



Case Western Reserve Journal of International Law

Volume 51 | Issue 1

Article 11

2019

Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining

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John G. Wrench, *Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining*, 51 Case W. Res. J. Int'l L. 437 (2019)

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NON-APPROPRIATION, NO PROBLEM: THE OUTER SPACE TREATY IS READY FOR ASTEROID MINING

*John G. Wrench**

Has technology outrun the international law governing outer space? This dilemma presents itself as private entities become capable of space travel and new technology makes asteroid mining a reality. Although the Outer Space Treaty's "non-appropriation" principle prohibits nations from claiming sovereignty over space bodies, that restriction does not prevent resource extraction. The non-appropriation principle, interpreted alongside existing legal regimes, distinguishes between forbidden appropriation and permissible extraction. Consequently, the non-appropriation principle is most accurately viewed as a flexible premise from which the international community is free to fashion unique laws governing resource extraction in outer space.

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INTRODUCTION

In late 2017, a business magnate was busy launching reusable rockets into space twice a week.¹ Using his recently successful

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1. Jason Rhian, *MEV-1 Working to Expand Spaceflight Revolution, Extend On-Orbit Operations*, SPACEFLIGHT INSIDER (Sept. 19, 2017), <https://www.spaceflightinsider.com/organizations/orbital-sciences-corp/mev-1-working-expand-spaceflight-revolution-extend-on-orbit-operations/> [https://perma.cc/R2DP-Y583].

technology, Elon Musk plans to put one million colonists on Mars within 40-100 years.² Elsewhere, a former car salesman has made millions of dollars selling lunar real estate to celebrities.³ To divvy up the acreage, Dennis Hope closes his eyes and points to a diagram of the moon, coloring in the newly sold property with a red pen.⁴ Hearing of the sale, a legal scholar cites the Outer Space Treaty (“OST”) and opines that Hope in fact owns nothing because “[n]o one can own any property in space.”⁵ Hope believes that he has found a loophole—retorting that the OST prohibits states, not *individuals*, from owning space property.

Their debate is not merely academic. Technological developments of the 1960’s gave rise first to Sputnik and, in the ensuing years, a full-blown space race between the Soviet Union and the United States.⁶ That tension spurred the international community to create a series of treaties governing the uses of outer space, the first and chief among them being the 1967 Outer Space Treaty (“OST”).⁷

While the OST has achieved many of its goals— particularly by avoiding violence in space—the treaty’s drafters could not foresee every challenge on the horizon. Technology has advanced rapidly since 1967, opening up outer space to increased government and private speculation. Asteroids, rich in the precious metals used in modern technology, have become something of a white whale for entrepreneurs and nations alike. As technology yields to these goals, fewer and fewer barriers remain.

One remaining, elusive obstacle to asteroid mining stems from the OST itself. Article II of the OST provides that outer space and celestial bodies are “...not subject to national appropriation by

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2. Nadia Drake, *Elon Musk: In Seven Years, SpaceX Could Land Humans on Mars*, NAT’L GEOGRAPHIC (Sept. 29, 2017), <http://news.nationalgeographic.com/2017/09/elon-musk-spacex-mars-moon-bfr-rockets-space-science/> [<https://perma.cc/522T-22QH>].
 3. Vivian Giang, *The Man Who ‘Owns’ The Moon Says His Galactic Government Could Solve The Federal Deficit*, BUSINESS INSIDER (Mar. 19, 2013), <http://www.businessinsider.com/this-man-who-owns-the-moon-2013-3> [<https://perma.cc/6YB2-K3KF>].
 4. *Id.*
 5. *Id.*
 6. See Rosanna Sattler, *Transporting a Legal System for Property Rights From the Earth to the Stars*, 6 CHI. J. INT’L L. 23, 27 (2005) (noting that “[o]ther nations feared that the two rising superpowers would dominate space and claim it for themselves.”).
 7. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Dec. 19, 1966, 610 U.N.T.S. 8843, art. 1 [hereinafter OST].

claim of sovereignty, by means of use or occupation, or by any other means.”⁸ This restriction—the “non-appropriation” principle—means that, at a minimum, nations cannot claim sovereignty over celestial bodies. More controversially, some scholars suggest that the non-appropriation principle calls into doubt whether nations or businesses can “own” what they extract from asteroids or other space bodies.⁹

Under a legal regime that forbids parties from claiming sovereignty over underlying land—does it necessarily follow that parties cannot “own” resources extracted from that land? This question has been the subject of debate for those seeking to define the scope of available property rights under the OST.¹⁰ Even if scholars agree that the non-appropriation principle applies equally to nations and their citizens, the scope of its restriction remains unclear.

This Note seeks to prove that the non-appropriation principle is, as a restriction on sovereign claims to land, no obstacle to outer space resource extraction. To prove that claim, Part I briefly walks through the history of space law. Part I continues by exploring competing interpretations of the non-appropriation principle, concluding that the non-appropriation principle is a narrow ban on actual claims of sovereignty, allowing an (albeit undefined) degree of ownership in extracted resources. Part II employs a different methodology than that used in related work on this subject, by showing that a robust system of rights in extracted resources is achievable, beginning with the non-appropriation principle’s restriction. To that end, Part II identifies three legal regimes that share the non-appropriation principle’s ban on sovereign claims, yet permit the ownership of extracted resources. The Note concludes that the non-appropriation principle is a useful and nuanced constraint, rather than a ban, on nations

8. *Id.* at art. 2.

9. See Virgiliu Pop, *Appropriation in Outer Space: The Relationship Between Land Ownership and Sovereignty on the Celestial Bodies*, 16 SPACE POL’Y 275, 276 (2000) (discussing the impact of the non-appropriation principle of the Outer Space Treaty on landed property rights of celestial bodies); see also Fabio Tronchetti, *The Non-Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty*, 33 AIR & SPACE L. 277, 278-282 (2008) (arguing for the need to safeguard the non-appropriative nature of outer space and view the principle as a customary rule of international law).

10. Andrew Tingkang, *These Aren’t the Asteroids You Are Looking For: Classifying Asteroids in Space as Chattels, Not Land*, 35 SEATTLE U. L. REV. 559, 573 (2012) (“[T]hough there is no national appropriation, there is an open question of what processes are available for appropriation by other means.”).

and businesses' abilities to establish property rights in extracted resources.

I. International Treaties, National Ambitions, and the "Non-Appropriation" Principle

This part briefly frames the history of space law and considers various interpretations of the non-appropriation principle. To examine the scope of property rights available under the non-appropriation principle, we must first address whether it permits *any* ownership, and whether it applies to both nations and their businesses. After the restrictions of the non-appropriation principle are clearer, the following sections will explore what other property regimes have established within those same restrictions.

A. International and National Laws Governing the Use of Outer Space

Despite the novelty of outer space, the treaties governing it are unmistakably preoccupied with the era's reoccurring worries. Plagued by Cold War tensions, the several international treaties governing the use of outer space reflect tensions between the United States and former Soviet Union.¹¹ Like other treaties created in the aftermath of World War II, one of the international community's chief concerns was to prevent space from becoming a setting for nuclear conflict.¹²

The first agreement, the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies"—known informally as the Outer Space Treaty ("OST")—emphasizes the restriction on nuclear weapons in space.¹³ Furthermore, the OST states that the exploration and use of outer space "...shall be the province of all mankind" and that states have "free access to all areas" of outer space."¹⁴ The OST makes nations liable for actions of the

11. See, e.g., Andrew R. Brehm, *Private Property in Outer Space: Establishing a Foundation for Future Exploration*, 33 WIS. INT'L L. J. 353, 357 (2015) ("Modern international space law can be traced back to the Cold War and the intensive space race between the United States and the Soviet Union.").

