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Untethering UMVs from Vessels: Why the United States Should Construct a New Environmental Legal Scheme for Unmanned Maritime Vehicles

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ABSTRACT

International and domestic laws and regulations, and in particular those addressing environmental protections related to the world's oceans, have no clear application to unmanned maritime vehicles (UMVs). Instead, legal scholars have attempted to fit UMVs into current legal schemes in a piecemeal manner that UMVs practically and realistically cannot comply with. UMVs are inherently different than their manned counterparts and therefore require a unique legal framework separate and apart from manned vessels.

Without its own legal scheme, the United States Navy and other organizations will not be able to realize the full potential of UMVs—not only for their military operational advantages but their significant environmental advantages as well. Thus, the United States should carefully construct a new legal regime for UMVs. By leading the way for the international community, the United States can effectively ensure proper legal recognition and widespread deployment of UMVs on both a domestic and international scale while also upholding strong environmental protection policies.

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TABLE OF CONTENTS

INTRODUCTION

Despite efforts in the legal community to fit unmanned maritime vehicles (UMVs) within current legal schemes, none adequately address the uniqueness of UMV design and operations compared to their manned vessel counterparts. Most efforts attempt to explore UMVs within individual legal stovepipes or fit UMVs within the definitional box of "vessel" without fully appreciating and recognizing UMVs as what they are: *unmanned* maritime vehicles. As a result, international and domestic laws and regulations, and in particular those addressing environmental protections related to the world's oceans, have no clear application to these superior machines. UMV technological development and advancement, as well as future implementation and operation, is therefore stifled without a clear path to knowing what laws appropriately apply. Yet UMVs have military operational advantages as compared to manned vessels, as well as significant environmental benefits. Such advantages and benefits will not be realized until the United States and the international community at large are able to develop

a unique legal scheme for UMVs. Efforts to represent UMVs as manned vessels should be avoided.

This Article proposes that UMVs offer a unique and ideal opportunity to marry national security interests with environmental protection. Current international and domestic legal schemes are insufficient for environmental law applications to UMV use despite best efforts of legal scholars to characterize UMVs within the international law field. The United States should lead the way in carefully constructing a new legal regime for UMVs to ensure proper international legal identity and national security for UMVs while still upholding environmental protection goals. In particular, UMVs should not be regulated in environmental law as closely as traditionally manned vessels due to their significant environmental benefits over manned vessels, except as UMVs relate to and interact with ocean noise pollution in testing and training (which, as noted below, is adequately addressed with current legal protections under the Marine Mammal Protection Act (MMPA)).

The United States (U.S.) government must also remedy the lack of designated legal application of environmental laws and regulations to unmanned maritime vehicles. Doing so will provide the military and the public with bright line rules to make development, implementation, testing and training, research, and operational activities easier for the U.S. military while still encouraging overarching environmental protection goals. Without a tailored legal scheme, the government will be forced to take laborious steps in the administrative and program planning process to determine what laws and regulations apply to UMVs on an individual basis, perhaps even to the point of individual sensors and technologies used. This will significantly slow efforts of the U.S. military to improve its technical capabilities in an increasingly competitive maritime environment. The lack of a well-designed legal scheme may also thwart large-scale efforts to reduce the U.S. military's environmental footprint and stifle innovation both within the military and in the private sector, which commonly provides components or systems for the military in addition to off-the-shelf systems.

This Article limits analysis to military uses of UMVs—non-military UMV use and unmanned aerial vehicles are not discussed. Additionally, the background and analysis sections cover only the most relevant international and domestic legal frameworks as applied to UMVs and their environmental impacts—in particular, frameworks that are ambiguous as to whether or not they currently cover UMVs (as opposed to manned vessels). Part II of this Article explores how UMVs are currently classified and analyzed (if at all)

in international agreements and U.S. domestic law, in particular, whether UMVs are confined to definitions of "vessel." Part III analyzes how international and U.S. domestic environmental laws and policies currently treat manned vessels and UMVs. Finally, Part IV justifies why UMVs deserve their own classification and unique environmental law regime, even if considered "vessels" under international law principles.

A. Operational Military Advantages of Unmanned Maritime Vehicles

Unmanned maritime vehicles offer significant advantages over manned vessels in the maritime environment. From an operational standpoint, the military gains from UMV use are astronomical, though not fully realized due to technical limitations, ethical/moral policies, and legal constraints. The main operational advantage is that UMVs are smaller than manned vessels and by nature do not have personnel onboard, thereby offering military forces the ability to have a presence in otherwise hostile ocean waters without risking human life (hostile in terms of either military/government forces or nature).

UMVs "provide access to areas that are prohibitively expensive, time consuming, or too hazardous to reach"[1] via manned vessels. Unmanned by nature, UMVs do not come with risks to human life. As a result, they are able to enter areas that are too dangerous for military personnel. For example, one of the most cited missions for proposed UMV use appears to be mine countermeasures (i.e., mine detection), an inherently risky operation for military personnel. UMVs are "particularly well suited for the 'dirty-dull-dangerous' tasks that [mine countermeasures] entail . . . keeping manned forces out of harm's way."[2] Another example is transiting disputed waters in the South China Sea or other hostile/disputed areas, as there is no concern for captured personnel on UMVs.[3] From an elemental standpoint, UMVs are also able to withstand "the harshness of the [ocean] environment related to weather, ocean currents,

1. SEC'Y OF THE NAVY, REPORT TO CONGRESS: AUTONOMOUS UNDERSEA VEHICLE REQUIREMENT FOR 2025, at 7 (2016) [hereinafter REPORT TO CONGRESS].

2. U.S. DEP'T OF THE NAVY, THE NAVY UNMANNED SURFACE VEHICLE (USV) MASTER PLAN 14 (2007) [hereinafter USV MASTER PLAN].

3. *See* Annie Brett, *Secrets of the Deep: Defining Privacy Underwater*, 84 MO. L. REV. 47, 58 (2019). One drawback noted by the author is that UMVs may be *more* prone to capture, especially in hostile locations. *Id.* at 59.

temperature, [and] underwater pressure"[4] that would otherwise prevent a manned vessel's presence.

UMVs also "provide greater area coverage, and more persistent coverage, than can be provided by manned systems alone."[5] UMVs have "no human physiological limitations," such as fatigue or need to return or surface for supplies.[6] UMVs can react faster and process data faster than humans, thereby increasing operational tempo.[7] By having numerous, smaller UMVs throughout an area of interest, the increased sensor and technology presence will assist in anti-submarine warfare via deception by decoy.[8]

Along similar lines, UMVs typically have superior sensing technology. When combined with greater area coverage, UMVs will allow military forces to collect far more intelligence and have much better situational awareness.[9] UMV technology—specifically certain types of sonar—can increase the detection range of objects from tens to hundreds of miles.[10] Where a UMV is located far away from its manned "mother" vessels,[11] the intelligence gathered would provide an overwhelming military advantage.

Costs represent the third major area of UMV superiority. Manned systems are dramatically more expensive to build. Militaries can build several more UMVs compared to manned vessels for far less money, and the lifelong costs are far lower due to lack of manned presence onboard (especially considering how much it

4. U.N. INST. FOR DISARMAMENT RSCH., THE WEAPONIZATION OF INCREASINGLY AUTONOMOUS TECHNOLOGIES IN THE MARITIME ENVIRONMENT: TESTING THE WATERS 2 (2015) [hereinafter TESTING THE WATERS].

5. REPORT TO CONGRESS, *supra* note 1, at 8.

6. U.S. DEP'T OF DEF., UNMANNED SYSTEMS INTEGRATED ROADMAP 2017–2042, at 38 (2017) [hereinafter ROADMAP FY2017].

7. *See id.* at 39.

8. *See* REPORT TO CONGRESS, *supra* note 1, at 8.

9. ANDREW NORRIS, LEGAL ISSUES RELATING TO UNMANNED MARITIME SYSTEMS MONOGRAPH 6 (2013) (quoting Captain Paul Siegrist, U.S. Navy, Special Assistant to the Dir. of the Intel. Surveillance & Reconnaissance Capabilities Div., Unmanned System Workshop (Mar. 20, 2012)).

10. *See* Taking Marine Mammals Incidental to U.S. Navy Surveillance Towed Array Sensor System Low Frequency Active Sonar Training and Testing in the Central and Western North Pacific Ocean and Eastern Indian Ocean, 84 Fed. Reg. 40,132 (Aug. 13, 2019) (to be codified at 50 C.F.R. pt. 218) [hereinafter SURTASS Incidental Taking] (Low Frequency Active Sonar "is able to reliably detect quieter and harder-to-find submarines at long range before these vessels can get within their effective weapons range to launch against their targets . . . [its] long-range detection capabilities can effectively counter the threat to the Navy and national security interests posed by quiet, diesel submarines.").

11. But see a few of the UMV communication constraints mentioned *infra* Part II.A.

costs for fuel, food, salaries for each person, and other supplies).[12] Indeed, UMVs are so cost-effective that a few U.S. Navy officials intend for some UMVs to effectively be disposable due to the low cost of construction compared to the cost of retrieval.[13]

Recent efforts of senior U.S. Navy officials have highlighted the urgency for increased testing, training, and procurement to ensure these operational and financial advantages are realized before their adversaries. "[T]he 'how' piece is clear: putting unmanned prototypes in the water, learning from them, wrapping lessons learned into acquisition plans for the next round of prototypes, and then eventually moving into acquisition of program of record [UMVs]."[14] While some land-based testing is available,[15] the U.S. Navy will not be able to completely realize the "how" of implementing UMVs full-scale unless the organization can quickly and effectively test and train the UMVs in real-world environments (i.e., various maritime locations), which could have major positive impacts on the maritime environment.

B. Environmental Advantages of Unmanned Maritime Vehicles

While the operational and strategic military advantages of UMVs have been discussed at length among legal scholars, the environmental advantages have received far less attention among military, government, and environmental protection groups. This is unfortunate given how UMVs can positively revolutionize the U.S. Navy's environmental impacts by significantly reducing its footprint.

First, UMVs rely primarily on clean energy, such as batteries, solar, or wave energy. While some larger UMVs require diesel engines, UMVs as a whole would significantly reduce oil or grease discharges at sea that are common among manned vessels. Additionally, the renewable energies of wave and solar provide secondary and tertiary environmental benefits by reducing the reliance on fossil fuels.

Second, UMVs inherently do not emit waste or pollution that comes with personnel living onboard manned vessels. UMVs them-

12. For a more thorough analysis of cost savings of UMVs over manned vessels, see Erich D. Grome, *Spectres of the Sea: The United States Navy's Autonomous Ghost Fleet, Its Capabilities and Impacts, and the Legal Ethical Issues That Surround*, 49 J. MAR. L. & COM. 31, 33–35, 45–46 (2018).

13. *See* REPORT TO CONGRESS, *supra* note 1, at 11.

14. Megan Eckstein, *Navy Pushing to Maintain 2023 USV Program of Record Timeline*, U.S. NAVAL INST. (Sept. 8, 2020, 7:38 PM), http://bit.ly/3rwAsxG [https://perma.cc/QAQ7-VMM6].

15. *See id.*

selves may end up becoming maritime refuse, but they do not result in waste disposed of at sea, such as human waste,[16] trash, or large-scale ballast deposits.

Thirdly, UMVs' reduced signature in size compared to manned vessels means they are able to enter ocean environments more easily and with less destruction. For example, UMVs can maneuver in critical habitats or otherwise protected maritime areas that manned vessels cannot—or should not—enter.[17] UMVs can reduce impacts on maritime wildlife, such as coral or marine mammals, while at the same time gather information on the environment that can further scientific research to assist in environmental protection efforts.

C. Issues with the Current [Non-Existent] Unmanned Maritime Vehicle Legal Regime

Despite the numerous advantages of UMVs over manned vessels, international and domestic laws and regulations have a shocking lack of legal recognition that directly (or indirectly) apply to UMVs. As argued further below, there is effectively no recognition of UMVs in international or domestic legal schemes. Consequently, many legal scholars regard UMVs as subject to the same laws and regulations that apply to manned vessels. This presents numerous issues given the specialized technology and lack of personnel of UMVs: there are many laws and regulations that they realistically cannot comply with.

In a quite appropriately titled memo—"Treat Unmanned as Unmanned"—the U.S. Navy has explicitly raised this issue, declaring that UMVs "are inherently different from their manned counterparts. Policies and procedures which apply to the design, development, testing and evaluation of manned systems do not necessarily support [UMV] development. . . . Therefore, existing policies and requirements must be tailored to support expeditious and risk-appropriate processes for unmanned systems."[18] This is exactly what the United States and the international community must do.

Indeed, without a unique legal scheme designed for UMVs, the U.S. Navy will not be able to obtain its goal to "explore and adopt technologies and solutions that offer long-term environmental and financial dividends," to include waste reduction (which was previ-

16. *See* DANISH MAR. AUTH., ANALYSIS OF REGULATORY BARRIERS TO THE USE OF AUTONOMOUS SHIPS 29 (2017).

17. *See* REPORT TO CONGRESS, *supra* note 1, at 7–8 (including other examples like the ability to collect data or military intelligence in "remote high traffic areas or very shallow water areas").

18. RAY MABUS, TREAT UNMANNED AS UNMANNED 1 (2015).

ously identified as one of the main environmental advantages of UMVs).[19] The U.S. Navy realizes that degraded naval ranges (i.e., the world's oceans) "limit realistic training,"[20] therefore requiring flexibility in testing and training of UMVs while also recognizing the importance of protecting the maritime environment.

Additionally, without knowing what technical constraints UMVs are subject to, further development and deployment are impossible. For example, should the international community prohibit nuclear-powered UMVs due to the lack of personnel available to immediately react to any onboard issues and/or the increased risk of inability to retrieve the UMV if disabled?[21] Or should nuclear-powered UMVs be limited to large-unmanned surface vehicles (USVs) that have additional protections in place and that are deployed in limited, manned-supported operations? Will a projected reduction in lithium availability and mining be justification for advancing non-lithium power sources for unmanned undersea vehicles (UUVs)? Based on international legal obligations (in particular, those of the United Nations Convention on the Law of the Sea (UNCLOS)),[22] must the United States and government agencies ensure certain pollution-prevention protections to control UMV diesel leaks, such as double-hulled oil tanker provisions? Without a proper legal scheme, UMV development will continue to be stifled unless the United States is able to take the lead by establishing customary international law within this realm.

I. DIFFICULTIES IN CLASSIFYING UNMANNED MARITIME VEHICLES UNDER VARIOUS INTERNATIONAL LAW REGIMES

A. Defining Unmanned Maritime Vehicles, Their Uses, and Technological Impacts

There are numerous types, technologies, and functions of unmanned maritime vehicles. Generally, UMVs are water-borne systems that are capable of operating without onboard personnel.[23]

19. U.S. DEP'T OF THE NAVY, DEPARTMENT OF THE NAVY COMPREHENSIVE ENVIRONMENTAL STRATEGY 4 (2008).

20. *Id.* at 2.

21. *See, e.g.*, TESTING THE WATERS, *supra* note 4, at 9–10.

22. United Nations Convention on the Law of the Sea art. 29, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS]. While the United States is not a signatory to UNCLOS, it still regards navigation and overflight provisions as customary international law. U.S. DEP'T OF THE NAVY, THE COMMANDER'S HANDBOOK ON THE LAW OF NAVAL OPERATIONS § 1.2, at 1.1 (2022).

23. *See* Robert Veal, Michael Tsimplis & Andrew Serdy, *The Legal Status and Operation of Unmanned Maritime Vehicles*, 50 OCEAN DEV. & INT'L L. 1, 23

UMVs are also commonly referred to as unmanned maritime systems (UMSs). As a result of most UMVs having some level of autonomy in order to operate without onboard personnel, some scholars use the term autonomous maritime vehicles (AMVs).[24] Two subcategories of UMVs include unmanned undersea vehicles (UUVs) and unmanned surface vehicles (USVs). As the name indicates, UUVs operate primarily submerged and are far stealthier compared to USVs, though they typically need to surface for communications purposes.[25] USVs are typically larger compared to UUVs and operate solely on water surfaces,[26] resulting in more reliable and effective communications.[27] USVs also have more payload capacity and endurance as compared to UUVs.[28] Smaller UMVs include "floaters" and "gliders" that often conduct maritime scientific research,[29] and UUVs are currently used for countermine operations[30] and antisubmarine warfare.[31] The U.S. Navy is presently developing two large USVs with anticipated capabilities ranging from intelligence collection and reconnaissance to firing

(2019); Craig H. Allen, *Determining the Legal Status of Unmanned Maritime Vehicles: Formalism vs Functionalism*, 49 J. MAR. L. & COM. 4, 477, 485 (2018); USV MASTER PLAN, *supra* note 2, at 52 ("[A] USV will have no vehicle operators on board, although it may have the capability of being manned for testing, troubleshooting or when required for a manned mission.").

