trawling, bottom longline	Avoid	Good
Shortspine thornyhead	Bottom trawling, bottom longline	Avoid	Best
Vermilion rockfish	Bottom longline	Avoid	Good
Widow rockfish	Bottom trawling	Avoid	Best
Yellowtail rockfish	Bottom trawling	Avoid	Best
OTHER GROUND FISH		RECOMMENDATION	
SPECIES	FISHING METHOD	OLD	NEW
Pacific grenadier	Bottom trawling	Avoid	Good

That step represented fundamental change, Lockhart said. It allows fishermen to fish at times and in places where they know they can

That step represented fundamental change, Lockhart said. It allows fishermen to fish at times and in places where they know they can

catch the right fish. It also allows them to work with the processors to develop markets so they can get the best possible prices.

The success of catch shares follows from the incentives created for fishermen. Someone with a catch share of, say, 2% of the total catch of a particular species of bottom fish, has a strong incentive to see the total fishery recover and expand. If there are 50% more fish the following year, each catch share would rise by up to 50%. Instead of a race to pull in as many fish as possible during limited fishing days, catch shares owners cooperate to both catch their share and work to conserve and expand the overall fishery.



The [Summer 2014 PERC Reports article "The Ocean's Off-shore Entrepreneurs"](#) reports innovative ocean development programs directed by eight entrepreneurs who have attended past PERC programs. One of the projects profiled connects to last year's topic:

Daylin Muñoz-Nuñez, a marine scientist who worked for the Cuban Ministry of Science, Technology and Environment, applied her entrepreneurial skill set to coordinate solutions for key fisheries in Mexico, Belize, and her home country of Cuba. Further offshore, she advanced the tri-national collaborative management of shark fisheries in the Gulf of Mexico, using innovative market-based tools that were modeled after catch shares.

U.S. Policies for Prosperity from the World's Oceans

Oceans are a lot like land, just wetter, and wet is good for life. The world's oceans cover 70% of the planet and can be a source of vast new wealth...or a source of continued conflicts. A *Wall Street Journal* op-ed, "How Africa Can Capitalize on Its Progress" (May, 8, 2014) reports: *West Africa loses about \$1.3 billion to illegal fishing.* On the east coast of Africa, illegal offshore fishing launched Somalian pirates. More recent articles claim increase security has frustrated Somalian pirates and led many to turn instead to providing security for illegal fishing. A U.N. Monitoring Group report claims:

The security services for fishermen bring piracy full circle. Somali pirate attacks were originally a defensive response to illegal fishing and toxic waste dumping off Somalia's coast. Attacks later evolved into a clan-based, ransom-driven business.



Up to 180 illegal Iranian and 300 illegal Yemeni vessels are fishing Puntland waters, as well as a small number of Chinese, Taiwanese, Korean and European-owned vessels, according to estimates by officials in the northern Somali region of Puntland. International naval officials corroborate the prevalence of Iranian and Yemeni vessels, the U.N. report said.

Fishermen in Puntland "have confirmed that the private security teams on board such vessels are normally provided from pools of demobilized Somali pirates and coordinated by a ring of pirate leaders and associated businessmen operating in Puntland, Somaliland, the United Arab Emirates (UAE), Oman, Yemen and Iran," the report said.

Communal ownership and government management of land has long created poor incentives, mismanagement, and contributed to famines. Top-down government efforts to manage fisheries and ocean waters suffer from incentive and information problems.

Dogs Bark; Dogfish Don't

On land, dogs helped with private land ownership. Prehistoric hunters and gatherers owned dogs that helped protect property and belongings while owners were off hunting and gathering. Over centuries, private ownership of property encouraged investment, increasing know-how and boosted productivity. Hernando de Soto tells of informal land ownership where communities informally agree who

owns what. Dogs bark to let people know when they are approaching someone's private property. (Though dogs also bark when hungry, confused, lonely, irritated, or just because. Thus on land as countries developed, people own property titles as well as dogs.)