12. *Id.* (describing the space race as "...the opportunity for either superpower to gain a leg up and end the geopolitical stalemate.").

13. OST, *supra* note 7, at art. 4 ("State Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.").

14. *Id.* at art. 1.

governmental and non-governmental entities they launch into space.¹⁵ Article II of the OST is of particular importance to our discussion because it contains the non-appropriation principle, which states that outer space “...is not subject to national appropriation by claim of sovereignty, by means of use or occupation by any other means.”¹⁶

After the OST, four treaties developed international law to address particular issues. The Rescue Agreement was negotiated in 1967 and sets forth nations’ shared responsibilities to rescue astronauts in distress within their own territories and to similarly inform the Secretary General of the United Nations of spacecraft in distress.¹⁷ The Liability Convention outlines a liability regime in which nations that launch an object—“launching states”—are liable for damage caused by that object.¹⁸ The Registration Convention requires states to provide the United Nations with details about each launched object’s orbit and function.¹⁹

The last of these is the Moon Agreement,²⁰ which failed to gain international support.²¹ The spacefaring nations’ primary reason for rejecting the Moon Agreement is its moratorium on resource appropriation.²² Article 11 provides:

Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-

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15. *Id.* at art. 7 (imposing “international liability” on parties to the treaty who launch objects which cause damage).
 16. *Id.* at art. 2.
 17. G.A. Res. 22/2345, Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Dec. 19, 1967) [hereinafter Rescue Agreement].
 18. G.A. Res. 26/2777, Convention on International Liability for Damage Caused by Space Objects (Nov. 29, 1971) [hereinafter Liability Convention].
 19. G.A. Res. 29/3235, Convention on Registration of Objects Launched into Outer Space (Nov. 12, 1974) [hereinafter Registration Convention].
 20. G.A. Res. 34/68, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Dec. 5, 1979) [hereinafter Moon Agreement].
 21. See Brehm, *supra* note 11, at 359 (stating that the Moon Agreement’s effect “...has been extremely limited...due to an absence of key signatories—neither the United States nor Russia has ratified the [Moon Agreement]...merely sixteen nations are signatories...”).
 22. See, e.g., Sattler, *supra* note 6, at 30 (noting that the Moon Agreement has not been widely accepted because it “further restricts ownership and prohibits any property rights until an international body is created.”).

governmental organization, national organization or non-governmental entity or of any natural person.²³

The Moon Agreement has not been ratified by any spacefaring nation and consequently has “little influence in international law.”²⁴ Since the Moon Agreement’s failure, nations and businesses have developed supplemental national policy and expressed ambitions to benefit from space exploration.²⁵

Concurrent developments in national space policy provide insight into how some nations interpret the scope of rights available under the non-appropriation principle. In 2015, the United States passed the “Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act of 2015 (“SPACE Act of 2015”).²⁶ The SPACE Act of 2015 asserts that citizens of the United States are “entitled to any asteroid resource or space resource obtained...in accordance with applicable law, including the international obligations of the United States.”²⁷ Former-Representative Jim Bridenstine’s “American Space Renaissance Act”²⁸ aimed to overhaul the nation’s space infrastructure by creating the “Office of Commercial Space Transportation” and establishing performance-based regulations.²⁹ More recently, Bridenstine was nominated by President Trump to be the 13th NASA Administrator, and was confirmed on April 23, 2018.³⁰ NASA’s goals under Bridenstine have included public-private cooperation, long-term plans for settlements, and stabilized infrastructure for launches.³¹ These national policies have

23. Moon Agreement, *supra* note 20, at art. 11.

24. Tingkang, *supra* note 10, at 572.

25. See RAM S. JAKHU & JOSEPH N. PELTON, GLOBAL SPACE GOVERNANCE: AN INTERNATIONAL STUDY (2017) (discussing the regulatory policies and issues of space and potential improvements to global space governance).

26. H.R. 2262, 114th Cong. (2015-2016).

27. *Id.* at §51303.

28. H.R. 4945, 114th Cong. (2015-2016).

29. See Michael Listner, *An Overview of the American Space Renaissance Act (Part 3)*, THE SPACE REVIEW (May 9, 2016), <https://www.thespacereview.com/article/2980/1> (giving an overview of the American Space Renaissance Act).

30. *NASA Administrator Jim Bridenstine*, NASA Leadership, NASA (Apr. 23, 2018), <https://www.nasa.gov/about/highlights/bridenstine-biography.html>.

31. See Alan Boyle, *NASA Lays Out its Commercial Roadmap for Putting Astronauts on the Moon in 2028*, YAHOO! (Feb. 14, 2019), <https://www.yahoo.com/news/nasa-lays-commercial-roadmap-putting-233352611.html>. In line with these plans, Bridenstine recently stated, “This time, when we go to the moon, we’re actually going to stay . . .

consequently paved the way for a paradigm shift, which highlights the central role of businesses in space exploration.

Promoting business activity in outer space through policy is one method nations have employed to harness the entrepreneurial capacity of businesses. For example, some states have devised favorable local tax schemes as a means to encourage businesses to launch space objects within the state's jurisdiction.³² These efforts stem from the observation that businesses' capacity for innovation is a leading factor in an ongoing paradigm shift to "new space"—risk-taking, ambitious businesses whose technology has prepared them to take the reins from the slow, top-down "old space" headed by NASA.³³

And, ambitious they are. U.S.-based businesses like Planetary Resources and Deep Space Industries have plans to profit from space mining.³⁴ Scientists believe that asteroids and other celestial objects are abundant with precious metals, including those used to create a wide range of technology.³⁵ In January of 2018, Planetary Resources accomplished a step in its resource mining plans, by launching a satellite capable of detecting water. Because water can be used to create rocket-fuel, identifying water on asteroids would essentially create "launch pads for long distance travel."³⁶ Similarly, Deep Space Industries plans to launch a spacecraft capable of prospecting near-

[w]e're not going to leave flags and footprints and then come home, to not go back for another 50 years." *Id.*

32. See, e.g., Debra Werner, *California Eyes Launch Income Regulation, Not a New Tax*, SPACENEWS (May 9, 2017), <http://spaceneews.com/california-eyes-launch-income-regulation-not-a-new-tax/> (discussing California's potential tax scheme that would remove income tax for in-state launches that arise from out-of-state contracts).
33. Joel Achenback, *Which Way to Space? Flights of Fancy May Launch the Industry's Future*, WASH. POST (Nov. 23, 2013), https://www.washingtonpost.com/sf/national/2013/11/23/which-way-to-space/?utm_term=.6aad500dad76.
34. See Dylan Taylor, *Maximising the Economic Opportunities of Deep Space*, ROOM (2017), <https://room.eu.com/article/maximising-the-economic-opportunities-of-deep-space> (identifying Planetary Resources and Deep Space Industries as the "most notable" deep space companies, both of which have shifted from the goal of purely asteroid mining to the broader goal of mining "space resources").
35. Joseph T. Miller & David Teague Coit, *Lunar Property and Mining Rights* (Aug. 2008) (unpublished B.S. thesis, Worcester Polytechnic Institute) (on file with Digital WPI).
36. Melody M. Bomgardner, *Chris Lewicki is Aiming at Asteroids to Launch a New Era of Space Travel*, C&EN (Feb. 20, 2018), <https://cen.acs.org/articles/96/i9/Chris-Lewicki-is-aiming-at-asteroids-to-launch-a-new-era-of-space-travel.html>.