24. For additional terms and acronyms for the same or similar systems, see Natalie Klein, *Maritime Autonomous Vehicles Within the International Law Framework to Enhance Maritime Security*, 95 INT'L L. S. 244, 248 (2019).

25. *See* Michael N. Schmitt & David S. Goddard, *International Law and the Military Use of Unmanned Maritime Systems,* 98 INT'L REV. RED CROSS 567, 571 (2016); *see also* NORRIS, *supra* note 9, at 10 ("Communications—whether command and control data to UUVs, or status from UUVs—are much more difficult through the water than on the surface or in the air.").

26. But see USV MASTER PLAN, *supra* note 2, at 6–7, in which the U.S. Navy defines "surface vehicles" as those that displace water at rest and operate "with near continuous contact with the surface of the water," indicating that there may be circumstances where the USV is fully submerged. The U.S. Navy's definition is further expanded to include "hydrofoils and semi-submersible (i.e., continuously snorkeling) crafts." *Id.* at 7.

27. *See* Schmitt, *supra* note 25, at 571; USV MASTER PLAN, *supra* note 2, at 52 ("Operating at or near the sea surface gives USVs the ability to continuously communicate with suitably-equipped surface, air and underwater assets.").

28. *See* RAND NAT'L DEF. RSCH. INST., U.S. NAVY EMPLOYMENT OPTIONS FOR UNMANNED SURFACE VEHICLES (USVS) xxi (2013).

29. Natalie Klein et al., *Maritime Autonomous Vehicles: New Frontiers in The Law of the Sea*, 69 INT'T & COMP. L.Q. 719, 720 (2020); *see also* Katharina Bork et al., *The Legal Regulation of Floats and Gliders—In Quest of a New Regime?*, 39 OCEAN DEV. & INT'L L. 3, 298, 301 (2008); REPORT TO CONGRESS, *supra* note 1, at 6 (including wave gliders and buoyancy gliders within the UUV category).

30. *See generally* USV MASTER PLAN, *supra* note 2, at 11–22 (discussing the mine countermeasure operations in detail).

31. *See generally* PETE SMALL, UNMANNED MARITIME SYSTEMS UPDATE (2019); *see also* USV MASTER PLAN, *supra* note 2, at 23–31.

missiles.[32] For purposes of this Article, the focus is on small and medium sized UMVs that are unable to transport several personnel that are planned for or currently used by military forces for military-related functions—in particular, by the U.S. Navy.[33]

The technical aspects and capabilities of individual UMVs vary widely. Most relevant for environmental law analysis of U.S. Navy UMVs are the types of onboard sensors used for navigation and detection and the power/energy systems. As they relate to laying the groundwork for discussing environmental impacts of UMVs later in this Article, UMVs generally make less operational noise as compared to other sonar and radar systems used by manned vessels.[34] Many UMVs use Synthetic Aperture Sonar (SAS) sensors[35] and other side-scan sonar systems.[36] These sound/acoustic systems are what cause noise in the water—not the UMV itself.[37] Those that rely on sonar use low,[38] mid,[39] and/or high frequency sonar systems,[40] each of which may have different applications and environmental law implications as it relates to interacting with marine wildlife[41] and will be analyzed further below. Though some UUVs are specifically designed to imitate submarines for training purposes, UUVs generally have similar (though far smaller) sensor signatures as compared to manned submarines.[42]

For onboard UMV power and energy subsystems, the type of power source is largely controlled by the size of the UMV and

32. SMALL, *supra* note 31.

33. For an expansive list of U.S. Navy UMVs either currently in operation or planned and their missions and capabilities, see DEP'T OF THE NAVY, UNMANNED CAMPAIGN FRAMEWORK Appendix A (2021).

34. *See* Stephanie Showalter, *The Legal Status of Autonomous Underwater Vehicles*, 38 MARINE TECH. SOC'Y J. 1, 80–81 (2004).

35. *See* USV MASTER PLAN, *supra* note 2, at 16 (discussing what Synthetic Aperture Sonar sensors are capable of).

36. *See* Showalter, *supra* note 34, at 81.

37. *Id.*

38. *See* RAND NAT'L DEF. RSCH. INST., *supra* note 28, at 77–78. LFA sonar systems are typically associated with larger USVs given many LFA systems are towed arrays.

39. *See generally* Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Atlantic Fleet Training and Testing Study Area, 78 Fed. Reg. 7049 (proposed Jan. 31, 2013) (to be codified at 50 C.F.R. pt. 218) (identifying UMV testing for LFA, MFA, and HFA testing).

40. *See* Julian Turner, *Sea Hunter: Inside the US Navy's Autonomous Submarine Tracking Vessel*, NAVAL TECH. (May 3, 2018), https://bit.ly/3EmTZs3 [https://perma.cc/7KRD-VYC8].

41. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 29 (2008) (comparing low with mid frequency active sonar).

42. *See* RAND NAT'L DEF. RSCH. INST., A SURVEY OF MISSIONS FOR UNMANNED UNDERSEA VEHICLES 121 (2009) [hereinafter RAND].

speed required. The more environmentally friendly UMVs are gliders, which are propelled primarily by wave motion supplemented by commercial alkaline batteries or rechargeable lithium ion batteries.[43] Additionally, gliders and smaller UUVs may implement solar-powered cells and/or subsystems harvesting energy from ocean water temperatures to assist in recharging the onboard batteries,[44] allowing smaller UMVs to conduct longer operations without human intervention.[45] Larger UUVs rely on hybrid-diesel machines or fuel cells,[46] whereas USVs are primarily powered by hydrocarbon energy sources[47] or diesel engines[48] (though smaller USVs are also capable of hybrid-diesel sources).[49] Each of these different power and energy systems could affect how environmental laws and regulations apply to UMVs, in particular relating to ocean dumping, water pollution, and the release of hazardous wastes.

Ballast systems are required for UMVs to maintain buoyancy to aid in submersion ascent or descent and to help compensate for various payloads. Typical buoyancy systems in UUVs are made of lead or foam systems, though UUVs may also have "emergency drop weights."[50] These ballast systems may implicate UMV compliance with international conventions and/or domestic water pollution control laws and marine ballast conventions.

B. International Legal Status of Unmanned Maritime Vehicles

There is no one internationally recognized definition of "vessel," and therefore it is often challenging to determine what laws and regulations apply to various maritime systems. Even manned and civilian maritime vehicles are sometimes difficult to classify.[51]

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43. *See* REPORT TO CONGRESS, *supra* note 1, at 6; RAND, *supra* note 42, at 48; U.S. DEP'T OF THE NAVY, THE NAVY UNMANNED UNDERSEA VEHICLE (UUV) MASTER PLAN 61 (2004) (suggesting that using high energy density batteries in UUVs may introduce safety/environmental risks due to pressure changes) .

44. *See* RAND, *supra* note 42, at 48.

45. *Id.* at 48–49 ("Gliders using this technology may be able to operate continuously for a year or more without being refueled or recharged.").

46. U.S. DEP'T OF ENERGY, POWERING THE BLUE ECONOMY: EXPLORING OPPORTUNITIES FOR MARINE RENEWABLE ENERGY IN MARITIME MARKETS 32 (2019) (suggesting that using diesel systems may result in higher risk of oil/fuel contamination).

47. RAND NAT'L DEF. RSCH. INST., *supra* note 28, at 26.

48. *See* Rebecca Perring, *Sea Hunter: The Self-Driving Drone Ship That Scours Waters Without Single Crew Member*, EXPRESS (Feb. 7, 2018, 2:12 PM), https://bit.ly/3CpKUgw [https://perma.cc/VP85-T2QL].

49. PRITPAL SINGH, UNMANNED SURFACE SEA VEHICLE POWER SYSTEM DESIGN AND MODELING 2 (2005).

50. RAND, *supra* note 42, at 48.

51. *See, e.g.*, Lozman v. City of Riviera Beach, 568 U.S. 115 (2013).

Given the breadth of types, functions, and technology used by UMVs, it is quite taxing to fit UMVs within a "vessel" legal scheme that provides a bright-line rule. Indeed, the best option for practitioners at this time is a time-consuming case-by-case analysis—not just with each law or regulation, but with each individual UMV within each law or regulation. UMVs, as a result, are not always able to be classified as vessels under various international conventions and laws.

Nonetheless, legal scholars have attempted to compartmentalize the legal status of UMVs for decades within the international legal framework of "vessels,"[52] in particular when UMVs are used for national security and military defense purposes, in hopes of clarifying the legal and practical implications of UMV use and development. Indeed, "[i]n general, the international treaties and domestic law governing marine activities apply only to vessels,"[53] however "vessels" are defined by that particular convention. As a result, many scholars state that *the* threshold question in determining the legal status of UMVs is whether they are "vessels"[54] given the current limitations with the international law of the sea framework.[55]

If countries and the international community do not provide UMVs with their own legal status and instead attempt to define UMVs within previously established constructs, they are left to wedge UMVs within current laws and regulations, significantly impacting the practical and technical requirements subjected to UMVs (and their owners, operators, and military forces). This can create a number of problems. From a practical perspective, the classification of UMVs as "vessels" may impose criminal penalties for damages caused to the UMV,[56] create sovereign rights in the UMV itself,[57] and impact UMV navigational rights within various sea zones.[58] Even the U.S. Supreme Court acknowledged that admi-

52. As with UNCLOS and numerous other legal conventions, the term "vessels" in this Article is interchangeable with the term "ship." *E.g.*, UNCLOS, *supra* note 22, at art. 224, 236.

53. Showalter, *supra* note 34, at 80.

54. Allen, *supra* note 23, at 480.

55. *See also* Oliver Daum, *The Implications of International Law on Unmanned Naval Craft*, 49 J. MAR. L. & COM. 71, 74 (2018) ("[T]he foremost question to address . . . is whether unmanned naval craft are 'vessels' or 'ships' in the sense that those terms are used in the international law of the sea.").

56. 10 U.S.C. § 910.

57. *See generally* Allen, *supra* note 23, at 491; *see* NORRIS, *supra* note 9, at 41.

58. See Veal, *supra* note 23, at 33, for a discussion on UMV status affecting navigation rights. For an excellent in-depth analysis of how UMVs would be treated in each of the various maritime zones depending on whether they are classified as vessels, see NORRIS, *supra* note 9, at 60.

ralty jurisdiction within course "may turn on application of the term 'vessel.'"[59] Unfortunately, much of the analysis is done in a piecemeal manner looking at whether UMVs are considered "vessels" on a case-by-case basis due to the lack of consistent terminology and definitions in international legal schemes.

Some scholars believe this piecemeal analysis is sufficient, noting "differing [definitional] approaches are understandable because the definitions are crafted for the purposes of the individual instruments. . . . Accordingly, when determining the applicability of a treaty to [UMVs], fidelity must be paid to the instrument's scope and definitional provisions."[60] Further, the lack of a consistent definition of "vessels" and the lack of consensus of how UMVs fit within the "vessel" definition is actually to the international community's benefit[61]—that trying to capture all maritime objects (no matter how similar or different) within a single definition could effectively make such laws overly broad and include maritime objects that are irrelevant to the law. Arguably, this uncertainty also provides more flexibility in interpreting individual applications of laws to unique UMVs on a case-by-case basis.[62] But the problem with this individualistic approach is that numerous treaties and legal definitions are *not* clear about whether UMVs should be covered by their provisions, and there should be some consistency among the various legal schemes and therefore requires updating legal frameworks or providing additional guidance for fitting UMVs into currently existing ones. Complete ignorance of these issues will negatively affect the United States' ability to help craft a UMV legal scheme to its benefit,[63] especially where the lack of legal guidance will exacerbate existing concerns with technology outpacing the law.[64]

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59. Lozman v. City of Riviera Beach, 568 U.S. 115, 128 (2013).

60. Schmitt, *supra* note 25, at 577.

61. NORRIS, *supra* note 9, at 25–26; *see also* Rob McLaughlin, *Unmanned Naval Vehicles at Sea: USVs, UUVs, and the Adequacy of the Law*, 21 J.L. INF. & SCI. 100 (2011).

62. Veal, *supra* note 23, at 29 (discussing how determining whether a UMV is a vessel or not (and therefore what rights it receives and what laws it is subject to) will need to be done on a case-by-case basis, and that determination may not be universally accepted).

63. NORRIS, *supra* note 9, at 62 (suggesting the U.S. specifically should be the leader in this effort).

64. For additional alternatives to pigeonholing UMVs into the definition of "vessels," see generally Christopher C. Swain, *Towards Greater Certainty for Unmanned Navigation, A Recommended United States Military Perspective on Application of the "Rules of the Road" to Unmanned Maritime Systems*, 3 GEO. L. TECH. REV. 119, 154–160 (2018).

Beginning initial analysis of whether UMVs can appropriately be classified as "vessels" within international regimes, the crowning international scheme—UNCLOS—does not define "vessels" or "ships," much less reference UMVs, despite the Convention relying on the terms "vessels" and "ships" throughout its articles. Other international instruments provide some clarification as to what items may constitute "vessels" or "ships," but without ideal consistency. For example, the International Convention for the Prevention of Pollution of Ships (MARPOL) defines "ships" as "a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms,"[65] and the London Dumping Convention defines vessels in a similarly broad manner as "waterborne . . . craft of any type whatsoever. This expression includes air-cushioned craft and floating craft, whether self-propelled or not."[66] The Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) defines vessels more narrowly, "includ[ing] every description of water craft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation *on* water" (emphasis added).[67] Thus, "vessels" under COLREGs are the subclass of watercraft that have a transportation function or capability, which is not a primary purpose of UMVs,[68] as well as limiting the definition to those maritime objects that navigate on the surface of the water (rather than *under* water). The Convention for the Protection of the Marine Environment of the North-East Atlantic (of which the United States is not a contracting party, but which numerous NATO parties belong to and is therefore enlightening for a robust international perspective) defines vessels as "waterborne or airborne craft of any type whatsoever, their parts and other fittings. This expression includes air-cushion craft, floating craft whether self-propelled or not, and other

65. International Convention for the Prevention of Pollution of Ships, art. 2(4), Nov. 2, 1973, 1973 U.S.T. 322 [hereinafter MARPOL].

66. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, art. I(6), Nov. 13, 1972, 1996 U.S.T. 87 [hereinafter London Dumping Convention]. One scholar argues that the broad definition is designed to be over-inclusive in order to better protect against potential threats to the maritime environment. Daum, *supra* note 55, at 80; *see also* Schmitt, *supra* note 25, at 577.

67. Convention on the International Regulations for Preventing Collisions at Sea, Rule 3(a), Oct. 20, 1972, 28 U.S.T. 3459 [hereinafter COLREGs].

68. However, some USVs envisioned by the U.S. Navy include larger vehicles that will be capable of transporting certain equipment, and possibly even personnel, on water. *See* USV MASTER PLAN, *supra* note 2, at 20–21, 42 (using USVs to transport UUVs and desiring larger USVs to be able to support special operations forces by transporting personnel, equipment, or other materials).

man-made structures in the maritime area and their equipment."[69] None of these conventions mention UMVs (or any variant thereof), much less define them.

Interpreting these various authorities' definition of vessels typically involves an exploration of the historical context of ships, as well as consideration of form versus function of UMVs as compared to vessels. Until relatively recently in human history, vessels were always manned crafts, and thus UMVs are, at first blush, a new breed of maritime craft that cannot squarely fit into the definition of "vessel" within UNCLOS and other authorities.[70] But when comparing UMV *function* (i.e. a vehicle used for a specific purpose in the maritime environment) over *form* (i.e. manned versus unmanned, USV versus UUV), additional analysis is necessary to explore how legal regimes apply to UMVs.[71] The issue with classifying UMVs based on their function (i.e., based on a specific mission set in a military context) is that legal regimes would be inconsistently applied from one moment to the next. For example, it seems illogical that a USV would be considered a vessel for COLREGs purposes only when it is transporting equipment to military operators, but not when it is returning from that mission with an empty cargo hold. The USV is still a military system, still being used in operations, but the only difference is whether it has loaded equipment or not. The issue with classifying UMVs based on comparing their form to vessels may result in organizations *avoiding* international regulations by purposefully designing the UMV to lack technology that would force them into a vessel classification. The end result is stifled innovation and development of UMVs.[72] From the reverse perspective, if UMVs *are* classified as vessels, they will need to abide by legal requirements for vessels, which is incredibly important with respect to engineering and design of the UMV itself and planning future systems. For example, if a USV is considered a vessel within COLREGs, its technical design must have proper lighting while on the surface[73] and have a "look-out" so as to avoid any potential collision.[74]

An additional consideration is whether UMVs are recognized as warships, which receive special considerations under international law. UNCLOS defines "warship" as:

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69. Convention for the Protection of the Marine Environment of the North-East Atlantic, art. 1(n), Sept. 22, 1992, 32 I.L.M. 1069 [hereinafter OSPAR].

70. *See* Allen, *supra* note 23, at 483.