Hernando de Soto's theory of the barking dog suggested that wherever there is a barking dog... there is a household. And a household in Peru or Cairo that could be conferred with leasehold – and thereby, legitimized and enabling its inhabitants to step in from the grey shadows to formal legal recognition. [Kathy Berman, *BizNews.com* 3/24/2014.]

It's harder to identify ownership boundaries offshore. On land boundaries can be shown with stakes, chalk, fences, trees, titles as well as barking dogs. Out in the ocean, who has title and where are the property lines? Technology offers various solutions.

Football fans used to puzzle over just where the first down line was. Markers along the sidelines were of limited help locating midfield first downs. Now on TV a bright yellow line shows how far for a first down. Computers digitally place the line between the sideline markets.



Computers, GPS devices, and satellite data can superimpose property lines onto the ocean to identify who owns or has responsibility for stewardship within fisheries regions. Establishing clear and enforceable property boundaries for fisheries isn't free but neither was the establishing property rights on land.

Over time, as pressure on land and ocean resources increases, property rights or other systems will reduce over-harvesting. Establishing institutions to manage the commons is key to fishery sustainability and productivity.

EDF catch shares page: www.edf.org/oceans/catch-shares

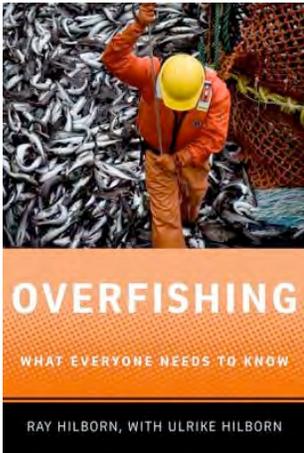


Community-managed Fisheries Say Goodbye to Fisheries Police States

Encouraging new evidence suggests that the bulk of the world's fisheries – including small-scale, often non-industrialized fisheries on which millions of people depend for food – could be sustained using community-based co-management.

"The majority of the world's fisheries are not – and never will be – managed by strong centralized governments with top-down rules and the means to enforce them," according to Nicolas Gutiérrez, a University of Washington doctoral student in aquatic and fishery sciences who is lead author of a paper that went online Jan. 5 in the journal *Nature*. "Our findings show that many community-based co-managed fisheries around the world are well managed under limited central government structure, provided communities of fishers are proactively engaged. --

www.washington.edu/news/2011/01/05/co-management-holds-promise-of-sustainable-fisheries-worldwide/



In Ray and Ulrike Hilborn's *Overfishing: What Everyone Needs to Know*, Chapter 11 discusses "Small-Scale and Artisanal Fisheries." Coastal fisheries in Chile offer models for reform for marine natural resource policies in the U.S. The key insight follows the diversity of coastal ecosystems and local knowledge of those ecosystems. Central and regional planners lack the knowledge to devise governance schemes to stop or reduce tragedy of the commons in local fisheries.

The Hilborns' story starts with a fist-sized snail called the Loco. Marketed as Chilean abalone, loco became popular in world markets and was soon fished out. The loco fishery closed nationwide by 1989. Another case of greedy capitalist exploitation of a marine ecosystem? Or another fishery collapsed by feverish consumption of exotic sushi in Japan?

No, just another failure of top-down fisheries regulation:

Chile, like many countries of the world, has largely adopted a Western style "top-down" management system. There is a centralized fisheries agency that coordinates data collection and research, sets regulations, and has enforcement officers to try to assure compliance with these regulations (*Overfishing*, p 85)

A regular fisheries police state!

Chile's new fisheries law in 1991 allowed for MEABRs (Management and Exploitation Areas for Benthic Resources). Benthic resources are those plants and animals of the ocean floor, and allowing local fishing communities to establish their own governance

system for sustainable management, which turned out to be a good idea. By 2005 some 547 MEABRs were registered in Chile, managed by caletas (the cove), and the locos are back providing local income and employment and restored to the plates of weird sushi consumers overseas.

