

Under the (Territorial) Sea: Reforming U.S. Mining Law for Earth's Final Frontier



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ABSTRACT

As mineral prices continue to rise and high-quality terrestrial supplies dwindle, hardrock mining will soon spread to the one place on this planet it currently does not occur: underwater. The United States has regulations permitting the issuance of offshore mineral leases, but these regulations rest on questionable authority from 1953 and are already obsolete even though they have never been used. The United States will need to adopt new legislation before it can effectively access and develop this final mining frontier. The history of American mineral law is littered with mistakes and scandals. But in this particular context, that tortuous past can have a silver lining if used as a precautionary tale: Learning from the mistakes of onshore mining law, onshore oil law, and offshore oil law, the United States has an opportunity to proactively reform underwater mineral law to responsibly usher in the future of hardrock mining. In light of this opportunity, this Comment examines three case studies from U.S. mineral law to extract lessons and suggests how such lessons could inform lawmakers in drafting a sensible offshore mining law.

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INTRODUCTION

In many ways, our current lives are a letdown compared to earlier predictions for the future: Flying cars still elude us, and we are so far from establishing colonies on the moon that nobody has boldly gone back there since 1972.¹ Still, every now and then a snippet of news about recent technological advances can pierce the disappointment of not having personal jetpacks and instill some small amount of awe for our modern world—even if it fails to live up to the expectations of science fiction. In the very near future, you will be reading about such a breakthrough in deep-sea underwater mining.

Offshore mining is an emerging phenomenon, but it does not owe its imminent arrival solely to some new technological breakthrough. In fact, humanity has possessed the tools to mine the seafloor since about the middle of the twentieth century, thanks in part to the declassification and commercialization of military technology.² Rather, changes in the broader economic outlook for various minerals remain the primary driver of offshore mining interest.

In the 1970s, for example, rising mineral prices nearly brought underwater mining to fruition, but the discovery of new terrestrial mineral deposits and advancements in terrestrial mining technology mitigated the push for risky, expensive deep-sea mining. To be sure, subsequent technological advances have made the prospect of underwater mining less daunting and potentially more lucrative than it would have been in the 1970s. Nevertheless, depletion of high-quality terrestrial deposits and rising mineral prices today are spurring mining companies to set their sights on the sea with renewed vigor. Indeed, underwater mining projects are already in the pipeline in other countries, so an examination of American offshore mining law is not merely academic.³

The aborted buildup toward underwater mining in the 1970s left a legal relic in its wake: As underwater mining is poised to begin in American waters for the first time, a regulatory framework already precedes it. Offshore mining permits could be issued today pursuant to decades-old regulations promulgated pursuant to one vague (and highly criticized) paragraph from a law passed

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1. Apollo 17 was the sixth and final mission to put a man on the moon. See David R. Williams, *The Apollo Program (1963–1972)*, NASA (Sep. 16, 2013), <http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo.html>.
 2. See U.S. CONG. OFFICE OF TECH. ASSESSMENT, OTA-O-342, MARINE MINERALS: EXPLORING OUR NEW OCEAN FRONTIER 3 (1987) [hereinafter MARINE MINERALS].
 3. See, e.g., Kip Keen, *Nautilus Cancels Underwater Equipment Construction on Flagship Solwara Project*, MINEWEB (Nov. 13, 2012), <http://www.mineweb.com/mineweb/content/en/mineweb-australasia?oid=161912&sn=Detail>.

in the 1950s—well before underwater mining was even seriously considered. In that single applicable law, the U.S. Congress offered almost no guidance on how to regulate the practice, and the subsequent regulations are functional but utterly inadequate to shepherd in a novel and untested form of mining. In short, America's offshore mining regime is already obsolete despite never having been utilized.

Nonetheless, in the absence of a crisis or concerted domestic pressure, Congress has not summoned the political will to enact a more comprehensive law. In light of our country's troubled history with public mineral law, it is worthwhile to consider what would constitute an effective offshore mineral law before the political process and special interests muddy the water. This Comment therefore proposes a more detailed legislative framework for offshore mining by distilling lessons from America's failures in crafting and enforcing other extractive laws and applying those lessons preemptively to underwater mining. Part I presents the history of underwater mining, describes underwater mineral resources, and briefly surveys current and planned underwater mining projects. Part II details the current legal framework for offshore mining in U.S. waters and explains why reform efforts are likely to gain support in the near future. Part III analyzes three case studies from other areas of extractive law on public lands each of which offers a lesson for the design of a new underwater mining law: (1) onshore mineral mining's ancient and maligned royalty-free claim system; (2) onshore oil drilling's scandal-ridden, trial-and-error path to a competitive leasing regime; and (3) offshore oil drilling's difficulty properly targeting development incentives. Finally, Part IV synthesizes and applies the lessons of these case studies to propose a comprehensive regulatory framework for offshore mining. This Comment concludes that America's tortuous history with extractive law can finally yield a silver lining: Regulators have an opportunity to learn from our history and guide underwater mining development without falling victim to the pitfalls that have marred our mineral law for centuries.

I. OFFSHORE MINING BACKGROUND

A. The History of Offshore Mining

Underwater mineral exploration traces back to the 1868 discovery of manganese nodules on the floor of the Arctic Ocean above Siberia.⁴ The 1872–1876 research expedition by the *H.M.S. Challenger* would later confirm that these nodules are scattered through most of the world's oceans.⁵ Interestingly, this discovery did not generate much interest at the time because of the contemporary misunderstanding of oceanic geology. Before the theory of plate tectonics, geologists thought of ocean basins “as big bathtubs that had served as containers for the oceans since early in Earth history.”⁶ Because the ocean floor was viewed as a permanent feature, whatever underwater mineral deposits might exist were assumed to have been the result of terrestrial erosion. Early geologists further believed that all submarine mineral resources had their origins in terrestrial sources—that is, that the oceans contained only those items that had happened to roll off the continents (or flow out in rivers) over time.⁷ From this perspective, underwater deposits were unlikely to justify serious investment except in certain special contexts such as coastal mining for heavy minerals (like gold and gemstones)⁸ and aggregates (like sand and gravel).⁹

That all changed during a scientific revolution that began in the 1960s. Plate tectonics posited that ocean basins are not merely passive collections of minerals eroded from land, but rather active sources of volcanic mineralization in their own right.¹⁰ This realization triggered a reexamination of underwater mining, which in turn led to the discovery of massive submarine minerals deposits that have never seen the light of day.

Commercial interest in ocean floor resources developed when converted military technologies from World War II made thorough surveys and poten-

4. INT'L SEABED AUTH., POLYMETALLIC NODULES 1 [hereinafter POLYMETALLIC NODULES], available at <http://www.isa.org.jm/files/documents/EN/Brochures/ENG7.pdf>.

5. *Id.*; see also MARINE MINERALS, *supra* note 2.

6. Peter A. Rona, *Resources of the Sea Floor*, 299 SCI. 673, 673 (2003).

7. *Id.*

8. See generally Dan Oancea, *Deep-Sea Mining and Exploration*, TECHNOMINE (Nov. 6, 2006), <http://technology.infomine.com/articles/1/99/deep-sea-mining.undersea-miners.black-smoker/deep-sea.mining.and.aspx> (discussing underwater diamond mining).

9. UNITED NATIONS DIV. FOR OCEAN AFFAIRS AND THE LAW OF THE SEA, OFFICE OF LEGAL AFFAIRS & INT'L SEABED AUTH., MARINE MINERAL RESOURCES: SCIENTIFIC ADVANCES AND ECONOMIC PERSPECTIVES 16 (2004) [hereinafter MARINE RESOURCES].

10. Rona, *supra* note 6, at 674; MARINE RESOURCES, *supra* note 9, at 16.

tial recovery feasible.¹¹ In the 1970s, interest in underwater mining rose to a crescendo: Thousands of scientific articles were published, and major international mining consortia made significant technical progress in exploration, transportation, processing, and marketing plans.¹² Ultimately, though, this momentum succumbed to a combination of political uncertainty about ownership for underwater resources, informational deficiencies, and, especially, declining metal prices.¹³ Although the vast potential of underwater resources has not diminished, underwater mining has generally appeared uneconomical since the late 1970s.¹⁴ Still, commentators continued to predict underwater mining's resurgence.¹⁵ After all, unless suitable substitutes are developed, inescapable scarcity on a planet of finite resources and continuing population growth will ultimately alter that economic equation. Indeed, that scenario is already underway.

We are currently undergoing a quiet crisis of supply for metals, particularly copper.¹⁶ Global copper demand has risen over 35 percent in the last ten years.¹⁷ Despite a significant recessionary dip in 2009, prices for copper, nickel, and platinum (which is an important feedstock for fuel cells and hybrid vehicles) have all tripled in the last five years.¹⁸ Beyond those traditional minerals, the global market is also clamoring for the so-called rare earth metals that are essential to modern commercial and military technologies.¹⁹ Yet despite that booming demand, China wields monopolistic control over 95 percent of the current,

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11. See MARINE MINERALS, *supra* note 2, at 3.
 12. See F. T. Manheim & J. R. Hein, *Ferromanganese Crusts*, in PROCEEDINGS, THE EXCLUSIVE ECONOMIC ZONE SYMPOSIUM: EXPLORING THE NEW OCEAN FRONTIER 79, 79 (Millington Lockwood & Gary Hill eds., 1985) [hereinafter EEZ SYMPOSIUM].
 13. See *id.*
 14. John Warren Kindt, *Environmental Implications of Developing the Nonliving Resources Situated in the Exclusive Economic Zone of the United States*, 23 VAND. J. TRANSNAT'L L. 329, 331 (1990).
 15. See, e.g., Conrad G. Welling, *Mining of the Deep Seabed in the Year 2010*, 45 LA. L. REV. 1249, 1267 (1985).
 16. *Pacific EEZ Minerals*, U.S. GEOLOGICAL SURVEY, http://walrus.wr.usgs.gov/research/projects/pac_eez_minerals.html (last modified Dec. 1, 2011).
 17. *Id.* In the past few years alone, China has increased its consumption of copper from 10 percent to 25 percent of global supply, with little sign of slowing; India is on a similar trajectory. *Id.*
 18. *Id.* Copper rose from \$1,843.85 per metric ton to \$8,053.74 per ton between January 2000 and January 2013. *Copper, Grade A Cathode Monthly Price – US Dollars Per Metric Ton*, INDEX MUNDI, <http://www.indexmundi.com/commodities/?commodity=copper&months=300> (last visited May 14, 2013).
 19. Rare earth minerals have names that sound exotic and are not known to most of the public, including scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium. *What are the Rare Earths?*, THE AMES LAB., U.S. DEPT. OF ENERGY, <https://www.ameslab.gov/dmse/rem/what-are-rare-earths> (last visited Apr. 1, 2014).

terrestrial rare earth mineral supply,²⁰ and the world is wary of such concentrated reliance on a single country—especially following China’s 2010 export embargo.²¹

The ocean floor contains massive quantities of dozens of desirable minerals, so offshore mineral development appears inevitable and even imminent. Indeed, given that asteroid mining has become the subject of straight-faced discussion,²² profitable underwater mining must be nearing feasibility. When economic conditions and technology finally align, there will be a rush to access these untapped reserves.

B. Underwater Mineral Resources

Earth’s oceans are expansive and cover about 70 percent of the planet. Even just considering nonliving marine resources, the ocean floor contains over eighty different mineral commodities, including many of strategic value and otherwise limited domestic availability.²³ To demonstrate the breadth of submarine mineral resources throughout American waters, the U.S. Commission on Ocean Policy offered a brief selection of these minerals in a 2004 report:

[E]normous phosphate deposits off the East Coast from North Carolina to northern Florida, titanium-rich heavy mineral sands from New Jersey to Florida, manganese nodules from South Carolina to Georgia, high-grade calcium carbonate sands off Florida, gold and platinum deposits off Alaska, polymetallic sulfides off Oregon, barite resources off southern California, and quantities of cobalt and platinum off Hawaii.²⁴

Submerged land, like the exposed land above sea level with which we are more familiar, is heterogeneous and contains a variety of geological features, each with its own mineral composition. Current mining interest focuses on

20. See William J. Broad, *Mining the Seafloor for Rare-Earth Minerals*, N.Y. TIMES, Nov. 8, 2010, http://www.nytimes.com/2010/11/09/science/09seafloor.html?_r=0.

21. See Keith Bradsher, *China Is Said to Resume Shipping Rare Earth Minerals*, N.Y. TIMES, Oct. 28, 2010, <http://www.nytimes.com/2010/10/29/business/energy-environment/29rare.html?pagewanted=all>.

22. See Harvey Morris, *Mining the Deep Sea and Outer Space for a Mineral Bonanza*, IHT RENDEZVOUS (Jan. 26, 2013, 9:19 AM), <http://rendezvous.blogs.nytimes.com/2013/01/26/mining-the-deep-sea-and-outer-space-for-mineral-bonanza/?src=recg> (reporting proposals to mine asteroids by two private companies).

23. Geological and Geophysical (G&G) Exploration of the Outer Continental Shelf, Prospecting for Minerals Other Than Oil, Gas, and Sulphur, 53 Fed. Reg. 25,242, 25,244 (July 5, 1988) (to be codified at 30 C.F.R. pts. 251, 280).

24. AN OCEAN BLUEPRINT FOR THE 21ST CENTURY, U.S. COMM’N ON OCEAN POLICY 368 (2004) [hereinafter OCEAN BLUEPRINT].

three of these features: (1) manganese nodules, (2) cobalt-rich ferromanganese crusts, and (3) polymetallic sulfides.

The first features, manganese nodules such as those first recovered by the *Challenger*, are mineral formations strewn about considerable areas of the ocean floor.²⁵ They are generally about the size of a potato, but can grow to sizes in excess of a dining room table.²⁶ They also vary in composition but are usually roughly one-quarter manganese and often contain significant quantities of copper, nickel, cobalt, and other minerals, including smaller amounts of precious metals.²⁷ Interest in these nodules, which miners can simply vacuum up from the ocean floor, drove much of the early enthusiasm for underwater mining.²⁸ The depth at which these nodules occur, however, complicates what is otherwise a straightforward harvesting technique: Manganese nodules can occur at any depth but are most often found in waters between four and six thousand meters deep.²⁹

The second mineral features, cobalt-rich ferromanganese crusts, are found in thick swaths of ocean floor at seamounts and other sites of former underwater volcanic activity, where cooling magma formed deposits of valuable minerals at the surface. Researchers have estimated that 6.35 million square kilometers of ferromanganese crusts line the ocean floors, with a total dry bulk mass of two hundred billion metric tons containing roughly one billion metric tons of cobalt.³⁰ These crusts also contain sizable deposits of other minerals, including titanium, nickel, platinum, molybdenum, and copper.³¹ Additionally, they represent the world's largest source of tellurium, which is widely regarded as offering the lowest cost photovoltaic technology and the current scarcity of which may be one of the greatest barriers to large-scale solar power deployment.³²

25. Manganese is a critical feedstock in steel production and the fourth most used metal in the world. Anthony King, *Riches Under the Sea*, CHEMISTRY & INDUSTRY, June 2012, at 28, 30.

26. Damond Benningfield, *Manganese Nodules*, SCI. & SEA (Oct. 25, 2009), http://www.scienceandthe sea.org/index.php?option=com_content&task=view&id=244&Itemid=10.

27. *Id.*

28. See generally Morris, *supra* note 22 (“Governments and private companies joined the treasure hunt as explorations were launched to determine whether projects to vacuum the nodules from miles below the ocean’s surface were commercially viable.”); William J. Broad, *Plan to Carve up Ocean Floor Riches Nears Fruition*, N.Y. TIMES, Mar. 29, 1994, <http://www.nytimes.com/1994/03/29/science/plan-to-carve-up-ocean-floor-riches-nears-fruition.html> (discussing that interest in nodules led prospective ocean miners to scan the seas for nodules in the 1960s).

29. POLYMETALLIC NODULES, *supra* note 4, at 1.

30. James R. Hein, U.S. Geo. Survey, *Seamounts and Cobalt-Rich Ferromanganese Crusts* 32 (July 31, 2006) (unpublished presentation), available at <http://www.isa.org/jm/files/documents/EN/Workshops/Jul06/J-Hein.pdf>.

31. *Id.* at 31.

32. *Id.* at 30.

To harvest these crusts, robotic rovers would grind the top layer of the ocean floor and suck up the freed material.³³ Although these minerals are more technologically difficult to obtain, they occur at more accessible depths of less than two thousand five hundred meters.³⁴

Prospectors have begun to turn to the third class of underwater minerals, polymetallic sulfides. This interest has been focused on giant, chimney-like formations known as “black smokers” that occur at hydrothermal vents in the ocean floor. These deposits form from accreted minerals spewing out of the seafloor in jets of superheated water.³⁵ Polymetallic sulfides can accumulate into massive deposits of up to one hundred million metric tons, containing high concentrations of lead, zinc, copper, silver, gold, and more.³⁶ For scale, worldwide, these structures are estimated to contain \$150 trillion worth of gold at current prices.³⁷ As if that were not incentive enough, polymetallic sulfides are also found at the comparatively shallow depth of two thousand five hundred to three thousand meters.³⁸ As a result, polymetallic sulfides are driving the first attempts to commercialize underwater mining.

C. Current Offshore Mining Activity

Private companies and national governments are positioning themselves to take advantage of the most lucrative underwater mining opportunities around the world. A company called Nautilus Minerals (Nautilus) was on track to open the world’s first underwater gold and copper mine off the coast of Papua New Guinea in early 2013, but the project stalled because of a funding disagreement and environmentally-driven political pressure.³⁹ Nautilus also has licenses and exploration applications for the territorial waters of Fiji,

33. See, e.g., Charles L. Morgan, *Ferromanganese Crust Mining Development Scenario 8* (Aug. 2006) (unpublished presentation), available at <http://www.isa.org.jm/files/documents/EN/Workshops/Jul06/CMorgan.pdf>.

34. J.R. Hein et al., *Cobalt-Rich Ferromanganese Crusts From the Central Pacific*, OFFSHORE TECH. CONF. (1986), available at <http://www.onepetro.org/mslib/servlet/onepetroreview?id=OTC-5234-MS>.

35. INT’L SEABED AUTH., POLYMETALLIC SULPHIDES 1 (2008), available at www.isa.org.jm/files/documents/EN/Brochures/ENG8.pdf.

36. *Id.*

37. Joseph Cafariello, *Underwater Mining for Minerals and Precious Metals*, WEALTH DAILY (Feb. 14, 2013), <http://www.wealthdaily.com/articles/underwater-mining-for-minerals-and-precious-metals/3986>.