71. *See* Swain, *supra* note 64, at 134–45.

72. *See id.* at 136.

73. *See generally* COLREGs, *supra* note 67, at pt. C.

74. *Id.* pt. B, § 1, r. 5.

> [A] *ship* belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, *under the command of an officer* duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and *manned by a crew* which is under regular armed forces discipline (emphasis added).[75]

Legal scholars have conducted fairly extensive analyses of whether UMVs should be classified as warships, with most arguing that UMVs should not be classified as warships for three reasons. First, UMVs would need to qualify as "ships" (i.e., "vessels"), which as previously discussed is in contention. Second, the UMV would need to be "under the command of an officer."[76] However, this could be overcome by extending "command" to include remote control or oversight of the UMV rather than requiring direct, in-person control.[77] Third, warships by definition are manned by a crew.[78] But this again can be overcome by extending the definition of "manned" to include remote manning (i.e., the UMV was placed in the water by military personnel, is retrieved by military personnel, is remotely controlled or powered by personnel, etc.).[79] The classification of UMVs as a subcategory of warships matters less in peacetime than in conflict,[80] but warships still receive additional UNCLOS rights that UMVs may wish to employ such as using force against enemies[81] and enforcing protections of the maritime environment.[82]

Therefore, the international community should create a new framework for UMVs instead of trying to pigeon-hole UMVs into (or out of) a definition that does not clearly fit. By updating (or adding new) definitions in various legal documents and authorities to incorporate UMVs rather than classify them in a blanket statement as "vessels," countries and military forces will have a far better understanding of which laws and regulations apply to UMVs—both generally as a class, but also within subclasses of UMVs (i.e., UUVs vs. USVs, technology-based classifications, capabilities). Le-

75. UNCLOS, *supra* note 22, at art. 29.

76. *Id.*

77. *See, e.g.*, DANISH MAR. AUTH., *supra* note 16, at 29.

78. Daum, *supra* note 55, at 88.

79. But see *id.* at 88, for a literal textual reading of UNCLOS Article 29 ("The reason is that unmanned naval craft are not manned, and it is presupposed by the condition 'manned by a crew' that warships are manned. Naval drones thus do not fall under the definition of Article 29 of the UNCLOS.").

80. *See* Schmitt, *supra* note 25, at 579–81.

81. *See, e.g.*, UNCLOS, *supra* note 22, at art. 95.

82. UNCLOS, *supra* note 22, at art. 224.

gal developments and recognition of new technological frameworks, concepts, and applications typically lag the actual technological advances significantly—a disappointment given UMVs' significant benefits to the research and environmental community and the speed with which the technologies used to deploy UMVs are developed. Instead of compartmentalizing UMVs as vessels or ships, the international community should create a unique class of maritime designation that can more accurately capture the legal and environmental implications of UMVs.[83]

C. Domestic Legal Status of Unmanned Maritime Vehicles

Unfortunately, there is even less discussion and guidance regarding how UMVs are legally characterized within the United States as compared to the international community. No overarching federal statute defines or characterizes UMVs. Cases involving unmanned vehicles and/or what maritime objects constitute "vessels" have largely dealt with tort liability or maritime drug interdiction, and only a few federal statutes or regulations even mention UMV variants. Most definitions of and guidance regarding UMVs come from military handbooks or other military-issued documents. This section briefly covers the (relatively small) field of UMV vessel status within U.S. jurisprudence.

U.S. federal law states that the term "vessel includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water."[84] By modifying this definition with a transportation component, it is similar to the COLREGs definition noted above. Additionally, the definition appears to completely exclude nearly every UMV currently or planned to be in operation by the U.S. Navy. One statute relating to maritime drug interdiction specifically includes UMVs in the definition,[85] which is a helpful reprieve compared to other statutes that are silent on the issue and implies that Congress may have intent to treat UMVs as "vessels" under federal law.[86] Congress more

83. Thankfully, IMO is currently working to do exactly this, albeit in a limited scope of only considering autonomous surface vehicles. *See generally In Focus: Autonomous Shipping*, INT'L MAR. ORG., https://bit.ly/3eamUFa [https://perma.cc/G65P-NFNY] (last visited Jan. 20, 2021).

84. 1 U.S.C. § 3.

85. 46 U.S.C. § 70502(f) ("(1) The term 'semi-submersible vessel' means any watercraft constructed or adapted to be capable of operating with most of its hull and bulk under the surface of the water, *including both manned and unmanned* watercraft. (2) The term 'submersible vessel' means a vessel that is capable of operating completely below the surface of the water, *including both manned and unmanned* watercraft" (emphasis added).).

86. *See* Allen, *supra* note 23, at 485.

recently enacted a statute within the military-focused U.S. Code Title 10 in December 2019, in which classes of naval vessels include "any group of similar undersea or surface craft . . . , including manned, unmanned, and optionally-manned craft."[87] Given the recency of this congressional action, it may indicate a moving shift towards officially recognizing UMVs as "vessels" under federal law.

Despite the nonexistence of any court cases attempting to characterize military UMVs or any legal applications thereof at the time of this writing, there are a few federal cases that touch on unmanned maritime objects and sovereign immunity of vessels. The most recent case is *Lozman v. City of Riviera Beach*,[88] in which the U.S. Supreme Court found that a non-propelled floating home was not a vessel and rejected the proposed "anything that floats" test.[89] The Court focused its analysis on the phrase "capable of being used . . . as a means of transportation on water" within 1 U.S.C. § 3, stating that "not *every* floating structure is a 'vessel.'"[90] Applying the dictionary definition of "transportation" in a practical, rather than theoretical, manner, the determinative test is whether a reasonable observer, looking at the "physical characteristics and activities, would consider it designed to a practical degree for carrying people or things over water."[91] Applying this purpose-based test with the *Lozman* facts as they may pertain to UMVs, the floating home had no steering mechanism that most, but not all, UMVs have. The home had no "capacity to generate or store electricity but could obtain that utility only though ongoing connections with land,"[92] whereas many UMVs have onboard battery storage or can generate enough electricity to propel via solar or wave generation. But some UMVs are temporarily or permanently connected to U.S. Navy vessels, which supply electricity and also use cables to receive data obtained by the UMVs.[93] Finally, the third major relevant factor in the Court's analysis was the home's lack of self-propulsion, which it found not dispositive, but relevant nonetheless.[94] UMVs often have some form of self-propulsion, but, as previously mentioned, some use wave technology to propel themselves through water. With respect to the "transportation" element, some UMVs

87. 10 U.S.C. § 8669b(d)(1).

88. Lozman v. City of Riviera Beach, 568 U.S. 115 (2013).

89. *Id.* at 129. The Court specifically stated this was far too broad of an application and would be inconsistent with the statutory text.

90. *Id.* at 121.

91. *Id.*

92. *Id.* at 121–22.

93. Schmitt, *supra* note 25, at 573.

94. *Lozman*, 568 U.S. at 122.

are being designed or currently operate with capabilities to convey people or supplies over water. As a legally frustrating result, not all (or even most) UMVs squarely meet the *Lozman* Court's test for the vessel definition.

Other prior U.S. federal cases, many of which were cited by the Court in *Lozman*, have similarly limited applicability to UMVs. For example, the *Evansville & Bowling Green Packet* Court found a wharf boat was not a vessel due to, among other reasons, not "encounter[ing] perils of navigation to which craft used for transportation are exposed."[95] But, many of the larger USVs operated (or planned) by the U.S. Navy would certainly experience "perils of navigation" as similarly sized vessels used for even short navigational distances.[96] In *Stewart v. Dutra Const. Co.*, the Court admitted that waterborne devices did not have to be used "*primarily*" for transportation purposes or be "in motion to qualify as a vessel,"[97] but the device had to be used *regularly* for transportation purposes.[98]

Interestingly, the *Lozman* Court took these cases further by highlighting that such structures could not be considered vessels if they were permanently attached to the ocean floor or land.[99] For UMVs that are permanently attached via cables to U.S. Navy vessels (or, in the less common example, the ocean floor), future courts may be unwilling to classify these UMVs as "vessels" by inferring the *Lozman* Court's "permanently attached" caveat in its definitional test for "vessel." This may result in the odd implication of treating untethered UMVs of nearly identical size and function as "vessels."

U.S. Department of Defense documents are similarly sparse on whether to characterize UMVs as vessels. The Joint Chiefs of Staff Department of Defense Dictionary of Military and Associated

95. Evansville & Bowling Green Packet Co. v. Chero Cola Bottling Co., 271 U.S. 19, 22 (1926).

96. That being said, the *Lozman* Court later went on to refer to the "perils of the sea" as dangers *to sailors*, not dangers to the *vessel*. *Lozman*, 568 U.S. at 126. Whether this was merely in reference to the purpose behind cited liability statutes or indeed part of the Court's analysis has not been addressed in later caselaw.

97. Stewart v. Dutra Constr. Co., 543 U.S. 481, 495 (2005).

98. *Lozman*, 568 U.S. at 124–25.

99. *Id.* The Court identified additional examples of structures and devices that were not considered vessels due to being permanently attached to another object, including a floating drydock permanently fixed to a wharf. *Id.* at 125. The dissent is more pointed, in specifically identifying the permanence is not *when attached* permanently, but when the structure's *place* is permanent. *Id.* at 135 (SOTOMAYOR, J., dissenting).

Terms does not mention UMVs (or any variant thereof),[100] nor does it define "ship" or "vessel."[101] The U.S. Navy's publications are more enlightening. The Commander's Handbook of the Law of Naval Operations defines UUVs and USVs, and explicitly states that both are sovereign immune craft.[102] The Handbook does not include "vessel" anywhere in either the definitions or the UUV/USV sovereign immunity discussion.[103] Indeed, all references in the definitions and sovereign immunity discussions merely refer to UUVs and USVs as "crafts."[104] Though the Handbook does define "auxiliary vessels" as "vessels, other than warships, that are owned by or under the exclusive control of the armed forces," the same definitions section explicitly refers to onboard passengers, crew, and actions.[105] This implies that U.S. Navy-controlled UMVs are not considered "vessels" (despite having sovereign immunity) because they inherently lack onboard personnel.[106] Further, UMVs are specifically set apart from other craft and vessels throughout the Commander's Handbook, signifying the United States recognizes UMVs as having their own unique legal status in international law.[107] Disappointingly, the lack of international and domestic UMV classification may have significant environmental UMV ramifications if not properly and uniformly delineated.

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100. *See* JOINT CHIEFS OF STAFF, DOD DICTIONARY OF MILITARY AND ASSOCIATED TERMS 337, 340 (2021). The acronym "UUV," however, is mentioned. In contrast, unmanned aircraft is defined and has numerous acronyms listed for reference.

101. *See generally id.*

102. U.S. DEP'T OF THE NAVY, THE COMMANDER'S HANDBOOK ON THE LAW OF NAVAL OPERATIONS § 2.3.5, at 2-4 (2017) [hereinafter COMMANDER'S HANDBOOK]. The Handbook states that "sovereign immune objects retain their sovereign immune status and remain the property of the flag State until title is formally relinquished or abandoned, whether the cause of the sinking was through accident or enemy action (unless the warship or aircraft was captured before it sank)." *Id.* § 2.1.2.

103. *See* COMMANDER'S HANDBOOK, *supra* note 102, § 2.3.6.

104. *Id.* §§ 2.3.1, 2.3.4, 2.3.5.

105. *Id.* § 2.3.1.

106. Compare *id.* § 2.5.2.5, where UMVs receive the right of innocent passage in territorial seas. This may indicate they are more than just "craft" or "objects" and should be treated more akin to vessels (or at least submarines) under UNCLOS.

107. For example, USV and UUV are explicitly listed in discussing navigation rights, along with warships, auxiliary vessels, and other maritime objects in § 2.5.3.2. COMMANDER'S HANDBOOK, *supra* note 102, § 2.5.3.2. In § 2.5.2.5, UMVs receive their own identified navigation rights. *Id.* § 2.5.2.5. Warships similarly receive their own discussion on navigation rights for innocent passage. *Id.*

II. CURRENT ENVIRONMENTAL LEGAL TREATMENT OF MANNED AND UNMANNED VEHICLES IN INTERNATIONAL AND UNITED STATES REGIMES

It is important to understand how international and domestic environmental laws and regulations bind military use of UMVs to ensure proper compliance while at the same time maintaining operational readiness. There are a number of unique environmental issues (and solutions) related to UMVs that do not apply to vessels. For example, while UMVs do not create nearly as much garbage waste as a 5,000-sailor U.S. aircraft carrier, it can sometimes be difficult—if not impossible—to recover certain UMVs, and, therefore, UMV use may increase the risk of certain types of pollution in the marine environment. UMVs typically rely on a number of sonar sensors that cause underwater noise that may disrupt marine animals in violation of the Endangered Species Act (ESA) and MMPA, but due to their size, UMVs are far less likely to otherwise harm marine life as compared to the larger, more traditional military warships currently in use. It is therefore imperative to explore how the various environmental laws apply to UMVs and vessels in order to determine whether UMVs should receive special treatment (if they do not already) under the various legal regimes, especially given the inability to easily or imminently access UMVs in case of a maritime accident or disposal.

A. International Environmental Obligations of Vessels and Unmanned Maritime Vehicles

Generally, military vessels are exempt from international environmental protection obligations, in particular where those vessels are specifically used for military/enforcement operations. However, many treaties and agreements provide that military vessels of party States should still strive to uphold environmental protections to the best of their ability. This section provides an overview of current international obligations, exemptions, and good faith provisions, while recognizing that individual States may have more stringent requirements within their coastal zones. Two relevant questions to address include: Are military vessels and UMVs subject to environmental policies and norms on the high seas or other internationally recognized areas?[108] Are UMVs treated differently, and if so, how?

108. For an example of the exploration of international environmental law application to U.S. Navy sonar assets and how U.S. environmental laws are more effective in governing marine protection, see generally Daniel Inkelas, *Security, Sound, and Cetaceans: Legal Challenges to Low Frequency Active Sonar Under*

1. United Nations Convention on the Law of the Sea

UNCLOS dedicates an entire section to the "protection and preservation of the marine environment," placing an affirmative duty on parties to uphold environmental conservation.[109] This duty extends to preventing, reducing, and controlling pollution "from any source," but pointedly identifies minimizing effects of "pollution from vessels, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, preventing intentional and unintentional discharges, and regulating the design, construction, equipment, operation and manning of vessels."[110] For other "devices," parties shall minimize effects of "pollution from other installations and devices operating in the marine environment, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, and regulating the design, construction, equipment, operation and manning of such installations or devices."[111] The only difference between these two obligations is that vessels have a slightly higher duty to prevent pollution by preventing "intentional and unintentional discharges."[112] This takes into account the notion that vessels, which are typically defined as manned marine craft, commonly create onboard wastes that are disposed of at sea, and therefore are under an UNCLOS obligation to reduce onboard-originated wastes. As previously stated, one of the major advantages of UMVs is the lack of onboard-originated waste, and therefore, Article 194 of UNCLOS does not impose any practical differences in environmental protection obligations for UMVs regardless of their classification as "vessels."

Article 217 discusses enforcement by flag States of their vessels' environmental compliance. While States are required to enforce environmental compliance of their vessels no matter where the violation occurs,[113] subsequent paragraphs discuss proper manning and onboard registry certificates,[114] both of which are not applicable to UMVs. This implies that UNCLOS's use of the term "vessels" excludes UMVs, a logical inference especially where

U.S. and International Environmental Law, 37 GEO. WASH. INT'L L. REV. 207 (2005).

109. UNCLOS, *supra* note 22, at art. 192.

110. *Id.* at art. 194(1), (3)(b).

111. *Id.* at art. 194(3)(c)–(d).

112. *Id.* at art. 194(3)(b)–(d).

113. UNCLOS, *supra* note 22, at art. 217(1).

114. *Id.* at art. 217(2)–(3).

UMVs are designed to be disposable or simply do not create pollution in the same manner as manned vessels.

Regardless of whether UNCLOS treats UMVs as vessels (directly applicable via the UNCLOS provisions) or not (and thus not necessarily receiving sovereign protection), this issue may be compounded by States that do not recognize the sovereign immunity of UMVs employed by military forces. A danger to these UNCLOS enforcement provisions is that hostile or adverse States may use environmental violations as pretext for "capturing" isolated UMVs in military use to justify physical inspections and detention of a UMV. Article 236 attempts to provide a safeguard for enforcement by non-flag States by exempting "any warship, naval auxiliary, other vessels or aircraft owned or operated by a State and used, for the time being, only on government non-commercial service."[115] Though U.S. Navy UMVs would likely fall into this broadly exempted class of maritime vehicles, some States may argue that a strict reading does not incorporate UMVs. Additionally, where contractors (not the U.S. federal government) own and operate a UMV for the U.S. Navy, those UMVs could arguably be used in "commercial service" because of the contractual relationship. As a result, the U.S. Navy should ensure future UMV operation (if not outright ownership) is conducted by some faction of the government to bolster the UMV protections under these articles.