Earth asteroids for valuable resources.³⁷ In response to what it deems “some misunderstanding,” the Deep Space Industries’ general counsel has reassured the international community that the non-appropriation principle prohibits ownership—not the “use”³⁸—of celestial bodies.

Luxembourg interprets the OST similarly. In 2017, it passed a law granting businesses operating within its jurisdiction rights in resources extracted in outer space.³⁹ Through the law, Luxembourg plans to invest at least \$230 million to encourage businesses to establish offices within its jurisdiction.⁴⁰ The plan seems to be working: Planetary Resources applauded the law as a step towards “stability and predictability” for asteroid mining,⁴¹ while Deep Space Industries’ prospecting spacecraft will now be co-funded by Luxembourg.⁴²

B. Defining the Non-Appropriation Principle

The non-appropriation principle’s definition is the starting point for determining whether it permits resource extraction. For commentators who do not reject an interpretation permitting resource extraction outright, many more are, at the very least, skeptical.⁴³ Indeed, one scholar has argued that interpretations of the OST that

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37. Deep Space Industries, *Prospector-1: First Commercial Interplanetary Mining Mission*, PHYS.ORG (Aug. 10, 2016), <https://phys.org/news/2016-08-prospector-1first-commercial-interplanetary-mission.html> (noting that the spacecraft will “fly to and rendezvous with a near-Earth asteroid, and investigate the object to determine its value as a source of space resources.”).
 38. Sagi Kfir, *Is Asteroid Mining Legal?*, LINKEDIN (Apr. 21, 2016), <https://www.linkedin.com/pulse/asteroid-mining-legal-sagi-kfir>.
 39. Jeff Foust, *Luxembourg Adopts Space Resource Law*, SPACENEWS (July 17, 2017), <http://spacenews.com/luxembourg-adopts-space-resources-law/> (stating that part of the law’s first article translates as: “[s]pace resources are capable of being appropriated.”).
 40. *Id.*
 41. *Id.*
 42. Emily Calandrelli, *Deep Space Industries Partners with Luxembourg to Test Asteroid Mining Technologies*, TECHCRUNCH (May 5, 2016), <https://techcrunch.com/2016/05/05/deep-space-industries-partners-with-luxembourg-to-test-asteroid-mining-technologies/> (Luxembourg’s Deputy Prime Minister and Minister of the Economy, Étienne Schneider, stated that the partnership “...clearly demonstrates the strong commitment of the Luxembourg Government to support the exploration and future use of space resources.”).
 43. Sarah Fecht, *Space Mining Bill Passes in Congress*, POPULAR SCIENCE (Nov. 17, 2015), <https://www.popsci.com/congress-approves-space-mining-bill> (mentioning that, in 2015, the founder of Space Law and Policy Solutions, Michael Listner, stated that “...[a]cademia is pretty much split right down the middle on this...[w]hen you have that much dissent, you have to talk about it.”).

allow ownership of space material twists Article II's actual language for the purposes of justifying commercial ambitions.⁴⁴ The non-appropriation principle's succinct prohibition presents additional interpretive issues because it omits reference to the role of non-governmental entities.⁴⁵ Consequently, two questions arising from the OST are whether the non-appropriation principle applies equally to nations and their businesses; and, what the scope of that restriction is.

First, while the OST only explicitly restricts nations from making sovereign claims, it would be paradoxical to permit businesses to freely violate their own nations' international obligations. The OST holds nations liable for damages caused by objects launched within the nation's jurisdiction.⁴⁶ The Liability Convention explicates this idea, clarifying that nations are "absolutely liable" for damages caused by space objects launched within their jurisdiction if that damage is caused "on the surface of the Earth or to aircraft in flight."⁴⁷ If that damage is caused elsewhere, a launching state is liable "only if the damage is due to its fault or the fault of persons for whom it is responsible."⁴⁸ Furthermore, the international community's emphasis on the peaceful use of outer space conflicts with an interpretation of the OST that would allow private individuals to violate its other prohibitions.⁴⁹ As one scholar noted, such an interpretation of the

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44. Ram Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32 J. SPACE L. 31, 33-46 (2006) (noting that during the 1976 First Committee of the UN General Assembly the representatives from both Belgium and France shared the view that the OST "prohibit[ed]...any claim of sovereignty or property rights in space" and that "growing pressure by a number of countries for increased privatization, commercialization, deregulation, and globalization, along with recent changes in the global geopolitical situation, are creating disturbing disagreements about the interpretation of the [OST], its implementation, and the direction of future legal development.").
45. Bryon C. Brittingham, *Does The World Really Need New Space Law?*, 12 OR. REV. INT'L L. 31, 38 (2010) (noting that "[n]one of [the OST] directly or indirectly speaks to appropriation by private entities.").
46. OST, *supra* note 7, at art. 7 (stating that each launching state "is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.").
47. Liability Convention, *supra* note 19, at art. 2.
48. *Id.* at art. 3.
49. See, e.g., JOHN G. SPRANKLING, *THE INTERNATIONAL LAW OF PROPERTY* 180 (2014) ("The goal of avoiding military confrontations between the United States and the Soviet Union would have been impaired if private citizens of either state were permitted to claim private ownership of celestial land. This process would inevitably produce conflicting title claims, leading to increased tension and the risk of armed conflict.").

OST permits counter-intuitive outcomes in which the international community prohibits a nation, but not a nation's private entities, from installing nuclear weapons on the moon.⁵⁰ An alternate interpretation would allow nations to "avoid their obligations" by acting vicariously through their private businesses.⁵¹

A further consequence of an interpretation allowing private-actor exemption from the OST is that such "rights" would be effectively unenforceable.⁵² In 2003, a brave U.S. citizen shouldered the quixotic mission to test that idea, asserting that after NASA landed on his asteroid it, naturally, owed him parking and storage fees of 20 cents per year.⁵³ Greg Nemitz claimed to have acquired those property rights when he registered the asteroid, named "Eros," with the Archimedes Institute—a website allowing visitors to register space objects.⁵⁴ The district court rejected Nemitz's claim that NASA's use of Eros amounted to a takings under the Fifth Amendment.⁵⁵ Noting that a takings claim requires "a constitutionally protected property interest," which Nemitz had not established by registering Eros, the court held that he had failed to state a legally cognizable theory for relief.⁵⁶ On appeal to the Ninth Circuit, Nemitz instead argued that his "inalienable rights" as a "natural Man" justified ownership.⁵⁷ In one paragraph, the Ninth Circuit tersely rejected that argument, affirming the district court's ruling.⁵⁸ At the very least, the United

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50. Leslie I. Tennen, *Towards a New Regime for Exploitation of Outer Space Mineral Resources*, 88 NEB. L. REV. 794, 806-07 (2010) ("[I]t would be absurd to contend that the Nuclear Test Ban Treaty, which does not mention private entities, thereby allows a state to license a private entity to conduct nuclear weapons tests in the atmosphere, in outer space, or under water.").
51. *Id.* at 807.
52. See Brehm, *supra* note 11, at 360 (noting that private parties will not be capable of "sustain[ing] successful commercial outer space material extraction enterprises" without governments' willingness to enforce those rights).
53. *Nemitz v. United States*, No. CV-N030599-HDM, 2004 WL 3167042 (D. Nev. 2004). For a full discussion on Nemitz's legal arguments and their rejection, see generally Robert Kelly, *Nemitz v. United States, A Case of First Impression: Appropriation, Private Property Rights and Space Law Before the Federal Courts of the United States*, 30 J. SPACE L. 297 (2004).
54. *Nemitz*, 2004 WL 3167042, at 1.
55. *Id.*
56. *Id.*
57. Appellant's Informal Brief at 7-9, *Nemitz v. United States*, No. CV-N030599-HDM, 2004 WL 3167042 (D. Nev. 2004) (No. 04-16223).
58. *Nemitz v. N.A.S.A.*, 126 F. App'x. 343 (9th Cir. 2005).