38. Welling, *supra* note 15, at 1259.

39. See Terry Macalister, *Prospects For Underwater Goldmine in Pacific Decline*, GUARDIAN (Jan. 1, 2013, 12:08 PM), <http://www.guardian.co.uk/business/2013/jan/01/underwater-goldmine-prospects-decline>.

Tonga, the Solomon Islands, and New Zealand.⁴⁰ Nautilus is not alone: A British company, Neptune, has similarly amassed substantial exploration licenses in New Zealand, Vanuatu, and the Federated States of Micronesia and has conducted several exploration programs off the shores of Japan, Palau, and Italy.⁴¹ China and Japan are also surveying in Papua New Guinea with hopes of development in the near future.⁴²

This flurry of activity demonstrates substantial offshore mining interest within national boundaries, but some of the most promising mineral reserves lie farther offshore, in deep waters to which no country may make a legal claim. The internationality of these resources presents questions of ownership that make mining companies reluctant to invest without a guarantee of title to the minerals they both discover and recover.⁴³ Today, that uncertainty is being resolved in many places thanks to the United Nations Convention on the Law of the Sea (UNCLOS).⁴⁴ UNCLOS was signed in 1982, went into effect in 1994, and views resources in international waters as the “common heritage of mankind.”⁴⁵ Under UNCLOS, the International Seabed Authority (ISA) grants leases for exploration and ultimately for mining those international resources.⁴⁶ In 2000, one of the ISA’s first moves was to promulgate regulations to allow prospecting and exploration for manganese nodules.⁴⁷ Since then, the ISA has issued prospecting contracts to outfits representing at least seventeen different countries.⁴⁸

UNCLOS raises a host of international and even domestic legal issues beyond the scope of this Comment, some of which stem from the fact that the United States signed the treaty but has not ratified it.⁴⁹ Yet UNCLOS is still relevant to the discussion below because it allows coastal nations to declare Exclusive Economic Zones (EEZs) of up to two hundred nautical miles

40. John Chadwick, *Davey Jones' Treasure Locker*, INT'L MINING, May 2008, at 20.

41. *Id.*

42. Macalister, *supra* note 39.

43. Secure title was one of the core political uncertainties that derailed underwater mining efforts in the 1970s. King, *supra* note 25, at 30.

44. United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994) [hereinafter UNCLOS].

45. *Id.* at pmb1. para. 7, art. 136.

46. MARINE RESOURCES, *supra* note 9, at 6.

47. INT'L SEABED AUTH., REGULATIONS ON PROSPECTING AND EXPLORATION FOR POLYMETALLIC NODULES IN THE AREA (2000), available at <http://www.isa.org.jm/files/documents/EN/Regs/MiningCode.pdf>.

48. *Contractors*, INT'L SEABED AUTH., <http://www.isa.org.jm/en/scientific/exploration/contractors> (last visited May 14, 2013).

49. See generally Robert C. "Rock" De Tolve, *At What Cost? America's UNCLOS Allergy in the Time of "Lawfare"*, 61 NAVAL L. REV. 1, 3 (2012).

around their coastlines.⁵⁰ The United States has declared its EEZ, and the vast majority of the offshore minerals that the country may now legally claim lie beyond the unexpanded reach of traditional maritime sovereignty in the deeper waters of the EEZ. Thus, an understanding of the law governing underwater extraction and the geographic scope of the United States' submarine jurisdiction provides a helpful background for understanding how prospectors can access these resources.

II. OFFSHORE MINING LAW

Although the crescendo of interest in the 1970s left an offshore mining legal regime on the books, those simple regulations are not up to the task of ushering in modern underwater mineral extraction. Nonetheless, the current state of the law provides an important background that is essential to understanding this Comment's proposal. This Part therefore explains (1) the geographic scope of the federal government's offshore mining jurisdiction, (2) the government's broad authority under the Outer Continental Shelf Lands Act (OCSLA), (3) the current regulations based on that authority, and (4) the reasons why this regime will face pressure for reform in the near future.

A. U.S. Offshore Jurisdiction

Submarine sovereignty is not perfectly analogous to terrestrial and aerial sovereignty. It would seem strange for a country to legally claim the air above land it does not own, or the ground beneath airspace it does not control. Yet that is precisely what occurs in the oceans. Each coastal nation in the world claims a twelve-mile "territorial sea" around its shores. International waters lie beyond that twelve-mile band. Overlaid on that straightforward system, however, is a more complex scheme for determining sovereignty over subsurface resources. The interaction of these two schemes results in a counterintuitive system under which a country can hold sovereign rights to subsurface resources beneath international waters.

50. UNCLOS, *supra* note 44, at art. 55-57. UNCLOS also has a complicated process to allow countries to claim an Exclusive Economic Zone (EEZ) extending beyond two hundred nautical miles if they can show that the geological shelf extends beyond two hundred nautical miles (as the American continental shelf does in numerous regions, such as the Atlantic Coast, Gulf of Mexico, Bering Sea, and Arctic Ocean), but only countries that have ratified the treaty may go through the process of establishing that claim. OCEAN BLUEPRINT, *supra* note 24, at 73. So as far as the United States is currently concerned, two hundred nautical miles is the EEZ limit and this Comment will continue to use that distance.

Just as coastal lands often slope gradually down to sea level, submerged lands normally extend gradually out to sea for many miles from the shore, forming a “shelf” of relatively shallow depth. The most easily accessible marine mineral resources lie atop that continental shelf, which has traditionally been defined as the submerged portions of continents that lie underwater. As explained in the preamble to the Submerged Lands Act:

The outer boundary of each shelf is marked by a sharp increase in the slope of the sea floor. It is the point where the continental mass drops off steeply toward the ocean deeps. Generally, this abrupt drop occurs where the water reaches a depth of . . . 600 feet . . .⁵¹

President Harry S. Truman claimed the country’s Outer Continental Shelf (OCS) in 1945, declaring American jurisdiction “over the natural resources of the subsoil and sea bed of the continental shelf by the contiguous nation[,] . . . since the continental shelf may be regarded as an extension of the land-mass of the coastal nation and thus naturally appurtenant to it”⁵² That single sentence belies the scale of Truman’s proclamation:

Along the Atlantic coast, the maximum distance from the shore to the outer edge of the shelf is 250 miles and the average distance is about 70 miles. In the Gulf of Mexico, the maximum distance is 200 miles and the average is about 93 miles. The total area of the shelf off the United States is estimated to contain about 290,000 square miles, or an area larger than New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, and Kentucky combined. The area of the shelf off Alaska is estimated to contain 600,000 square miles, an area almost as large as Alaska itself.⁵³

With that single act, Truman exerted national control over roughly 1.4 billion acres of submerged land.⁵⁴

Yet the current American claim extends even farther—well beyond the boundary of the geologic OCS. In 1983, per UNCLOS, President Ronald Reagan established the U.S. EEZ, a sovereign claim to all living and nonliving submerged resources within two hundred nautical miles of every shoreline.⁵⁵ This includes the twelve-mile territorial sea but also far exceeds it. Beyond the initial three miles of normal state jurisdiction, the federal government

51. H.R. REP. NO. 83-413, at 2 (1953), *reprinted in* 1953 U.S.C.C.A.N. 2177, 2178.

52. Proclamation No. 2667, 10 Fed. Reg. 12,303 (Oct. 2, 1945) (codified as amended at 43 U.S.C. § 1331 (1953)). The Outer Continental Shelf Lands Act (OCSLA) codified that proclamation.

53. H.R. REP. NO. 83-413, *supra* note 51, at 2.

54. MARINE MINERALS, *supra* note 2, at 6.

55. UNCLOS, *supra* note 44, at arts. 56.1 (limited jurisdiction), 76.1 (distance). The United States was the 59th nation to establish an EEZ.

now controls the next 197 miles that extend off of the ninety thousand miles of American coastline. In fact, the U.S. EEZ is the largest in the world, spanning over 1.7 billion acres of submerged land.⁵⁶ The EEZ exceeds the geologic continental shelf because it extends not just from the contiguous United States, but also from the coasts of Alaska, Hawaii, and in a full two-hundred-nautical-mile radius from each Pacific island of U.S. affiliation.⁵⁷ Thus, if one were to travel linearly out from any U.S. beach, governmental jurisdiction is delineated as follows: (1) for the first three nautical miles, both submerged lands and waters are under state control;⁵⁸ (2) the next nine nautical miles are under purely federal control, both at the surface and underwater; and (3) the final 188 nautical miles are submerged American land covered by international waters. Beyond two hundred nautical miles, everything is international—that is, until one comes within two hundred nautical miles of another shoreline.

It is hard to overstate the significance of the EEZ declaration. Not since the Louisiana Purchase had a president doubled the size of the country's resource jurisdiction with the stroke of a pen. For reference, at nearly 3.4 million square miles,⁵⁹ the U.S. EEZ is not much smaller than the roughly 3.8 million square miles of terrestrial land in the United States. Yet none of the resources in those submerged lands are accessible without a legal regime to permit their extraction.

B. Development of the Outer Continental Shelf Lands Act (OCSLA)

Submerged federal lands off American coasts are currently governed by a vague, one-paragraph provision nestled in the Outer Continental Shelf Lands Act of 1953—an act dealing primarily with oil and gas exploration. Although

56. OCEAN BLUEPRINT, *supra* note 24, at 352; *Map of the U.S. Exclusive Economic Zone*, NAT'L OCEANIC AND ATMOSPHERIC ADMIN., http://www.gc.noaa.gov/documents/2011/012711_gcil_maritime_eez_map.pdf.

57. These islands include the U.S. Commonwealth of the Northern Mariana Islands and the eight U.S. territories including Guam and American Samoa. JAMES R. HEIN ET AL., U.S. DEP'T OF THE INTERIOR & U.S. GEOLOGICAL SURVEY, MARINE MINERAL RESOURCES OF PACIFIC ISLANDS—A REVIEW OF THE EXCLUSIVE ECONOMIC ZONES OF ISLANDS OF U.S. AFFILIATION, EXCLUDING THE STATE OF HAWAII, CIRCULAR 1286 1 (2005). Legally, “Outer Continental Shelf” is a term of art denoting the federally controlled submerged lands beyond the inner three-mile ring of state-controlled shelf. In this way, even volcanic islands that technically have no geological continental shelf may have a full two-hundred-mile legal continental shelf (provided they are inhabited).

58. *See infra* notes 58–66 and accompanying text.

59. *Maritime Stewardship*, U.S. COAST GUARD, <http://www.uscg.mil/top/missions/MaritimeStewardship.asp> (last modified Sept. 19, 2013).

subsequent regulations promulgated in 1989 sought to implement this statute and fill in the holes, neither Congress nor the Interior Department can really be faulted for having crafted a flawed regulatory regime for an industry that still does not quite exist today. Blame aside, though, an incomplete and obsolete legal system cannot adequately regulate the pending rush to extract submarine resources. An examination of the existing legal framework and its flaws is a necessary starting point for this Comment's proposal for improving the regime.

Before serious underwater resource extraction was possible, prospectors had little interest in offshore, submerged lands. The first offshore oil drilling began just off the California coast in 1896 and relied on narrow pier-like boardwalks extending from the shore.⁶⁰ Even as companies gained experience working offshore, they stayed in quite shallow water. For example, the first company to drill beyond the sight of land did not do so until 1942, and although the drilling occurred 10.5 miles off the Louisiana coast, the waters were still only eighteen feet deep.⁶¹ So although technology was opening up submerged resources, there was little interest in the vast majority of submerged lands, which lie at more substantial depths.

Interest in offshore lands intensified when those deeper resources became accessible, leading to the question of to whom submerged resources should belong. In fact, the counterintuitive split between federal and state jurisdiction explained above was the result of a federalist compromise.⁶² Initially, submerged land ownership mattered little because nobody realized these lands contained valuable resources. Offshore extraction expanded slowly, so for the first fifty years, coastal states offered offshore oil leases without interference from the federal government. Then in 1945, as offshore oil drilling became more viable and productive, the federal government decided to assert its own claim to those submerged lands and resources. The states understandably objected, setting off a scuffle between state and federal governments that made its way up to the U.S. Supreme Court. In *United States v. California*,⁶³ the Court held that the federal government had complete jurisdiction beyond the coastline despite

60. *A Brief History of Offshore Drilling* 1 (Nat'l Comm'n on the BP Deepwater Horizon Oil Spill and Offshore Drilling, Staff Working Paper No. 1, 2010) [hereinafter BP Commission].

61. *Id.* at 2.

62. See generally Jeffrey C. Cartmell, *A Shift in the Winds: What the Outer Continental Shelf Renewable Energy Program and the Dismantling of the Minerals Management Service Mean for Offshore Energy*, 7 OKLA. J.L. & TECH. 55 (2011).

63. 332 U.S. 19 (1947).

one hundred years of ostensible, if not explicit, state control over submerged coastal lands.⁶⁴

The court battle was settled, but there was still one more way the states could wrest some jurisdiction back. General Dwight D. Eisenhower campaigned in part on a promise to return some control over coastlines to the states, and his election prompted Congress to overrule the Court's holding with the Submerged Lands Act of 1953.⁶⁵ This act granted states title to the first three nautical miles of submerged land off their coasts and all the resources therein.⁶⁶ That law remains in effect today. Where state control ends, federal jurisdiction begins and extends over all the submerged lands from three nautical miles offshore to the distant boundary of the subsurface American claim.⁶⁷

To the victor go the spoils, and this vast new federal jurisdiction required regulation, so Congress passed the Outer Continental Shelf Lands Act of 1953 (OCSLA) in tandem with the Submerged Lands Act.⁶⁸ OCSLA, which governs the OCS to this day, was motivated exclusively by oil and gas interests; at the time, little was known about hardrock minerals in the OCS.⁶⁹ However, OCSLA did contain a single catchall paragraph, section 8(k), authorizing the Secretary of the Interior to account for those resources should they exist:

The Secretary is authorized to grant to the qualified persons offering the highest cash bonuses on a basis of competitive bidding leases of *any mineral other than oil, gas, and sulphur* in any area of the outer Continental Shelf not then under lease for such mineral upon such royalty, rental, and other terms and conditions as the Secretary may prescribe at the time of offering the area for lease.⁷⁰

Thus, as the Interior Department would ultimately argue, OCSLA delegates immensely broad authority for the agency to regulate hardrock mining in the OCS. Yet that power lay dormant for three decades because there was no

64. See MICHAEL W. REED, 3 SHORE AND SEA BOUNDARIES 3–11 (2000), available at <http://www.nauticalcharts.noaa.gov/hsd/shalowitz.html>; AARON L. SHALOWITZ, 1 SHORE AND SEA BOUNDARIES 3–6 (1962), available at <http://www.nauticalcharts.noaa.gov/hsd/shalowitz.html>.

65. 43 U.S.C. §§ 1301–1315 (2006); BP Commission, *supra* note 60, at 3.

66. For historical reasons, the state boundaries of Texas and Florida's Gulf coast extend out to nine miles instead of the typical three. OCEAN BLUEPRINT, *supra* note 24, at 353.

67. Thus, this Comment focuses on federal law because it applies to the vast majority of submerged territory and hardrock minerals, which lie well beyond the narrow ring of state jurisdiction.

68. 43 U.S.C. § 1331–1356 (2006).

69. MARINE MINERALS, *supra* note 2, at 28.

70. 43 U.S.C. § 1337(k) (2006) (emphasis added).

demand for the Interior Department to issue underwater hardrock mining regulations pursuant to section 8(k)—until the federal government suddenly came to control the largest swath of subsurface jurisdiction in the world.

C. Current Regulations Under OCSLA

As technology advanced and especially following the EEZ proclamation in 1983, the sheer scale of potential resources in that vast new territory reinvigorated interest in underwater mining. It was then that the Interior Department began to consider exercising its OCSLA authority over OCS hardrock mining. But Congress objected to the Department's asserted hardrock mining authority in the EEZ: OCSLA barely mentioned underwater mining, and even if Congress conceded Interior's theoretical jurisdiction over mining in federal waters, that would not necessarily confer Interior jurisdiction over mining in the EEZ, because the EEZ came into existence thirty years after the law allegedly authorizing regulation of its resources. As a result, many critics initially doubted that declaring the EEZ could have retroactively expanded the scope of an old law such that Congress had delegated sweeping authority over territory the U.S. would not acquire for decades.⁷¹ Whether or not it did, there was (and remains) a strong argument that the Interior Department should not promulgate a regulatory framework for EEZ mining without new, explicit enabling legislation to more clearly convey Congressional authority and guidance.⁷²

Yet the Interior Department had its marching orders and pressed on without waiting for new legislation. Despite these criticisms, President Reagan's Solicitor General concluded that Congress had already delegated sufficient authority in section 8(k) some three decades earlier, and therefore no new law was necessary. Crucially, he found that the term "OCS" was "an expanding concept that would broaden automatically whenever the U.S. enlarged its claims under the continental shelf doctrine," and thus the term had already "chang[ed] with the altering perception of the U.S. jurisdiction over the continental shelf under international law."⁷³ So the Interior Department began drafting hardrock mining regulations without waiting for Congress. Over the next

71. William Perry Pendley, *Legal Considerations Regarding Development of Resources of the Exclusive Economic Zone*, in EEZ SYMPOSIUM, *supra* note 12, at 55–56.

72. *Id.*

73. William Perry Pendley, *Development of the Exclusive Economic Zone*, NAT. RESOURCES & ENV'T, Spring 1986, at 29, 31. This legal basis has spawned some interesting consequences. Because this interpretation tied the definition of OCS not to geology but rather to national need and international law, it is possible that this guidance could extend U.S. jurisdiction beyond the two-hundred-nautical-mile limit at some time in the future.

three years, Congress attempted to intercede three times, but failed.⁷⁴ Without successful legislation to halt them, the OCSLA regulations went into effect in 1989 and stand today.⁷⁵

Within the Interior Department, regulatory responsibilities originally came under the purview of the Minerals Management Service (MMS). But that notoriously scandal-ridden agency was disaggregated and reorganized in 2010. Today, offshore mineral oversight falls to the Bureau of Ocean Energy Management (BOEM) for leasing programs, and its sister agency, the Bureau of Safety and Environmental Enforcement (BSEE), for safety and environmental compliance.⁷⁶ Additionally, a third agency, the Office of Natural Resources Revenue (ONRR) now conducts all revenue collection and management.⁷⁷

Under the 1989 regulations, which constitute the entirety of the offshore mining legal regime, hardrock mineral leases are competitively offered to the highest qualified bidder, per OCSLA section 8(k). Hardrock mineral leases run for at least twenty years and may be extended as long as production continues and the recipient complies with regulations.⁷⁸ As for revenue—the primary public benefit of allowing access to national resources—leases would generate either royalties or rental fees. Beginning in year five of each lease, the government assesses a rental fee for any year in which royalties are not owed.⁷⁹ The Secretary of the Interior has discretion over how to calculate royalties for each lease, but the general metrics depend on value or quantity extracted.⁸⁰ While the Secretary has not established a default royalty rate, agency comments predict that actual rates “will likely fall within the range of 2 to 5 percent.”⁸¹

74. The most serious proposal, the National Seabed Hard Minerals Act (NSHMA), would have implemented a 12.5 percent royalty (reducible for economic reasons) and a “priority of right” for the first applicant to comply with licensing requirements for a given site. H.R. 5464, 99th Cong. §§ 302, 309(a)(2) (1986). Although the priority of right was not to be a full regression to the General Mining Act’s (GMA) right to mine, it was controversial because it would be a big step back from OCSLA’s competitive leasing regime. Kindt, *supra* note 14, at 341–42. The merits of competitive versus noncompetitive leasing are discussed *infra* Part III.C.