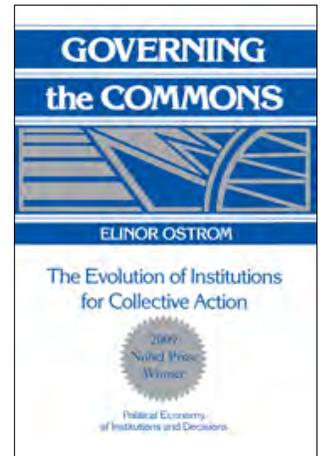
More examples of locally-managed fisheries are in this FAO report, "[Case studies in fisheries self-governance.](#)" ([pdf](#))

Rules for Ocean Development

Consider people gaining ownership of resources as they work to create value, mixing productive labor with land. A farmer's labor plowing land sets boundaries for farms and orchards as labor and capital is invested planting, fertilizing, weeding, and pruning.

For farmers of the sea, ownership institutions and boundaries are more difficult. Who owns lobster beds and how will disputes be managed? The late Elinor Ostrom won the Nobel Prize in economics for research on how to govern common pool resources:

Well, let me use the example of lobster fisherman in the state of Maine. In the 1920s, they almost destroyed the lobster fishery. They regrouped and thought hard about what to do and over time developed a series of ingenious rules and ways of monitoring that have meant that the lobster fishery in Maine is among the most successful in the world. --[From Elinor Ostrom Nobel Prize telephone interview](#)



Here is a further discussion of Ostrom's research of common pool resource challenges and institutional custom-based solutions:

One of the most well-known treatments of the question is Garrett Hardin's 1968 book *The Tragedy of the Commons*, which describes how overexploitation of common pools was rapidly increasing worldwide. Traditional economists proposed two responses to overexploitation.

The first is privatization with adequate means of measurement and control. This depends on having the necessary technical and financial means to exercise adequate control and may only be feasible if ownership is restricted to a few participants.

The second is government ownership and a tax on using the resource.

Ostrom proposed a third solution: retain the resource as common property and let the users create their own system of governance. In *Governing the Commons: The Evolution of Institutions for Collective Action*, Ostrom argues that common property governance doesn't have to be tragic, and that users themselves can devise rules and enforcement mechanisms that may be better than restrictions imposed by outsiders with little knowledge or understanding of local conditions.

One of the more surprising conclusions of her research is that users should take care of monitoring and sanctions themselves (or entrust this to someone accountable to them). As the [Nobel committee](#) points out, this "challenges conventional notions whereby enforcement should be left to impartial outsiders". -- [from OECD Insights](#), July 1, 2011

Oil Under the Sea Seeps Out

The *Wall Street Journal* reports in "[Chilly North Sea Comes Back to Life: New Technology Is Set to Liberate Natural Gas That for 25 Years Was Trapped Beneath Sea Floor](#)" (April 25, 2013) on significant advances in deep sea drilling technologies. Accidents still happen, but ocean drilling technologies continue to advance. If companies can discover, drill, and deliver oil and natural gas from deep under stormy North Sea locations, why can't oil and gas from offshore Santa Barbara, and other U.S. offshore fields be developed?

The reason is likely that environmentalists and average citizens fear offshore oil drilling will lead to offshore oil spills and oil-drenched sea birds like those shown in the picture at right.



It is a tragedy when seabirds are caught in oil spills. These birds are from a February incident and story: "[The San Pedro-based International Bird Rescue \[IBR\]'s Los Angeles center has received 77 oiled birds.](#)"

In this case though, the oil spill was an oil seep, and a natural one off the California coast. According to the article:

Natural oil seepage occurs in several places along the Southern California coast, including Coal Oil Point in the Santa Barbara Channel, the world's largest natural seep emitting thousands of gallons of oil daily, according to the IBR, which has been helping seabirds and other aquatic birds around the world since 1971. (Malibu Patch, 2/18/13)

The 1969 Santa Barbara oil spill led to a political backlash blocking oil exploration and drilling offshore in California. But a lot has changed on the technology front since 1969.