States rejects the idea that its own citizens may enforce ownership of bodies in outer space without national recognition of those rights.

Secondly, even if nations, businesses, and individuals are equally bound by the non-appropriation principle, the scope of that restriction is not entirely clear from the text of Article II.⁵⁹ It is unlikely, however, that the non-appropriation principle is an absolute ban on the ownership of resources extracted in outer space.

An interpretation of Article II supporting a blanket ban on resource ownership is unwarranted by the text of the OST and ill-founded on account of the international community's common practices. Scholars have noted that the international community has never questioned whether scientific samples harvested from celestial bodies belong to the extracting nation.⁶⁰ Furthermore, space-faring members of the international community rejected the Moon Treaty precisely because it prohibited all forms of ownership in resources extracted from celestial bodies.⁶¹ The space-faring nations' support for the OST, coupled with their rejection of an alternative set of rules governing extracted resources, is at the very least an indication of what those nations believe the non-appropriation principle to stand for.

It is equally improbable that the international community drafted the non-appropriation principle to be merely idealistic rhetoric. The OST leaves no room for interpretations to squirm out from under its ban on sovereign claims of land.⁶² The following section illustrates, however, that the distinction between sovereign ownership of land, and the vestment of property rights in resources extracted from that land, is nothing new.

59. See Kevin MacWhorter, *Sustainable Mining: Incentivizing Asteroid Mining*, 40 WM. & MARY ENVTL. L. & POL'Y REV. 645, 661 (2016) (noting that while the OST explicitly prohibits the ownership of real property, it does not mention or define "extracted materials" and does not rule such ownership out).

60. See Matthew Schaefer, *Property Rights in Space (Part II): Post-NewSpace Conference Thoughts- Posey ASTEROIDS Act, Bigelow Payload Safety Review, On-Orbit Jurisdiction, Etc.*, LAW OF SCHAEFER (July 26, 2014), <https://lawofschaefer.com/2014/07/26/property-rights-in-space-part-ii-post-newspace-conference-thoughts-posey-asteroids-act-bigelow-payload-safety-review-on-orbit-jurisdiction-etc/> (stating that "[t]here should be no debate over this" because of the "numerous" examples of resource samples being "returned to Earth and owned by the extracting nation and even sold in some cases.").

61. See Brehm, *supra* note 11, at 359.

62. OST, *supra* note 7 (stating that appropriation is prohibited "...by claim of sovereignty, by means of use or occupation by any other means.").

II. LEGAL REGIMES DISTINGUISHING RESOURCE EXTRACTION FROM APPROPRIATION

Although the OST does not provide a comprehensive guideline for resource extraction in outer space, its foundational logic provides a workable distinction between ownership and use. This part explores three property regimes developed under the same fundamental constraints as the non-appropriation principle: the United Nations Convention on the Law of the Sea (“UNCLOS”), the Antarctica Treaty System, and the prior appropriation doctrine as applied in United States water law.⁶³ Under each regime, parties may establish some form of ownership in extracted resources despite being restricted from claiming sovereignty over the underlying land.

Each section includes a brief discussion of the property regime’s history, its major traits and their relationship to the overarching characteristics of the non-appropriation principle. This part further describes how each property regime fits within the non-appropriation principle’s prohibition on claims to land, while prohibiting waste, separating land ownership from rights to extracted resources, enforcing liability for destruction or damage, and establishing a simple regulatory system to manage claims.

A. *The Law(s) of the Sea: UNCLOS and the Seabed Act*

International and national maritime laws addressing resource extraction deal with many of the same obstacles present in outer space. Like outer space, “[t]he seabed is rich in minerals...[c]ollecting and mining these minerals is expensive and requires sophisticated technology capable of reaching the great depths.”⁶⁴ Additionally, the international regulatory regime created to address seabed mining contemplates widely applicable issues including the “protection and preservation of the marine environment,” “promot[ing] the peaceful uses of the seas and oceans,” and the “efficient utilization” of the

63. Other scholars have analogized UNCLOS and the Antarctic Treaty System to the law of outer space as models for potential development. See, e.g., Barbara Ellen Heim, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica*, 23 VAND. J. TRANSNAT’L L. 819, 845 (1990). This Note, however, asserts that those property regimes share the same doctrinal foundations as the non-appropriation principle, and therefore are useful for a different purpose—to determine the scope of rights available in extracted resources under the non-appropriation principle. In other words, this Note uses those regimes as examples of what scope of property rights in extracted resources the non-appropriation principle already permits.

64. Sattler, *supra* note 6, at 34.

resources therein.⁶⁵ Although international law forms the backbone of seabed mining regulations, individual nations have concurrently developed their own regulations.

The foremost international maritime law is the United Nations Convention on the Law of the Sea (“UNCLOS”).⁶⁶ The current iteration of UNCLOS came into force in 1982, replacing decades of international treaties that had not addressed seabed mining.⁶⁷ The 1982 UNCLOS established the International Seabed Authority (“ISA”), a body responsible for managing seabed mining through regulations and licensing.⁶⁸ UNCLOS further established a dispute resolution system through the Seabed Disputes Chamber of the International Tribunal.⁶⁹

The United States found some features of the 1982 UNCLOS objectionable. Originally, the ISA was empowered to create an entity called the “Enterprise”, which would conduct mining operations for the benefit of developing countries alongside private mining operations.⁷⁰ Under this agreement, private businesses were compelled to provide the Enterprise with the location of discovered minerals and the technology necessary to extract them, all in addition to the funding from member states.⁷¹ Some of these requirements proved controversial.

Several developed nations subsequently rejected UNCLOS and signed the “Provisional Understanding Regarding Deep Seabed Matters” (“The Provisional Understanding”) in 1984.⁷² The Provisional Understanding established “...procedures to follow in order to avoid overlapping claims to seabed sites,” while encouraging reciprocal recognition of other party’s claims.⁷³ The Group of 77—a

65. See United Nations Convention on the Law of the Sea preamble, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

66. See *id.*

67. The U.N. had drafted deep-sea regulations since the 1950’s, “...but these documents did not deal with undersea mining because the necessary technology had not yet been developed.” Sattler, *supra* note 6.

68. *Id.*

69. *Id.*

70. *Id.*

71. Brittingham, *supra* note 45, at 52 (“Thus, the Enterprise would be given all of the advantages and none of the expenses of prospecting or developing the technology.”).

72. Provisional Understanding Regarding Deep Seabed Matters, Sept. 2, 1984, TIAS 11066. Parties to the Provisional Understanding included Belgium, France, the Federal Republic of Germany, Italy, Japan, the Netherlands, the United Kingdom, and the United States of America.