75. These regulations are scattered through the code because of the Interior Department Reorganization in 2011. *See* Reorganization of Title 30: Bureaus of Safety and Environmental Enforcement and Ocean Energy Management, 76 Fed. Reg. 64,432 (Oct. 18, 2011).

76. *The Reorganization of the Former MMS*, BUREAU OF OCEAN ENERGY MGMT., <http://www.boem.gov/About-BOEM/Reorganization/Reorganization.aspx> (last visited May 14, 2013).

77. *Id.*

78. 30 C.F.R. § 581.19 (2012).

79. *Id.* § 581.27.

80. *Id.* § 581.28.

81. Outer Continental Shelf Minerals and Rights-of-Way Management; General Leasing of Minerals Other Than Oil, Gas, and Sulphur in the Outer Continental Shelf, 54 Fed. Reg. 2042, 2048 (Jan. 18, 1989) [hereinafter OCS Mining]; *see* 30 C.F.R. § 581.28 (2012).

In practice, a number of production incentives would further reduce these already low royalty rates. For example, the regulations provide an exception from the otherwise mandatory imposition of a minimum annual royalty fee⁸² if the recipient company mines for minerals that are located (1) under particularly deep waters or (2) in shallow waters, but deep underground—sites where production would be comparatively unprofitable absent such incentives.⁸³ Additionally, the regulations allow a lessee to initiate a single, consecutive five-year period of reduced royalties at any point within the first fifteen years of the lease.⁸⁴ The Secretary also retains authority to waive, suspend, or reduce royalties at his discretion.⁸⁵ Therefore, as written, these regulations do not appear likely to generate substantial revenue from offshore mining.

This Comment asserts that updated offshore mining law should generate substantial revenue and contain strong environmental protections. As Part III explains, these are not the hallmarks of current mining law in America. Given the favorable regulatory treatment mining has received throughout the nation's history, one might not expect the industry to embrace calls for new legislation. However, a number of factors could drive the mining industry and critics of offshore mining law to the negotiating table as willing negotiators in the near future.

D. Offshore Mining Law Reform Is Likely

A participant in a 1985 symposium on OCS resource extraction reflected on recent technological advances at that time: “Each generation, it seems, marvels at the limits a previous generation placed upon its technology. We may be limited in the EEZ, occasionally by geology, infrequently by technology, but most often by public policy.”⁸⁶ Even though mining technology has continued to make great strides since 1985,⁸⁷ public policy remains one of the biggest

82. 30 C.F.R. § 581.30 (2012). If production ceases in a given year after it has begun, the annual rental is charged per § 581.27.

83. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-45R, MINERAL RESOURCES: MINERAL VOLUME, VALUE, AND REVENUE 24 (2012) [hereinafter GAO 2012]. Note the incentive for minerals buried deep underground; none of the three mineral types discussed above lies deep underground. The concern today is water depth, not mineral depth. This provision demonstrates the obsolescence of these regulations.

84. Royalties may be reduced to zero in years one through ten, and to half the normal rate from years eleven through fifteen. 30 C.F.R. § 581.28(b) (2012).

85. *Id.* § 581.32.

86. Pendley, *supra* note 71, at 61.

87. For example, that same speaker also remarked: “Who would have imagined, a few short years ago, when the technological limit for offshore development was then 600 feet, that in 1983, a platform would be placed in 1,080 feet of water . . .” *Id.* Today, the newest drill ships can operate in twelve

hurdles to sensible resource development today. Offshore mining policy will therefore likely come under intense scrutiny as the economic and technological barriers to underwater extraction continue to fall away.

In the abstract, a reform process requires interested parties to come together and negotiate. As discussed below, critics of onshore mining have been trying to get to the negotiating table for well over a century,⁸⁸ so they should welcome any chance at reform. Environmental advocates will certainly oppose opening pristine marine areas to commercial development, but if and when it appears that some offshore mining is bound to occur despite their opposition, the more pragmatic elements of the environmental movement will at least insist on a seat at the table when crafting new law or regulations. Given the mining industry's success at resisting reform efforts, however, it would seem that industry participation may be the sine qua non of offshore mining reform. Yet as it turns out, there are a number of reasons why even staunch mining advocates should be willing to negotiate on offshore mining: (1) Compared to terrestrial mining law, which the industry has zealously protected, the industry has less to lose and more to gain from potential offshore mining reform; (2) reform could provide valuable regulatory certainty; and (3) even a generous interpretation of OCSLA may not actually grant access to the most promising underwater mineral reserves.

First, OCSLA is not as purely proindustry as terrestrial mining law. Onshore mining law is strikingly prodevelopment and does not even attempt to balance mining with any other potential land use or consideration. It is so industry-friendly that no reform effort could realistically result in a better outcome for mining interests. As a result, the industry has steadfastly blocked all attempts at reform for well over a century.⁸⁹ Offshore mining presents a starkly different situation. Because offshore mining law is largely regulatory and is based on only a single paragraph of vague statutory authority, it is far less developed. As a result, mining interests should have a long list of features they would like to see incorporated into offshore mining law. Additionally, unlike onshore mining law, section 8(k) does not enshrine industry-friendly values like its onshore counterpart, so the industry has far less incentive to protect that status quo and stands to gain much more than it could conceivably lose at the negotiat-

thousand feet of water. See Jad Mouawad & Barry Meier, *Risk-Taking Rises as Oil Rigs in Gulf Drill Deeper*, N.Y. TIMES, Aug. 29, 2010, http://www.nytimes.com/2010/08/30/business/energy-environment/30deep.html?pagewanted=all&_r=0.

88. See *infra* Part III.A.

89. See *infra* Part III.A.

ing table. With a sizable wish list and no existing advantage to protect, there is far less incentive for mining interests to block offshore mining reform.

Second, regulatory uncertainty might help bring mining advocates to the negotiating table. As noted above, OCSLA has but one short paragraph on hardrock mineral extraction.⁹⁰ Section 8(k) imposes a single limit on hardrock mineral regulations: competitive leasing. There is an argument that section 8(k)'s brevity is a strength, because its broad authority allows regulators to draft new regulations to respond to changing conditions as they develop.⁹¹ Thus, pending new legislation, the Interior Department is likely to continue interpreting section 8(k) as broadly as necessary to promulgate relevant regulations. Yet that vague authority can cut both ways: For a capital-intensive industry that ostensibly requires twenty-year leases to pursue a single project, this flexibility would also breed uncertainty. With such broad authority, offshore mineral policy could conceivably shift wildly under different presidential administrations; assuming no incumbent president were reelected, regulations could reverse course a full five times over the term of a single offshore mineral lease.⁹² Whatever its contents, an underwater mining bill could provide the certainty investors desire to launch new underwater ventures.

An additional cause of uncertainty might prompt mining advocates to pursue reform: litigation. Section 8(k) has yet to be litigated, but a broad look at OCSLA litigation demonstrates that the industry might welcome a chance to keep offshore mining away from that law. In general, OCSLA has spawned an infamously chaotic body of case law. The vast majority of this litigation is related to oil drilling in the Gulf of Mexico and thus occurs primarily in just the Fifth Circuit.⁹³ Yet even without having to navigate circuit splits, OCSLA jurisprudence has been so remarkably unstable and self-contradictory that even the Fifth Circuit is uncommonly critical of its own work.⁹⁴ The Supreme

90. It is hard to fault OCSLA's drafters for offering little guidance regarding an industry that did not exist when the law was passed in 1953. See Richard J. Greenwald, *Current (Hard Minerals Industry) Activities in the EEZ*, in EEZ SYMPOSIUM, *supra* note 12, at 39, 40. After all, it still does not quite exist today, sixty years later.

91. Pendley, *supra* note 71, at 59. Even in 1985, the flexibility of the delegated authority was characterized as, "increasingly rare, essentially unique and [a feature] that should be welcomed by the private sector." *Id.*

92. Changes in mining regulations have historically not been applied retroactively to existing leases, but the desire for regulatory certainty ought to support a push to enact more detailed offshore mineral legislation.

93. David W. Robertson, *The Outer Continental Shelf Lands Act's Provisions on Jurisdiction, Remedies, and Choice of Law: Correcting the Fifth Circuit's Mistakes*, 38 J. MAR. L. & COM. 487, 489 (2007).

94. See *id.* at 489–90 n.13.

Court could resolve these issues if it so chose, but the confinement of litigation to a single circuit has prevented a circuit split that might invite Supreme Court review from developing.⁹⁵ The same problem could emerge in offshore mining litigation if early mining activities are focused in just one or a few areas.

Third, and perhaps most importantly, mining advocates will want to negotiate in order to secure access to the most promising offshore sites. When President Reagan's Solicitor General determined that OCSLA delegated enough authority to promulgate mining regulations, he did note a limitation to that authority: He found that the term "OCS" as used in OCSLA included only lands that "appertain to the United States and are subject to its jurisdiction and control."⁹⁶ As a result, the EEZ surrounding U.S. trust territories and possessions does not fall under OCSLA jurisdiction.⁹⁷ The U.S. EEZ surrounding its Pacific islands is actually greater than that of the U.S. mainland and Alaska.⁹⁸ It also contains some of the most lucrative mineral deposits available to the United States. Because OCSLA does not apply to those waters, however, those resources will remain legally inaccessible without an update to U.S. underwater mining law.⁹⁹

The future of offshore mining is bright and rapidly approaching, but U.S. mining law under OCSLA is not poised to respond to this coming surge. Mining advocates and critics both stand to gain from reforming underwater mining law and should find themselves at a negotiating table in the not-too-distant future.

III. LESSONS FROM THE HISTORY OF AMERICAN EXTRACTIVE LAW

As a byproduct of America's vast mineral wealth, the nation has an extensive history of extractive law and policy—and it is littered with mistakes and cautionary tales. The prospect of establishing a regulatory regime without entrenched interests or inertial precedents presents an opportunity to accomplish what these other mineral regulations have failed to do time and time again: get it right. This Part draws on the legal histories of American mineral law

95. *See id.* at 490.

96. Pendley, *supra* note 71, at 58.

97. *Id.*

98. Greenwald, *supra* note 90, at 39.

99. Admittedly, a solicitor general could remove these barriers to access by embracing a broader interpretation of OCS, but mining advocates should nonetheless prefer a legislative update because it would provide greater certainty. Notably, the NSHMA, discussed *supra* note 74, would have granted the authority to enforce mining regulations in the entire U.S. EEZ, and would even have authorized the Secretary to negotiate agreements with the freely associated Pacific Island nations, such as the Marshall Islands and the Federated States of Micronesia.

to extract transferable lessons that can inform the drafting of underwater mineral law.

The three case studies presented below inform the proposal for underwater mining law set forth in Part IV. Case Study 1 reviews the history of onshore mining on federal land to consider the repercussions of offering public resources without generating sufficient government revenue, particularly royalties. Specifically, it highlights how underwater mining shares some of the frontier characteristics of the early American West that led to royalty-free mining on federal land. Those frontier characteristics influenced onshore mining law with unfortunate consequences. This Comment therefore argues that Congress and regulators should not succumb to similar pressures in reforming underwater mining law. Case Study 2 recounts the scandal-ridden trial and error journey of onshore oil regulations toward a competitive leasing system, with an emphasis on the pitfalls of poorly designed and noncompetitive leasing regimes. Case Study 3 then surveys the offshore oil leasing system under OCSLA and extracts the lesson that any development incentives must be tied to the ongoing need for those incentives.

A. Case Study 1: Onshore Mining Teaches That Royalties and Nontrivial Fees Must Be Assessed

Government revenue has been one of the most contentious aspects of American mineral law since its inception. Mining advocates argue that, unlike other extractive resources such as oil and gas, hardrock minerals mined from federal lands should generate essentially no direct public revenue. Indeed, that is the effect of current onshore mineral law. The logic and merits of that argument are discussed below, but before engaging in that analysis, one should understand the broader rationale for revenue in this context. This Comment posits that mining on federal lands should generate substantial government revenue for two reasons: first, to help balance market forces that are otherwise skewed, and second, to compensate the public for its resources.

Regarding market forces, it is beyond debate that the free market undervalues environmental degradation. Many environmental considerations are excluded from market calculations because environmental health is often difficult to quantify: What is the value of clean air? What is the appropriate cost for the incremental addition of pollution to the air we share? To exacerbate this problem, many environmental services, such as a forest's water filtration or a wetland's flood protection, are cumulative and their benefits are dispersed. This means that no single private property owner is especially aggrieved by a marginal decrease

in services caused by the loss of an individual parcel of undeveloped land, and therefore individual property owners lack a strong incentive to protect their own fraction of an ecosystem and receive no compensation for maintaining natural systems that provide valuable services to entire regions or even the global community.¹⁰⁰ Yet together, these individual losses have dire cumulative effects, and there is no inherent mechanism to internalize that cost. Thus despite the near certainty of environmental harm from many activities, environmental effects are systematically undervalued in development decisions because most environmental impacts are externalities for which polluters do not pay.

This is particularly true for hardrock mining, in which developers are not held responsible either for the full extent of their environmental pollution or for the opportunity cost of excluding other uses of public lands.¹⁰¹ The omission of these externalized costs results in a market that encourages more mining than would be optimal if the true costs of mining were internalized and imposed on developers. This market failure exists even without subsidies but is especially pronounced in hardrock mining law, which is replete with hundreds of millions of dollars in annual incentives that distort the market even further and promote rampant mineral overdevelopment on federal land.¹⁰² Thus, this Comment encourages policymakers to set substantial royalty rates and other direct government revenues in order to raise the cost of mining activities and thereby economically rein in some of the distorted overproduction that occurs because of externalized environmental harms.¹⁰³

100. If something damages conventional property with discrete ownership, like a home, a specific owner suffers a direct harm and will react. Moreover, our legal system will account for that loss. On the other hand, for communal environmental services like water filtration from a forest or air available in the atmosphere, even if parties do own fractions of the system, benefits of and harms to the system are so dispersed that they do not elicit a strong personal response. Without a government response or regulation, these harms will likely go unchecked.

101. Most other uses of public land, such as hiking and conservation or ecosystem services, are able to coexist without precluding other public uses. When public land is used for mining, however, no other members of the public may use that land, and the mining may even spoil other public lands. Thus mining on public lands effectively privatizes that land and excludes other uses, but the onshore mining regime does not consider the value of those other uses.

102. To name a few, there are low administrative fees, royalty-free extraction, land patenting that allows miners to take titles in fee simple to mining claims for nominal fees, and numerous tax breaks such as the "percentage depletion allowance," which alone is estimated at \$100 million annually. THE PEW CAMPAIGN FOR RESPONSIBLE MINING, REFORMING THE U.S. HARDROCK MINING LAW OF 1872: THE PRICE OF INACTION 3 (2009), available at http://www.pewtrusts.org/our_work_report_detail.aspx?id=48424.

103. Evaluating the specific environmental concerns of offshore mining would require a much longer and more technical paper. Instead, this Comment's focus on the economics of environmental harm attempts to collectively highlight those market distortions in resource extraction and preemptively correct for them before offshore mining even begins.

Correcting a market distortion is helpful, but ensuring that the government receives adequate compensation from private, for-profit mining corporations is also important because public resources are just that—public. When those resources are privatized and public lands are degraded, the public deserves to be compensated for its loss. This simple statement is actually controversial in the realm of American mineral politics, and, as discussed below, has been argued back and forth since the nineteenth century.

Recall that this Comment urges reform for the nation's offshore mineral regulations because they are now obsolete at twenty-four years old. Yet consider that the centerpiece of terrestrial mining law on public land—the General Mining Act of 1872 (GMA)¹⁰⁴—has been overdue for reform for well over a century. As alluded to above, this law has survived not because of its policy brilliance or record of success, but rather because industry interests have impressively managed to thwart repeated reform attempts for over a century.¹⁰⁵ What started as an informal, royalty-free, and hands-off approach to encourage frontier development was cemented through political inertia into long-term mineral policy that has proven impenetrable to subsequent economic, social, and political changes.

The General Mining Act's unfortunately long life has entrenched wildly outdated perspectives toward public resource management and cannot help but serve as a case study in royalty-free extraction and what happens when frontier pressures are allowed to shape long-term mineral policy. Especially in an era of record-breaking inaction in Congress, it takes considerable political pressure to change a system once it is in place.¹⁰⁶ This case study demonstrates how important it is for regulators to lay out a forward-looking regulatory regime from the beginning, before special interests become embedded in the political system. The time to consider the prudence of our submarine resource management policy is now—before these resources are really in play. The General Mining Act proves this point beyond any doubt.

104. General Mining Act of 1872, 30 U.S.C. §§ 22–47 (2006).

105. *See generally* JOHN D. LESHY, *THE MINING LAW: A STUDY IN PERPETUAL MOTION* 366 (1987). Recently, even a 0.03 percent royalty to create a mine cleanup program was easily defeated. MARC HUMPHRIES, CONG. RESEARCH SERV., RL33908, *MINING ON FEDERAL LANDS: HARDROCK MINERALS* CRS-7, at i (2008).

106. *See, e.g.*, Dan Roberts, *Gridlocked Congress on Track for Least Productive Year in History*, *GUARDIAN*, Dec. 3, 2013, <http://www.theguardian.com/world/2013/dec/03/congress-least-productive-year-partisan-tensions>.