Both automobiles and oil drilling have become far safer and less polluting. If you don't believe me, just take a ride in a 1969 Malibu.



Allowing ocean oil exploration and development technologies off the California coast could reduce natural seepage by relieving pressures that push oil and gas out into Santa Barbara and other California waters. Over time as operations generate revenue as well as reduce natural oil seepage, more confidence about safety will likely lead to further offshore oil and gas development.

[SOS California](#) promotes oil and gas operations to reduce oil and gas seepage. And the U.S. Geological Survey ([USGS](#)) [has a page on oil and gas seepage](#).

California could gain millions in tax revenue and oil and gas users would have another source of domestic supply. California's coastal waters and wildlife would no longer have to absorb the thousands of gallons of oil and gas seepage each year.

According to [this 1999 press release from the University of California at Santa Barbara](#):

Most of the seepage is methane, a potent greenhouse gas which escapes into the atmosphere, said Luyendyk. About 10 percent of the seepage is composed of "higher hydrocarbons," or reactive organic gases which interact with tailpipe emissions and sunlight, creating air pollution.

The researchers state that the production rate of these naturally-occurring reactive organic gases is equal to twice the emission rate from all the on-road vehicle traffic in Santa Barbara County in 1990.

According to the articles, studies of the area around Platform Holly showed a 50 percent decrease in natural seepage over 22 years. The researchers show that as the oil was pumped out the reservoir, pressure that drives the seepage dropped.

Offshore drilling technologies and knowhow advance as billions of dollars are invested developing new fields in the North Sea. The UK and Norway government are not known to be lax about environmental issues. New technologies developed and deployed for North Sea and other modern ocean drilling can be transferred to California and other U.S. offshore fields. These technologies reduce the likelihood of another Deepwater Horizon oil spill.

The reality of natural oil and gas seeps provides another reason to deploy these technologies in California waters. [According to this 2003 study](#), about half of oil released into marine ecosystems is from oil seeps rather than oil spills:

Recent global estimates of crude-oil seepage rates suggest that about 47% of crude oil currently entering the marine environment is from natural seeps, whereas 53% results from leaks and spills during the extraction, transportation, refining, storage, and utilization of petroleum. (Kvenvolden, Cooper, Natural seepage of crude oil into the marine environment, http://137.227.239.65/reports/reprints/Kvenvolden_GML_23.pdf)

Astounding Ideas: Marine Natural Resources



The Economics of Ocean Exploration and Development study guide is for students researching

the 2014-2015 ocean topic. Articles are from Economic Thinking's [Astounding Ideas Marine Natural Resources](#) site which draws from economic and policy research



emphasizing markets and legal institutions. Economic Thinking is a Seattle-based nonprofit. The Mackinac Center, a research and educational organization in Midland, Michigan, hosts workshops for high school debaters and sponsors this study guide.

Blue Ocean Development

With 139 million square miles of open ocean, there is room for hundreds or even thousands of open ocean fish farms that could feed the world's people and their cats ten times over.

One Hawaii firm with open-ocean farming operations is [Blue Ocean Mariculture](#).

This operation is in Hawaiian state waters because only in that coastal zone does the U.S. federal government allow open ocean fish farming. The Aquapod fish pen can be "entrained in eddies" so that it doesn't drift into U.S. federal waters.

Of course not everything is going swimmingly with open ocean fish farms. Pirates can attack to steal fish or hijack fish farms. Sea lions and sharks can drop in for dinner. Lawyers are sometimes categorized as [Chondrichthyes](#) and they too can endanger open-ocean fish farms.