Despite Article 236's maritime pollution exemptions for vehicles in government service, the article also provides a good faith provision to require States to adhere to all UNCLOS environmental protections as is "reasonable and practical."[116] Therefore, though UMVs may be exempt, there is still an expectation to design and operate UMVs in a manner that does not harm the ocean maritime environment.

Some scholars and organizations have extended UNCLOS pollution to cover "ocean noise," which includes many of the same sonar technologies employed by UMVs.[117] By expanding the definition of pollution to include ocean noise, UMVs—and indeed, any other devices using sonar, no matter the purpose or location of the device—would be subject to the articles. States could enforce

115. UNCLOS, *supra* note 22, at art. 236. See *id.* at art. 211(4)–(5), which allows Coastal States to "adopt laws and regulations for the prevention, reduction, and control of marine pollution from foreign vessels, including vessels exercising the right of innocent passage" within their territorial seas and exclusive economic zone.

116. *Id.* at art. 236.

117. Inkelas, *supra* note 108, at 224.

these environmental protection provisions against UMV (or other sonar) use in their seas unless the UMV is clearly marked or identified as a military vessel (and is recognized as sovereign by the enforcing State).

2. Noise Pollution Agreements

Many of the concerns of UMV impacts on the maritime environment relate to UMV's inherent need to use sensors (specifically, sonar) to detect objects in its surroundings that impact marine life. Often referred to as "ocean noise" or "noise pollution,"[118] sonar impacts on marine life have been the subject of numerous articles, Environmental Impact Statements (EISs), and U.S. litigation.[119] Internationally, numerous organizations and conventions recognize ocean noise as a form of pollution beyond the aforementioned UNCLOS articles, and therefore, sonar use by UMVs can fall under pollution protection provisions of additional agreements.[120] For example, the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) urges parties to reduce noise pollution caused by military activities that harm whales and dolphins,[121] and the OSPAR[122] commission has identified ocean noise as particularly harmful to marine mammals.[123] Further, the European Union Commission has directed member States to "prevent, reduce and control" ocean noise *from any source*, identifying underwater noise as "a form of pollution of the marine environment covered by UNCLOS."[124]

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118. Inkelas, *supra* note 108 ("acoustic pollution").

119. See *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7 (2008), which was a suit filed against the U.S. Navy to protect marine mammals from the U.S. Navy's active sonar use that ultimately reached the U.S. Supreme Court.

120. This section provides a brief overview of a few of the more well-known agreements and organizations. For a more thorough list of various international ocean noise acknowledgments and agreements, see Joel R. Reynolds, *Submarines, Sonar, and the Death of Whales: Enforcing the Delicate Balance of Environmental Compliance and National Security in Military Training*, 32 WM. & MARY ENV'T. L. & POL'Y REV. 759, 792–99 (2008).

121. Protocol to Amend the Agreement on the Conservation of Small Cetaceans of the Baltic and North Sea, *opened for signature* Aug. 22, 2003, 1772 U.N.T.S. 217 (adopted Mar. 17, 1992).

122. OSPAR, *supra* note 69.

123. OSPAR COMM'N, CASE REPORTS FOR THE INITIAL LIST OF THREATENED AND/OR DECLINING SPECIES AND HABITATS IN THE OSPAR MARITIME AREA 180, 182, 185 (2008), https://bit.ly/3V4kSa7 [https://perma.cc/P9MW-JNFN] (linking human activities causing acoustic disturbances as a threat to the bowhead whale, blue whale, and northern right whale).

124. Environmental Effects of High-Intensity Active Naval Sonars, EUR. PARL. DOC. B6-0089(F) (2004), https://bit.ly/3UsCz1Q [https://perma.cc/3G9H-B7AF].

3. MARPOL

UMVs' potential for creating physical pollution in oceans is a far less discussed application of environmental law but is nonetheless crucial to consider given the unique characteristics of UMVs and their design as compared to traditionally manned vessels—regardless of whether UMVs are classified as vessels or not. As previously discussed, a major advantage to UMVs is their reduced maritime pollution footprint due to not having onboard refuse to discard at sea.[125] Though UMVs are considered "ships" under MARPOL, UMVs would be exempt when used for military purposes per Article 3(3)'s military exception: MARPOL "shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service."[126] But like UNCLOS, MARPOL encourages "good faith compliance" with pollution prevention and control for government ships.[127] Difficulty arises where MARPOL's pollution prevention and control provisions specifically refer to or require a ship's master and/or crew, such as when crewmembers must report pollution incidents at sea.[128] As one State has recommended, the lack of onboard crew can be resolved by extending the definitions of "master" and "crew" to include those remotely operating (or owning) UMVs.[129] Where a UMV is completely autonomous, reporting requirements and other MARPOL obligations should rest with the deploying military force.

4. London Dumping Convention

Though there are some UMVs that may discharge in violation of MARPOL (for example, a diesel-powered USV leaking oil), battery or renewable powered UMVs are far less likely to violate MARPOL by design. The more likely cause of a physical pollution

125. DANISH MAR. AUTH., *supra* note 16, at 29.

126. MARPOL, *supra* note 65, at art. 3(3). The language referring to a ship's use for government non-commercial service presents similar contractor-owned or operated legal issues previously identified under UNCLOS.

127. *Id.*; UNCLOS, *supra* note 22, at art. 236.

128. MARPOL, *supra* note 65, at art. I.

129. DANISH MAR. AUTH., *supra* note 16, at 29. The Danish Maritime Authority states:

> It must be presumed that the obligations resting with the master under MARPOL Protocol I . . . to report incidents that could result in pollution of the marine environment could be met by a remote operator . . . to the extent that it is technically possible to collect the required information about the incident and any pollution of the sea.

Id. The Authority interprets this provision to allow UMVs, in particular autonomous ones, "as long as 'a person having charge' is able to make the reporting." *Id.*

violation would result from disposable UMVs—where the UMV itself is the discharged pollutant and therefore falls under dumping conventions. The London Dumping Convention's broad definitions of both "vessel" and "dumping" includes UMVs, and in particular, disposable UMVs. "Dumping" as defined by the London Dumping Convention includes any "deliberate disposal at sea of vessels . . . or other man-made structures at sea."[130] When UMVs are not expected to be retrieved after their useful lifespan, they may be violating the London Dumping Convention. As with UNCLOS and MARPOL, the Convention provides an exemption to vessels "entitled to sovereign immunity under international law,"[131] but UMVs may not be universally recognized to have sovereign immunity in all circumstances, *especially* where the UMV has been expressly abandoned in the ocean after its useful life and therefore no longer in government non-commercial service.

B. Domestic Environmental Obligations of Unmanned Maritime Vehicles

1. Marine Wildlife Protections and Ocean Noise Pollution

This first subsection covers U.S. laws and regulations aimed at protecting marine wildlife to include the MMPA and related caselaw concerning ocean noise pollution caused by specific types of sonar. This Article does not explore applications of the ESA or other maritime wildlife/plant protection laws to UMVs, as most environmental concerns related to UMV use are centered on sonar effects on marine mammals covered by MMPA. Numerous marine mammals covered by MMPA are also listed as endangered or threatened species under the ESA. As a result, ESA challenges against sonar use nearly always implicate MMPA challenges, and environmental conservation groups typically challenge U.S. Navy sonar use under both statutes.[132]

UMVs have the potential to harm marine wildlife in two major ways: physical interactions and disrupting marine mammals via so-

130. London Dumping Convention, *supra* note 66, at art. I(4.1.1)–(4.1.2). UNCLOS art. 1(1)(5)(a)'s definition of "dumping" is similarly broad. UNCLOS, *supra* note 22, at art. 1(1)(5)(a).

131. London Dumping Convention, *supra* note 66, at art. VII(4).

132. But see *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7, 29 (2008), in which environmental conservation groups sued the U.S. Navy for violating ESA, Coastal Zone Management Act (CZMA), and National Environmental Policy Act (NEPA), not directly challenging the Navy's actions under MMPA due to a previously received MMPA National Defense Exemption. The sonar use was originally challenged as a violation of the MMPA but was later dropped on appeal due to the exemption received after litigation began.

nar use.[133] That being said, UMVs typically move quite slowly and thus are less likely to physically strike marine wildlife as compared to faster manned vessels.[134] In a recent 2019 finalized rule approving the incidental take of marine mammals for U.S. Navy's use of its Surveillance Towed Array Sensor System Low Frequency Active Sonar ("SURTASS LFA," which operates at approximately the same speed as many proposed U.S. Navy UMVs), the U.S. National Marine Fisheries Service (NMFS) did not "anticipate takes of marine mammals to result from ship strikes from any SURTASS LFA vessels because each vessel moves at a relatively slow speed . . . it is likely that surveillance vessels will be able to avoid any marine mammals."[135] There is practically no expected physical impact on marine wildlife to implicate a MMPA "take" prohibition.[136] As a result, most challenges of UMV use would be not due to physical interactions between the UMV and marine mammals but the sonar sensor equipment that may disrupt marine mammal behavior.

As previously mentioned, UMVs may use a variety of different sensor technologies that include sonar, which uses sound to navigate and/or detect objects underwater.[137] Though not all UMVs have employed sonar technology, it is one of the primary payloads that is used for submarine and mine detection. There are two types of sonar technology: passive and active. Passive sonar listens for sounds emitted by other objects, whereas active sonar sends out "pings" to bounce off objects and then receives the echo of the ping.[138] The U.S. Navy has found that newer active sonar technologies are crucial for detecting ultra-quiet diesel submarines and recently recognized the challenge of "locating undersea threats solely by using passive acoustic technologies due to the advancement and use of quieting technologies in diesel-electric and nuclear subma-

133. The UMV's ocean noise pollution is caused by its sensors (i.e., sonar), not noise made by the UMV itself. Showalter, *supra* note 34, at 81.

134. *Id.*

135. SURTASS Incidental Taking, *supra* note 10, at 40,134; *see also* U.S. DEP'T OF THE NAVY, ATLANTIC FLEET TRAINING AND TESTING FINAL ENVIRONMENTAL IMPACT STATEMENT 3.0-73 (2018) ("Most devices do not have a realistic potential to strike living marine resources because they either move slowly through the water column (e.g., most unmanned underwater vehicles) or are closely monitored by observers manning the towing platform who ensure the towed in-water device does not run into objects in the water.").

136. This assumes that marine mammals are behaving normally and are able to perceive the UMV and get out of its way. Regardless, the risk to marine mammals is exceedingly low. UMVs could, however, be pre-programmed to appropriately respond to and avoid perceived marine life based on sensor-derived data.

137. YANNICK ALLARD & ELISA SHAHBAZIAN, OODA TECH. INC., UNMANNED UNDERWATER VEHICLE (UUV) INFORMATION STUDY 15–16 (2014).

138. *Id.* at 16; Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 13 (2008).

rines."[139] Additionally, active sonar can determine the bearing and distance of pinged objects—a function that eludes passive sonar technology.[140] The downside to active sonar is that the ping sent out can notify enemy submarines and ships of the originating sonar's location, resulting in possible danger for the originating ship and crew. UMVs therefore offer an additional safeguard by not only preventing danger to human life but also acting as a possible decoy of manned ships by being the maritime vehicle that sends the originating ping.[141]

The three types of active sonar used by UMVs are low-frequency active sonar (LFA), mid-frequency active sonar (MFA), and/or high-frequency active sonar (HFA).[142] MFA is most commonly used of the three by the U.S. Navy: it has been used since World War II and continues to be mission critical in both testing, training, and operations.[143] However, MFA (and HFA) is limited in detection range compared to LFA. HFA, currently used by the U.S. Navy, can detect objects up to approximately 1.2 miles away from the receiving HFA sensor,[144] and MFA sonar has a range of up to 11.5 miles.[145] Meanwhile, LFA sonar can detect objects from hundreds of miles away,[146] and the U.S. Navy has determined after years of analysis that LFA sonar is the *only* technology "capable of providing reliable, long-range detection of today's quieter, harder-to-find submarines."[147] By detecting threats from farther away, manned ships will have significantly more time (hours, instead of mere minutes)[148] to react.

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139. *Winter*, 555 U.S. at 13; SURTASS Incidental Taking, *supra* note 10, at 40,134.

140. *Winter*, 555 U.S. at 13.

141. REPORT TO CONGRESS, *supra* note 11, at 8.

142. LFA is a sonar source producing signals less than 1 kHz. MFA is a tactical and non-tactical source providing signals 1–10 kHz, and HFA produces signals between 10–100 kHz. U.S. DEP'T OF THE NAVY, OPNAV M-5090.1, ENVIRONMENTAL READINESS PROGRAM MANUAL 35–61 (2021) [hereinafter ENVIRONMENTAL READINESS PROGRAM MANUAL].

143. *Winter*, 555 U.S. at 14; KRISTINA ALEXANDER, CONGRESSIONAL RESEARCH SERVICE, RL 34403, WHALES AND SONAR: ENVIRONMENTAL EXEMPTIONS FOR THE NAVY'S MID-FREQUENCY ACTIVE SONAR TRAINING 1 (2009).

144. SURTASS Incidental Taking, *supra* note 10, at 40,137.

145. ALEXANDER, *supra* note 143, at 1 (converting 10 nautical miles to 11.5 standard miles).

146. Nat. Res. Def. Council, Inc. v. Pritzker, 828 F.3d 1125, 1130 (9th Cir. 2016).

147. U.S. DEP'T OF THE NAVY, RECORD OF DECISION FOR SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY ACTIVE (SURTASS LFA) SONAR 48,146 (2012).

148. *Id.*

However, a major drawback to active sonar technology is the impact on marine wildlife, in particular marine mammals such as whales and dolphins. As briefly discussed above, several organizations and conventions recognize ocean noise pollution as an increasing threat to marine wildlife. But active sonar in particular can be especially disruptive and has been a near-constant focus of litigation against the U.S. Navy in the last 20 years. At a basic level, sound waves created by active sonar can cause harm to marine mammals by damaging their ears, causing internal bleeding and/or disorientation which may result in the marine mammal surfacing too quickly.[149] Some scientists have attributed numerous deaths and beach strandings to military-related sonar use.[150]

Because numerous UMVs use active sonar and other acoustic sensors to detect obstacles and foreign threats, UMV technology must comply with domestic laws and regulations regardless of whether UMVs are considered vessels.[151] MMPA, ESA, CZMA, and NEPA are all commonly cited laws environmental conservationists use to prevent the U.S. Navy from using technologies—primarily LFA[152] and MFA[153]—during training and testing that may cause harm to marine mammals, with varied legal success.

The purpose of MMPA is to prevent disruptions to the marine ecosystem by preventing human actions that cause significant population declines in marine mammal species.[154] Specifically, MMPA makes it illegal for "any person subject to the jurisdiction of the United States or any vessel or other conveyance subject to the jurisdiction of the United States to take any marine mammal on the high seas."[155] Marine mammals covered by MMPA include mem-

149. ALEXANDER, *supra* note 143, at 1.

150. Stephen Dycus, *Osama's Submarine: National Security and Environmental Protection After 9/11*, 30 WM. & MARY ENV'T. L. & POL'Y REV. 1, 31 (2005). Compare *Winter v. Natural Res. Def. Council, Inc.*, 555 U.S. 7, 21 (2008), where the Navy presented to the Supreme Court "that ever since the Navy's training program began 40 years ago, there has been no documented case of sonar-related injury to marine mammals" using MFA off the coast of Southern California, *id.*, further asserting that "at most, MFA sonar may cause temporary hearing loss or brief disruptions of marine mammals' behavior patterns." *Id.* at 14.

151. *See* ENVIRONMENTAL READINESS PROGRAM MANUAL, *supra* note 142, at 35–61.

152. For cases involving LFA, see *Nat. Res. Def. Council, Inc. v. Evans*, 364 F. Supp. 2d 1083 (N.D. Cal. 2003) and *Nat. Res. Def. Council, Inc. v. Pritzker*, 828 F.3d 1125, 1130 (9th Cir. 2016).

153. For cases involving MFA, see *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7 (2008) and *Intertribal Sinkyone Wilderness Council v. Nat. Marine Fisheries Serv.*, 970 F. Supp. 2d 988 (N.D. Cal. 2013).

154. 16 U.S.C. § 1361.

155. *Id.* § 1372(a)(1).

bers of the *Sirenia* (dugongs and manatees), *Pinnipedia* (sea lions and seals), and *Cetacea* (dolphins and whales) orders,[156] the last of which is often cited by environmental protection groups as species that are most susceptible to active sonar used by the U.S. Navy.