1. Frontier Pressures Led to Royalty-Free Extraction Under the General Mining Act (GMA)

During its first eighty-three years as a nation, the United States did not have an explicit or coherent public lands mineral policy.¹⁰⁷ It did not need one until the country began expanding beyond the original states because the federal government initially possessed little land of its own. That all changed in 1848. On January 24 of that year, a carpenter named James Wilson Marshall discovered gold in California while operating a sawmill on the American River.¹⁰⁸ Just nine days later, Mexico signed the Treaty of Guadalupe Hidalgo,¹⁰⁹ ceding to the United States much of the land that would become the American West. Until that cession, Mexican mining law had governed mineral activity in the area, but on February 12, the new American military governor of California, Colonel Richard B. Mason, proclaimed: “From and after this date, the Mexican laws and customs now prevailing in California, relative to . . . [making formal claims] of mines, are hereby abolished.”¹¹⁰ With those words, America unwittingly ushered in the Gold Rush by incorporating a territory of vast and newly discovered mineral wealth while simultaneously nullifying the region’s legal framework for orderly mining.

The federal government had a miniscule presence in its new territory—just one hundred Army soldiers—and, even if it had wanted to, could not have imposed mining regulations on the three hundred thousand 49ers that would flock to California in the next two years.¹¹¹ For better or worse, with mineral fortunes at stake in a legal vacuum, miners were more than happy to establish their own rules. These “mining district regulations” were based on longstanding mining customs, which, like many of the 49ers themselves, came to America from Europe and particularly from colonial Spain.¹¹² This

107. COUNCIL ON ENVTL. QUALITY, *HARDROCK MINING ON THE PUBLIC LANDS* (1977), in JAMES RASBAND, JAMES SALZMAN & MARK SQUILLACE, *NATURAL RESOURCES LAW AND POLICY* 1078, 1078 (2d ed. 2009).

108. *New Perspectives on the West: James Wilson Marshall*, PBS, http://www.pbs.org/weta/thewest/people/i_r/marshall.htm (last visited Oct. 28, 2013).

109. Treaty of Peace, Friendship, Limits, and Settlement With the Republic of Mexico, U.S.-Mex., Feb. 2, 1848, 9 Stat. 922.

110. John C. Lacy, *The Historic Origins of the U.S. Mining Laws and Proposals for Change*, 10 NAT. RESOURCES & ENV'T 13, 13 (1995) (quoting GREGORY YALE, *LEGAL TITLES TO MINING CLAIMS AND WATER RIGHTS IN CALIFORNIA UNDER THE MINING LAW OF CONGRESS OF JULY 1866* at 17 (1867)).

111. *Id.* at 13; Barbara Maranzani, *8 Things You May Not Know About the California Gold Rush*, HISTORY (Jan. 24, 2013), <http://www.history.com/news/8-things-you-may-not-know-about-the-california-gold-rush>.

112. Lacy, *supra* note 110, at 16–17.

system was largely successful, at least from the miners' perspective. For almost two decades, Congress effectively deferred to this self-governance by not passing legislation for mining on federal land. Congress officially legalized mining on federal land in 1866¹¹³ and finally laid out a broader system for mining on public lands in the General Mining Act of 1872.

Under the GMA, and to this day, any U.S. citizen or domestic corporation¹¹⁴ may enter unreserved¹¹⁵ public lands to prospect for minerals¹¹⁶ and stake a mining claim.¹¹⁷ Once a party stakes a claim, it may freely mine and sell any minerals extracted from that land without payment to the government. Thus, in effect, this law gives away public resources virtually for free. Although certain types of minerals have been removed from the ambit of this law,¹¹⁸ and a few features have been suspended,¹¹⁹ the GMA still operates today largely as it did in 1872 on the hundreds of millions of acres of unreserved federal land in the United States.¹²⁰

Although the GMA is one of the oldest laws still on the books, it does not owe its longevity to its sensible results or public satisfaction; in fact, it has been criticized since its passage. Within just seven years, the Public Land Commission of 1879 would recommend its thorough overhaul.¹²¹ Yet while calls to reform this "destructive relic" began almost as soon as President Ulysses S. Grant signed it into law, the GMA endures, stubbornly enshrining outdated frontier incentives in the legal code nearly a century and a half after they were even arguably merited.¹²²

113. *Id.* at 17.

114. Note that wholly-owned domestic subsidiaries of foreign mining companies satisfy this requirement. 30 U.S.C. § 24 (2006).

115. Areas such as National Forests, National Parks, and National Monuments are considered "reserved."

116. In the mining law context, the word "mineral" includes "all minerals and mineral fuels including oil, gas, coal, oil shale and uranium." 30 U.S.C. § 21a (2006).

117. 30 U.S.C. § 22 (2006). See generally John D. Leshy, *Mining Law Reform Redux, Once More*, 42 NAT. RESOURCES J. 461, 461 (2002).

118. See *infra* notes 153–165 and accompanying text for a discussion of onshore oil drilling.

119. Under the GMA, a mining claim is allowed to ripen into ownership of the land in fee simple for the nominal payment of \$2.50 or \$5.00 per acre, depending on the type of mine. 30 U.S.C. § 29 (2006). This grossly anachronistic provision is still the law, but has been suspended annually via the appropriations process since 1994. See, e.g., Department of the Interior and Related Agencies Appropriations Act, 2000, Pub. L. No. 106-113, § 312, 113 Stat. 1501, 1501A-191 (1999); Department of the Interior and Related Agencies Appropriations Act, 2001, Pub. L. No. 106-291, § 311, 114 Stat. 922, 988 (2000).

120. See MARC HUMPHRIES & CAROL HARDY VINCENT, CONG. RESEARCH SERV., IB89130: MINING ON FEDERAL LANDS (2001), available at <http://cnie.org/NLE/CRSreports/mining/mine-1.cfm>.

121. John D. Leshy, *Reforming the Mining Law: Problems and Prospects*, 9 PUB. LAND L. REV. 1, 2 (1988).

122. See Editorial, *A Bad Law's Birthday*, N.Y. TIMES, May 13, 2002, <http://www.nytimes.com/2002/05/13/opinion/a-bad-law-s-birthday.html>.

In the late nineteenth century, this public resources giveaway was justified because land was viewed as an unlimited asset as the country expanded. As a result, early federal lands policy sought to privatize public land rather than to manage it.¹²³ The GMA, like the Homestead Acts, was in part intended to draw people out West and to encourage them to settle new areas with the promise of owning what useful land they could find.¹²⁴ By the early twentieth century, however, we had successfully settled the West, and that policy has since long outlived its usefulness. Perhaps more troubling, mining operations have dramatically increased in size since 1872. Accordingly, royalty-free mineral extraction in the modern era effectively transfers a shocking amount of wealth from public coffers to private pockets.

For example, in 1995, Secretary of the Interior Bruce Babbitt held a press conference announcing that he had just signed over 109 acres of federal land, containing more than \$1 billion in mineral reserves, to an American subsidiary of a Danish mining company—for a grand total of \$275 in administrative fees:

You might reasonably ask, how can a public official give away a billion dollars without going to jail? . . . The fact is, I have no choice. . . . This corporate welfare has been going on nonstop for 124 years and the U.S. Congress is the only place that can bring a halt to this.¹²⁵

This was not an isolated episode. Just one year earlier, Secretary Babbitt had been forced to sign over federal land with \$10 billion in mineral reserves to a Canadian company for the price of roughly \$10,000 in combined fees.¹²⁶ Such massive handouts are not mistakes or flukes; this is precisely how the GMA was designed to function in the late 1800s. The problem is that this anachronism is still operating in the modern world.

These anecdotes raise the question of just how much public mineral wealth has been given away over the last century and a half. The deeply unsatisfactory answer is that nobody knows.¹²⁷ The government tracks how

123. COUNCIL ON ENVTL. QUALITY, *supra* note 107, at 1079.

124. U.S. GOV'T ACCOUNTABILITY OFFICE, B-118678, MODERNIZATION OF 1872 MINING LAW NEEDED TO ENCOURAGE DOMESTIC MINERAL PRODUCTION, PROTECT THE ENVIRONMENT, AND IMPROVE PUBLIC LAND MANAGEMENT, at i (1974) [hereinafter GAO 1974] ("The law's second major purpose [is] to induce settlement in the West . . .").

125. Tom Kenworthy, *A \$1 Billion Return for \$275: Babbitt Labels Terms Mandated by Mining Act a 'Tawdry Process'*, WASH. POST, Sept. 7, 1995, at A17 (quoting Secretary Babbitt).

126. *Id.*

127. See Juliet Eilperin, *Mining Firm Profits From Public Lands Remain a Mystery, New GAO Study Shows*, WASH. POST, Dec. 11, 2012, <http://www.washingtonpost.com/national/health-science/mining->

much oil, natural gas, and coal are extracted from federal lands because those quantities are necessary to calculate royalties. States track hardrock mining data on state lands for the same reason.¹²⁸ Yet because federal hardrock minerals generate no royalties, the government does not collect hardrock mineral data for federal lands; thus, the quantity of hardrock minerals taken from federal lands is literally unknowable.¹²⁹

Despite that hurdle, there have been efforts to quantify public mineral losses. The most recent attempt estimated that \$6.41 billion in hardrock minerals was extracted from federal lands in 2011.¹³⁰ In 2012, reformers unsuccessfully proposed a 12.5 percent hardrock mineral royalty and estimated that proceeds could total as much as \$2 billion annually¹³¹—suggesting that the annual value of minerals taken from federal lands could reach \$16 billion. Whatever the exact number, public mineral losses are indisputably large, especially when tallied over the ongoing lifetime of the GMA: The Mineral Policy Center estimated that, even by 1993, the GMA had given away over \$230 billion in royalty-free minerals from federal land.¹³² In short, the United States' frontier policies, which demanded insufficient fees and royalties for valuable public resources, have deprived the public of mammoth sums to which it is rightfully entitled.

firm-profits-from-public-lands-remain-a-mystery-new-gao-study-shows/2012/12/11/c3416110-43c1-11e2-8061-253bccfc7532_story.html.

128. GAO 2012, *supra* note 83, at 47 Enclosure II.

129. See generally *id.* (discussing the lack of data collection from hardrock mine operations). This willful ignorance is reminiscent of the laws preventing research on gun violence. See, e.g., Michael Luo, *Sway of N.R.A. Stymies Firearms Research, Scientists Say*, N.Y. TIMES, Jan. 25, 2011, http://www.nytimes.com/2011/01/26/us/26guns.html?_r=0. This data gap is not the result of quite such transparent lobbying as in the gun control context. Nonetheless, it exerts an analogous stifling effect on reform: Without accurate data, the magnitude of this wealth transfer successfully eludes authoritative quantification.

130. GAO 2012, *supra* note 83, at 47 Enclosure II. The methodology to which the government had to resort is telling. The total value of U.S. hardrock mineral production in a given year is known. This study relied on a 1993 Interior Department estimate that 15.3 percent of U.S. hardrock production value comes from federal land. Hoping that figure was still roughly true nineteen years later, researchers multiplied the total U.S. hardrock mineral production by that percentage to estimate the federal share. *Id.*

131. Jason Dearen, *U.S. Mining Reform: Lawmakers Hope to Overturn Royalties Exemptions on Public Lands*, HUFFINGTON POST (Dec. 12, 2012, 12:23 PM), http://www.huffingtonpost.com/2012/12/12/us-mining-reform-royalties_n_2283953.html.

132. *Mining Law Reform: Hearing on S. 326, S. 327 and S. 1102 Before the Subcomm. on Forests and Public Land Mgmt. of the S. Comm. on Energy and Natural Res.*, 105th Cong. 46 (1998) (statement of Stephen D'Esposito, President, Mineral Policy Center).

2. Resource Extraction Can Occur Profitably Despite Royalties

As previously explained, gold found on public land is free under the GMA. Conversely, current regulations would impose a royalty on gold extracted from federal submerged lands. Although Part IV will argue that any new offshore mining regulations should assess royalties (ideally at a higher rate than those imposed at present), there is some logic to the contention that the government should receive the same revenue from any given resource—regardless of whether it was extracted from terrestrial or submerged federal lands.¹³³ Without going into detail, this Comment generally posits that onshore mineral law should also be amended to more closely resemble the updated offshore mining law proposed in Part IV. However, some will argue that to achieve equal treatment, offshore regulations should actually be relaxed to bring them into harmony with the GMA.

As explained in the previous Subpart, the GMA was designed to provide incentives to develop domestic mineral deposits and settle the West.¹³⁴ The latter argument is no longer viable, yet modern mining advocates argue that royalty-free extraction is still sound public policy because of the risks involved in prospecting and mining.¹³⁵ Specifically, mining companies argue that the government should rightly forgo mineral royalties because miners provide the nation with two services: First, they invest in exploring federal lands for mineral wealth, and, second, when they find minerals, they extract them and make them available to sate the country's mineral appetite.¹³⁶

Neither point is wrong, but neither is persuasive either. There are other models that can encourage and achieve federal land exploration, as discussed in Part IV, and the national service argument just does not hold water. The claim that miners sate the country's mineral appetite may have been true in the late 1800s when minerals mined in America were likely consumed in

133. In response to a comment on its OCS hardrock regulations, the Minerals Management Service (MMS) wrote: "It is anticipated that the royalty prescribed in leasing notices announcing tracts to be offered for lease will be comparable to the royalty prescribed in onshore *leases* which convey rights to similar mineral deposits." OCS Mining, *supra* note 81, at 2048 (emphasis added). This statement referred to the minority of hardrock mining conducted on acquired federal land, which is leased under MLA. Even balancing royalties between onshore and offshore leases for the same resource would leave a gaping asymmetry with minerals claimed under the GMA.

134. *See, e.g.*, Dearen, *supra* note 131.

135. HUMPHRIES, *supra* note 105, at CRS-7 (2008). Despite or perhaps because of its origins, mining advocates argue that royalty-free extraction and a claim-patent system are critical to the success of hardrock mineral mining.

136. *See* T. S. Ary, *Royalties*, in *THE MINING LAW OF 1872: A LEGAL AND HISTORICAL ANALYSIS* 73 (1989).

America. Today, however, multinational and even foreign mining companies deliver American minerals to the global market, not to the U.S. government or to its people, so the characterization of mining as a domestic public service is not quite accurate.

More broadly, while mining is certainly a capital-intensive business, miners are richly compensated for their efforts. For these corporations to suggest that their ventures would not be profitable if they had to pay royalties on minerals extracted from federal lands is simply disingenuous.¹³⁷ After all, mining companies already pay royalties on minerals profitably extracted from private, state, and foreign lands.¹³⁸ In fact, hardrock mineral royalties are levied for resources extracted from everywhere except American federal land; royalty-free extraction is a contemporary and even historical anomaly, not a critical requirement for mining's profitability.¹³⁹ Profit arguments are additionally suspect in light of rising mineral prices: For example, the price of gold has soared from \$300 an ounce to \$1700 an ounce in just the last decade.¹⁴⁰ Mining costs have not matched this meteoric rise in price. There is enough profit in that margin to pay the public something for its resources. The industry can unquestionably survive and indeed thrive while subject to royalties—because it already is doing so everywhere else.

Mining companies also argue against direct revenue provisions because many of their activities are taxed.¹⁴¹ Yet taxes are the price of doing business in a country, and business costs do not justify free access to a public resource. Industry costs—whatever they may be—are not a satisfactory argument for why the American public should give away its resources to profitable multinational and foreign corporations that sell those resources in the international marketplace.

137. See, e.g., Brad Knickerbocker, *Hard to Crystalize Support to Amend US Mining Law*, CHRISTIAN SCI. MONITOR (Aug. 24, 1995), <http://www.csmonitor.com/1995/0824/24051.html>.

138. The lion's share of American hardrock mining occurs in the twelve western states, including Alaska. A considerable amount of that mining occurs on state-owned lands, where all these states charges royalties of up to 10 percent. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-08-849R, *HARDROCK MINING: INFORMATION ON STATE ROYALTIES AND TRENDS IN MINERAL IMPORTS AND EXPORTS* 1, 26, 28 (2008). In fact, most of these states also charge taxes on mining that occurs anywhere in the state, be it on state-owned, private, or even federal land. *Id.* at 2. Thus, it is quite likely that mining on federal lands brings in more direct state revenue than federal revenue.

139. For example, mineral royalties date back to the classical city-state of Athens, which owed its wealth to royalties levied on silver mines that began production around 800 B.C.E. Similarly, the Spanish empire imposed a progressive royalty regime on silver of between 10 and 50 percent, depending on the size of the find. Lacy, *supra* note 110, at 1–2, 4–5.

140. Eilperin, *supra* note 127.

141. See Dearen, *supra* note 131.

Finally, the mining industry's claims are undercut by the fact that the oil industry could make parallel claims to every one of these arguments, but it does not simply because it has been subjected to royalties since 1920. In fact, the oil experience proves that carefully crafted royalty systems can generate substantial public revenue while simultaneously delivering private economic incentives for resource development. Nonetheless, these arguments are likely to resurface in the debate about offshore mining policy, particularly regarding exploration.

The preceding paragraphs have asserted that domestic mineral production would not wither under a less generous regulatory system.¹⁴² Even more important, however, is the recognition that advocates of royalty-free mining continue to argue for frontier development policies on land even though the terrestrial frontier has long been tamed. If they can continue to make those arguments on land, they will certainly make them with respect to underwater mining in this planet's final frontier. And because offshore mining will implicate many of the same frontier pressures that led to the adoption of the GMA, such arguments may again appear to carry substantial force. Prospectors will again face a massive wilderness of largely unknown mineral possibilities. They will again need to invest considerable money in prospective areas before potentially discovering that extraction may be uneconomical or unfeasible. Moreover, the technologies for underwater mining are currently unproven and in flux, so advocates may well argue that the same incentives enjoyed on federal land are needed to encourage and protect offshore investment. In short, it is possible that the same frontier pressures that spawned the GMA onshore could encourage a similar mining law offshore.

3. Nontrivial Fees Also Generate Revenue and Prevent Speculative Holding

Royalties should bring in the bulk of government revenue from mining, but administrative fees also have a role to play in responsible regulation. The fees charged for onshore hardrock mining are low today, but in 1872, they were even lower—they did not exist. Once a prospector had explored public land and located an area believed to contain valuable minerals, that miner could legally exclude others from the area by claiming the land. Staking or locating a claim involved posting a notice in the middle of an area, marking the corners with posts, rock piles, or blazed trees, and recording a description of

142. See HUMPHRIES, *supra* note 105, at CRS-5.

the claim with a local district or county recorder.¹⁴³ That was it. A miner was then free to mine the claim and sell whatever was excavated with no further payment.

Maintaining a claim was only slightly more difficult: The GMA required that claimants sign an affidavit attesting that they had expended \$100 worth of labor on the site each year.¹⁴⁴ That work requirement was intended to be somewhat substantial; \$100 in 1872 was worth well over \$1,500 today.¹⁴⁵ However, because that amount was not tied to inflation or set to rise, the work requirement became much less burdensome as the buying power of \$100 decreased over the next century.