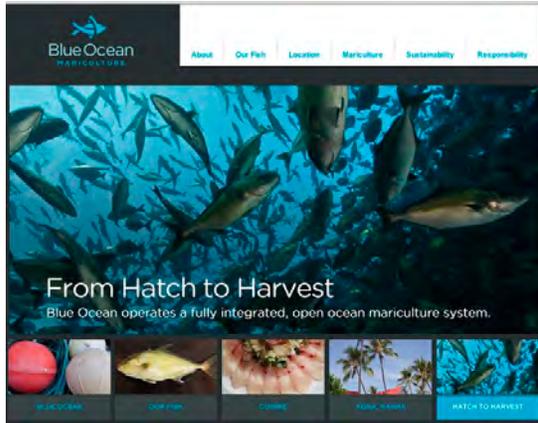
Interested in starting a ocean enterprise creating jobs and serving Americans high-quality, nutritious, and tasty dinners? Step one: take your entrepreneurial energy and investment capital to another country and build your company there. Why? Well, some reasons listed by Bill Frezza, at the [Competitive Enterprise Institute](#):

Getting the required permits and licenses to operate a deep-water fish farm in the U.S. would require running the gantlet of dozens of federal

and state regulatory agencies, some with overlapping jurisdictions and none with a mandate to lead the process. Agencies would include the Environmental Protection Agency, Army Corps of Engineers, Fish

and Wildlife Service, Food and Drug Administration, and National Oceanic and Atmospheric Administration (NOAA). Regulations that would have to be complied with include the Magnuson-Stevens Fishery Conservation and Management Act, Jones Act, OSHA rules, and who knows how many others. Regional Fishery Management Councils and various state agencies involved in historic preservation and tourism would all have a say. ([RealClearMarkets](#) article source.)

<http://astoundingideasmarineresources.blogspot.com/>



[Open Blue](#) tried to get permits for U.S. waters but gave up and developed their deep sea fishing operations off the coast of Panama, where founder Brian O'Hanlon found the government regulatory process to be less costly and complex than in the U.S.

Fish farms far out to sea have many advantages over those close to shore. Bill Frezza notes deep sea operations are "where swift currents carry away and disperse the waste produced by concentrated fish stocks, it would allow the farmed fish to swim in the same fresh water as their wild cousins--the best of both worlds."

Mr. Frezza also notes that NOAA did try some years ago to streamline permitting (hint: affirmative case idea):

NOAA made several attempts a decade ago to promote a national aquatic farming initiative that would cut through the red tape and set up a one-stop-shop for deep-water fish farming permits. Bills were introduced in Congress twice but were shot down due to opposition from entrenched fishing interests.

This 2009 CNN article looks at [Brian O'Hanlon's Open Blue enterprise](#).



Ocean Econ Videos

Online videos from the Reason Foundation and Property and Environment Research Center (PERC) explain the economics behind catch shares and the incentives they create for sustainable and even expanded fisheries.

An online Environmental Defense Fund video provides a catch shares update: http://youtu.be/_QGgK4P6e5A



[Carp Jumps Over Dragon Gate](#) looks at traditional Chinese fish farming. China produces 2/3rd of the world's farmed fish.



<https://www.youtube.com/watch?v=MI80VvPTGkQ>



<https://www.youtube.com/watch?v=B0AqI1re0FY>



<https://vimeo.com/48899618>

A Big Ocean With Lots of Room for More Fish

Civilization began as societies learned to plant grain, fruit, and vegetables in farms, orchards, and gardens rather than wander the countryside gathering them. Early tribes domesticated and raised cattle and sheep rather than chasing them with spears.

The University of Washington's March 14, 2014 issue of *Conservation* features an [optimistic article on open ocean farming](#) by Paul Greenberg, author of *Four Fish: The Future of the Last Wild Food*.

In [The Wild World of Open Ocean Farmed Fish](#) and [Farming the Deep Blue Sea](#) the challenges entrepreneurs face with mariculture technology and regulatory barriers are discussed. Only the state of Hawaii even allows open ocean farming.