"Vessel or other conveyance" is not defined, though "vessel" has easily been applied to U.S. Navy ships for MMPA purposes. In a strict textual reading of this provision, this MMPA take restriction arguably does not directly apply to UMVs unless "vessel" is interpreted by courts to include UMVs. Because the statute limits the restriction to vessels "*or other conveyance[s]*," there is a strong implication that this statute is meant to be limited to transportation maritime vehicles based on Merriam-Webster's definition of "conveyance."[157] Courts have not directly addressed whether all UMVs are subject to MMPA, but some courts have found that the MMPA applies to U.S. Navy active sonar use that may impact marine mammals regardless of the mode of transport using the sonar sensors.[158]

MMPA's "take" definition includes harassment of marine mammals,[159] which is further defined to include:

> [A]ny act of pursuit, torment, or annoyance which . . . has the potential to injure a marine mammal . . . or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.[160]

However, Congress added a military-specific definition for harassment in 2003 to limit MMPA's applicability for military readiness activities as a result of legal action by the Natural Resources Defense Council (NRDC) against the U.S. Navy's active sonar use off the California coast.[161] As amended, MMPA's prohibition of marine mammal harassment is narrowed for military readiness activities[162] that result in:

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156. *Id*. § 1362(6).

157. *Conveyance*, MERRIAM-WEBSTER DICTIONARY ONLINE, https://bit.ly/3ULabsO [https://perma.cc/2X66-4TBQ] (last visited Jan. 19, 2021). Conveyance, as a noun, is defined as "(1) the action of conveying (the conveyance of goods), and (2) a means or way of conveying: such as a means of transport: vehicle." *Id.*

158. *See, e.g.*, *Intertribal Sinkyone Wilderness Council*, 970 F. Supp. 2d at 996.

159. 16 U.S.C. § 1362(13).

160. *Id.* § 1362(18).

161. *See* National Defense Authorization Act for Fiscal Year 2004, Pub. L. No. 108-136, § 319, 117 Stat. 1392, 1433 (2003); Nat. Res. Def. Council, Inc. v. Evans, 364 F. Supp. 2d 1083 (N.D. Cal. 2003).

162. Defined as:

> [A]ny act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild; or any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered.[163]

This is a narrower definition of "take" as compared to activities that are not related to military readiness, as evident in the addition of the word "significant" in the military definition of harassment. Therefore, military readiness activities have a higher threshold to meet the definition of harassment than non-military activities. Nonetheless, the 2003 addition of this heightened threshold has not prevented the litany of litigation against the U.S. Navy's continued (and in many ways, increased) use of active sonar.

Finally, MMPA jurisdiction of vessel "takes" extends to the high seas and all "waters . . . under the jurisdiction of the United States,"[164] which includes the territorial seas of the United States and its Exclusive Economic Zone (EEZ).[165] Therefore, the MMPA applies to U.S. Navy vessels anywhere except for other countries' territorial seas and EEZs, though there is some dispute over whether it is applicable in a foreign country's EEZ.[166]

> [A]ll training and operations of the Armed Forces that relate to combat; and (B) the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. (2) The term does not include—(A) the routine operation of installation operating support functions, such as administrative offices, military exchanges, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, morale, welfare, and recreation activities, shops, and mess halls; (B) the operation of industrial activities; or (C) the construction or demolition of facilities used for a purpose described in subparagraph (A) or (B).

National Defense Authorization Act for Fiscal Year 2003, Pub. L. No. 107-314, § 315(f), 116 Stat. 2458, 2510 (2002).

163. 16 U.S.C. § 1362(18)(B).

164. *Id.* § 1372(a)(1), (a)(2)(A).

165. *Id.* § 1362(15). The MMPA's definition also includes "the areas referred to as eastern special areas in Article 3(1) of the Agreement between the United States of America and the Union of Soviet Socialist Republics on the Maritime Boundary, signed June 1, 1990." *Id.* § 1362(15)(C).

166. For example, NOAA regulation 50 C.F.R. § 216.11(c) (2022) provides that MMPA "take" prohibition applies to "any person subject to the jurisdiction of the United States" with no qualifying ocean limits, whereas the prior two sections include specific geographical boundaries of the high seas and waters "under the jurisdiction" of the United States. 50 C.F.R. § 216.11(a)–(b) (2022). While this unlimited geographical boundary is applied only to persons (not vessels), NOAA interprets the regulation and "high seas" (as applied to vessels) to include the EEZ of foreign nations as amplified in recent proposed rulemaking by NOAA. Permit-

MMPA provides a few exceptions that are applicable to military readiness activities allowing for incidental take permits. The U.S. Navy may apply for an incidental take permit for military readiness activities, taking into account the "least practicable adverse impact on such species or stock."[167] This does not require a balancing of military readiness interests against the environmental protections of the MMPA, but it does expect the relevant government agencies to take into account various mitigation and monitoring alternatives to reduce marine mammal impacts.[168]

The determination of the "least practicable adverse impact" is critical in furthering UMV development and use by the U.S. Navy. MMPA requires the Secretary of the U.S. Department of the Interior or of the National Oceanic and Atmospheric Administration (NOAA)[169] to consult with the Department of Defense and consider "personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity."[170] This is not just an analysis of an individual UMV use but the overall military readiness activity (and future use in times of war or conflict). This language requires the analysis of the overall readiness activity; for example, the large-scale exercises or long-term training in the Pacific Ocean. Based on this, UMVs *are* the solution in providing a least practicable adverse impact because of the numerous benefits UMVs offer in reducing risks to Sailors, increased ability to identify enemy submarines (and thus result in more effective anti-submarine detection and warfare) and reduced overall environmental impacts compared to their manned counterparts.

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ting and Monitoring of U.S. High Seas Fishing Vessels, 80 Fed. Reg. 19,611, 19,613 (Apr. 13, 2015) (to be codified at 50 C.F.R. pt. 300). In that 2015 proposed rule, NOAA stated that the ESA and MMPA geographic jurisdiction includes foreign nations' EEZ "up to the seaward boundaries of the territorial seas of such nations." *Id.* The definition of "person" includes any "officer, employee, agent, department, or instrumentality of the Federal Government," which may certainly include a UMV that is owned and/or operated by the U.S. Navy and its Sailors. 16 U.S.C. § 1362(10). Oddly, the MMPA statute includes the U.S. EEZ as part of the definition of "waters under the jurisdiction of the United States," which conflicts with NOAA's interpretation of extending MMPA's jurisdiction into that of foreign nations' EEZs. *Id.* § 1362(15)(B). For further analysis of the MMPA in foreign nation's EEZ, see Keith S. Gibel, *Defined by the Law of the Sea: "High Seas" in the Marine Mammal Protection Act and the Endangered Species Act*, 54 NAVAL L. REV. 1 (2007).

167. 16 U.S.C. § 1371(a)(5)(A)(i).

168. Intertribal Sinkyone Wilderness Council v. Nat'l Marine Fisheries Serv., 970 F. Supp. 2d 988, 1017 (N.D. Cal. 2013).

169. 16 U.S.C. § 1362(12).

170. *Id.* § 1371(a)(5)(A)(iii).

The second major MMPA incidental take exemption applies for actions "necessary for national defense," in which the Secretary of Defense "may exempt any action or category of actions undertaken by the Department of Defense of its components from compliance with any requirement of this chapter, if the Secretary determines that it is necessary for national defense."[171] Though authorized by Congress, the Department of Defense rarely invokes this exemption except for active sonar use while awaiting final incidental take permits.[172]

Incidental take permits will likely remain the main obstacle for the U.S. Navy to fully realize UMVs' extensive benefits.[173] Physical harm caused by UMVs is not the primary risk to marine mammals—it is low- and mid-range frequency active sonar payloads used by the UMVs to detect submarines and other objects in the water.[174] Though the U.S. Navy and other government agencies have admitted that some active sonar use can negatively affect marine mammals (in particular whales), without further testing of UMV active sonar and other UMV technologies, the extent of harm cannot be determined, and the U.S. Navy will continue to be subject to litigation by environmental protection groups under MMPA. But, if allowed to continue testing and training with UMVs, the U.S. Navy would be able to determine how to *safely* use UMVs while preventing increased harm to marine wildlife. Additionally, the military should be able to explore new technologies and test them unimpeded in the oceans to reduce risk to human life

171. *Id.* § 1371(f)(1).

172. One example was a six-month National Defense Exemption granted by the Secretary of Defense allowing the U.S. Navy to use mid-range frequency active sonar in a major Pacific Ocean exercise named RIMPAC 2006. U.S. Dep't of Def., *National Defense Exemption to MMPA Authorized for Navy*, U.S. NAVY NEPA PROJECTS (June 30, 2006), https://bit.ly/3BY9bsJ [https://perma.cc/W93G-VTVM]. A second, two-year National Defense Exemption was granted the following year. Navy Off. of Info., *New National Defense Exemption to MMPA Authorized for Navy*, U.S. NAVY NEPA PROJECTS (Feb. 23, 2007), https://bit.ly/3SmMUvL [https://perma.cc/M48Y-QZWF]. The exemptions required the U.S. Navy to implement several mitigation and monitoring procedures to reduce the chances of an incidental take. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 15 (2008). One of the more recent National Defense Exemptions was granted for SURTASS low-range frequency active sonar from August 2017–August 2019 while completing NEPA requirements. Takes of Marine Mammals Incidental to Specified Activities: Taking Marine Mammals Incidental to U.S. Navy Surveillance Towed Array Sensor System Low Frequency Active Sonar Training and Testing in the Central and Western North Pacific Ocean and Eastern Indian Ocean, 84 Fed. Reg. 40,132, 40,133 (Aug. 12, 2019) (to be codified at 50 C.F.R. pt. 218).

173. Though not addressed here, the incidental take permits include those under MMPA and ESA.

174. Showalter, *supra* note 34, at 81.

and overall marine environmental wellbeing. Therefore, MMPA incidental take permits pertaining to UMVs should be balanced in favor of military readiness activities where possible until more scientific evidence is provided to dispositively show harm claimed by conservation groups given the significant advantages of UMV use over manned vessels.[175]

This is not to say that the U.S. Navy would be absolved of its duty to mitigate possible adverse effects, nor has the U.S. government interpreted a *lack* of significant threats to marine populations as a reason to thwart efforts to mitigate possible harm to marine mammals or restrict areas in which to conduct testing and training of UMVs.[176] Indeed, U.S. Navy commanders have "an affirmative obligation to avoid unnecessary damage to the environment to the extent that it is practicable to do so consistent with mission accomplishment."[177] To further environmental protection goals and address marine mammal protection concerns, the U.S. Navy requires officers and program managers to "assess potential impacts to marine mammals from training and testing" and comply with the MMPA when using LFA, MFA, and HFA sonar.[178] Modeling and effects analyses are required "where naval activities may introduce sound or explosive energy into the marine environment."[179] Additionally, the U.S. Navy should avoid or minimize "adverse effects to marine mammals from underwater sound."[180] These compliance requirements are only applicable in *training and testing*, discussed further below.

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175. But see opposing arguments against tipping the balance in favor of the military in light of MMPA's ultimate purpose to protect marine mammals. Taking Marine Mammals Incidental to U.S. Navy Surveillance Towed Array Sensor System Low Frequency Active Sonar Training and Testing in the Central and Western North Pacific Ocean and Eastern Indian Ocean, 84 Fed. Reg. 40,132, 40,160 (Aug. 13, 2019) (to be codified at 50 C.F.R. pt. 218).

176. *See id.* at 40,178 ("[E]ven when the effects of an action satisfy the negligible impact standard (*i.e.,* in the Court's words, 'population levels are not threatened significantly'), still the agency must prescribe mitigation under the least practicable adverse impact standard.") (quoting Nat. Res. Def. Council, Inc. v. Pritzker, 828 F.3d 1125, 1134 (9th Cir. 2016)).

177. COMMANDER'S HANDBOOK, *supra* note 102, § 8.4. As discussed further below, this paragraph is focused on military operations and targeting, not training or testing, and arguably has different standards of due care in environmental protections between the two scenarios.

178. ENVIRONMENTAL READINESS PROGRAM MANUAL, *supra* note 142, at 12–15.

179. *Id.* at 12–16.

180. *Id.* at 12–17.

2. *Marine Pollution Control*

A great deal of physical marine pollution comes from the discharge of oil, sewage, and garbage from manned vessels.[181] Because UMVs are not manned, they do not produce the sewage and garbage of manned vessels. For comparison purposes, consider a small UMV operating in the ocean with the same submarine detection capabilities as that of a 300-crew manned naval vessel. The amount of sewage and garbage from that manned vessel is astronomical compared to the UMV—and that manned vessel is considered "small" in relation to the larger 5,000-crew aircraft carriers. Additionally, UMVs are powered primarily through batteries, unlike their larger oil-powered manned counterparts,[182] and are therefore less likely to result in oil spill accidents. Some are even powered with renewable sources, such as wave or solar energy. The largest pollution impact of UMVs is from being disposed of in the ocean—either by accident, or when operators decide they are irretrievable[183] or designed to be disposable.[184] Nevertheless, accidents happen, and some UMVs may discharge pollutants and other wastes (including the UMV itself) into the waters they operate in. This second section covers two major U.S. statutes related to physical marine pollution control and prevention applied to vessels and UMVs: the Clean Water Act (CWA) and the Act to Prevent Pollution from Ships (APPS).

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181. DANISH MAR. AUTH., *supra* note 16, at 29.

182. But see larger USVs, mentioned above, that are powered via hybrid diesel/battery systems.

183. *See* SEC'Y OF THE NAVY, REPORT TO CONGRESS: AUTONOMOUS UNDERSEA VEHICLE REQUIREMENT FOR 2025, at 10–11 (2016) (noting that recovering UUVs can be very different from recovering USVs and other items in the ocean). This certainly brings up issues of environmental protections related to ocean waste and dumping. The U.S. Navy has stated that some less expensive UUVs may be expendable, thereby negating the need for recovery, indicating there is a very real notion that these will be abandoned. Whether abandoned UMVs constitute "waste" is explored further below.

184. *Disposal of Vessels at Sea*, U.S. ENV'T PROT. AGENCY, https://bit.ly/3rHfXyc [https://perma.cc/JG6T-NSXM] (last visited Jan. 19, 2021).

> Vessels, as well as items in and on vessels, can pose potential environmental, human health and navigational concerns. Vessels may contain harmful pollutants or serve as sources of pollution, such as oil, fuel, lubricants, polychlorinated biphenyls (PCBs), asbestos and floatable materials (e.g., plastics). Some vessels may not be suitable for ocean disposal because they may float or are likely to break apart and create marine debris. Vessel debris and floatable solids can be a navigational obstruction and safety hazard. Vessel debris can also physically destroy marine habitats and smother and entrap marine organisms.

Id. As a result, it is important that UMVs be designed to not be overly damaging to the environment if abandoned.

The purpose of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," including the U.S. territorial sea, contiguous zone, and oceans.[185] CWA requirements apply to federal agencies.[186] Discharging pollutants into such waters is prohibited from "vessels or other floating craft" (among other types of "point sources")[187] without a valid permit.[188] Vessels are specifically defined as "every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on the navigable waters,"[189] indicating that this provision may not apply to UMVs unless the UMV is specifically designed to transport personnel. Though at first blush UMVs could be subject to this prohibition as "other floating craft," numerous UMVs (specifically UUVs) are not designed to float. Interestingly, discharging pollutants explicitly *excludes* pollutants from a "vessel or other floating craft" within the contiguous zone or the ocean,[190] where most UMVs would be operating. U.S. Environmental Protection Agency (EPA) regulations further extend this provision to qualify "other floating craft" as those "being used as a means of transportation."[191] As a result, UMVs may actually be covered by this prohibition if *not* considered "vessels or other floating craft,"[192] assuming UMVs are somehow otherwise characterized as point sources.[193]

If UMVs (whether all or only some variants) are covered by the CWA as point sources,[194] pollutants would occur in a few differ-

185. 33 U.S.C. §§ 1251(a), 1362. "Oceans" includes "any portion of the high seas beyond the contiguous zone." § 1362(10).

186. 33 U.S.C. § 1323(a).

187. *Id.* § 1362(14).

188. *Id.* §§ 1311, 1342–1343.

189. *Id.* § 1322(a)(1)–(2).

190. *Id.* § 1362(12). Discharged pollutants into waters by vessels are covered by other provisions or acts.

191. 40 C.F.R. § 122.2 (2020).

192. The closest comparison to UUVs are submarines, which are or can be used as a mode of transportation and therefore falls within the CWA's definition of vessel. There appears to be no court cases interpreting whether UUVs or other unmanned vehicles are included in the CWA's definitions. A textualist judge could interpret the statute to find UMVs not included in the definition of "vessel or other floating craft," especially where transportation appears to be required, and would have to interpret UMVs into the statutory or regulatory definition of "point source."

193. For example, Congress had specifically excluded certain deep-sea mining and drilling "vessels" from the CWA's definition of "vessel or other floating craft," and therefore any discharges from those objects are subject to the CWA. Nw. Env't Advocs. v. Env't Prot. Agency, 537 F.3d 1006, 1024 (9th Cir. 2008) (quoting 30 U.S.C. § 1419(e)).