73. BOLESŁAW ADAM BOCZEK, INTERNATIONAL LAW: A DICTIONARY 258 (2005).

coalition of developing countries—and the ISA, criticized the Provisional Understanding on the grounds that it established an illegal regime.⁷⁴ As one critic concedes, however, the Provisional Understanding is probably legal because it “...neither claims sovereignty or ownership...nor grants exclusive rights...” to seabed areas.⁷⁵

UNCLOS was renegotiated in 1994, in part due to the changes brought about by the end of the Cold War and decreased focus on deep-seabed mining.⁷⁶ Among the changes, it secured permanent seats on the ISA Council for the United States and Russia,⁷⁷ created a Finance Committee consisting of the five parties with the largest financial contributions,⁷⁸ removed mandatory funding of the Enterprise,⁷⁹ made technology-sharing optional,⁸⁰ and made development plans a prerequisite for granting permits for resource mining.⁸¹ Despite these changes, the United States “remains the only major seafaring nation” that has not ratified 1994 Agreement.⁸²

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74. Declaration of the Preparatory Commission, U.N. Doc. LOS/PCN/72 (Sept. 2, 1985) (“Any claim, agreement or action regarding the Area and its resources undertaken outside the Preparatory Commission which is incompatible with the United Nations Convention on the Law of the Sea and its related resolutions shall not be recognized...[the Preparatory Commission] [r]ejects such claim, agreement or action as a basis for creating legal rights and regards it as wholly illegal.”).
75. Steven J. Molitor, *The Provisional Understanding Regarding Deep Seabed Matters: An Ill-Conceived Regime for U.S. Deep Seabed Mining*, 20 CORNELL INT’L L. J. 223, 243 (1987).
76. See Brittingham, *supra* note 45.
77. UNCLOS, *supra* note 65, at Art. 161.
78. *Id.* at Annex. § 9 (“Until the Authority has sufficient funds...the membership of the Committee shall include representatives of the five largest financial contributors to the administrative budget of the Authority.”).
79. *Id.* at Annex. § 2 (“The obligation of States Parties to fund one mine site of the Enterprise...shall not apply and States Parties shall be under no obligation to finance any operations in any mine site of the Enterprise or under its joint-venture arrangements.”).
80. *Id.* at Annex. § 5 (“The Enterprise, and developing States...shall seek to obtain [deep seabed mining technology] on fair and reasonable commercial terms and conditions on the open market, or through joint-venture arrangements...”).
81. *Id.* at Annex. § 6 (requiring parties to submit an “exploitation plan” that includes an “anticipated production schedule” estimating the maximum amount of extracted resources per year under the plain).
82. David Widgerow, *Boldly Going Where No Realtor Has Gone Before: The Law of Outer Space and a Proposal for a New Interplanetary Property Law System*, 28 WIS. INT’L L. J. 490, 506 (2010).

The United States' disagreements with the 1982 UNCLOS led to the creation of an interim national law called the Deep Seabed Hard Mineral Resources Act ("Seabed Act").⁸³ While the Seabed Act is intended as a temporary regime, it acknowledges that a functional international regime may take some time to develop.⁸⁴ Under the Seabed Act, companies are required to obtain licenses and permits to explore and extract, both of which expire after a period of years.⁸⁵

The United States has not entirely abandoned UNCLOS. Addressing recent conflicts in the South China Sea, President Trump called for "...claimants to clarify and comport their maritime claims in accordance with the international law of the sea as reflected in the 1982 United Nations Convention on the Law of the Sea..."⁸⁶ Additionally, several United States presidents have supported ratification of UNCLOS since the 1994 Agreement.⁸⁷ And, although President Reagan was dissatisfied with the 1982 UNCLOS, changes incorporated into the 1994 Agreement have addressed those complaints.⁸⁸

83. 30 U.S.C. § 1401 (2018) [hereinafter Seabed Act].

84. *Id.* at § 1401(a)(8) ("[I]t is in the national interest of the United States and other nations to encourage a widely acceptable Law of the Sea Treaty, which will provide a new legal order for the oceans covering a broad range of ocean interests, including exploration for and commercial recovery of hard mineral resources of the deep seabed...").

85. *Id.* at § 1417(a)-(b) ("[e]ach license for exploration shall be issued for a period of 10 years...[e]ach permit for commercial recovery shall be issued for a term of 20 years and for so long thereafter as hard mineral resources are recovered annually in commercial quantities from the area to which the recovery plan associated with the permit applies.").

86. *Joint Statement between the United States of America and the Socialist Republic of Vietnam*, THE WHITE HOUSE (Nov. 12, 2017), <https://www.whitehouse.gov/briefings-statements/joint-statement- united-states-america-socialist-republic-vietnam/>; *but see* Mark J. Valencia, *Parsing Trump's Recent Policy Statements on the South China Sea*, THE DIPLOMAT (Nov. 17, 2017), <https://thediplomat.com/2017/11/parsing-trumps-recent-policy- statements-on-the-south-china-sea/> (referring to President Trump's statements as "disingenuous" because of the United States' non-ratification of UNCLOS).

87. Support also includes five former Secretaries of States. *See* Henry Kissinger, George Shultz, James Baker III, Colin Powel & Condoleezza Rice, *Time to Join the Law of the Sea Treaty*, WALL ST. J. (May 31, 2012), <https://www.wsj.com/articles/SB10001424052702303674004577434770851478912> [<https://perma.cc/9P8R-BCY2>] ("Presidents Bill Clinton and George W. Bush have supported ratification, as do Presidents H.W. Bush and Barack Obama, because it is in the best interest of our nation.").

88. George Shultz served as Secretary of State under President Reagan and noted, "[i]t surprises me to learn that opponents of the treaty are

The laws regulating resource extraction in the sea share major traits with the non-appropriation principle, as UNCLOS and the Seabed Act allow parties to establish property rights in extracted resources without violating the non-appropriation principle. First, under both regimes, parties extract minerals without laying claim to underlying land.⁸⁹ Secondly, UNCLOS's requirement for development plans and the Seabed Act's licensing-system place some pressure on parties to extract resources or forfeit their rights.⁹⁰ This feature prevents parties from sleeping on a license, thereby encouraging productive use of land. In other words, the licensing system reduces waste and protects against de facto ownership of land resulting from inordinately long periods of occupation. The United States, by adopting both traits from UNCLOS, and voicing its willingness to enter into a robust international regime for resource extraction, indicates support for an international regime reflecting those features.

Even if the United States' framework under the Seabed Act were adopted as a model for resource extraction in space, it comports with the non-appropriation principle. The United States' conceptual distinction between land ownership and resource extraction is a gauge for whether it would accept a similar arrangement for space law.⁹¹ And, while the United States is only one of many members of the international community, it is difficult to conceive of a successful international agreement without the involvement of the major space-faring nations.

B. *The Antarctic Treaty System*

The Antarctic Treaty⁹² and the subsequent agreements collectively regulating the peaceful use of Antarctica form the

invoking President Reagan's name, arguing that he would have opposed ratification despite having succeeded on the deep sea-bed issue. During his administration, with full clearance and support from President Reagan, we made it very clear that we would support ratification if our position on the sea-bed issue were accepted."

89. See UNCLOS, *supra* note 65, at Art. 89 ("No State may validly purport to subject any part of the high seas to its sovereignty."); see also Seabed Act, *supra* note 83, at § 1402 (a)(2) (clarifying that the Seabed Act "does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any areas or resources in the deep seabed.").
90. See Sattler, *supra* note 6, at 36 (stating that "[s]uch a provision ensures development of the area instead of dormant claims that leave an area unproductive.").
91. Seabed Act, *supra* note 83, at § 1412(b)(3) (a valid license entitles the license-holder only to "recover hard mineral resources, and to own, transport, use, and sell" those extracted resources).
92. The Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71 [hereinafter *The Antarctic Treaty*].