But Greenberg writes that ocean entrepreneur Neil Sims' diligent politicking allowed at least two fish to swim their way through the federal bureaucratic maze:

The two fish Sims sent me were almaco jack. To my knowledge, they were among the only fish ever cultured in what is known as the U.S. "Exclusive Economic Zone" or EEZ—the federally controlled stretch of water extending from U.S. coastal boundaries all the way past the continental shelf, some 200 nautical miles from shore. [\[Source.\]](#)

Greenberg notes that the United States Exclusive Economic Zones (EEZs) are fairly new, and thanks to vast U.S. coastlines and island territories, provide double the space for future fisheries than all U.S. land for agriculture:

Thanks to a series of political maneuvers over the course of the past half-century, the U.S. has come to control the world's largest EEZ, with over 2.5 billion acres of ocean—more than twice what we have for growing land food. And yet, this vast expanse produces relatively little food for us, either from the farm or from the wild. At present, 91 percent of the seafood Americans eat comes from abroad. Most galling to people like Sims, the majority of that foreign seafood is aquacultured. We Americans love farmed fish, it seems, but we just don't seem to want them produced in our home oceans. [\[Source.\]](#)

The transition from gathering to ranching to farming required a series of transitions in property institutions. Most of the overfishing that wiped out ocean fisheries is recent, in the last fifty to sixty years. Europe's wild salmon fisheries were wiped out just in the 1960s when the annual Atlantic salmon converge area was discovered off the coast of Greenland. Without institutional rules to limit catches, new larger fishing boats harvested unsustainably. Greenberg explains:



NATIONS HAVE CARVED UP THE OCEAN. NOW WHAT?

March 14, 2014 Fisheries, Oceans 1 Comment

On a series of exploratory fishing trips in 1951, Jørgen Nielsen, chief of Greenland Fisheries Research for the Danish government, deduced that a large percentage of Europe's and North America's wild Atlantic salmon converged annually in a relatively small portion of Greenland's waters. Nielsen, as was his duty, placed this information into the hands of the Danish fishing fleet. What followed was an unregulated, species-decimating blitzkrieg in which Scandinavian fleets effectively stole salmon from the nations of the world. Their catches rose from 60 to more than 2600 metric tons within a decade. Catches were so phenomenal and seemingly limitless that a Danish captain named Ole Martensen bragged to a Copenhagen newspaper that he planned to go to Japan to learn the techniques of fishing on the publicly owned high seas. [\[Source.\]](#)

Greenberg's article doesn't discuss the similar fate of the Grand Banks Atlantic Cod fishery off Newfoundland. Cod, the [Fish That Changed the World](#), were wiped out by new fishing fleets (built with Canadian government subsidies) just a decade after the salmon. Government fisheries scientists contributed to overfishing by being way too optimistic in setting catch limits.

A *New Scientist* article outlines the cod fishery disaster and how political pressure to "create jobs" overwhelmed the doubts of the fisheries scientists:

"Politicians used the uncertainty to set catches as high as possible." This meant 235 000 tonnes. In January 1992, the DFO recommended a TAC of 185 000 tonnes. Then it did another research cruise and cut that to 120 000. Then in June, it recommended banning fishing altogether. Suddenly, the scientists realised there were no cod old enough to spawn left. [\[Source.\]](#)

Fertilizing the Oceans?

For thousands of years coastal communities have relied on "hunting and gathering" for fish.



Ocean fertilization experiment loses in B.C. court; charges now likely

DENE MOORE

VANCOUVER — The Canadian Press
Published Monday, Feb. 03 2014, 5:50 PM EST
Last updated Monday, Feb. 03 2014, 8:00 PM EST

Coastal fish farms are fairly recent, but now fish fertilizing and farming is heading out to the open seas. A \$2.5 million investment for 120 tons of iron sulfate fertilizer may have contributed to huge salmon runs. The organization behind a controversial ocean-fertilization experiment off the coast of British Columbia could face up to 10 charges for environmental violations after losing a court bid that would have brought an end to the investigation.

The Haida Salmon Restoration Corp. caused waves around the world in July, 2012, when it dumped more than 100 metric tonnes of iron into the ocean near Haida Gwaii, hoping it would increase salmon returns and produce profits from carbon capture.