The GMA made the cost of locating a claim so low that, once the maintenance requirement came down, it practically invited miners to stake speculative claims that they had no intention of developing in the short term.¹⁴⁶ In 1993, in part to combat that speculation, the Interior Department converted the \$100 maintenance requirement into a \$100 maintenance fee. As a result of that minor change, the annual number of claims plummeted from about 1.2 million the year before to fewer than three hundred thousand.¹⁴⁷ In other words, roughly eight hundred thousand claims were being staked each year by parties who were unwilling to pay even \$100 to hold them.

Today, the maintenance fee is still the most substantial cost involved in staking a mining claim on federal land. The Federal Land Policy and Management Act of 1976¹⁴⁸ sought to centralize the claim recording process in the federal government and imposed small filing fees to do so. It now costs \$189 to stake a mining claim: a \$15 recording fee, a \$34 location fee, and an upfront payment of the first year's maintenance fee, which is now \$140.¹⁴⁹ Although

143. GORDON MORRIS BAKKEN, *THE MINING LAW OF 1872: PAST, POLITICS, AND PROSPECTS* 37 (2008).

144. *Id.* at 55.

145. *Id.* at 56 (calculating that one hundred dollars in 1872 was worth \$1589.12 in 2005 dollars based on the Consumer Price Index).

146. *See id.* at 61 (“Early miners behaved as they did because the government required almost nothing of them, and because they were businessmen.”) (internal citation omitted).

147. HUMPHRIES, *supra* note 105, at CRS-2. Ironically, miners labeled the maintenance fee a “regressive tax” because its cost did not vary with the value of the claim. BAKKEN, *supra* note 143, at 142. Of course the cost of acquiring a mining claim and the right to extract any minerals within does not vary in value either.

148. 43 U.S.C. §§ 1701–1785 (2006).

149. 30 U.S.C. §§ 28g, 28f(a) (2006); *see* 43 C.F.R. § 3830.21 (2012). Since 1993, the maintenance and location fees have been tied to the Consumer Price Index and revised every five years. 30 U.S.C. § 28j(c)(1) (2006). A 2012 rule change also tied maintenance fees to the acreage of “placer” claims (unconsolidated alluvial deposits of minerals often found in sand or gravel, as opposed to “lode” claims for minerals that are embedded in rock or deep

even these low fees bring in some revenue,¹⁵⁰ their real value is in covering administrative costs and fighting speculative land holding, which has been a problem throughout the history of American extractive law. Speculative claims, staked and held in hopes of better prices in the future, effectively privatize public land without development and provide no immediate benefit to anyone except the investor. In short, whatever public gains that federal resource development can generate do not accrue to the public unless the private companies actually develop the public resources they control. So while it might seem counterintuitive, administrative fees can actually encourage that desired mineral development by ensuring that only serious developers receive access to public resources. Overall, the failures of onshore mining law teach that sound mineral regulation should feature direct revenue from royalties and administrative fees as a central component.

B. Case Study 2: Onshore Oil Drilling Teaches That Regulators Must Employ Competitive Leasing

The single requirement imposed by OCSLA section 8(k) is that offshore mining tracts be offered under a competitive leasing program.¹⁵¹ If and when underwater mining reform occurs, it is critical that this provision be protected. Mining advocates may well target this feature during negotiations because a leasing program is incompatible with the “right to mine” that the industry currently enjoys for onshore hardrock mining on federal land. This Subpart therefore begins by explaining how the right to mine and competitive leasing approaches differ in order to demonstrate why offshore mineral regulations must strike a better balance between competing interests than their onshore predecessor.

Under most other extractive laws, private parties must seek permission from the government to tap public resources, and the government retains discretion to deny such requests or to impose specific terms with which any

underground). 43 C.F.R. § 3830.21 (2012). This change stands to raise maintenance fees as high as \$1120 for those claims, but that is still insignificant for large mining operators, and many of these fees are waived for “small miners” who hold fewer than ten claims on federal land. 30 U.S.C. § 28f(d)(1)(A) (2006). Note that claim and maintenance fees do not change based on the value of the claim. The government receives the same revenue from a hardrock claim from which nothing is mined as from one from which billions are extracted. Once the initial fees are assessed, the federal government is legally entitled to no compensation for public resources beyond the \$140 annual maintenance fee.

150. Maintenance and location fee revenues were estimated to have peaked at \$35.9 million in FY 1997. HUMPHRIES & VINCENT, *supra* note 120.

151. 43 U.S.C. § 1337(k) (2006).

permitted extraction must comply. As discussed in Case Study 1, the GMA reverses who has the power for hardrock mineral extraction: Instead of seeking government approval, miners have an unconditional legal right to enter unreserved public lands and conduct mineral extraction. This presumption of accessibility and privatization under a right to mine regime is incompatible with significant regulatory oversight. In contrast, a leasing regime allows the government to incorporate specific terms into mineral leases, and thereby provides a fundamentally better and more balanced structure for extractive law.

Yet even leasing programs can have unintended consequences if not implemented properly. This Subpart explores the history of onshore oil drilling on federal lands to illustrate some of the potential pitfalls of establishing an extractive leasing regime.¹⁵² In particular, this history reveals that a leasing system must be carefully designed in order to avoid public resource overproduction and undervaluation. The most important takeaway from this lesson is that leases must be offered on a competitive basis, at least at first. Competitive leasing ensures that public resources are distributed at market value and, like the royalties discussed in Case Study 1, provides substantial revenues for the government. As is true of most history lessons, it is instructive to understand the events leading up to the period of study.

1. Oil Drilling Under the GMA Led to Overproduction

Oil drilling originally fell within the ambit of the GMA somewhat by default: With vast oil reserves on public land and no other authority from Congress to regulate them, the Interior Department decided to allow prospectors to access petroleum-rich public lands under mining law.¹⁵³ The first commercial oil extraction from public lands took place in 1875.¹⁵⁴ A federal

152. It is worth noting that oil drilling and hardrock mining are not entirely analogous: Oil and gas are extracted using one suite of technologies, while mining uses an entirely different and more widely varying set. See Bramlette McClelland, *The Role of Government in Exploring and Developing the Mineral Resources of the Exclusive Economic Zone*, in EEZ SYMPOSIUM, *supra* note 12, at 125, 127. Especially offshore, the state of knowledge and experience with oil drilling is far greater than for mining. *Id.* Additionally, the oil and mining sectors differ in global resource distribution, developmental timeframes, market characteristics, profit margins, and risk profiles. Greenwald, *supra* note 90, at 40. While acknowledging that differences exist, there are still lessons from the oil context that are transferable to hardrock mining law.

153. See David W. Miller, *The Historical Development of the Oil and Gas Laws of the United States*, 51 CAL. L. REV. 506, 511 & n.27 (1963) (citing W.H. Hooper, 1 Interior Dec. 560 (1881)).

154. *Id.* at 511. Commercial oil production on private land had begun a few years earlier, in 1859. *Id.*

court affirmed the use of mining law for oil in 1894,¹⁵⁵ and Congress explicitly codified the practice in 1897.¹⁵⁶ However, as with hardrock mining, royalty-free extraction exerted powerful economic incentives that predictably spurred a rapid overproduction from public lands, especially against the backdrop of dramatic oil discoveries on public lands in the West.¹⁵⁷ Under these conditions, California came to lead the nation in oil production by 1903, largely because of its abundance of federal land.¹⁵⁸

The government had no control over resource production from federal lands under the GMA, and by 1908, this oil rush had generated a political fear of overexploitation. That concern was elevated to a national security threat when the U.S. Navy converted from coal to oil as a power source for the fleet, so in 1909 Congress reacted by withdrawing petroleum lands from GMA accessibility to create the Naval Petroleum Reserves.¹⁵⁹ The imminent fear of exhausting the national oil supply would slowly subside as large discoveries and high production continued for decades, but during the subsequent eleven years, public lands were effectively closed to new oil development under the GMA. During that time, Congress was persuaded that mining law was ill suited to the needs of oil development on public land.¹⁶⁰

In 1920, Congress removed oil from the GMA altogether by enacting the Mineral Leasing Act (MLA).¹⁶¹ Perhaps the most important feature of the MLA was that it ended the right to mine for oil drilling. Under the GMA, the government could not impose any special terms on an individual site or on oil drilling as a practice. The MLA changed that, essentially requiring developers to contract with the government—as they would with any private landowner—prior to oil extraction on public lands.¹⁶² Through leases, the Interior Department now possessed the power to decide which bidder, if any, would

155. *Gird v. Cal. Oil Co.*, 60 Fed. 531, 532 (C.C.S.D. Cal. 1894).

156. Act of Feb. 11, 1897, ch. 216, 29 Stat. 526. This move was precipitated by the Secretary of the Interior's attempt to reverse course to conclude that public lands chiefly valuable for petroleum were not mineral lands that could be entered under mining law. Miller, *supra* note 153, at 511 & n.27 (citing *Union Oil Co.*, 23 Interior Dec. 222 (1896)).

157. Miller, *supra* note 153, at 511.

158. *Id.*

159. See Marion E. James, *The Power of the Secretary of the Navy to Interpret and Delimit Boundary Descriptions of the Naval Petroleum Reserves: An Historical Perspective*, 27 JAGJ. 439, 449–50 (1973).

160. Miller, *supra* note 153, at 512–13.

161. Act of Feb. 25, 1920, ch. 85, 41 Stat. 437 (codified as amended in scattered sections of 30 U.S.C. (2006)).

162. RASBAND ET AL., *supra* note 107, at 1153, 1153–54 (quoting CHARLES F. WILKINSON, *CROSSING THE NEXT MERIDIAN: LAND, WATER, AND THE FUTURE OF THE AMERICAN WEST* 53–54 (1992)).

be allowed to develop a given tract¹⁶³ and even to dictate specific lease terms for development in more sensitive areas.¹⁶⁴

Oil leases had short terms, initially just five years, so that idle tracts could be repossessed and re-leased to another developer.¹⁶⁵ Like nontrivial administrative fees and maintenance requirements in the onshore mining context, this provision helped combat speculative holding of public lands. Oil leasing empowered the government to guide sensible resource development and more broadly enabled a transition in public lands policy from a preference for privatization toward retention and long-term management in the public interest.

2. Oil Drilling Under the MLA's Noncompetitive Leasing Scheme Led to Systemic Abuse

The MLA contained major structural improvements over the GMA, but its implementation raised new problems. Under the MLA's original terms, the Interior Department awarded oil leases in one of two ways.¹⁶⁶ If a tract lay within a "known geologic structure" (KGS)—meaning an area known to likely contain oil—leases were offered on a competitive basis: Interested parties would bid for the lease, and the highest qualified bidder would win. Thus demand set the price for a competitive lease. For all other lands outside a KGS, the government offered leases on a noncompetitive basis to the "first qualified applicant."¹⁶⁷ Essentially, this procedure amounted to a sale in which the price of the noncompetitive lease was set low and arbitrarily, regardless of demand. The rationale for offering tracts cheaply under noncompetitive leasing was that exploration and production on more marginal petroleum lands would require an economic incentive to encourage developers to invest in unproven reserves—the same argument underlying royalty-free extraction in the GMA.

Exploration incentives for marginal lands are not intrinsically unworkable, but the KGS distinction was based on congressional intuition rather than empirical evidence or expert testimony. Even with this flaw, the MLA could still have achieved its ostensible goal—establishing a pricing system dependent

163. *See id.*

164. For example, Alaskan leases may contain "winter access only" provisions to prevent leaseholders from disturbing sensitive Arctic areas except when they are frozen and thus protected. *Id.*

165. *Id.*

166. *See* Abraham E. Haspel, *Drilling for Dollars: The Federal Oil-Lease Lottery Program*, 9 REGULATION 25, 25 (1985).

167. 43 C.F.R. § 3111.1 (1987).

on the presence or absence of known oil reserves—if the term “known geologic structure” had been interpreted broadly to encompass all petroleum lands that were unlikely to require significant exploration expenses and risk.¹⁶⁸ Instead, however, the Interior Department interpreted the term so narrowly that many lands adjacent to a KGS and believed to be valuable, or sometimes even lands that had themselves recently produced under different owners and were literally known to be valuable, were deemed non-KGS and leased on a noncompetitive basis.¹⁶⁹ In short, this clumsy noncompetitive leasing for unquestionably productive tracts allowed companies to privatize valuable public resources for nominal sums well below market rates, arriving at a result similar to that achieved under the GMA.

In one of the most notorious examples, thirty three thousand acres in Arkansas that were known to contain valuable petroleum reserves were nonetheless characterized as non-KGS and leased on a noncompetitive basis for just \$1 per acre.¹⁷⁰ The next year, the Interior Department changed its KGS designation for the area and leased another twenty four thousand acres nearby on a competitive basis; this time, the land went for \$1,705 per acre.¹⁷¹ To be fair, the losses from noncompetitive oil leasing pale in comparison to those for hardrock minerals, because even noncompetitive leases require royalties. Still, that land in Arkansas was leased at a rate three orders of magnitude below market value. It should therefore come as no surprise that the Court of Appeals for the Eighth Circuit ultimately found the KGS procedure to be arbitrary and capricious and finally ended the practice in 1984.¹⁷²

The noncompetitive leasing system had an additional problem. In situations such as lease nonpayment, non-KGS tracts that had previously been leased reverted back to federal possession. Sometimes, even though the prior lessee had struck oil, the tract retained its non-KGS status. Re-leased non-KGS lands were therefore in high demand, and the first-come-first-served process generated furious competition to become the next lessee for those low-priced tracts.¹⁷³ To combat this issue, the Bureau of Land Management (BLM) decided in 1959 to implement a lottery system to determine who would receive re-leased

168. 43 C.F.R. § 1300.0-5 (1987).

169. WILKINSON, *supra* note 162, at 1154–55.

170. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO/RCED-85-88, ISSUES SURROUNDING CONTINUATION OF THE NONCOMPETITIVE OIL AND GAS LOTTERY SYSTEM 10, 2 n.2 (1985) [hereinafter NONCOMPETITIVE OIL].

171. RASBAND ET AL., *supra* note 107, at 1155. *See generally* NONCOMPETITIVE OIL, *supra* note 170.

172. *Arkla Exploration Co. v. Texas Oil & Gas Corp.*, 734 F.2d 347 (8th Cir. 1984), *cert. denied*, 469 U.S. 1158 (1985).

173. *See* Haspel, *supra* note 166, at 25–27.

non-KGS tracts.¹⁷⁴ Again, this system could have worked in theory, but suffered a fatal flaw in implementation.

BLM decided to charge only a nominal fee per lottery ticket (initially \$10) and to impose no other restrictions beyond a one-ticket-per-person limit.¹⁷⁵ After that small payment, a “winner” could freely transfer her lease to any other qualified party—often at a considerable profit. For example, in 1983, a lottery winner immediately turned around and sold his \$10 lease to a developer for \$5 million.¹⁷⁶ With such windfalls consistently available, a whole industry developed to abuse the system: Middlemen would pay random citizens a modest sum to collect “stables” of blank, pre-signed lottery applications, which were then sold to oil companies to rig the lotteries.¹⁷⁷ These abuses and scandals ultimately generated enough public outrage to fuel bipartisan support for reform, which culminated in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA) of 1987,¹⁷⁸ on which the current onshore oil regulations are based.

3. Hybrid Competitive/Noncompetitive Leasing as a Potential Solution

The lesson from this history is that public resources should always be offered first on a purely competitive basis to determine whether a market actually exists. If it does not, and only if it does not, should regulators even begin to contemplate the use of noncompetitive leasing to incentivize more marginal development. The current onshore oil regime has arrived at this conclusion.

Under the FOOGLRA-based regulations, the BLM still governs onshore oil extraction under both competitive and noncompetitive leasing, but the KGS distinction has been eliminated. Today, all oil lands must first be offered for auction on a competitive basis. A lease is awarded to the “highest bid from a responsible bidder which is equal to or greater than the national minimum acceptable bid”¹⁷⁹ The minimum acceptable bid is currently the statutorily provided \$2 per acre, but the Interior Department has the authority to raise

174. *See id.* at 26.

175. *See id.*; 43 C.F.R. § 3112 (1987).

176. Haspel, *supra* note 166, at 27.

177. *Id.* at 26.

178. Federal Onshore Oil and Gas Leasing Reform Act of 1987, Pub. L. No. 100-203, 101 Stat. 1330-256 (1987) (codified as amended at 16 U.S.C. § 3148 and scattered sections of 30 U.S.C. (2012)).

179. 30 U.S.C. § 226(b)(1)(A) (2012).

that number.¹⁸⁰ If a lease fails to attract a high enough competitive bid for two years, it may then be leased on a noncompetitive basis to the first qualified applicant who pays a nonrefundable application fee,¹⁸¹ which is currently \$390.¹⁸²

All onshore oil leases also require royalties of “not less than 12.5 percent”¹⁸³ This default rate applies to both competitive and noncompetitive leases, but royalty rates may be lowered under specific circumstances, such as in older leases with declining production,¹⁸⁴ or occasionally increased, as for a noncompetitive lease reinstated after failure to make a payment.¹⁸⁵ When a lease is not producing and therefore generates no royalties, a lessee must pay a rental rate of \$1.50 per acre for the first five years or \$2 per acre in any subsequent year.¹⁸⁶

Onshore oil leasing has a troubled past, but that past is instructive. Moreover, its current hybrid system strikes a decent balance between generating revenue and encouraging development. With some minor changes, offshore mining law could successfully replicate this hybrid model.

C. Case Study 3: Offshore Oil Drilling Teaches That Incentives Must Be Tied to Need

Revenue mechanisms do more than simply raise revenue; they also create artificial market forces and alter behavior. Revenue mechanisms should therefore be designed with those forces in mind. The United States may legitimately decide that responsible, offshore natural resource development is in the public’s interest. If it does, legislators and regulators must take care to ensure that economic incentives achieve the desired goals—without outliving their need, distorting the market, or wasting taxpayer money. America’s experience in attempting to promote deepwater oil drilling is the perfect vehicle to teach this lesson. The inter lease disparity between royalty rates for the same resource also provides an opportunity to consider the rationale and effect of varied royalty rates. To appreciate this tale, however, one must first understand the basic structure of the offshore drilling regime.

180. *See id.* § 226(b)(1)(B).

181. *Id.* § 226(c)(1) (2006).

182. *See Fixed Cost Recovery Fees*, BUREAU OF LAND MGMT., http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/lease_fees.html (last updated Oct. 2, 2012). The fee for a competitive lease application is \$150. *Id.*

183. 30 U.S.C. § 226(b)(1)(A) (2012).

184. *See id.*

185. *See* 43 C.F.R. § 3103.3-1 (2012).