194. The next closest comparison would be that of vehicles (cars/bulldozers), which have been found to be point sources. However, these types of vehicles are

ent UMV scenarios. Pollutants include "wrecked or discarded equipment,"[195] which would include UMVs designed to be disposable. In that case, the UMV would be both the point source *and* the pollutant itself, being discharged into a covered body of water. Pollutants also include filter backwash, munitions, heat, oil, biological materials,[196] and chemical wastes,[197] all of which may leak or be discharged from a UMV in either the course of normal operations or with equipment failures.[198] Therefore, the use of UMVs may require proper CWA permits, especially where they are considered a non-vessel point source and are irretrievable (either by accident or on purpose).

If UMVs are considered vessels and specifically fall within the definition of "vessels of the Armed Forces,"[199] then they would fall under the CWA's section dedicated to discharge standards for vessels of the Armed Forces.[200] Section 1322(n) applies to all discharges from such vessels that are "incidental to the normal operation . . . unless the Secretary of Defense finds that compliance . . . would not be in the national security interests of the United States."[201] As a result, such discharges would be covered by Uniform National Discharge Standards, rather than traditional CWA discharge permits.[202] Promulgated standards may distinguish different types of vessels, in which UMVs (either collectively or based on power source or size, if more granularity is required) could receive their own unique standards as compared to manned vessels, or could receive a waiver of standards altogether.[203] Therefore, CWA

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also used as a mode of transportation (either to transport people or to transport a pollutant), and therefore the comparison is weak. *See* United States v. Banks, 873 F. Supp. 650, 657 (S.D. Fla. 1995) (citing Weiszmann v. Dist. Eng'r, U.S. Army Corps of Eng'rs., 526 F.2d 1302, 1306 (5th Cir. 1976)).

195. 33 U.S.C. § 1362(6).

196. In particular, this would be relevant where a UMV uses a ballast system that could inadvertently transport an invasive species from one body of water to another. *See, e.g.*, *Nw. Env't Advocs.*, 537 F.3d at 1020–21.

197. 33 U.S.C. § 1362(6).

198. Though there is an exception for "a discharge incidental to the normal operation of a vessel of the Armed Forces," previous discussion argues that UMVs are not strictly considered vessels under the CWA definitions. *Id.* § 1362(6).

199. Defined as "any vessel owned or operated by the Department of Defense, other than a time or voyage chartered vessel." *Id.* § 1322(a)(14). If "vessel" was interpreted to include UMVs within the CWA coverage, then any UMV owned or operated by the U.S. Navy would be covered by this definition.

200. *Id.* § 1322(n).

201. *Id.* § 1322(n)(1).

202. I.e., National Pollutant Discharge Elimination System (NPDES) permit. *Id.* § 1342.

203. *Id.* § 1322(n)(3)(C)(iii).

applications of UMVs would provide the U.S. Navy with more flexibility if UMVs were considered "vessels of the Armed Forces."

The APPS codifies and implements U.S. obligations under MARPOL.[204] The statute broadly defines "ship" to include a "vessel of any type whatsoever, including hydrofoils, air-cushion vehicles, submersibles, floating craft whether self-propelled or not, and fixed or floating platforms."[205] The statute further defines "submersible" as "a submarine, or any other vessel designed to operate under water."[206] All UMV types fall under this definition of "ship," but APPS contains an exemption for ships of the Armed Forces,[207] which would extend to U.S. Navy UMV use.[208] Finally, APPS provides a general exemption from MARPOL obligations "during time of war or a national emergency declared by the President or Congress."[209]

3. NEPA Applications and Considerations

NEPA is a procedural statute[210] that requires federal agencies to take a "hard look" at their activities and how those activities may impact the environment. Generally, the U.S. military must consider possible adverse environmental impacts before and during planning phases of acquisition, construction, and testing and training operations and exercises. Federal agencies are also required to consider various alternatives to planned actions, including a "no action" alternative. There is no "national defense exemption" from NEPA.[211] NEPA applies to any major federal activity—it is not limited based

204. *Id.* §§ 1901–1915.

205. *Id.* § 1901(a)(12).

206. *Id.* § 1901(a)(13).

207. 33 U.S.C. § 1902(b)(1)–(2).

208. Exempt Armed Forces ships are those that have "unique military design, construction, manning, or operating requirements; and cannot fully comply with the discharge requirements of Annex V to the Convention because compliance is not technologically feasible or would impair the operations or operational capability of the ship." *Id.* § 1902(b)(2). Because UMVs do not generate garbage like manned vessels, they would not require technical compliance with garbage-processing equipment, as required in § 1902(b)(3).

209. *Id.* § 1902(b).

210. NEPA itself does not set any particular substantive environmental standards, as compared to CWA or MMPA, but merely requires federal agencies to "think twice" about its activities. Charles J. Gartland, *At War and Peace with the National Environmental Policy Act: When Political Questions and the Environment Collide*, 68 A.F.L. REV. 27, 34 (2012). The goal of NEPA is "to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation." 42 U.S.C. § 4321.

211. Concerned About Trident v. Rumsfeld, 555 F.2d 817, 822–23 (D.C. Cir. 1976). The lower court in *Concerned About Trident v. Schlesinger* stated:

on definitions of "vessels" like other statutes. Instead, NEPA looks at *how* the activities and actions impact the environment, not *what* causes those impacts. Therefore, NEPA would apply regardless of whether UMVs are classified as vessels under U.S. domestic law and policy. For example, under NEPA analysis, active sonar-guided torpedoes are treated the same as manned vessels that use active sonar technology to detect threats.[212] Additionally, the U.S. Navy already employs numerous "sonobuoys" that use MFA to detect threats in the water.[213] These are designed to be expendable objects left in the water, and only last about eight hours[214]—a far shorter lifespan than that of the current UMVs. The U.S. Navy regularly abandons these sonobuoys—they are designed to be expended in the ocean after their limited lifespan and their deployment is covered under NEPA.[215]

That being said, NEPA analysis is nonetheless enlightening in UMV military use and application. The U.S. Navy is already including UMV use in NEPA-required EIS analysis and implementation, as evident from a September 2018 Final EIS for Atlantic Fleet

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> With respect to the consideration of environmental factors and the balance of costs and benefits, it is important to bear in mind that there are peculiar aspects of national defense decisions which distinguish in some measure the nature of compliance with NEPA. . . . This is not to say that the Defense Department may ignore the environment. . . . It is [ ] a realization that some changes, even major changes, in the environment may be required for the survival of the Republic.

Concerned About Trident v. Schlesinger, 400 F. Supp. 454, 484 (D.D.C. 1975). For a thorough argument for why all national defense [military] activities should be exempt from NEPA, see generally Gartland, *supra* note 210, at 29, noting:

> National defense activities rooted in the Constitution and ordered by the legislative or executive branches are upended out of deference to a procedural statute . . . the most efficient and legally plausible way of resolving the NEPA-national defense conflict is by removing the courts from NEPA enforcement altogether, and exempting national defense activities from NEPA.

Id.

212. *See* U.S. DEP'T OF THE NAVY, ATLANTIC FLEET TRAINING AND TESTING FINAL ENVIRONMENTAL IMPACT STATEMENT 3.0-74 (2018) (comparing the speed of various in-water devices, including towed, UUVs, USVs, and torpedoes).

213. Intertribal Sinkyone Wilderness Council v. Nat'l Marine Fisheries Serv., 970 F. Supp. 2d 988, 996 (N.D. Cal. 2013) (pointing out that these MFA sonar systems "operate at significantly lower source levels than the hull-mounted systems and for far shorter periods of time.").

214. Joe Gould & Aaron Mehta, *US Could Lose a Key Weapon for Tracking Chinese and Russian Subs,* DEFENSENEWS (May 1, 2019), https://bit.ly/3y4wdNC [https://perma.cc/KN89-W6VY].

215. *Id.*; *see also* U.S. DEP'T OF THE NAVY, NORTHWEST TRAINING AND TESTING FINAL ENVIRONMENTAL IMPACT STATEMENT 2–19 (2015).

Training and Testing.[216] Part of the NEPA process is analyzing alternatives. Though the promulgated EISs generally cover a wide variety of collective large-scale exercises and their alternatives (in other words, alternatives are not necessarily based on one or two vessel differences, but rather larger differences in the exercise planning), UMVs should be considered feasible alternatives to proposed actions. The U.S. Navy is in a continuous process of taking a "hard look" at environmental consequences for its ongoing and planned training and testing operations, and in doing so should consider UMVs' lower environmental impacts as reasonable alternatives to other manned naval vessels and equipment.[217] This is especially true given NEPA is meant to reduce prospective environmental harms, and UMVs can do just that with reduced waste and pollution as compared to manned vessels.[218] UMVs would further the *Winter v. NRDC* Supreme Court's balancing test between military interest and the environmental public interest:[219] where a military method can reduce risk of human life while at the same time reducing environmental harm, the military should clearly choose that alternative where possible.

Further, part of the NEPA review process is to determine whether a categorical exclusion (CATEX) applies to the proposed action in which the relevant federal agency "has determined, in its agency NEPA procedures, normally do not have a significant effect on the human environment" (citations omitted).[220] If so, the action is "categorically excluded" and requires no further detailed environmental analysis. The U.S. Navy currently has developed 49

216. U.S. DEP'T OF THE NAVY, ATLANTIC FLEET TRAINING AND TESTING FINAL ENVIRONMENTAL IMPACT STATEMENT 2–19 (2018) ("Testing of anti-submarine warfare systems is conducted to develop new technologies and assess weapon performance and operability with new systems and platforms, such as unmanned systems."). Proposed testing activities include "the development or upgrade of unmanned surface vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles" and "[t]esting involves the development or upgrade of unmanned underwater vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles." *Id*. at 2–32.

217. 42 U.S.C. § 4332(C)(iii).

218. *See* Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 23 (2008) ("[T]his is not a case in which the [Navy] is conducting a new type of activity with completely unknown effects on the environment. . . . Part of the harm NEPA attempts to prevent in requiring an EIS is that, without one, there may be little if any information about prospective environmental harms and potential mitigating measures.").

219. *Id.* at 23 (discussed further below).

220. 40 C.F.R. § 1508.1(d) (2022).

CATEXs.[221] Upon initial review, CATEX 24, 43, and 44 may apply to individual UMV use. CATEX 24 exempts

> Military training conducted on or over nonmilitary land or water areas, where such training is consistent with the type and tempo of existing nonmilitary airspace, land, and water use (e.g., night compass training, forced marches along trails, roads and highways, use of permanently established ranges, use of public waterways, use of civilian airfields).[222]

UMVs used for military training could occur in public waters (not specifically "military water areas") where there are already other non-military maritime vessels and UMVs in use (i.e., traditional navigational lanes used for commercial shipping).[223] CATEX 43 and 44 could also apply to UMVs: where the U.S. Navy has previously completed NEPA analysis of similar technology—such as LFA or MFA sonar—as that used for UMVs in a particular area and found that there would be no significant impacts to the environment while conducting evaluation, testing, or training with similar equipment.[224] However, no CATEX can be used—even if it fits the description of a particular CATEX—where the proposed action or activity may have "more than an insignificant or discountable effect on Federally protected species under the ESA or have impacts that would rise to the level of requiring an IHA under the

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221. ENVIRONMENTAL READINESS PROGRAM MANUAL, *supra* note 142, at 10–44.

222. *Id.* at 10–42.

223. REPORT TO CONGRESS, *supra* note 1, at 10. The U.S. Navy has stated that UMVs "are designed to operate in home waters near ports and transit lanes, in broad open ocean waters and chokepoints, or in far forward contested waters." *Id.*

224. ENVIRONMENTAL READINESS PROGRAM MANUAL, *supra* note 142, at 10–43. CATEX 43 exempts:

> Routine testing and evaluation of military equipment: (a) on a military reservation or an established range, restricted area, or operating area (OPAREA); (b) similar in type, intensity and setting, including physical location and time of year to other actions for which it has been determined, through NEPA analysis where DON was a lead or cooperating agency, that there are no significant impacts; and (c) conducted in accordance with all applicable SOPs protective of the environment.

Id. CATEX 44 exempts:

> Routine military training associated with transits, maneuvering, safety and engineering drills, replenishments, flight operations, and weapon systems: (a) conducted at the unit or minor exercise level; (b) similar in type, intensity and setting, including physical location and time of year, to other actions for which it has been determined, through NEPA analysis where DON was a lead or cooperating agency, that there are no significant impacts; and (c) conducted in accordance with all applicable SOPs protective of the environment.

Id.

MMPA irrespective of whether one is procured."[225] Therefore, where a UMV's specific technology uses sensors that *may* impact marine mammals (whether or not in direct violation of ESA or MMPA), a CATEX is not available for use. But, if the UMV is using a technology that is known or reasonably known to not cause any adverse impacts to marine mammals, the U.S. Navy could use CATEX to exempt the UMV use from further NEPA analysis.

4. U.S. Caselaw Concerning Unmanned Maritime Vehicle-Related Technologies

Environmental conservation groups have brought several suits against the U.S. Navy over the last two decades revolving around the use of active sonar in peacetime activities, training, and testing. The pinnacle case, *Winter v. NRDC*, reached the U.S. Supreme Court in 2008. Because numerous scholars have discussed these cases at length,[226] this section limits its review of active sonar litigation only where it relates to potential UMV applications. However, a common thread through all cases was the highlighted importance of realistic testing and training of military forces and equipment.

The first major case involving the U.S. Navy's sonar use was *NRDC v. Evans* in 2003. The plaintiff's claims of ESA, NEPA, Administrative Procedure Act (APA), and MMPA violations was limited to SURTASS-LFA sonar use during peacetime "training, testing and routine operations."[227] The district court judge held, among other things, that the relevant federal agencies (including the U.S. Navy) had not adequately explored all reasonable alternatives[228] or required mitigation measures that would assist in reducing harm to marine wildlife.[229] The judge issued a permanent injunction that allowed the U.S. Navy to operate training and testing of the SURTASS-LFA sonar system, but in a limited capacity.[230] This case was the impetus in leading the U.S. Congress to update MMPA by limiting MMPA application to military readiness activities.[231]

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225. *Id.* at 10–39.

226. For analysis of the various active sonar cases, see generally Inkelas, *supra* note 108 and Reynolds, *supra* note 120.

227. Nat. Res. Def. Council, Inc. v. Evans, 279 F. Supp. 2d 1129, 1138 (N.D. Cal. 2003). The implications of the claim to *peacetime* use is discussed further below.

228. *Id.* at 1164–66.

229. *Id.* at 1164.

230. *Id.* at 1191–92.

231. *See supra* Part III.B.1; Nat. Res. Def. Council, Inc. v. Gutierrez, No. C-07-04771, 2008 WL 360852, at *4 (N.D. Cal. Feb. 6, 2008).

The same district court judge provided a similar opinion four years later in *NRDC v. Gutierrez*.[232] Nearly identical issues were litigated again, but the court considered the MMPA statutory changes made after *Evans*.[233] Though the court found the U.S. Navy and NMFS had done a better job justifying certain mitigation and monitoring measures to reduce marine mammal harm from active sonar use,[234] the court nonetheless issued an injunction limiting the U.S. Navy's SURTASS-LFA use after balancing the national security interests with those of protecting marine wildlife.[235] The U.S. Supreme Court decided *Winter v. NRDC* shortly thereafter.

Winter v. NRDC introduced a new wrinkle in active sonar use by the U.S. Navy. Instead of determining implementation facets of low-frequency active sonar, this case involved mid-frequency active sonar, which the U.S. Navy and other foreign navies had used extensively for decades.[236] The Court specifically highlighted the difference between LFA and MFA use, and that mitigation measures for one type of sonar would be different from the other.[237]

Significantly, the Supreme Court tipped the balancing scales in favor of the U.S. Navy and vacated the preliminary injunction limiting sonar use in the Pacific Ocean,[238] which was a departure from lower court rulings that placed less emphasis on the military readiness and national security aspects as compared to environmental protections. The Supreme Court did not get to the merits of whether the U.S. Navy was violating MMPA, NEPA, CZMA, or ESA; rather, the Court found that a few specific injunction provisions preventing the U.S. Navy from conducting testing and training were improper.[239] What is important from *Winter v. NRDC* for UMV use is the Court's focus on the national security interests and weighing them more heavily compared to environmental protections. Though this decision came out during the height of the War on Terror (and therefore, heightened concerns over military readiness being felt throughout the world), it represented a significant

232. *Gutierrez*, No. C-07-04771, 2008 WL 360852, at *32 (N.D. Cal. Feb. 6, 2008).

233. *Id.* at *1. The court highlighted that "Congress did not exempt the Navy . . ." from MMPA requirements despite the 2003 amendments. *Id.* at *31.

234. *Id.* at *13–15. The court found that the agencies had not "acted arbitrarily or capriciously in establishing its monitoring protocol." *Id.* at *15.