More here: [It's a Big Ocean With Lots of Room for More Fish.](#)

Surf's Up! Surf's Down... Save the Beaches and Make Waves

When an ocean development topic drifts in, debaters are drawn to alternative ocean energy projects. What if limitless energy could be harvested

from ocean waves? What if energy could be extracted from surface and deep ocean temperature differences? Could daily tidal flows turn giant turbines? (See Puget Sound [tidal energy post: Whale of an Idea for Generating More Alternative Energy](#)).

Early ocean energy projects have failed to generate enough energy to cover operating costs. An alternate approach though offers cost-effective wave energy developed and deployed in the southern hemisphere. Shorelines can be protected and ideal surf shaped.

Enthusiasm for wave and tidal energy projects focused on reducing oil imports. But over the last five to ten years increased use of natural gas has significantly reduced U.S. emissions. And vast shale gas and oil deposits available with new horizontal drilling and hydraulic fracturing have reduced concerns about imported oil.

However, energy from ocean waves continues to be in high demand in California and Hawaii where surfers rely on all-natural wave energy for their daily exercise and entertainment. More waves more often and in more locations could attract tourists and tens of thousands of young people to the active surfing life-style.

The Boscombe Surf Reef was installed by a New Zealand company in Dorset, UK. However, the reef was damaged by boat propellers and the company is out of business. [An April, 2013 BBC News article](#) reports that the company director has gone missing. It's unfortunate for surfers and for Dorset tourism that this \$5 million dollar artificial reef project is broken and bankrupt (unfortunate for investors too).

Coastal erosion is an expensive problem. Millions of dollars are spent each year trucking in sand to try to restore beaches after storms have carried tons of sand away.

Artificial reef companies claim they can protect shorelines as well as create excellent surfing waves. But so far, more problems.

[A Surfline.com article discusses an artificial reef in India](#) designed to protecting coastlines and generate waves for surfing.

Unfortunately, the surfing reef installed in India also failed. An upbeat 2010 *Surfer* article, [India's First Artificial Surfing Reef... Works](#), was followed in June 2014 by a downbeat article telling the story of another broken reef: [Pipe Dreams: The reality of artificial reefs](#).

<http://astoundingideasmarineresources.blogspot.com/>

Snohomish County PUD: OpenHydro Turbine with Gravity Base



Oyster Reef Restoration

While sandbag reefs for surfing and shoreline protection have stumbled, man-made oyster reefs offer alternative technology for restoring key habitat, creating jobs, producing food, and providing protection. [Think Oyster Reefs For Protecting Coastlines](#) looks at the Nature Conservancy's [Oyster Reef Restoration](#) page:

... decades of over-harvesting, disease, pollution and declining habitat have decimated the massive oyster reefs that once dominated the country's coastal estuaries. ... Globally, 85 percent of reefs have been lost, making oyster reefs the most severely impacted marine habitat on Earth. ... Because oyster reefs are essential to a healthy marine system, The Nature Conservancy has been experimenting — from North Carolina to Texas — with techniques that may provide hope for the oyster's future.

The Nature Conservancy 

Mark Tercek argues that manmade oyster reefs are better than concrete for protecting coastlines. (See "[Green Infrastructure Outperforms Gray](#).")

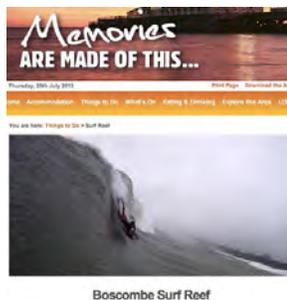
Oyster reef restoration builds habitat for fish and oysters, creating jobs and putting more seafood on tables while protecting coastal areas. People buy oysters, generating income for jobs harvesting, preparing, and serving oysters. Coastline protection from oyster reefs shields the value of coastal properties. Oyster reefs provide habitat for fish, crabs, and other marine creatures as well. We humans prefer this habitat and these creatures, over the mud, muck, and worm habitat of un-restored offshore areas.