“Antarctic Treaty System.”⁹³ The first of these treaties was created in 1959 to preserve environmental integrity and prohibit violence in the region.⁹⁴ Antarctica’s size, impenetrableness, and vast resource stores have made it a reoccurring model for outer space law.⁹⁵ While the Antarctic Treaty System shares key features with the law of outer space, its development and subsequent legal regime is distinctive.

Several nations made property claims to Antarctica before the first Antarctic Treaty.⁹⁶ Parties suspended those claims, however, in effort to moderate claims and prevent Antarctica from becoming a site of violent competition.⁹⁷ Although the 1959 Antarctic Treaty does not directly address resource-mining, parties “...understood that the question of how Antarctic mineral activity was to be regulated...would not go away.”⁹⁸

The international community originally attempted to establish a legal regime for Antarctica that distinguished between sovereign claims and resource extraction. The Convention on the Regulation of Antarctic Mineral Resource Act (“CRAMRA”) was the first venture to provide a foundation for an international property regime in Antarctica.⁹⁹ CRAMRA defined, as a means to regulate resource

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93. *Key Documents of the Antarctic Treaty System*, SECRETARIAT OF THE ANTARCTIC TREATY, https://www.ats.aq/e/ats_keydocs.htm [<https://perma.cc/F22J-TK3Q>] (last visited Feb. 21, 2019).
94. See The Antarctic Treaty, *supra* note 92, at Article IX (stating that two of the Antarctic Treaty’s goals are the “preservation and conservation of living resources in Antarctica” and the “use of Antarctica for peaceful purposes only”).
95. See Sattler, *supra* note 6, at 32 (“Like the moon, Mars, and asteroids, the continent of Antarctica is also a vast expanse of land that is undeveloped and contains mineral deposits. The development and utilization of Antarctica, like the development of these celestial bodies, is expensive, requires great technical innovations, and provides unique challenges to humans working in that environment.”).
96. Blake Gilson, *Defending Your Client’s Property Rights in Space: A Practical Guide for the Lunar Litigator*, 80 *FORDHAM L. REV.* 1367, 1386 (2011) (“[S]even countries successively claimed sovereignty in Antarctic territory” in the century after they discovered that Antarctica was a continent rather than a “patchwork of ice islands . . .”).
97. Sattler, *supra* note 6, at 32 (“[C]laims were then suspended by the Antarctic Treaty of 1959 in favor of a legal regime that protected the fragile environment and fostered scientific research in the region.”).
98. Introductory Note, U.S. State Dep’t, Regulation of Antarctica Mineral Resource Activities, <https://www.state.gov/documents/organization/15282.pdf> [<http://perma.cc/D73C-HB6L>] (hereinafter Antarctic Mineral Resource Introductory Note).
99. See A.D. Watts, *The Convention on the Regulation of Antarctic Mineral Resource Activities 1988*, 39 *THE INT’L AND COMP. L. Q.* 169,

mining, three categories of resource-related activity: “prospecting”, “exploration”, and “development.”¹⁰⁰ The Regulatory Committee, one of several institutions established under CRAMRA, was responsible for considering permit applications for the “exploration and development” of mineral resources.¹⁰¹ Unlike exploration and development, prospecting does not require the authorization of any of the institutions.¹⁰²

CRAMRA’s definition of “prospecting” is crucial for understanding the role of property rights under the regime. Prospecting includes the investigation of areas for potential exploration or development using a variety of sensing technologies.¹⁰³ Dredging, excavation, or drilling, however, are defined as “prospecting” only if used for the purpose of obtaining small-scale samples or drilling less than 25 metres.¹⁰⁴ Furthermore, activities defined as “prospecting” do not confer property rights to mineral resources.¹⁰⁵ As a result, an operator gains property rights to mineral resources “...at the exact point where prospecting activities cease to be prospecting activities and become exploration or development activities.”¹⁰⁶

The six years of negotiation that culminated in CRAMRA¹⁰⁷ were not ultimately fruitful. Under its terms, CRAMRA could not enter into force unless all states with territorial claims to Antarctica were parties to it.¹⁰⁸ Australia and France, while supportive of CRAMRA during negotiations, stated in 1989 that they would not ratify the Convention.¹⁰⁹ Consequently, no nations have ratified CRAMRA.¹¹⁰

169-70 (1990). Convention on the Regulation of Antarctic Mineral Resource Activities, June 2, 1988, 27 I.L.M. 868 [hereinafter CRAMRA].

100. *Id.* at 869.

101. *Id.* at 883.

102. *See id.*

103. *Id.* at 869.

104. *Id.*

105. Elliot Reaven, *The United States Commercial Space Launch Competitiveness Act: The Creation of Private Space Property Rights and the Omission of the Right to Free from Harmful Interference*, 94 WASH. U. L. REV. 238, 253-4 (“[T]he extracting entity has a right to property as soon as its excavations and dredging are no longer for the purpose of obtaining “small-scale samples” or when its drilling extends to depths below twenty-five meters.”).

106. *Id.* at 254.

107. *Id.* at 251.

108. Antarctica Mineral Resource Introductory Note, *supra* note 98.

109. For the series of events leading up to Australia’s rejection of CRAMRA, including pleas from Jacques Cousteau and the *Exxon Valdez* oil spill,

Antarctic resource extraction is currently regulated under the Protocol on Environmental Protection to the Antarctic Treaty, also known as the “Madrid Protocol”.¹¹¹ Concluded in 1991, the Madrid Protocol prohibits “...[a]ny activity relating to mineral resources, other than scientific research...”¹¹² Parties to the Madrid Protocol are able to reconsider the ban on commercial resource mining in 2048 and have reaffirmed the moratorium as recently as 2016.¹¹³

Although it was not ultimately adopted, CRAMRA’s negotiation provides insight into the international community’s willingness to create a resource extraction regime starting from a premise that ownership and use are distinct. Although CRAMRA permitted nations to extract resources, extraction explicitly could not amount to ownership of the underlying land.¹¹⁴ From that premise, CRAMRA does not grant property rights to parties who have merely used sensing technologies on the land, requiring more significant labor through activities like drilling or dredging.¹¹⁵

While the Madrid Protocol removes commercial resource extraction as an option, it allows nations to extract scientific samples without requiring—or permitting—claims of sovereignty.¹¹⁶ Because the Madrid Protocol “neither modif[ies] nor amends” the framework laid out by the Antarctic Treaty,¹¹⁷ extraction—whether scientific or commercial—remains separate from the ownership of underlying land. While the international community chose to restrict commercial extraction in Antarctica, that arrangement is a result of

see Sam Blay & Ben M. Tsamenyi, *Australia and the Convention for the Regulation of Antarctic Mineral Resource Activities (CRAMRA)*, 26 POLAR RECORD 195, 198 (1990).

110. Antarctica Mineral Resource Introductory Note, *supra* note 98.
111. Protocol on Environmental Protection to the Antarctic Treaty, Oct. 4, 1991, 30 I.L.M. 1455 [hereinafter Madrid Protocol].
112. *Id.* at 1464.
113. Secretariat of the Antarctic Treaty, Resolution 6 (2016) ATCM XXXIX – CEP XIX, Santiago (June 1, 2016), https://www.ats.aq/devAS/info_measures_listitem.aspx?lang=e&id=642 [https://perma.cc/65BP-MGUS] (“[T]he [Madrid Protocol]...is an essential element of current efforts to protect the Antarctic environment...”).
114. CRAMRA, *supra* note 99, at 874 (“Nothing in this Convention and no acts or activities taking place while this Convention is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in the Antarctic Treaty area or create any rights of sovereignty in the Antarctic Treaty area”).
115. *See* Seabed Act, *supra* note 83.
116. Madrid Protocol, *supra* note 111, 30 I.L.M. at 1464.
117. *Id.* at 1463.

environmental concerns and not the failure to develop a property regime.¹¹⁸ CRAMRA's successful illustration of a property regime remains instructive for the international community as it develops finer points of space law.