235. *Id.* at *31.

236. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 14 (2008).

237. *Id.* at 29 ("[E]quating MFA sonar with LFA sonar is completely misleading and is like comparing 20 degrees Fahrenheit to 20 degrees Celsius.") (internal quotations omitted).

238. *Id.* at 33.

239. *Id.* at 31–33.

shift from lower courts—in particular, those in the Ninth Circuit and California federal district courts where most active sonar cases were filed. The Supreme Court additionally recognized and held that active sonar use—in particular MFA sonar use—was "essential to national security."[240] As applicable to UMV use by the U.S. Navy, this presents more opportunities and recognition that UMV active sonar use in testing and training should be treated more favorably in balancing interests against environmental protections, regardless of whether UMVs are specifically identified as "vessels" or not in other environmental protection schemes.[241]

Winter v. NRDC has impacted active sonar-related litigation since 2008. The most recent case brought against the U.S. Navy for its sonar use is *NRDC v. Pritzker*.[242] Originally brought in 2013 after a final rule was issued for the U.S. Navy's continued SURTASS-LFA use, it wasn't until 2016 that the Ninth Circuit held the rule authorizing incidental takes of marine mammals under MMPA for military-readiness sonar use was insufficient.[243] The only issue on appeal was whether "NMFS's mitigation measures satisfied the MMPA's least practicable adverse impact standard."[244] Pertinent for UMV use, the final rule's required mitigation measures included human lookouts on U.S. Naval ships and shutting down the active sonar systems if a marine mammal was detected within two kilometers of an LFA-equipped vessel.[245]

> In connection with *peacetime activities* such as use of *LFA sonar* for training, testing, and routine operations, Congress struck a balance to permit incidental take of marine mammals caused by *deployment of LFA sonar or other techniques* that might incidentally harm whales and other marine mammals . . . so long as mitigation measures were fashioned to limit harm to the marine mammals to the "least *practicable* adverse impact" (emphasis added).[246]

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240. *Id.* at 26.

241. See *infra* Part III.B.5.a on why *Winter v. NRDC* is important for increased UMV use and development and should continue to be viewed in the most favorable light.

242. Nat. Res. Def. Council, Inc. v. Pritzker, 828 F.3d 1125, 1129 (9th Cir. 2016).

243. *Id.* As discussed more below, the court noted that the case only related to peacetime military readiness activities. *Id.* at 1128 n.1.

244. *Id.* at 1129. The U.S. Navy was a defendant in the action, but the legal claim by NRDC revolved around the actions of NMFS. The court came just short of applauding the U.S. Navy for its thorough plans to decrease harm to marine life. *Id.*

245. *Id.* at 1132.

246. *Id.* at 1130.

Further, agencies "must adopt mitigation measures aimed at protecting marine mammals to the greatest extent practicable in light of military readiness needs," where practicable means, in a military context, "must be both effective in reducing impact [to marine mammals], but also not so restrictive of military activity as to unduly interfere with the government's legitimate needs for military readiness activities."[247] Applying the *Pritzker* standard to UMVs, however, indicates that these numerous mitigation measures that were sufficient for manned vessels would not be practicable for UMVs, especially UUVs (as discussed further below). As a result, the technological and practical differences between UMVs and manned vessels highlights the need for a different legal scheme and approach for UMVs in military activities.

Interestingly, *NRDC v. Pritzker* is the most recent sonar-related case brought against the U.S. Navy in federal court—there have been no cases heard against the U.S. Navy for sonar use in the last 5 years, despite the proliferation of litigated cases and ongoing appeals in the prior 15 years. This is an indication that after *Winter v. NRDC* (as reinforced by *NRDC v. Pritzker*), the courts' recognition of active sonar as critically necessary for military readiness activities has resulted in environmental protection groups having a smaller appetite to bring litigation against the military knowing their burden will be much higher than over a decade ago.

5. *Environmental Applications in Testing and Training Versus Operations Within the United States*

Numerous environmental laws and regulations provide exemptions for military operations, and these exemptions have been interpreted to apply generally in times of war. But many of these exemptions do not apply for testing, training, and general military readiness activities (which are sometimes referred to as military operations by civilians and military personnel alike). Historically, domestic environmental laws and regulations applied strictly to these military readiness activities. But, beginning with the 2003 MMPA amendments, Congress and the courts have eroded the strict appliance of these environmental protections to such activities, while still recognizing a complete war-time exemption. This section provides an overview of how this erosion has occurred and how it will impact current and future applications to UMV military readiness activities.

247. *Id.* at 1134–35. The court found that NMFS did not consider these impacts within the rulemaking process, not that the measures taken by the U.S. Navy were insufficient. *Id.*

a. Growing Acceptance of Peacetime Testing and Military Readiness Exemptions

Starting with MMPA amendments in 2003, there has been a growing erosion of environmental protection in favor of military readiness. While this move was no doubt partially precipitated by the politics involved with the United States entering a new era of conflict in the Middle East,[248] it was Congress and the courts that formally recognized the importance of military readiness activities, even at the expense of marine wildlife. The court in *NRDC v. Evans* began this trend by recognizing the court's decision was limited to peacetime operations. The court stated that the military and public interest's "peacetime use of LFA sonar is not as compelling as it would be in wartime or in a time of a declared heightened threat. A permanent injunction will not interfere with the Navy's ability to use LFA sonar during war or in response to an imminent threat."[249] Importantly, the U.S. Navy "is free to use the system without restriction in time of war or heightened threat."[250] While providing the U.S. Navy with complete flexibility to use LFA sonar in times of war, the court failed to consider wartime *prevention* operations, such as intelligence collection or submarine detection operations that would occur regardless of being in a time of peace or formally declared war (discussed more thoroughly below).

NRDC v. Gutierrez, decided five years after *NRDC v. Evans*, involved the same peacetime-use of LFA sonar and noted that the U.S. Navy would be "free to use [LFA sonar] during wartime or periods of heightened threat."[251] Though the court noted that Congress did not completely exempt the U.S. Navy from MMPA requirements, there was an increased need for the U.S. Navy to train and test new technologies in the global posture involving two wars in the Middle East.[252] The court still issued a preliminary injunction, but one that was tailored to provide "greater flexibility to operate in more areas than currently allowed," shifting further towards favoring military readiness interests.

248. For an overview of the shift in balancing environmental interests versus those of the military in the aftermath of the September 11th attacks, see generally Nancye L. Bethurem, *Environmental Destruction in the Name of National Security: Will the Old Paradigm Return in the Wake of September 11?*, HASTINGS W.N.W. J. ENV'T L. & POL'Y 109 (2002).

249. Nat. Res. Def. Council, Inc. v. Evans, 279 F. Supp. 2d 1129, 1191 (N.D. Cal. 2003).

250. *Id.* at 1138.

251. Nat. Res. Def. Council, Inc. v. Gutierrez, No. C-07-04771, 2008 WL 360852, at *1 (N.D. Cal. Feb. 6, 2008).

252. *Id.* at *31.

As quoted in *Winter v. NRDC*, "[t]o be prepared for war is one of the most effectual means of preserving peace,"[253] and one "of the most important ways the Navy prepares for war is through integrated training exercises at sea," including training with modern sonar.[254] At the height of the wars on terror in the Middle East, the Supreme Court in 2008 placed significant emphasis on the importance of training in order to best prepare for war or direct conflicts.[255] The majority of the court had no hesitation in eliminating parts of the injunction against the U.S. Navy's use of MFA sonar, reasoning that the injunction was "jeopardizing national security."[256] While the Court recognized the important environmental protection interests for marine mammals, those interests were "plainly outweighed" by those of the military's training.[257] Given the technology at issue in *Winter v. NRDC* is similar (if not identical) to numerous technologies planned for UMVs, the holding and justifications of the case are similarly extended to those of UMVs.

Finally, *NRDC v. Pritzker* is the most recent case to discuss wartime applications of environmental laws and regulations, in particular MMPA's applications to military activities. The *Pritzker* court declared, almost as an afterthought in a footnote, that MMPA does not apply to the military in times of war,[258] and that the dispute at issue only applied to the peacetime use of LFA sonar.[259] The court's analysis, therefore, was limited to protecting marine mammals "in light of military *readiness* needs."[260] As a result, the MMPA should not be examined in a vacuum—marine mammal protections must still be balanced against other interests, including national security readiness.[261]

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253. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 12 (2008) (quoting 1 MESSAGES AND PAPERS OF THE PRESIDENTS 57 (J. Richardson comp. 1897)).

254. *Winter*, 555 U.S. at 12.

255. *Id.* at 26. The majority opinion appeared highly persuaded by the fact that President George W. Bush granted the U.S. Navy exemptions for the exercises in question due to their importance, finding the training exercise was "essential to national security." *Id.* at 26.

256. *Id.* at 33.

257. *Id.* at 26.

258. Related, one of the main challenges in the case was whether the NMFS incidental take permit promulgated under the MMPA was sufficient. That permit (and the related rule) specifically only applied to routine testing and training operations, "[t]hey do not constrict the Navy's operations during a war or active military engagement." Nat. Res. Def. Council, Inc. v. Pritzker, 828 F.3d 1125, 1131 (9th Cir. 2016).

259. *Id.* at 1128 n.1.

260. *Id.* at 1134.

261. *Id.* at 1129.

As the recent cases highlight, the balancing test between interests is swaying more and more to the side of national security interests. Whether the new, more conservative Supreme Court composition will continue to further this particular weighing of interests—during a time of withdrawing from the Middle East and fatigue from being in a near-constant state of War on Terror—has yet to be seen. But, as it relates to testing and training with the new and proliferating UMV technologies (including the exact technology at issue in many of these highlighted cases), it is nonetheless imperative for UMV testing and training to continue receiving more flexible treatment under environmental requirements. Though the U.S. Supreme Court acknowledged "military interests do not always trump other considerations,"[262] it is clear that in the cases of sonar-related technology on manned vessels and UMVs (and indeed perhaps most, if not all, military readiness activities that are deemed essential for national security), it will not be a "close question" for environmental public interests to bow to the military.[263] This is especially true for situations where the balancing test comes down to the health and safety of human life (i.e., military personnel requiring training to prepare for war) versus those of marine life. Because UMV use is intended to reduce risk to human life and environmental impacts, their operation in military readiness activities can reduce the military's interests in the *Winter* balancing test, such that marine protection interests end up receiving more weight. In other words, once the U.S. Navy is able to fully implement a fleet of UMVs that partially replace manned vessels, environmental protections will not only benefit from UMV use, but they will receive more consideration in the court's balancing test of environmental interests versus those of the military.

b. Current Military Policies Regarding Testing and Military Readiness

Despite Congress and courts providing the military more flexibility with regards to testing and training in the face of environmental regulations, the U.S. Navy still designs policies aimed at protecting the environment and abiding by environmental protection requirements—typically with no distinction between manned vessels and UMVs.[264] For example, the U.S. Navy's Environmental Readiness Program Manual dedicates a significant section to protection of marine mammals but strictly limits much of the protec-

262. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 26 (2008).
263. *Id.*
264. Eckstein, *supra* note 14 (identifying UMVs that are currently in testing).

tion to only training, testing, and construction activities while identifying sonar, in particular, as one of the main culprits of ocean noise pollution.[265]

Though these numerous policies cover testing and training, the same environmental protection policies are absent for wartime operations or direct military conflicts. This is not surprising, however, given the weighted risks to human life compared to that of marine life. Nonetheless, the U.S. Navy provides that a commanding officer "has an affirmative obligation to avoid unnecessary damage to the environment to the extent that it is practicable to do so consistent with mission accomplishment. . . . Destruction of the natural environment not necessitated by mission accomplishment and carried out wantonly is prohibited."[266]

The U.S. Navy's UUV Master Plan identifies the need to increase experimentation, testing, and training of UMV platforms to establish standards that will allow the United States to maintain maritime superiority.[267] The intersection of these two notions—environmental protection and increased testing and training operations—obviously comes to a head, as identified by the U.S. Department of Defense: "To operate within the existing regulatory environment, programs must comply with existing policy framework or get policy waivers because policies tailored to unmanned systems are still in development. . . . In this paradigm, technology development and tests will help shape the appropriate requirements, standards, and regulations."[268] Without expanded testing and training (and lower environmental protection expectations), the U.S. Navy may not be able to realize its ultimate goal of deploying more UMVs.

c. Importance of Testing and Military Readiness for Unmanned Maritime Vehicle Use and Development

Moving forward, the changing landscape regarding military threats and fast-paced technological changes highlight the impor-

265. ENVIRONMENTAL READINESS PROGRAM MANUAL, *supra* note 142, at 12–15, 35–61 ("This requirement applies to *all units* (e.g., surface, submarine, aviation, and *other platforms*) that *employ active sonar* or other acoustic devices" (emphasis added).).

266. COMMANDER'S HANDBOOK, *supra* note 102, § 8.4. Much of this protection is in terms of targeting military objectives, not routine testing, training, or other uses for which UMVs are planned. *Id.*

267. U.S. DEP'T OF THE NAVY, *supra* note 43, at 72.

268. U.S. DEP'T OF DEF., UNMANNED SYSTEMS INTEGRATED ROADMAP FY2013–2038, at 90 (2013), https://bit.ly/3rrJhsC [https://perma.cc/26GM-NH3F] [hereinafter ROADMAP FY2013].

tance of testing, training, and military readiness activities for the U.S. Navy, especially where UMVs are concerned. This is not to say that the U.S. Navy should be exempt from all environmental laws and regulations—merely that the balance between military readiness to address emerging threats as compared to environmental impacts should tip in favor of military interests *where those military interests will lessen environmental impacts*. This is especially true for UMVs given their significantly reduced environmental footprint as compared to their manned counterparts.

The U.S. Navy continues to conduct significant NEPA environmental impact analysis and assessments,[269] and this should not change given the importance of alternatives analysis. That being said, UMVs should be *the* alternative considered in the NEPA analysis with respect to antisubmarine warfare and mine countermeasure operations, to include testing and training of such technologies. But, without adequate testing and training of UMVs and their various technological capabilities, full operational use cannot be realized (either in peacetime activities or in wartime).[270]

Further, while much of the litigation in the last two decades has covered military readiness activities (to include testing and training of new technologies such as LFA sonar), and courts have differentiated this military readiness use from wartime use, there has been no caselaw analysis of peacetime operations that are contemplative of war-prevention.[271] This requires additional consideration given many UMV uses are actually for peacetime, preventative military operations. For example, UMVs used for antisubmarine warfare or intelligence collection will naturally be expected for use in periods of "peacetime," where the United States is not directly involved in conflict or war but is conducting military operations to *prevent* such

269. *See* SURTASS Incidental Taking, *supra* note 10, at 40,160.

270. Eckstein, *supra* note 14 ("[T]he 'how' piece is clear: putting unmanned prototypes in the water, learning from them, wrapping lessons learned into acquisition plans for the next round of prototypes, and then eventually moving into acquisition of program of record UUVs and USVs.").

271. A single case has been brought challenging the U.S. Navy's use of sonar during wartime or heightened threat conditions, but it was dismissed without reaching the merits on other grounds. At the time, the U.S. Navy did not have plans to use that particular sonar technology (SURTASS-LFA) in wartime operations and had only sought rules and completed an environmental impact statement for sonar use in testing and training. *See* Cetacean Cmty. v. President of the U.S., 249 F. Supp. 2d 1206, 1212 (D. Haw. 2003), *aff'd*, Cetacean Cmty. v. Bush, 386 F.3d 1169 (9th Cir. 2004). No other cases have been brought challenging the military's sonar use in non-peacetime operations. Given more recent caselaw identifying the U.S. Navy's ability to use SURTASS-LFA in wartime operations in an unrestricted manner, it is doubtful similar claims as those in *Cetacean Community* would be successful.

conflict or war. Freedom of Navigation Operations conducted in the South China Sea, as an example, are not considered testing or training operations, but meant to exercise and assert U.S. navigation rights and freedoms.[272] These are not considered testing and training, but do not rise to the level of "direct conflict" or "war" as envisioned by the courts. Nonetheless, UMVs are critical for these types of operations and will collectively result in better environmental stewardship when fully employed by the U.S. Navy, and UMVs must be tested and used in training operations unimpeded (or at least, with the most realistic training circumstances allowed).[273] Clearly, wanton disregard of all environmental laws—both international and domestic—is violative of U.S. Navy policies. But here, where the UMV is engaged in peacetime, preventative military operations, the balancing of environmental versus military interests should tip clearly in favor of the latter, and the U.S. government (either through Congress, the courts, or the military) should address this particular form of military engagement to provide clarification of UMV use apart from those applying to traditional manned vessels.