Developers wanting to invest in offshore oyster reefs face a challenge first to secure permits to build oyster reefs, and then to exclude others from harvesting oysters and fish once the reef is established and thriving.

Oyster reefs can also be constructed as part of larger recreational or preservation projects. [The Clive Runnels Family Mad Island Marsh Preserve](#) in Texas is profiled by Nature Conservancy.

Mentioned in the Nature Conservancy

article is Dr. Jennifer Pollack, a researcher at Texas A&M Corpus Christi. The [Pollack Lab](#) page is a valuable resource for students researching and debating the ocean exploration and development topic. Here's hoping debaters develop a federal policy enabling new oyster reefs enriching and protecting U.S. coastlines.



Reef Wranglers & other Undersea Adventures

Informal “reef entrepreneurs” in Louisiana search for used washing machines, dryers, and refrigerators to purchase by day and sink offshore by night. Once on the ocean floor home appliances attract fish and become small private reefs. In a year, fish will be hanging out in these dumped dryers and washing machines, and only the dumper knows to fish the exact location.

States like Delaware have been dumping on a much larger scale into offshore waters. [“Saltwater Fishing”](#) in *The Sportsman's Guide* describes subterranean subway car reefs off the coast of Delaware that attract both fish and fishermen. The largest is 1.3 square miles of underwater reef made from: dozens of tanks and armored personnel carriers, a 90-foot sunken barge, a navy barge, and more than 400 old subway cars.

In this man-made underwater reef world: schools of sea bass cruise from one subway car to another...sea bass also love to move in and around the open back of the armored personnel carriers. Big tog also hang out on the ocean reef sites...

Environmental economists focus on property rights as key institutions to *manage the commons*. Building off-shore fishing reefs, whether by washing machine or subway car leaves the challenge of preventing overfishing once the reefs are full of fish. The State of Delaware can, in theory, manage their subway car reefs with regulations and fishing permits (though the article reports demand has been too strong and state management less than ideal so far).

Private reef wranglers in Louisiana dump by night to keep secret their home appliance reefs. And I guess they try to avoid fishing with others nearby.

One state has a better idea and is now home for more artificial reefs than the rest of the country combined.

With less than sixty miles of coastline, Alabama is home to some 17,000 artificial reefs boosting fishing and tourism and helping create 50,000 jobs and each year generating \$2 billion in revenue.

Alabama lacks natural offshore reefs so has since the 1950s allowed private reefs. Michael De Alessi, in a 1986 study, noted that Alabama and Florida:

Growing Pains for a Deep-Sea Home Built of Subway Cars

The New York Times



A New York City subway car being added to an artificial reef off the coast of Delaware. The reef's success has led to crowding for marine life and fishermen. [More Photos >](#)

By IAN URBINA
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“They’re basically luxury condominiums for fish,” Jeff Tinsman, artificial reef program manager for the Delaware Department of Natural Resources and Environmental Control, said as one of 48 of the 19-ton retirees from New York City sank toward the 666 already on the ocean floor.

The Weather Channel has

jumped onboard the booming reef business with its reality series [“Reef Wranglers”](#) based on Walter Marine in Orange Beach, Alabama.

Alabama’s artificial reefs dramatically increased the red snapper fishery. With just 5% of the Gulf Coast, recreational fishermen in Alabama waters reel in 40% of red snappers caught in the gulf. New reefs are new homes for red snapper and other fish.

Perhaps the most productive artificial reef would be one made of the thousands of pages of Army Core of Engineers regulations. Students can [read the National Artificial Reef Plan \(as Amended\) here](#) for a sense of the bureaucratic challenge for artificial reefs that results from involving six federal agencies. Reforms could open federal waters to far more reef wranglers.



- Approximately 1,200 square miles of offshore waters are included in the artificial reef general permit areas of Alabama, ...