186. *Id.* §§ 3103.2-2(a), (c) (2012).

1. Offshore Oil Drilling Regulations Under OCSLA

Most parties involved would agree that American offshore drilling regulations are far from perfect. Yet they suffer from far fewer issues than the GMA. For all its shortcomings and demonstrably lax environmental and safety protections, the current offshore oil leasing program has its strengths: It is “on balance, coherent and reasonably predictable,” such that “in those regions of our nation where offshore development is accepted, the internal administrative process is well known and understood by those who invest in offshore leases and those who choose to observe and comment on such activity.”¹⁸⁷ As a result, this system is “process rich” while still presenting a pathway to offshore development that offers a “clearer roadmap than most other offshore resource management laws or programs.”¹⁸⁸ In some respects, these programmatic strengths make the OCS oil program, “a model for the management of a wide variety of offshore activities.”¹⁸⁹

The current offshore oil system is significantly different from that laid out by OCSLA in 1953. Like section 8(k) for offshore mining, the offshore drilling section was initially drafted to delegate to the Interior Department such a remarkable amount of discretion that limitations and clarification were subsequently needed.¹⁹⁰ While the original OCSLA terms succeeded in opening the OCS to extractive development, they were overzealous and did so without any kind of environmental controls. OCSLA’s weaknesses were publically exposed during the catastrophic Santa Barbara Channel blowout in 1969, which ultimately generated enough political pressure to drastically amend the law.¹⁹¹

When the offshore oil provisions were heavily amended, the amendments were viewed not just as tinkering with the original program, but rather as establishing a “new statutory regime” to replace the “outmoded” original, which was already considered obsolete thirty-five years ago.¹⁹² As laid out in the 1978 OCSLA amendments, offshore drilling now occurs under a competitive

187. OCEAN BLUEPRINT, *supra* note 24, at 355.

188. *Id.*

189. *Id.* at 356.

190. See John J. Costonis, *The Macondo Well Blowout: Taking the Outer Continental Shelf Lands Act Seriously*, 42 J. MAR. L. & COM. 511, 529 (2011).

191. BP COMMISSION, *supra* note 60, at 3–4. The purpose of this Comment is to proactively reach that reform stage for underwater mineral law without waiting for a crisis to precipitate that push.

192. Costonis, *supra* note 190, at 541 (citing H.R. Rep. No. 95-590, at 8–9 (1977), *reprinted in* 1978 U.S.C.C.A.N. 1450, 1461).

leasing regime with four distinct phases:¹⁹³ (1) a five-year planning program phase,¹⁹⁴ (2) a preleasing activity and lease sales phase,¹⁹⁵ (3) a lessee exploration phase,¹⁹⁶ and (4) a development and production phase.¹⁹⁷ In the first phase, BOEM prepares a five-year leasing program under which it offers specific offshore tracts for lease while attempting to balance both environmental concerns and resource development goals.¹⁹⁸ In the second phase, leasing occurs on a purely competitive basis by sealed bid and at the discretion of the Secretary of the Interior.¹⁹⁹ In the third phase, after leases are awarded, a lessee submits plans to explore its lease territory.²⁰⁰ The Interior Department will reject an exploration plan if it interferes with coastal requirements or national security,²⁰¹ or if it would “probably cause serious harm or damage . . . to the marine, coastal, or human environment . . .”²⁰² Finally, after the completion of a fruitful exploration phase, development and production may occur, again pending submission and approval of a plan.²⁰³ This regime facilitates extensive offshore production, but contains numerous opportunities for government oversight and revenue generation.

2. Royalty Relief Programs Teach That Economic Incentives Must Be Carefully Structured

Offshore oil leases generate substantial revenues: Although annual returns fluctuate, offshore oil royalties have generated as much as nearly \$4.5 billion in a single year. Combined with natural gas drilling, offshore mineral leasing as a whole can bring in as much as \$18 billion annually.²⁰⁴ Like its onshore

193. See generally *Sec’y of the Interior v. California*, 464 U.S. 312, 337–41 (1984); ADAM VANN, CONG. RESEARCH SERV., RL33404, OFFSHORE OIL AND GAS DEVELOPMENT: LEGAL FRAMEWORK 5–14 (2011).

194. 43 U.S.C. § 1344 (2012).

195. *Id.* §§ 1337, 1345.

196. *Id.* § 1340.

197. *Id.* § 1351.

198. *Id.* § 1344.

199. *Id.* § 1337.

200. *Id.* § 1340.

201. *Id.* § 1340(c)(2). This discretion is broad; agency determinations in this context will be upheld as long as “some consideration of the relevant factors” occurs. *California v. Watt*, 683 F.2d 1253, 1269 (9th Cir. 1982).

202. 43 U.S.C. §§ 1334(a)(2)(A)(i), 1340(c)(1) (2012).

203. *Id.* § 1351.

204. Data from ONRR Statistics Tool showed 2008 had the highest revenue in the last decade, so the numbers in the text are approximations of the 2008 data. Bonuses for offshore oil and gas were not disaggregated, so the aggregate total had to include gas as well. *ONRR Statistical Information*

counterpart, the MLA, OCSLA requires a base royalty rate of at least 12.5 percent for oil leases.²⁰⁵ When royalties are not being generated (because production has yet to begin or has ceased), leases require rents of between \$5 and \$9.50.²⁰⁶ Offshore oil leases have a primary term of five to ten years, but the lease term is automatically extended for as long as productive operations continue.²⁰⁷ In 2007, the Bush II administration announced its intention to raise the royalty rate for new leases in the Gulf of Mexico to 16.67 percent.²⁰⁸ Soon after, the Gulf royalty rate was quickly raised again to 18.75 percent,²⁰⁹ which the Obama administration made its default royalty rate for new Gulf oil leases in 2009.²¹⁰ The rates for Alaska and “other frontier areas” remained at 12.5 percent as of November 15, 2012.²¹¹

Despite those default levels, offshore oil developers rarely pay the full royalty rate in the lease. OCSLA authorizes “royalty relief” to promote increased offshore production.²¹² This relief often comes in the form of deductions from royalty payments to offset the costs of transportation to an “off-lease point” and certain processing allowances—costs most other industries simply bear.²¹³ Thus perhaps a more useful metric than the base royalty rate is the effective royalty rate, or the rate lessees actually pay once nonrevenue volumes and royalty deductions are considered. In 2011, the effective royalty rate on 12.5 percent royalty leases was 8.13 percent; for 16.67 percent leases, the effective rate was 16.28 percent;²¹⁴ and for 18.75 percent leases, the effective

Page, OFF. OF NAT. RES. REVENUE, <http://statistics.onrr.gov/ReportTool.aspx> (last visited Oct. 25, 2013).

205. 43 U.S.C. § 1337(a)(1)(C) (2012).

206. See, e.g., MARC HUMPHRIES, CONG. RESEARCH SERV., RS22567, ROYALTY RELIEF FOR U.S. DEEPWATER OIL AND GAS LEASES 2 (2009).

207. 30 C.F.R. § 556.70 (2012) (stating that the term of the lease shall be extended beyond the primary term provided the conditions set forth in 30 C.F.R. § 250.180 are met).

208. Edmund L. Andrews, *U.S. to Raise Royalty Rates for Oil and Gas Leases in the Gulf*, N.Y. TIMES, Jan. 10, 2007, http://www.nytimes.com/2007/01/10/washington/10royalty.html?_r=0.

209. Ben Geman, *Interior Raises Royalty Rate for New Gulf Leases*, E&E NEWS (Nov. 1, 2007) available at http://www.rigzone.com/news/article.asp?a_id=52296.

210. See, e.g., HUMPHRIES, *supra* note 206, at 2; Outer Continental Shelf (OCS) Western Planning Area (WPA) Gulf of Mexico (GOM) Oil and Gas Lease Sale 229, 77 Fed. Reg. 65408-01 (Oct. 26, 2012).

211. GAO 2012, *supra* note 83, at 32 Enclosure I; see, e.g., Outer Continental Shelf (OCS) Chukchi Sea Alaska, Oil and Gas Lease Sale 193, 76 Fed. Reg. 53481 (Aug. 26, 2011).

212. 43 U.S.C. § 1337 (2012); see HUMPHRIES, *supra* note 206, at 2.

213. GAO 2012, *supra* note 83, at 35 Enclosure I.

214. This would include certain Gulf of Mexico leases issued after the Bush increase but before the Obama increase, as well as leases on Native American land, which are not analyzed in this Comment.

rate was 17.70 percent.²¹⁵ Recall that the existing offshore mining regulations provide a number of these same royalty relief provisions.²¹⁶

Clearly, the royalty relief provided under OCSLA is significant. But some oil developers qualify for even more favorable treatment under the OCS Deep Water Royalty Relief Act (DWRRA), enacted in 1995.²¹⁷ The DWRRA offered royalty-free leases for certain new Gulf wells drilled before the year 2000 at depths of at least two hundred meters.²¹⁸ Many royalty relief provisions exempt only a given volume from a well over a time period, but that volume is substantial: up to 87.5 million barrels in the deepest wells.²¹⁹ Although some sunset provisions in the DWRRA expired in 2000, MMS (now BOEM) retained the authority to reduce royalties upon the determination that production would otherwise not be economical,²²⁰ and Congress expanded that authority further under the Energy Policy Act of 2005.²²¹

Deepwater incentives might have seemed like sound policy to encourage domestic production when oil prices dropped to their nadir of \$11 per barrel in 1998, but crude prices are now back around \$100 per barrel. High commodity prices make leases that used to be only marginally profitable economic in their own right and thus no longer deserving of special economic incentives.

This program has long outlived its need, yet a great deal of royalty-free deepwater production continues to this day due to another agency error in implementation.²²² When Congress enacted the DWRRA in 1995, it realized that prices could improve again; leases offered under the DWRRA were supposed to contain a commodity price ceiling (\$28 tied to inflation) that would deactivate the automatic royalty relief when it became no longer needed.²²³

215. GAO 2012, *supra* note 83, at 36 Enclosure I.

216. See *supra* text and accompanying notes 84–85.

217. Outer Continental Shelf Deep Water Royalty Relief Act, Pub. L. No. 104-58, 109 Stat. 563-66 (1995).

218. *Id.*

219. Specifically, the DWRRA exempts 17.5 million barrels from wells in between two and four hundred meters of water, 52.5 million barrels between four and eight hundred meters, and 87.5 million barrels in water deeper than eight hundred meters. *Id.*

220. 43 U.S.C. § 1337(a)(3)(A) (2012); HUMPHRIES, *supra* note 206, at 2; see 30 C.F.R. §§ 203.60–91 (2012); *Royalty Relief Information*, BUREAU OF OCEAN ENERGY MGMT., <http://boem.gov/Oil-and-Gas-Energy-Program/Energy-Economics/Royalty-Relief/Index.aspx> (last visited May 14, 2013).

221. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005); see HUMPHRIES, *supra* note 206, at 4.

222. Steven Mufson, *Lawmaker Attacks Oil Companies' 'Free' Drilling in Gulf of Mexico*, WASH. POST, Feb. 26, 2013, http://articles.washingtonpost.com/2013-02-26/business/37318701_1_royalty-payments-oil-and-gas-oil-prices.

223. *Id.*

In 1996, 1997, and 2000, oil leases did contain that term.²²⁴ Yet for whatever reason, the industry-friendly MMS omitted the price thresholds in leases offered during 1998 and 1999.²²⁵ That action turned out to be irreversible: A Fifth Circuit panel held that the government could not retroactively insert the threshold lease term into those leases, rendering them royalty-free regardless of oil prices for the full term of the lease.²²⁶ A 2011 report estimated that, as a result of this error, royalty-free deepwater drilling had already cost the federal government \$11 billion in lost revenue,²²⁷ and projected losses could climb as high as \$53 billion over the lifetimes of the exempted wells.²²⁸ To put this in perspective, at 2012 production levels, the loss of \$53 billion is enough to cancel out eight years' worth of royalty revenue from all U.S. offshore oil and gas production.²²⁹

The DWRRA fiasco demonstrates how a single careless omission can quickly cost the government tens of billions in forgone revenue. If low commodity prices warrant lower royalties, those royalties must be effectively tied to the low prices that justified them. If technological difficulty warrants economic incentives, those incentives must be conditioned on the continued existence of technological difficulty. In short, if economic incentives are necessary, the government can promote marginal development without granting windfalls and handing out public resources for free. The DWRRA also teaches that drafting sound regulations is a good first step, but these policies must be vigilantly implemented if they are to succeed.

3. Revenue Rates for Offshore Oil Are More a Product of Politics Than Policy

Revenue mechanisms do not have to stifle development: As discussed in Part IV, they can be designed to harness market forces and promote desired

224. HUMPHRIES, *supra* note 206, at 2. Leases since 2000 also contain those thresholds under MMS/BOEM discretion.

225. *Id.*

226. *Kerr-McGee Oil & Gas Corp. v. U.S. Dep't of Interior*, 554 F.3d 1082, 1086–87 (5th Cir. 2009).

227. STAFF OF H. COMM. ON NATURAL RES., 112TH CONG., OIL FOR NOTHING AND GAS FOR FREE: ROYALTY BREAKS FOR BIG OIL COST AMERICA BILLIONS 1 (Comm. Print 2013).

228. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-318SP, OPPORTUNITIES TO REDUCE POTENTIAL DUPLICATION IN GOVERNMENT PROGRAMS, SAVE TAX DOLLARS, AND ENHANCE REVENUE 201 (2011), *available at* <http://www.gao.gov/assets/320/315920.pdf>.

229. Offshore oil revenues in FY2012 totaled \$6.9 billion. Data from ONRR Statistics Tool, <http://statistics.onrr.gov/ReportTool.aspx> (set "Data Type" to "Reported Revenues – Revenues"; set "Year Type" to "Accounting Year"; set "Fiscal Year Start" to "FY2012"; set "Fiscal Year End" to "FY2012"; set "Land Category" to "Federal Offshore"; set "Geographic Area" to "All Offshore Regions"; and click "Submit").

policy outcomes. Current policies waste this opportunity, as demonstrated by a comparative look at the regulatory regimes for onshore and offshore oil drilling. Offshore drilling generates substantially more government revenue than onshore drilling—in part because greater offshore reserves remain today, but also because regulations typically impose higher fees on offshore developers relative to their onshore counterparts. For example, onshore rental rates are either \$1.50 or \$2.00 per acre; as of a rate increase in March 2009, offshore rental rates now vary by depth and duration of inactivity from \$7 to \$44 per acre.²³⁰

Despite fee disparities, royalties and bonuses are the primary revenue mechanisms for all federal resources offered via leasing programs, also known as leasable minerals.²³¹ The size of bonus bids fluctuates widely and depends on the bidder and the tract, so royalty rates are more reliable indicators of actual revenues. In fiscal year 2011, leasable minerals from federal land generated \$11.4 billion in revenue; \$10.5 billion of that came from royalties, \$500 million came from bid bonuses, and \$300 million came from rents.²³² Of that \$11.4 billion total, \$6.6 billion came from combined offshore and onshore oil royalties alone.²³³ As noted above, royalty rates vary depending on the location of the federal oil wells: Alaska and other “frontier areas” pay 12.5 percent, other offshore areas pay 16.67 percent, and new leases in the Gulf of Mexico now pay 18.75 percent.²³⁴

One might question why such geographic disparities exist. Unfortunately, the answer is likely unsatisfying because royalty differences seem to be driven more by politics than by pure policy. The Gulf of Mexico royalty rates first increased in 2007. At this time, the Bush II administration was taking political flak for its failure to collect royalties from DWRRA leases in the Gulf, as discussed above.²³⁵ As a response to DWRRA, raising the Gulf rates was more symbolic than impactful, because the increased rates only apply to new leases, and revenue from the Bush-era increases will be dwarfed by

230. U.S. DEP'T OF INTERIOR, OIL AND GAS LEASE UTILIZATION, ONSHORE AND OFFSHORE: UPDATED REPORT TO THE PRESIDENT app.1 tbl.9 (2012) [hereinafter UNUSED LEASES].

231. GAO 2012, *supra* note 83, at 31 Enclosure I. Leasable minerals include oil, gas, coal, and natural gas liquid products. *Id.* at 37.

232. *Id.* at 31. Interestingly, prior to *Deepwater Horizon*, and perhaps in part due to the reduced royalties, developers were highly interested in deepwater tracts: Deepwater demand drove FY2008 bonus bid revenue surging to \$9.5 billion, up from just \$902.6 million in FY2007. HUMPHRIES, *supra* note 206, at 1.

233. GAO 2012, *supra* note 83, at 37 Enclosure I.

234. *See supra* notes 205–211 and accompanying text.

235. *See Andrews, supra* note 208.

DWRRA losses in the long-term and even in the short-term.²³⁶ The Obama administration's additional rate increase for new Gulf of Mexico leases also only applies to new leases, and a large portion of new production still qualifies for deepwater royalty relief.

That said, although the immediate effect may be minor, these rate increases signal the recognition that current royalty rates are likely not generating a fair return to the public. Indeed, state royalty rates are normally much higher than the federal rate. Even Texas, arguably the most prodrilling state in the nation, charges oil royalties of 20 to 25 percent.²³⁷

The imposition of rate increases on only Gulf drillers further demonstrates the arbitrariness of royalty rates. Admittedly, the Bush administration increased rates in response to a scandal in the Gulf, so a targeted response may have seemed logical. The Obama administration, not unlike its predecessor, may also have moved on Gulf rates first because it faced less opposition there due to the unique politics of royalty disbursement in the Gulf region. Specifically, the federal government gives 37.5 percent of all revenues collected from qualified offshore drilling in federal waters directly back to the Gulf states.²³⁸ Thus, because Gulf royalties effectively function as federal aid to states, proposed rate increases in the Gulf encounter less political resistance from state representatives. On the one hand, there is something to be said for any mechanism that can facilitate royalty rate increases in such an entrenched industry. On the other hand, though, revenue sharing is yet another aspect of mineral law that distorts the market and artificially bolsters demand for federal minerals. Federal resources—especially those that lie offshore and not within any state's borders—belong to the public at large, not to any specific state.²³⁹

236. *Id.* See *supra* notes 228–229 and accompanying text.

237. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-09-74, OIL AND GAS LEASING: INTERIOR COULD DO MORE TO ENCOURAGE DILIGENT DEVELOPMENT 13–14 (2008) [hereinafter GAO 2008 OIL & GAS]. To encourage rapid development, the state offers developers the 20 percent rate if a lease starts producing within two years, and 22.5 percent if production begins in the third or fourth years. *Id.*

238. See 30 U.S.C. § 191 (2012); see also Gulf of Mexico Security Act, Pub. L. 109-432, 120 Stat. 3000 (2006) (codified as 43 U.S.C. § 1331). Federal receipts from offshore drilling were not directly shared with the states until the 1980s. Milner S. Ball, *Good Old American Permits: Madisonian Federalism on the Territorial Sea and Continental Shelf*, 12 ENVTL. L. 623, 643 (1982). The states that benefit from revenue sharing now are Alabama, Louisiana, Mississippi, and Texas.

239. The strongest argument for revenue sharing is that the federal lands on which mineral activities occur are necessarily located within or near a given state, and that state therefore deserves a share of the revenues to offset the spillover ecological harm it suffers. If the shared royalties were earmarked solely for environmental restoration, this Comment would complain less of a market distortion. Yet that does not happen. Rather, when great mineral

In short, there is no principled reason for assessing higher royalties on offshore drilling in the Gulf, especially as compared to onshore drilling. In fact, with the majority of new Gulf drilling occurring in deeper and thus more expensive waters, the actual economics of Gulf drilling should warrant, if anything, comparatively lower royalties than those assessed elsewhere.²⁴⁰

Alaska advances this narrative further. As mentioned above, royalty rates in Alaska remain at the statutory minimum. One could argue that the technological difficulty of drilling in the Arctic justifies lower rates, but politics are an equally plausible explanation because the Land of the Midnight Sun has long enjoyed special status in mineral law. For example, states normally receive 50 percent of the onshore mining revenues from federal land within their borders.²⁴¹ Alaska receives 90 percent.²⁴² Additionally, political influence over Alaskan mineral regulations is especially likely because the state disperses its oversized mineral revenue directly to its citizens, creating a uniquely proextraction political culture.²⁴³

catastrophes occur, the federal government has historically been quick to dole out substantial aid to affected states instead of requiring them to absorb losses and cleanup costs with moneys already received through generous revenue-sharing agreements. For example, in the wake of *Deepwater Horizon*, the U.S. Congress passed the so-called RESTORE Act as part of its 2012 transportation and federal highway legislation. Moving Ahead for Progress in the 21st Century Act, Pub. L. No. 112-141, §§ 1321, 1601–1608, 126 Stat. 405 (2012) (directing 80 percent of federal penalties resulting from the *Deepwater Horizon* spill to the affected Gulf states). See generally Megan Herzog & Jay Austin, *Detailed Analysis of The Restore Act*, ENVTL. L. INST. (Oct. 5, 2012), <http://eli-ocean.org/gulf/files/RESTORE-Analysis.pdf>. But do not mistake this remedial cleanup funding for a legislative response to fix a flawed mineral regime; yes, Congress appropriated some money to help clean up this catastrophe, but despite the introduction of over 150 bills proposing substantial overhauls to this flawed system in the aftermath of *Deepwater Horizon*, Congress passed only three other minor proposals focusing on short-term concerns that will not have a lasting impact on the overall regulatory regime. Pub. L. No. 111-191; Pub. L. No. 111-212; Pub. L. No. 111-281.

240. Royalty relief, particularly for deepwater wells in the Gulf, does undercut some of the higher rates assessed on offshore drilling. Indeed, a Government Accountability Office (GAO) analysis of ONRR data shows that, in 2011, 20 percent of all oil extracted from federal waters did not generate revenue for the federal government. See GAO 2012, *supra* note 83, at 25 Enclosure I (listing the 2011 revenue-bearing volume at 513 million bbl, and the 2011 nonrevenue bearing volume at 132 million bbl, and 132/645=0.2047). But for the majority of offshore drilling, the counterintuitive higher rates still apply.
241. Of the remainder, 40 percent goes into a Reclamation Fund for water projects and program activities in the seventeen Western states, and 10 percent is deposited into the federal Treasury. 30 U.S.C. § 191 (2012); see GAO 2012, *supra* note 83, at 42 Enclosure I.
242. 30 U.S.C. § 191 (2012). The remaining 10 percent goes to the federal Treasury; the state's royalties make no contribution to the Reclamation Fund. *Id.*
243. ALASKA CONST. IX, § 15.

The Obama administration has proposed raising all onshore oil drilling royalties to match the newest offshore drilling rate of 18.75 percent,²⁴⁴ which, in the words of former-Interior Secretary Salazar, “is an appropriate fair market value rate.”²⁴⁵ If nothing else, this statement serves as an admission that current rates are low.

Regardless, this whole examination reinforces the point that today’s mineral revenue structures are set with little consideration of the actual economics of the market for a given mineral—a factor that logically should be the central focus when determining appropriate rates. Unfortunately, by the time an extraction regime becomes established, special interests are entrenched and confound policy reform. The absence of significant inertial precedent in the offshore hardrock mining context therefore presents a golden opportunity to implement a new extractive regime under which royalty rates reflect optimal economic and policy incentives rather than political expediency.

IV. APPLYING MINERAL LAW HISTORY TO DRAFT SENSIBLE OFFSHORE MINING LAW

Although OCSLA does not provide adequate authority for offshore mining as written, its stated purpose does properly frame the issue at hand:

[T]he outer Continental Shelf is a vital national resource reserve held by the Federal Government for the public, which should be made available for expeditious and orderly development, subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs[.]²⁴⁶

This Comment proposes nothing more than that Congress utilize its plentiful experience to achieve its stated goal from 1953. If legislators properly balance the competing national interests in expeditious, competitive resource development and proactive environmental safeguards, they will be able to craft a framework for sensible offshore mining regulation.²⁴⁷

244. See Phil Taylor, *Salazar Plans 50% Hike in Onshore Royalty Rates*, E&E NEWS PM (Feb. 16, 2012, 5:23 PM), <http://www.eenews.net/eenewspm/2012/02/16/full>.

245. *Id.*

246. 43 U.S.C. § 1332(3) (2012).

247. The proposals presented below recommend revenue rates and regulatory controls for offshore mining well in excess of those imposed on onshore mining. It is difficult to argue that terrestrial mining, which is undeniably simpler and cheaper than underwater mining, deserves more lax regulatory treatment than its offshore counterpart. Thus, wherever this Comment proposes offshore requirements in excess of the GMA, I suggest that comparable regulation, if not even tighter control, is warranted for onshore mining as well. Nevertheless, the imposition of proper offshore mining regulations without analogous changes to the GMA would not cause

Some might say there is little need to address offshore mining regulations until the practice begins. However, as illustrated above, reform is difficult once political interests have a stake in the status quo. Thus the time to reform and fully establish offshore mining law is now, as underwater hardrock extraction is poised to commence. If we are not proactive, we set ourselves on a course to repeat the follies of the GMA.

The EEZ is vast and, especially from a hardrock mineral perspective, undeveloped. There is no reason to set off another gold rush or to wait for a crisis before Congress takes action. Setting up a proactive regime allows interested parties to meet at the negotiating table as equals and achieve balanced resource development. Moreover, promulgating underwater mining regulations slightly ahead of their need would encourage investment in technology, information, and exploration before market forces align to trigger EEZ mineral demand. Having that research and technical experience—not only about how to extract minerals, but also about how to do so in a safe and environmentally responsible manner—would enable the United States to enter this emerging market on top of the learning curve, rather than behind it.²⁴⁸ As underwater mining becomes economically viable, regulators should focus on facilitating responsible and balanced public submerged land use that protects other marine resources and ensures a fair return for public resources.

Carefully controlled offshore mining could be a boon to the United States. The nation stands to benefit from the price effects of increased capacity, a more stable mineral supply, and job creation. That said, the benefits will not be purely domestic: Unlike many other countries, our nation's natural resources sector is privatized rather than nationalized, so the public resources we make available are available to multinational corporations alongside domestic mining outfits. And even domestic companies sell the minerals they extract from federal land on global markets. Therefore, because many of the benefits of public mineral access accrue to international entities, the country has little incentive to promote a reckless rush for domestic mineral development at any

additional problems (though it might defy notions of equity). Although the comparatively lower onshore costs would theoretically shift production from prospective offshore sites to remaining onshore sites, the dwindling supply of quality onshore resources would necessarily temper such market forces. Additionally, offshore mining will become feasible only when offshore extraction costs decrease or mineral prices increase enough to make offshore mining roughly cost competitive. In short, imposing different regulatory burdens for on- and offshore mining regulations would not substantially hinder the development of a robust offshore mining industry once market conditions are ripe enough to support one.

248. McClelland, *supra* note 152, at 128. This is especially important because most underwater mining will occur in otherwise pristine environments that have never been directly influenced by mankind.

cost—especially because America would bear all the local environmental damage.

In light of these conditions, a new legal framework for underwater mining is vital. As discussed above, the current offshore mineral regime—though admittedly not a blank slate—is close to one, especially because the current regulations lack any particularly favorable provisions that the mining industry might otherwise seek to preserve. OCSLA section 8(k) is not entirely misguided *per se*; rather, it just barely begins to scratch the surface of what is necessary to address the complexities of underwater mining.²⁴⁹ Thus, this Comment suggests that OCSLA provides a good foundation, but is critically incomplete. In line with that perspective, the proposals below would not necessarily require standalone legislation; they could be crafted as significant amendments to OCSLA, similar to the 1978 oil amendments discussed above. Nonetheless, an effective regime will require both new legislation and new regulations pursuant to that new authority.

Applying the lessons from the case studies discussed in Part III, this Part makes three main proposals to promote informed development. First, learning from Case Study 1, offshore mining law should include substantial revenue mechanisms designed to promote the optimal level of resource extraction as well as to ensure proper compensation for the loss of public resources. Second, Case Study 2 dictates that offshore mining should occur under a carefully structured and vigilantly administered competitive-leasing program. Third, to avoid repeating the mistakes of Case Study 3, whatever development incentives are warranted must be structured to terminate once the underlying circumstances that justified their existence improve. Employing these lessons, offshore mining law may be able to set the nation's mineral history on a new trajectory.

A. Substantial Revenue

This Comment argues that underwater mining should not occur until developers can afford to pay fair value for the resources they extract. If underwater mining cannot be profitable while generating substantial government revenue, the rational course of action is to wait until the practice's economics improve enough to sustain responsible development. Imposing substantial

249. Decades of commentators have expressed this concern. *See, e.g.*, MARINE MINERALS, *supra* note 5, at 29 (“DOI is given little congressional guidance for planning, environmental guidelines, intergovernmental coordination, and other administrative details needed for structuring a hard mineral leasing regime under Section 8(k) of OCSLA.”).

royalties and fees on offshore mining activity obviously provides a valuable revenue stream for our cash-strapped federal government, but this revenue feature also serves a less-intuitive and perhaps even more important function: It helps to correct the market's failure to fully account for externalities. It is an unfortunate reality that mining and environmental harm are inextricably linked. As discussed in Case Study 1, without significant revenue, mining on public land skews the mineral market, denies compensation to the public, and encourages environmental degradation. Businesses are even less likely to internalize the environmental costs associated with hardrock mining on the OCS, where pollution and ecological destruction will occur far beyond the eyes of the public and all but the most determined and well-funded research or reporting. This reality accentuates the importance of regulators imposing the proper incentive structure from the outset—before irreversible damage occurs.

In the offshore mining context, not only is the argument for revenue especially persuasive, but arguments against such revenues are particularly weak. The concept of royalty-free extraction was barely supportable when it was used to achieve the national goal of settling the West. While the EEZ may present some frontier characteristics, unlike the Western frontier, there is no dire need to develop the relevant lands that could justify accelerating access at the public's expense. At best, the overarching public interest in developing submarine resources might justify governmental support for pilot projects or other experimental programs. Unless mining advocates can identify a strong, additional national policy that would be served by hastily boosting offshore development, regulators should reject comparisons to the Western frontier and calls to replicate the misguided royalty-free approach employed there.

OCSLA section 8(k) already implicitly rejects a low-revenue approach to offshore mining by requiring competitive leasing, and current regulations call for an as of yet undefined royalty rate on minerals extracted under the resulting leases. These provisions are a good start, especially compared to those that regulate onshore mining. Still, this Comment proposes some changes to existing features, including royalties, rents and fees, and the competitive leasing structure, along with suggestions for potential new features, such as development or exploration incentives built into lease terms, hybrid leasing, and expanding the definition of the OCS.

1. Royalties

Offshore mineral leases should assess royalties. However, this proposal does not suggest a specific percentage or formula. Rather, this Comment's primary concerns are that royalty rates be (a) significant and (b) logically related to achieving optimal mining activity in light of market conditions. This proposal therefore recognizes that although it makes intuitive sense for a given resource to generate the same royalties on all federal land, different circumstances may nevertheless justify small geographic or conditional deviations in royalty rates for the same resource. Whatever rates are implemented, there should be at least some strong policy rationale for setting those rates—and especially for setting variations between royalty rates in different leases. However logical this may seem, it unfortunately represents a new proposal.

As discussed at length above, the United States should focus more on objective policy goals and less on politics when setting mineral royalty rates. Some states offer models for designing royalties to advance more appropriate policy objectives. For example, New Mexico offers exploratory leases with a 12.5 percent royalty rate for areas not known to contain oil, as opposed to rates of 16.67–20 percent in areas of known production.²⁵⁰ Similarly, Utah assesses a baseline royalty of 12.5 percent in a new area, but charges 16.67 percent royalties in areas within a mile of a known production site.²⁵¹ Both of these systems allow an incentive structure akin to what the onshore oil KGS distinction attempted, but failed, to achieve—without giving away public resources virtually for free. Alternatively, we might draw inspiration from the seventeenth-century Spanish empire, which employed a progressive royalty system for silver mining in which larger finds paid a larger share of the bounty. Driven by the same principle of equity that justifies our progressive tax code, a progressive royalty would ensure adequate returns on public resources without dissuading marginal exploration.²⁵² Any of these approaches would remain sensitive to high economic risks of exploration while ensuring that public resources are not given away for free.

If at all possible, legislators should reject the impulse to share revenue from offshore mining with coastal states. As discussed in Case Study 3, the income stream from revenue sharing artificially bolsters state government

250. See GAO 2008 OIL & GAS, *supra* note 237, at 14–15.

251. *Id.* at 15. The federal government does this in certain situations as well: In areas likely to produce in the National Petroleum Reserve in Alaska, BLM administers a 16.67 percent royalty rate instead of the normal 12.5 percent rate. *Id.* at 14.

252. Lacy, *supra* note 110, at 16–17.

support for extractive activity on federal land. Additionally, by setting up an income stream to state governments, revenue sharing creates more of the entrenched special interests that confound future amendments and reforms. Preventing these interests from taking hold will be far easier than combating them after the fact.

The case against revenue sharing for offshore mining is particularly strong because what few arguments do support revenue sharing with the Gulf states fail to translate from oil drilling to hardrock mining. For example, Gulf Coast states have argued that they deserve a share of federal oil proceeds because they should be compensated for the risk of oil on their shores in the event of an accident.²⁵³ This argument is less persuasive for mining because, unlike oil, hardrock minerals are not pressurized and therefore do not pose the same type of threat as an uncontrollable oil blowout a la *Deepwater Horizon*. Rather, because underwater mining activity will occur predominantly in deeper waters well away from state coastlines, and because underwater mining impacts are relatively localized, offshore mining pollution is unlikely to as directly affect coastal states as oil drilling can. Without oil's risk of large-scale coastal damage, the argument for state-federal profit sharing loses all its force.²⁵⁴ For the most part, revenue sharing for mining is likely to create more problems than it resolves. The one exception here is that it may be necessary—and indeed fairer—to share revenue with U.S. trust territories and possessions (as opposed to full states) in order to negotiate access to that new territory.²⁵⁵ As a general rule, however, federal resources should generate primarily federal revenue.

2. Low Fees and Comparatively High Rents

In a departure from current mineral regulations, this Comment proposes keeping administrative fees low but implementing comparatively high rents on nonproducing leases. Recall that rents are paid in lieu of royalties under existing regulations and that rents are the only cost of maintaining a nonproducing lease.²⁵⁶ High rental rates would raise the cost of holding leases without pursuing

253. The merit of this argument for offshore drilling is discussed *supra* note 239.

254. Mining pollutants emitted into the oceans could be dispersed by ocean currents and could conceivably find their way towards state coastlines, but oil presents a somewhat unique threat because it is hydrophobic and therefore can accumulate on coastlines and does not dilute in water.

255. See *infra* Part IV.D.

256. If “producing” were defined to include active exploration, increased rental rates would not raise the price of production, because a leaseholder that quickly set about exploring a new lease would never pay any rents.

exploration and development, creating an incentive for companies to bid only on leases they plan to develop in the near future and to relinquish those they do not realistically intend to develop.

Decreasing speculative land grabs while keeping fees low should make it easier for serious developers to obtain leases. The current OCSLA regulations offer twenty-year base lease terms. As discussed below, this Comment would shorten that period significantly, but, in order to encourage development, would allow repeated renewal for productive leases. Moreover, in recognition of the likelihood that offshore extraction might have extended development timelines, rental rates could be designed to start low and increase steadily. These increases could potentially occur across renewed leases or perhaps upon renewal, or rates could step-up significantly after an initial grace period (similar to what is currently in place).²⁵⁷ Together, shorter leases with rising rental rates should provide adequate incentives for rapid development, especially in conjunction with the additional exploration incentives proposed below that could be built into a competitive leasing system.

B. Competitive Leasing

1. Leasing With No Right to Mine

As laid out in the histories above, OCSLA rightly abandoned the GMA's claim system, with its right to mine, in favor of a leasing regime. A claim system with the right to mine would likely help spur exploration, but it would also preclude meaningful government regulation and environmental protection. Moreover, the right to mine's implied default preference for mining on federal land is inconsistent with modern multiple-use public land management practices.²⁵⁸ Contrary to traditional public lands wisdom, mining is not always the "highest" use of public land.²⁵⁹ This is especially true for marine resources: Mineral extraction may be as low as the sixth most economically valuable use for even a mineral-rich tract at tropical latitudes, coming in behind fisheries, scientific research, recreation/tourism, ocean thermal energy, and

257. The Obama administration also adopted this policy in the Gulf, adding a fifth year step-up in rental rates for new leases. UNUSED LEASES, *supra* note 230, at 9.

258. Industry advocates seek (and on land enjoy) a right to prospect, which is necessarily followed by a right to mine. *See, e.g.*, Pendley, *supra* note 71, at 60. In that framework, any other use of public land after prospecting begins would violate the right to mine.

259. The belief that mining is the highest use of public land is codified in the GMA and traces all the way back to ancient Rome, but no longer applies to the modern area of multiple use public lands management. COUNCIL ON ENVTL. QUALITY, *supra* note 107, at 1079.

so-called ocean space upon which floating structures or even cities and industries may someday be built.²⁶⁰ Responsibly mined minerals remain important to our future, but mining activity should not occur without factoring in the loss of other resources or the exclusion of other, more valuable and sustainable uses.