C. *The Prior Appropriation Doctrine*

The prior appropriation doctrine is a system developed in the American West to simplify miners' water claims, granting rights to use the water to whoever made beneficial use of it first.¹¹⁹ The prior appropriation doctrine is useful for analyzing the law of outer space in both functional and abstract ways. First, scientists expect that water will be necessary for creating fuel and breathable air in outer space.¹²⁰ Secondly, the prior appropriation doctrine evolved to resolve various claims in the water-scarce American West.¹²¹ The prior appropriation doctrine developed against the backdrop of commercial/private tension, embodies deeply-rooted American ethical assumptions, and contemplates the "public ownership" of underlying land.¹²² The prior appropriation doctrine is also "a rule of scarcity, not plenty," and is therefore concerned with managing limited resources.¹²³ These features of the doctrine make it a useful comparison to the demands of outer space resource extraction. Most importantly, the prior appropriation doctrine has resulted in an intuitive set of rules distinguishing between ownership and productive use.

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118. See Reaven, *supra* note 105, at 251 (noting that CRAMRA demonstrated that "a significant portion" of the international community desired to effectively regulate mineral resource activities).
119. Michael Arthur et al., *Doctrine of Prior Appropriation*, PENNSTATE, <https://www.e-education.psu.edu/earth111/node/948> [<https://perma.cc/WZ5M-3PLM>] (last visited Feb. 24, 2019).
120. Collin Skocik, *Planetary Resources' Arkyd-6 Ready for Launch*, SPACEFLIGHT INSIDER (Dec. 27, 2017), <http://www.spaceflightinsider.com/missions/commercial/arkyd-6-ready-for-launch/> [<https://perma.cc/FX5Y-KLJS>].
121. See David B. Schorr, *Appropriation as Agrarianism: Distributive Justice in the Creation of Property Rights*, 32 *ECOLOGY L. Q.* 3, 7-8 (2005) ("When it came to resolving disputes over water use, the miners, finding the eastern law of riparian rights unsuited to the exigencies of their environment, applied the rules they had created for mining claims to surface water claims...[a]pplying the miners' rules to water rights provided security of title to those displaying the entrepreneurial initiative necessary to make the earliest claims on the water, thereby facilitating economic expansion.").
122. See *id.* at 41.
123. Gregory J. Hobbs, Jr., *Reviving the Public Ownership, Antispeculation, and Beneficial Use Moorings of Prior Appropriation Water Law*, 84 *U. COLO. L. REV.* 97, 111 (2013).

The prior appropriation doctrine grew out of the chaos and grit that embodied the mining rush to the Western United States.¹²⁴ The unpredictable availability of water, combined with the need for a simple adjudicative system, led early miners and farmers to adopt an “intuitive common sense” system of rules to resolve water claims.¹²⁵ Essentially, the first claimant to make actual beneficial use of the water has senior rights to later users.¹²⁶ Claimants do not own the land, however, but rather the right to use the water.¹²⁷ Consequently, claimants may transfer their rights to the use but the public ultimately owns the water.¹²⁸ Each of these features is explored below.

Central to the prior appropriation doctrine, and exemplified in Colorado’s constitution, is that water is a publicly owned resource.¹²⁹ This concept stands in contrast to the idea that ownership of land is tied to ownership of the land’s water.¹³⁰ The prior appropriation doctrine severs those concepts from one another, justifying citizens’ right to appropriate water while nullifying riparian claims.¹³¹ This feature is a doctrinal cornerstone of the prior appropriation system, as it distributes ultimate decision-making authority to the public while protecting valid claims.

Not all claimants establish or retain valid claims to use diverted water. Prior appropriation requires a claimant to make actual beneficial use of the water to obtain and retain their right to continue

124. Dan Tarlock, *Prior Appropriation: Rule, Principle, or Rhetoric*, 76 N. D. L. REV. 881, 890 (2000) (“Western water rights were initially a practical, intuitive response to the seasonable unreliability of western stream flows.”).

125. *Id.*

126. *Id.* at 882.

127. See Schorr, *supra* note 121, at 42 (“Only the right to use could be acquired, and then only under conditions stipulated by the owner (through its agent, the state).”).

128. *Id.*

129. *Id.* at 41 (“The water of every natural stream, not heretofore appropriated, within the state of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as hereinafter provided.”) (citing COLO. CONST. art. XVI, § 5).

130. See *id.* at 62 (“[W]ater’s special value in the west elevates it to a ‘distinct’ estate, i.e. one not related to the rights of riparian landowners, not ‘a mere incident to the soil.’”).

131. This is doctrinally distinct from the premise that water is available as a result of it being “unowned.” See, e.g., *id.* at 42 (“Opening up the opportunity to acquire a water right to all members of the public was not, as one might have expected, based on a theory of the water being *res nullius*, unowned, and therefore freely available to all. It was, rather, . . . the property of the public, *publici juris*.”).

that use.¹³² In the context of the doctrine's development, this stipulation prevented vast, speculative hoarding of property for the purpose of a later sale.¹³³ This emphasis on "antispeculation" is derived from the era's intensely anti-monopoly sentiment, favoring the distribution of water rights to those who could make actual use of the land.¹³⁴ Therefore, claimants must define the location and expected scope of their use to establish or transfer rights.¹³⁵

Parties who establish valid claims are protected against other future users who seek to use the same water at the earlier claimant's detriment. Parties who make actual beneficial use of water have "seniority" over later claimants who use the water for similar purposes.¹³⁶ In this system of senior and junior claimants, the latter must yield their use to senior claimants in times of water scarcity.¹³⁷ Although this arrangement protects senior claimants from losing their use in times of scarcity, one scholar notes that claims often avoid their seniority.¹³⁸ Furthermore, some states simply prohibit senior claimants from enforcing their priority over junior claimants when

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132. *See id.* at 21 (stating that water claims are only valid under the prior appropriation doctrine ". . . as long as used and, in a further instance of the sufficiency principle, an exception was made only for the proprietor who was taking active steps toward construction of his mill, and only for as long as necessary to procure the necessary equipment.").
133. *See id.* at 21-22. ("The function of the work or use requirement was, rather, to prevent speculative appropriations; in other words, appropriations intended not for immediate use but for resale at a profit, especially by absentee owners.").
134. *See id.* at 27-28 ("'[M]onopoly' became something of an epithet for all the institutions agrarian reformers disliked or feared. It also had a more specific sense, referring to the accumulation of property on a scale beyond what was practical for personal use, particularly for purposes of speculation or deriving income from tenants. . . . Anti-monopolism went hand-in-hand with a desire for limits to the private accumulation of land and the yeoman ideal of wide distribution to actual settlers.").
135. Claimants who fail to identify the nature of their use compromise the validity of their claim and ability to transfer that right to another party. *See, e.g.,* Hobbs, *supra* note 123, at 128 (use applications dismissed when claimants fail to sufficiently identify the "need, amount, or place" of the use).
136. Junior claimants who use water for "essential" purposes, however, are sometimes capable of supplanting senior rights. *See* Schorr, *supra* note 121, at 23 (prior appropriation does not prohibit "domestic" uses from taking priority over agricultural uses even when the domestic use was not first in time).
137. *See* Tarlock, *supra* note 124, at 882.
138. One reason for avoiding enforcement is that water users are often "repeat users" and senior claimants are therefore incentivized not to compromise those relationships. *Id.* at 883.