The strongest defense of a GMA-style claim system is that prospecting on public land is analogous to a buying a scratch-off lottery ticket: One does not know if a given venture will be profitable until after investment. Therefore, mining advocates argue: “[T]he [GMA] offers an important model for governments looking for the means to privatize public property where the value of the property is unknown.”²⁶¹ Because underwater mining—like onshore mining—requires a developer to make a substantial investment in a given area with very little knowledge about its ultimate value, the argument that the claim system should also apply offshore might seem logical. Regulators should resist that impulse.

What mining advocates do not say is that if the governmental objective is anything short of privatization—for example, if the objective were simply resource development—the above argument unravels. The mining industry’s high upfront capital costs do justify a regulatory system that does not impose excessive burdens on exploration and prospecting, but a claim system with the right to mine is not the only solution to the problem of unknown resources. As discussed below,²⁶² the government could take over or subsidize exploratory efforts, or could structure lease terms to offer exploration incentives that achieve similar effects without compromising other land-use objectives. Thus, the offshore mining regime should reject both a claim system and a right to mine.

2. Competitive Leasing With Managed Demand

The conclusion that a leasing regime is superior to a claim system with a right to mine does not end our inquiry. As Case Study 2 demonstrates, the details of a leasing program are as important as the selection of the overall lease system itself. For example, Case Study 2’s account of the KGS designation misadventure teaches that leasing programs can be heavily abused when public

260. John Craven, *Implications of the Exclusive Economic Zone Proclamation on Hawaii and Pacific Trust Territories*, in EEZ SYMPOSIUM, *supra* note 12, at 235, 235–37.

261. Andrew P. Morriss et al., *Homesteading Rock: A Defense of Free Access Under the General Mining Law of 1872*, 34 ENVTL. L. 745, 751–52 (2004).

262. See *infra* notes 276–279 and accompanying text.

resources are distributed on a purely noncompetitive basis. So as section 8(k) wisely instructs, offshore extraction should occur primarily under a competitive leasing program. The government should never offer a tract of public land for development without first offering that land at competitive auction. This is especially true for underwater resources: Submerged mineral resources will be difficult to value prior to investment, but harnessing market forces to aid in those estimates is more likely to produce accurate valuations than the arbitrary pricing of public land at nominal sums. If nothing else, a competitive leasing system will present fewer opportunities for abuse and prevent windfalls at the public's expense.

Although OCSLA already embodies this principle, it lacks the necessary details to implement this framework. For example, consider the minimum bid price. Recall that the competitive aspect in competitive leasing is the "bonus" bid that potential developers offer to pay for the lease, with the lease awarded to the highest bonus bidder.²⁶³ In a smoothly functioning competitive leasing system for desirable lands, single-bidder scenarios should be rare, so the minimum bid price should not normally matter: If at least two bidders desire a given lease, the winning bid will necessarily exceed the minimum bid. However, if only a single bidder is interested in a competitive tract, the minimum bid price essentially becomes a sale price. Yet winning minimum bids should only arise if one bidder knows something about a tract that no other bidder does,²⁶⁴ or if there are enough equally desirable tracts to satisfy all interested bidders.

As a result, the number (and quality) of leases offered at once is highly relevant to setting the appropriate minimum bid price—or having that price matter at all. So long as relatively few leases are offered at a time, there ought to be sufficient competition to render the minimum bid price irrelevant. Yet if the government opened wide swathes of submerged lands all at once, a competitive leasing system would transform into a sale system because of lack of competition. Thus, the government should set the pace of lease offerings, as well as the minimum bid, with an eye to the number of prospective underwater mining operators and overall demand.

At least at first, the expense of underwater mining may limit the number of actors interested in the practice. If this occurs, the government should respond by constricting the initial supply of lease tracts, ideally to small areas in the most promising and least ecologically sensitive locations. By so limiting market

263. As discussed below, royalties ought to be the prime revenue stream from mineral extraction because they are payment for the use of public minerals; bonus bids merely enlist market forces to set help appropriate lease prices for access to the land.

264. Informational asymmetries and mechanisms to manage them are discussed *infra* Part IV.C.

supply, the government will increase the likelihood of competitive bidding on each respective lease, thereby rendering the minimum bid irrelevant in most cases. Healthy competition is even more likely if the government is the main party conducting exploration (as proposed below), because bidders would have access to the same information about a given tract's potential.²⁶⁵ If and when more actors enter the market and technological advances make currently marginal areas more accessible, the minimum bid price will become more relevant unless the government continues to offer fewer leases than necessary to satisfy market demand.

Because the minimum bid price should take into account presently unknowable characteristics of the future underwater mining market such as how many companies will be interested in offshore mining, it would be premature to propose a specific minimum bid. Instead, this Comment suggests that the law should permit or require periodic review and modification of the minimum bid price. However, an underwater mining law should include policy-based guidelines or limits for minimum bid price modification in light of the likelihood that pure discretion could be abused once regulators are exposed to industry pressures.²⁶⁶

3. Shorter Lease Durations With Options to Renew

Long lease durations encourage and protect investments in what can be a lengthy development process. The current regulations set the base lease term at twenty years.²⁶⁷ That is one way to protect and encourage investments, but it can also lock up large areas of federal land without development if a leaseholder decides to wait or to not develop the tract at all. Especially because this proposal advises opening small quantities of land at a time, this Comment recommends a different solution to protecting investments: shorter lease durations, perhaps on the order of five to ten years, counterbalanced by certain more favorable terms. The negative effects of shorter leases—uncertainty about retaining a given lease and the resulting disincentive to invest in long-term development—could be mitigated in two ways: first by offering numerous options for renewal, especially if production is ongoing, and second by tiering lease

265. See *infra* notes 276–277 and accompanying text.

266. These limits could take any number of forms, such as allowing price modifications of only a certain amount per year, or only allowing modification at all if the percentage of leases won by single-bidders crosses a given threshold. Whatever the form, these restrictions should be designed to allow needed modifications without allowing a hypothetically captured agency to effectively circumvent the competitive leasing system.

267. 30 C.F.R. § 581.19 (2012).

terms with depth so that developers have more time to develop deeper, more challenging sites.

Like high rents, shorter, renewable leases would encourage turnover for unused leases and combat speculative holding by forcing leaseholders to “use it or lose it.”²⁶⁸ This is a serious issue for mineral leases. As of May 2012, 72 percent of offshore area leased for oil production lay idle.²⁶⁹ In fact, since the mid-1990s, only about 30 percent of leased federal acreage has ever been in a producing status.²⁷⁰ The public derives no benefit from idly held federal lands made available for mining because they generate low rents and prevent more serious developers from accessing those resources. That is not to say that in the abstract more mining is always better or that full development of federal lands is a desirable goal. It is not. Rather, this Comment proposes opening a relatively small portion of the EEZ for underwater mining, and ideally only those targeted locations with the most valuable minerals that can be extracted while causing the least amount of harm. Because this Comment proposes opening only a small area to underwater mining, addressing speculation and ensuring the efficient use of what limited acreage will be designated for offshore mining would be within the public interest.

Additionally, offering slightly longer lease durations for leases in deeper water could help promote development there. This concession to the difficulty of deepwater extraction could further spur private investment without undercutting public returns.²⁷¹ However, to balance this concession, regulators should consider other antispeculation policies, such as high rents, in order to prevent speculative lease hoarding. In short, private parties should only be allowed to control federal land they intend to develop in the near future.

Shorter lease terms have an ancillary benefit as well: They would not lock in unavoidable mistakes for as long. As the DWRRA saga demonstrated, there is a precedent for not imposing new regulatory requirements on mineral leases whose enactment preceded the regulation. Shorter leases would permit more frequent term adjustment throughout the inevitable trial-and-error process of implementing a new regulatory regime. This would theoretically allow regulators to home in on optimal lease terms more quickly and without amplifying the effects of whatever mistakes or omissions do occur.

268. See GAO 2008 OIL & GAS, *supra* note 237, at 24.

269. UNUSED LEASES, *supra* note 230, at 3.

270. *Id.* at 12.

271. The Obama administration recently adopted this approach for oil leases in the Gulf of Mexico. *Id.* at 9.

C. Development Incentives Tied to Need

Overactive policies to promote marginal, uneconomic development are currently unnecessary as high-quality resources are plentiful. Yet all of our mineral regulatory regimes offer subsidies for extraction in some form or another,²⁷² so it is highly likely that offshore mining law will ultimately offer at least some incentives; this Comment's exhortation that policy trump politics will not magically alter reality in Washington. At least at first, there are unlikely to be many companies involved in offshore mining, so regulators may well decide it is in the national interest to spur offshore development.²⁷³ If they do, Case Study 3 demonstrates the great importance of periodic review and conditioning such incentives on ongoing need. The most likely and prudent incentives would manage to spur exploration and development under a competitive leasing regime—without forgoing revenue.

1. Exploration Incentives Within a Leasing System

There are valid arguments that a pure competitive leasing program could stifle private exploration and prospecting in areas that are either difficult to access or poorly explored, and most lands within the United States' EEZ exhibit at least one of those attributes. It is not difficult to see why competitive leasing could have this effect: Underwater hardrock mineral exploration is a high-risk investment, and mining companies are unlikely to bid on a tract without at least some indication of prospective value. Additionally, if leases are written to generate substantial public revenues and penalize parties for holding leases without development, mining companies are unlikely to bid on a lease just for the opportunity to then conduct normal exploration activities. Therefore, given this economic reality, at least some prospecting activity will likely be required before a lease will garner substantial, competitive interest.

But who should conduct that initial prospecting? Private parties have little incentive to invest in exploring the EEZ if, once they have found valuable minerals, they can be outbid for that lease by a free rider who did not pay for the prospecting. Especially with so much of the EEZ unexplored, this chilling effect on exploration could seriously inhibit offshore resource devel-

272. *See supra* note 102.

273. It is telling that some of the most developed parts of the current OCSLA mining regulations are royalty relief provisions. *See supra* notes 82–85 and accompanying text.

opment.²⁷⁴ Although some have used this drawback of competitive leasing to argue that the GMA's right to mine is the sine qua non of offshore mineral exploration,²⁷⁵ it need not be. There are at least two potential solutions that could operate within a leasing program: public exploration or a hybrid noncompetitive leasing program.

2. Option 1: Public Exploration

Private companies currently have a lot of the better exploration data, but the first option to achieve exploration within a competitive leasing program is for the government to ramp up its own exploration, either through existing agencies or through contractors. Perhaps a small amount of additional royalty revenue could be earmarked for that purpose, or, preferably, the government could levy a new offshore mining tax or fee on the industry so that exploration does not become another mining subsidy. And such a proposal could be politically viable: The U.S. Geological Survey has been mapping the EEZ since 1984, and the government has already devoted extensive resources to mapping and researching the EEZ.²⁷⁶ In fact, a bill to fund a nonenergy mineral assessment of the EEZ was introduced as recently as 2011.²⁷⁷ With better information, the government could offer only the most promising tracts for competitive leasing. This would reduce some of the risk of offshore mining investments and thus justify and protect strong revenue mechanisms that ensure a fair return for public resources. If the government conducted and published at least basic exploratory information, mining companies could base their bids on their comparative capabilities and expected costs rather than on confidential information about a given tract. This would more closely align offshore mining with most other normal governmental operations.²⁷⁸

274. In the 1980s, minerals in international waters were potentially accessible, but the U.S. hardrock mining regulations had yet to be implemented. Companies operating survey ships that were passing through the EEZ to deepwater sites actually ordered their crews not to slow down and scan the ocean floor en route because there was no way for that knowledge to benefit the surveying companies; the dark side of the moon was better mapped at the time. See Greenwald, *supra* note 90, at 41.

275. See, e.g., Clifford E. McLain, *The Ocean Industry Perspective*, in EEZ SYMPOSIUM, *supra* note 12, at 215, 218.

276. See *U.S. Exclusive Economic Zone (EEZ) GLORIA Mapping Program*, U.S. GEOLOGICAL SURVEY, <http://coastalmap.marine.usgs.gov/gloria> (last updated Jan. 15, 2013).

277. H.R. 2803, 112th Cong. (2011).

278. With government exploration, lease bidding would more closely resemble the bidding process for other federal contracts, in which different companies vie for the right to complete a given task based on their individual ability to complete that project at lowest cost. Rewarding companies for efficient operation should be a better model for accessing public

3. Option 2: Hybrid Competitive/Noncompetitive Leasing

As noted in Case Study 2, modern onshore oil regulations employ a hybrid competitive/noncompetitive leasing program in which tracts that fail to garner competitive bids are then offered on a noncompetitive basis. Such a regime would likely prove successful in the offshore hardrock mining context. Indeed, an effective hybrid leasing regime could preserve the economic incentives of noncompetitive leasing while harnessing market forces to help prevent systemic abuse. As explained above, initially offering of every tract under competitive leasing prevents a developer from snatching up land publically known to be valuable for a nominal price—if a tract were publically known to be valuable, it would attract multiple bids. By providing a secondary, noncompetitive opportunity to purchase tracts unsuccessfully offered through competitive bidding at more attractive rates, the government could preserve exploration incentives for areas whose value is legitimately unknown. In this way, parties willing to invest in exploring unproven areas could secure relatively inexpensive leases to help offset exploration costs.

One difficulty establishing this regime would be setting noncompetitive lease terms that would allow a party to recoup some of the additional cost of exploration—a process which at times will fail—without depriving the public of a fair return on any resources ultimately discovered. Challenging though this might be, as long as the government charges some kind of royalties, thereby ensuring some correlation between government revenue and the quantity or value of resources extracted, any outcome under this system would be fairer than the GMA's royalty-free giveaway for onshore minerals.²⁷⁹ It may take a few tries to find the optimal royalty rate and incentives, so this Comment posits that noncompetitive lease terms should err on the side of being too stringent; leaving marginal lands undeveloped is preferable to giving them away undervalued. The DWRRA fiasco in Case Study 3 shows that if base lease terms prove too prodevelopment, the government likely cannot impose more stringent regulations on those leased tracts for the duration of the existing lease. As discussed above, shorter lease terms will help, but if market conditions suggest a need for more beneficial lease terms, regulators should only alter those terms incrementally until the market shows the desired improvement. Besides, the government can always offer temporary royalty relief if sudden, unforeseen circumstances arise.

resources than allowing companies with special information to stake their claims without real competition.

279. Admittedly, "fairer than the GMA" is a low bar to set, and regulators should strive for slightly more.

Case Study 2 has one more lesson for establishing a hybrid leasing program: When leases expire or are forfeited for any reason, they should always be offered for re-lease on a competitive basis first—just like the initial offering of public land. As previously discussed, first-come-first-served or lottery distribution designs increase the likelihood of racketeering and windfall profits at the public's expense. A prior owner's possession of a lease and the manner of its forfeiture are factors that the market should be allowed to value once more. Only if expired or forfeited tracts fail to attract a suitable competitive bid should they be offered for noncompetitive leasing.

Employing one or both of these exploration options—along with the short lease durations, low fees, and royalty structures outlined above—could encourage private investment within the competitive leasing model without locking in needless incentives that outlive their usefulness.

D. Additional Considerations

The case studies offer guidance for the general framework of an effective new offshore mineral regime, but a few more considerations should factor into these policy decisions. First, as noted above, assuming the U.S. trust territories and possessions desire access to their marine mineral resources, the definition of "Outer Continental Shelf" in OCSLA may need to be amended to include the full EEZ. This potential action could bring the mining industry to the negotiating table and increase responsible access to the most promising underwater mineral resources under American jurisdiction.

Second, as an overarching principle, the KGS saga outlined in Case Study 2 demonstrates that a regulatory regime must base its terminology and distinctions on sound science, not just common sense or colloquial diction. Additionally, even the best ideas will fail unless legislation is carefully drafted. A successful law must be specific enough to unambiguously convey congressional intent, and successful regulations must set forth clear rules capable of consistent and effective application. Unfortunately, underwater mining may not lend itself to simple, straightforward lawmaking.

Underwater hardrock minerals appear in many different structures and locations, so the technologies necessary to harvest them will vary considerably. For example, scooping up manganese nodules scattered atop the seabed is drastically different from excavating the ferromanganese crusts that compose parts of the ocean floor. Underwater mining technologies and even our fundamental understanding of ocean geology and biology will assuredly advance as development proceeds. It is therefore critical that underwater mining laws be

written in a way that acknowledges the likely growth of this field over time. As a result, this would seem to be an ideal opportunity to employ adaptive management techniques.²⁸⁰

This is particularly important given the nature of contemporary politics. While the early phases of oil extraction demonstrated the danger of overly broad delegated authority, Congress is a reactive body; once a regulatory system is in place, amendments are unlikely to gain sufficient momentum unless a major event forces a response. And even then, action is not assured.²⁸¹ Therefore, even (or especially) for a new frontier, new extractive laws must be drafted with either the foresight to account for reasonably predictable future conditions or sufficient delegated authority to respond to circumstances that, although unpredictable, are likely to change in the future.²⁸² In short, extractive regimes must strike a balance between the needs for specificity and flexibility. Legislators can best respond to this challenge by carefully circumscribing the bounds of regulatory discretion, giving regulators room to maneuver without completely abdicating major regulatory decisions to the executive rulemaking process.

CONCLUSION

The United States' record with mineral law on public lands is underwhelming at best. Instead of burying these failures—or in the case of the GMA, inexplicably allowing them to persist—offshore mining presents a final opportunity for regulators to get it right from the beginning. To aid that process, this Comment has surveyed relevant U.S. mineral law to extract and apply the most promising characteristics for a successful mineral regime: substantial royalties and revenue mechanisms, primary competitive leasing, and development incentives tied to their ongoing need. If Congress can summon the political courage to proactively reform offshore mining law and heed the wisdom of its previous failures, America may yet be able to make mining law better, down where it's wetter, under the sea.

280. Adaptive management is a flexible mechanism to promote effective decisionmaking in the face of uncertainty by taking an iterative approach that continuously reevaluates the success of extant programs and implements modifications based on those experiences. *See generally* B. K. WILLIAMS, R. C. SZARO, & C. D. SHAPIRO, ADAPTIVE MANAGEMENT WORKING GROUP, ADAPTIVE MANAGEMENT TECHNICAL GUIDE (2009), available at <http://www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf>.

281. *See supra* note 237.

282. *See* McClelland, *supra* note 152, at 127 (“To foster continued technology development, any government leasing and regulatory regime will need to be flexible and adaptive, capable of incorporating the lessons learned from earliest mining activities.”).