doing so would be futile.¹³⁹ Claimants may actually benefit from avoiding enforcement, especially when enforcement is sought solely to prove seniority at the expense of junior claimants.¹⁴⁰

Because prior appropriation separates the ownership of land from rights to beneficial use of water, claimants can freely transfer their validly established water rights.¹⁴¹ The technology claimants use to divert water for “out-of-stream” uses, like mining and agriculture, helps make the use “measurable and enforceable,” and therefore identifiable for transfer.¹⁴² Although transfers require new users to satisfy the actual beneficial-use requirement, the arrangement is flexible enough to facilitate the temporary transfer of use rights.¹⁴³

The prior appropriation’s system of senior and junior claimants is enforced and regulated by a centralized authority. Acting in a “trusteeship role,” the government is responsible for enforcing validly established water rights.¹⁴⁴ Although enforcement is sometimes avoided, as noted above, the value of a senior claim is necessarily dependent on the enforcement of those rights, especially when water is in short supply.¹⁴⁵ In addition to adjudicating claims, the government is responsible for the “conservation of the public’s water resources.”¹⁴⁶ Here, the implications of the “public ownership” concept is significant:

...[T]he state assumed a trusteeship role to administer the waters of the state for the benefit of the public. As such, it became responsible not only for minimal administrative functions but also for administration of the kind a trustee owes to the beneficiary of the trust. Its responsibilities include, first and foremost, the conservation of the estate and avoidance of waste; second, the promotion of beneficial use by assisting the

139. *Id.* at 882.

140. For the retelling of an incident in Aspen, Colorado, arising from a senior claimant’s erection of a damn to prove their senior rights, *see id.* at 899 (Junior claimants may have a legally unjustified expectation that senior claimants will share in time of scarcity even though there is no “reasonableness” requirement in priority enforcement).

141. Dan Lueck, *The Rule of First Possession and the Design of the Law*, 38 J. L. & ECON. 393, 427 (1995) (noting that prior appropriation “allows transfer of these water rights separate from any land...”).

142. *Id.* at 428.

143. *See* Hobbs, *supra* note 123, at 131 (temporary transfers are particularly flexible when made from agricultural to municipal uses on a “contract basis”).

144. *Id.* at 109.

145. *Id.* at 111.

146. *Id.* at 109.

appropriator in achieving use objectives to the maximum extent feasible; third, the representation of beneficiaries in a *parens patriae* capacity and maintaining the use regimen on the river system; and fourth, the promotion of efficiency and prudence of the kind expected of a trustee.¹⁴⁷

The prior appropriation doctrine serves as a unique example for space law because of how it conceptualizes land ownership. Underlying land is available for use not because it is “unowned,” but because it is owned by a community who has the right to make productive use of it.¹⁴⁸ Because the community owns the land, claimants have an obligation to use the land properly and the government is responsible for stewardship.¹⁴⁹ This framing fits neatly with proponents of the idea that outer space is collectively “owned” by the international community. Regardless, stewardship and government ownership do not necessarily displace the potential for productive use.

Parties do not violate the non-appropriation principle simply by extracting—or as here, diverting—resources from the land. At no point does extraction equate to a sovereign claim over the land. In instances where non-productive use or the like violates those principles, property rights disappear. Furthermore, the OST encourages the idea that outer space is to be used to benefit the broader international community.¹⁵⁰ The prior appropriation doctrine illustrates that parties can establish and transfer robust property rights in resources independent from land-ownership, while promoting beneficial use.

CONCLUSION

The non-appropriation doctrine restricts parties from making sovereign claims over underlying land—the same restriction embedded in each of previous section’s legal regimes. Without violating the non-appropriation principle, those regimes grant parties the right to extract resources from land they do not own, transfer that right, and limit wasteful use. Each system similarly vests an entity with the authority to regulate and enforce those rules. With some tailoring,

147. *Id.* at 110 (citing The Water Right Determination and Administration Act of 1969, 1969 Colo. Sess. Laws ch. 373, 200).

148. *See* Schorr, *supra* note 121, at 42.

149. *Id.*

150. OST, *supra* note 7, at art. I (“The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”).

those rules could graft onto the uniqueness of outer space resource extraction.

The property regimes explored in Part II do not provide answers for all claims likely to arise in cases involving outer space resource extraction. One looming issue is that some attempts at resource extraction are bound to straddle the line between use and sovereign claims over land. For example, in instances where parties continually seek extensions on mining permits (to the exclusion of others) or take blatant steps to unreasonably exclude other parties from nearby locations. Those seeking to preserve the line between use and ownership would be wise to police it. Answers to these granular regulatory questions will require some regulatory flexibility, but these issues are only different in scale from those addressed by our existing property regimes.

At least one author explicitly criticizes what they describe as attempts to “merely superimpose an earth-based system of rules and regulations on the realm of space.”¹⁵¹ This reasoning is rooted in the observation that Antarctica and the high seas are property regimes “inexorably...linked to the Earth itself,” reflecting the idea that “a landowner has dominion from the depths of the Earth to the stars above.”¹⁵² This is a curious observation, as the laws governing the seas and Antarctica conceive of land ownership as separate from non-wasteful *use* of that land. In fact, UNCLOS, CRAMRA, and the prior appropriation doctrine all distinguish between land ownership and resource extraction. Existing property regimes reflect attempts to balance a universal set of competing demands—specifically, issues of cost and benefit. Policy-makers should be encouraged to innovate effective rules for outer space resource extraction, but our legal system reflects fundamentally human issues that are here to stay. Regardless of analogous regimes, the OST’s language reflects a consciousness of these issues.

Looking to earth-based property regimes is not merely a “misdirected” or “convoluted” attempt to avoid applying the non-appropriation principle.¹⁵³ Rather, parties to the OST should adhere to the non-appropriation principle. In its current form, the OST is flexible enough to permit nuanced and useful developments in space law; it does not need to be re-tooled to be amenable to outer space resource extraction. Consequently, the non-appropriation principle should not be interpreted as a death-knell for resource extraction, but a functional starting point permitting a robust system of rights and responsibilities.

151. See Tennen, *supra* note 50, at 797.

152. *Id.*

153. *Id.* at 798.

This Note does not support the re-packaging of an existing property regime for use in space law. Rather, that existing property regimes, discussed in Part II, begin from the same premise as the non-appropriation principle. Those property regimes are therefore useful for determining whether there is a place for resource extraction within a system that bans sovereign claims. While this Note does not explore what a regulatory system for outer space resource extraction should include, the first step in that process is to clear away doubts concerning the non-appropriation principle. There are, as other legal regimes show, distinctions between land ownership and use. Because extraction falls into the latter category, it alone should not bar the future plans of businesses like Planetary Resources and Deep Space Industries.

Despite the non-appropriation principle's workability, there may be other obstacles to resource extraction. Just as ideological disagreements created splintered legal regimes for seabed extraction, and environmental concerns halted commercial mining in Antarctica, any number of political issues could halt recent advances. Furthermore, non-appropriation is not the only principle governing numerous and complex international laws, all of which could provide separate obstacles to outer space mining. But, in light of the international community's demonstrable ability to respond to challenges and create workable legal regimes in the face of uncertainty, this author is optimistic that those same traits will manifest themselves once again. After all, the challenges we face in outer space are only variations of the ones we have faced before.