III. WHY UNMANNED MARITIME VEHICLES DESERVE THEIR OWN ENVIRONMENTAL LAW REGIME, EVEN IF CONSIDERED "VESSELS" IN INTERNATIONAL AND DOMESTIC LEGAL SCHEMES

A. Environmental Advantages of Unmanned Maritime Vehicles Compared to Manned Vessels

UMVs have numerous environmental advantages over manned vessels, and therefore deserve special considerations in environmental laws and regulations compared to their manned counterparts. The biggest environmental advantage is that of reduced waste. UMVs produce little (if any) waste, depending on their design and type of energy used. Indeed, some may not only produce no waste, but rely primarily or solely on renewable energy, thereby further reducing a UMV's environmental footprint. U.S. Navy manned vessels, on the other hand, produce hundreds of thousands of pounds of waste *each day*. Recent estimates by the U.S. Navy reveal each aircraft carrier can produce an average of 15,000

272. DEP'T OF DEF., REPORT TO CONGRESS: ANNUAL FREEDOM OF NAVIGATION REPORT FISCAL YEAR 2020, at 1 (2021).

273. *See* Eckstein, *supra* note 14 (praising "the contributions that Congress has made—particularly the Senate Armed Services Committee's insistence that the Navy use land-based testing" for UMV mechanical and electrical systems).

pounds of waste each day.[274] While aircraft carriers are the U.S. Navy's largest ships with the most onboard personnel, it is still indicative of the massive amount of trash collected (and, in many cases, dumped in the ocean) from manned vessels. Though UMVs are not envisioned to completely replace all manned craft, the move toward symbiotic UMV/manned vessel operations can significantly reduce the amount of waste generated and disposed of at sea.

A minor counterpoint may be made for UMVs that are irretrievable, which would result in UMVs (with possible onboard hazardous materials, such as diesel oil or lithium batteries) being abandoned at sea and resulting in additional waste. This concern can be downplayed for a few reasons. First, the U.S. Navy does not have an incentive to needlessly abandon UMVs, especially in testing and training. The costs to develop and deploy UMVs, while less than that of manned vessels, could prove to be too high to rely on numerous abandonments (especially given most military UMV use is envisioned to include more advanced technology than that used for disposable sonobuoys, for example). Additionally, because of the communication limitations of UMVs, especially UUVs, much of the intelligence and information collected must be stored onboard the UMV (at least temporarily) until the UMV can effectively transmit the data to a U.S. Navy receiver/operator.[275] Further, many of the military UMVs are designed for intelligence collection and on-board information storage. The U.S. Navy surely wouldn't want UMVs, with their potentially classified technology and information onboard, to end up in the wrong hands.[276] Regarding testing and training military readiness activities, the U.S. Navy has an explicit *disincentive* to abandon UMVs (even those designed or intended to be disposable). The point of testing and training is to learn from UMVs, and the U.S. Navy will therefore want to ensure recovery of UMV systems for performance evaluation. Finally, if the U.S. Navy does plan to design disposable UMVs, technological innovations can spur new materials and components that are either biodegradable or that are made from non-hazardous materials. This

274. Esteban Diaz, *Food Waste Transfer System from Ship Galleys to the Ship Solid Waste Processing Equipment*, U.S. NAVY SMALL BUS. INNOVATION RSCH., https://bit.ly/3URwkWv [https://perma.cc/U7XW-NPPS] (last visited Jan. 20, 2021).

275. *See* TESTING THE WATERS, *supra* note 4, at 5–6.

276. *See, e.g.*, Press Release, U.S. Dep't of Def., Statement by Pentagon Press Secretary Peter Cook on Incident in S. China Sea (Dec. 16, 2016), https://bit.ly/3EaB7MP [https://perma.cc/N34T-ZMKK]; Megan Eckstein, *Navy to Expand Land-Based Testing for Unmanned Vessels, Conduct Offensive Firepower Analysis for USVs*, U.S. NAVAL INST. (Jan. 25, 2021, 2:39 PM), https://bit.ly/3BUYWFE [https://perma.cc/CH2L-QW3G] ("[L]awmakers worried that the vessel could be hacked or physically overtaken by an adversary. . . .").

could have additional far-reaching environmental impacts if such technology is used for systems other than UMVs.

The second major environmental advantage to UMVs is their reduced reliance on traditional fuels. Though some larger USVs are currently designed to partially operate using diesel fuel, many UMVs rely on renewable energy sources, such as solar power, wave energy, and/or buoyancy changes. As a result, there are less risks of oil discharges if more UMVs are used in place of manned vessels, which were the originally contemplated subject of the current [outdated] environmental legal framework for ocean pollution.

B. Environmental Laws and Regulations Only Contemplated Manned Vessels

Most laws and regulations pertaining to the ocean are geared towards (if not strictly apply only to) manned vessels.[277] As a result, many of the legal requirements for manned vessels simply do not apply to UMVs—either practically or intuitively. Many examples are available both internationally and domestically and are reviewed briefly below in the practical implications of applying current "vessel" definitions (and their legal requirements) to UMVs.

1. Manned Lookouts, Mitigation Measures, and Reasonable Alternatives

Domestically, the U.S. Navy's testing and training plans require NEPA-governed EISs and incidental take permits under MMPA and ESA. Many of these permits and the EISs envision or require mitigation measures that the U.S. Navy must take. Indeed, many of the federal cases described above specifically challenged or addressed the mitigation measures NMFS recommended to prevent marine mammal harm. Unfortunately, many of these mitigation measures are based on manned vessels and other practical considerations that cannot apply to UMVs. Manned lookouts and shutting down sonar operations when the U.S. Navy detects nearby marine mammals are two such examples. The court in *NRDC v. Pritzker* explained these mitigation measures succinctly:

> The [ ] Final Rule contains three mitigation measures intended to minimize the impact of this incidental take on marine mammal species, stock, and habitat. First, there is a requirement that the Navy shut down or delay LFA sonar use if it detects a marine

277. TESTING THE WATERS, *supra* note 4, at 6 ("[E]xisting law relevant to armed conflict at sea is primarily built around the concept of a vessel, such as a ship, submarine, landing craft, etc.").

> mammal near a sonar *vessel*. This requirement instructs the Navy to use a combination of human lookouts and a dedicated marine mammal detection system (called the "High Frequency Marine Mammal Monitoring" system) to detect nearby marine mammals. If a marine mammal is detected within two kilometers of an LFA sonar *vessel*, the Navy must delay or suspend sonar transmissions (emphasis added).[278]

The court specifically refers to sonar *vessels* in this case, which leads one to believe that this may only apply to manned vessels rather than being applicable to other sonar-emitting maritime objects such as torpedoes or sonobuoys. But, as with other caselaw, there is no further distinction what maritime objects are encompassed in this "vessels" rule.[279]

Even if UMVs were considered "vessels" in this context, these mitigation measures are not technically feasible. In particular, lookouts and sonar shutdown processes are ineffective in reducing harm to marine mammals for testing and training of UMVs.[280] For one,

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278. Nat. Res. Def. Council, Inc. v. Pritzker, 828 F.3d 1125, 1132 (9th Cir. 2016).

279. Winter v. Nat. Res. Def. Council, Inc., 555 U.S. 7, 15 (2008) lists a number of mitigation measures that were in effect under a Secretary of Defense two-year exemption from MMPA, with nearly all referring to vessels:

> (1) [T]raining *lookouts* and officers to watch for marine mammals; (2) requiring at least five *lookouts* with binoculars on each *vessel* to watch for anomalies on the water surface (including marine mammals); (3) requiring aircraft and sonar operators to report detected marine mammals in the vicinity of the training exercises; (4) requiring reduction of active sonar transmission levels by 6 dB if a marine mammal is detected within 1,000 yards of the bow of the *vessel*, or by 10 dB if detected within 500 yards; (5) requiring complete shutdown of active sonar transmission if a marine mammal is detected within 200 yards of the *vessel*; (6) requiring active sonar to be operated at the "lowest practicable level"; and (7) adopting coordination and reporting procedures (emphasis added).

Id. Though the facts of the case relate to primarily MFA use on manned vessels, there were still other sonar-equipped objects that would be employed in the military readiness activities in both *Winter* and *Pritzker*.

280. Interestingly, many of the aforementioned cases highlight the insufficiency of these required mitigation measures for even manned vessels using sonar. *See, e.g.*, Nat. Res. Def. Council, Inc. v. Gutierrez, No. 07-4771, 2008 U.S. Dist. LEXIS 8744, at *44 (N.D. Cal. 2008).

> These measures are laudable, as far as they go, but plainly limited in their efficacy. Visual monitoring is not very effective even under the best of conditions, particularly for smaller animals who spend long periods under water, much less in rough seas or in the dark. Passive sonar also misses quieter animals. While the active sonar is fairly effective in detecting large whales, it is much less effective in detecting smaller animals, such as fast moving dolphins. Furthermore, none of these measures are designed to detect marine mammals beyond 2 km (1.2 miles) from the LFA source.

Id.

UMVs are not manned, and therefore, cannot accommodate manned lookouts. Secondly, because they are not manned, UMVs are specifically designed to operate in areas that may be more hostile or dangerous to humans, and therefore, even manned vessels that could act as a manned lookout for marine mammals may not be able to (or cannot) operate in the same area as the UMV.[281] Third, due to the aforementioned communication network limitations of UUVs, even if manned lookouts were nearby and available, they may not be able to effectively communicate with the UMV in time to shut down active sonar pulses as required in the mitigation measures. This was noted by the court in *NRDC v. Gutierrez*, responding to the proposed mitigation measure of using passive acoustic gliders (a type of UMV) to detect marine mammals. There, the court stated that "[u]se of external platforms was impractical because of the limited communications with the LFA vessels and the time delay in relaying information."[282]

This case brings into play the interesting proposal by the original plaintiff in *Gutierrez*—the NRDC—who actually argued for increased UMV use as not only a reasonable alternative for sonar-using manned vessels, but as an actual mitigation measure to assist in detecting (and reducing harm to) marine mammals.[283] Final EISs released by the U.S. Navy involving large-scale military readiness opportunities address few reasonable alternatives, typically encompassing all activities within one alternative rather than looking at minutely detailed alternatives, such as using one type of UMV over non-UMVs in a massive training exercise. However, the U.S. Navy should analyze alternatives with and without UMVs, in which there is little doubt the U.S. Navy would prefer the reasonable alternative of UMVs to manned vessels for many of the aforementioned reasons. Because UMVs are a reasonable (if not ideal) alternative to certain manned vessel uses and have smaller environmental impacts, their use should not only be encouraged and expanded, but be treated differently (and more leniently) than manned vessels. Where NEPA or MMPA require mitigation measures to "address the extent to which mitigation measures can be taken to minimize

281. For example, the court in *Gutierrez* noted that one mitigation measure, aerial monitoring for marine mammals, wouldn't work well for LFA sonar use, which is "designed for deep water use which is often, although not always, further from shore. Therefore, any aerial monitoring would be less likely to be available over deep water and could not be easily dispatched from shore." *Id.* at *46.

282. *Id.* at *46–47.

283. *Id.* at *44.

adverse environmental impacts,"[284] it is clear that UMVs should be *the* mitigation measure over manned vessels wherever possible. It would be remiss to not recognize that UMVs, especially those using specific types of active sonar, may still result in harming marine mammals under the MMPA. This Article does not minimize those potentially significant harms but argues that overall environmental maritime impacts of military readiness activities and testing and training involving UMVs, as compared to manned vessels, will be reduced if (and hopefully when) UMVs are fully integrated into the U.S. Navy fleet.

Thus, while some mitigation measures are reasonably applicable to UMVs (such as being programmed to not conduct sonar military readiness operations in particularly high-sensitive biological areas[285] and using passive acoustic monitoring to avoid interactions with marine life[286]), many of the mitigation measures at issue in numerous court cases indicate the need for a unique environmental legal regime for UMVs. The current regulatory regime is practically choking UMV implementation and integration: "To operate within the existing regulatory environment, [UMV] programs must comply with existing policy framework or get policy waivers because policies tailored to unmanned systems are still in development. Regulatory and cultural hurdles must be carefully considered early in system development."[287] Complying with the current framework can stall innovation and development (including that which would reduce environmental impacts) and continue to try to fit the UMV's "square peg" in the manned vessel's "round hole." Waivers, though effective, are typically temporary[288] and do not resolve the long-term legal concerns of fully realizing UMV benefits and incorporation into the fleet. "In this paradigm, technology development and tests will help shape the appropriate requirements, standards, and regulations,"[289] but only if UMV testing and training are adequately supported. Only after tailoring laws and regulations to appropriately support UMVs can the U.S. Navy "create requirements for their systems with a complete set of expectations."[290]

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284. *Id.* at *73. See also SURTASS Incidental Taking, *supra* note 10, at 40,180 for examples of currently implemented mitigation measures for SURTASS-LFA sonar system.

285. Referred to as "Offshore Biologically Important Areas" (OBIAs). Nat. Res. Def. Council, Inc. v. Evans, 364 F. Supp. 2d 1083, 1111 (N.D. Cal. 2003).

286. *See id.*

287. ROADMAP FY2013, *supra* note 268, at 90.

288. For example, the MMPA exemption issued by the Secretary of Defense, mentioned earlier, is only valid for two years. *See* 16 U.S.C. § 1371(f)(2)(B).

289. ROADMAP FY2013, *supra* note 268, at 90.

290. *Id.*

2. *Vessel Obligations in International Law: The Precautionary Principle*

The precautionary principle is commonly used as justification preventing certain actions or activities and has been incorporated in many international environmental law agreements and declarations. As provided in the Rio Convention, "[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[291] Some environmental proponents use the precautionary principle to either prevent the U.S. military from conducting training or other activities, or to challenge the administrative process of planning such activities via NEPA. When viewed individually and as discussed above, some UMVs come with a small amount of environmental harm risk: some of their sensors may cause harm to marine mammals, they may leak small amounts of oil or other hazardous materials in the ocean, and/or they may be abandoned after their useful lifespan and become ocean waste. But this only looks at environmental impacts "in the weeds" and fails to consider the more holistic "tree top" vantage of overall comparative environmental benefits UMVs have to offer. While science and technology are rapidly evolving and not all environmental risks may be known, the U.S. Navy does know the significant benefits—both in the environmental and the national security landscape—UMVs have to offer compared to their manned counterparts. By replacing [some] manned vessels with UMVs in the fleet, the U.S. Navy can actually further the precautionary principle in reducing marine waste and pollution.

C. *Rapidly Changing Technologies and the Impact on Unmanned Maritime Vehicle Development*

Due to rapidly changing technological advancements in the United States and its adversaries, significant environmental legal hurdles can delay testing and development of UMVs, thereby impeding the United States' efforts to stay at the forefront of national security superiority in the ocean environment.[292] The time required for the various NEPA, MMPA, and other permit planning processes can significantly hinder not only the development of UMVs but also defer the retirement of manned vessels that are more damaging to

291. U.N. Conference on Environment and Development, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I), annex I, at 3 (Aug. 12, 1992).

292. *See* Eckstein, *supra* note 14.

the environment. As a result, the U.S. Navy would have to use outdated UMV technology once fully operational in the fleet.

Additionally, though environmental protections are crucial in long-term planning, the U.S. Navy could fall significantly behind other competing armed forces if prevented from quick and practical implementation of new technologies and UMV operation. Other countries' advancements in anti-detection technology exacerbates this lag of UMV technological development. The U.S. Navy has already acknowledged that currently employed technology is insufficient for detecting foreign adversary submarines, such as those from Russia and China.[293]

Further, foreign countries are already reproducing UMV technology that is eerily analogous to that of the United States. For example, satellite imagery confirmed that an unmanned vehicle built in China looks "remarkably similar to the [U.S. Navy's] Sea Hunter in almost every respect."[294] Continued lag in technological advancements due to overly restrictive environmental protections that delay (or are affirmatively used to delay) UMV deployment can put the United States at a precarious disadvantage in the maritime environment.

> Over the last decade, the advancement of unmanned systems technology has exploded, and the extrapolated growth curve hints that by the time of the publication of this document, some unidentified emerging technology or issue will likely emerge to disrupt any path that a traditional strategy might lay out. . . . The rapid advancement in technology development requires DoD to be more agile in developing, standardizing, acquiring, *deploying*, *lawfully operating*, and maintaining the technology (emphasis added).[295]

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293. Gould, *supra* note 214.

> "With the new generation of quiet submarines being fielded by Russia and China, traditional approaches to [anti-submarine warfare] using our submarines or surface ships are becoming less successful," Clark said. "Our ships and submarines have to get too close to the Russian or Chinese submarine to hear them on passive sonar, and ship and submarine active sonars are relatively short range and expose the transmitting platform to detection."

Id.

294. H. I. Sutton, *Chinese Navy Crafts Unmanned Sea Hunter Knock-off*, U.S. NAVAL INST. (Sept. 25, 2020, 11:07 AM), https://bit.ly/3CtkBq5 [https://perma.cc/8LSQ-FKK3] ("While Chinese defense manufacturers have a reputation for copying, this vessel is unusual in the degree to which it appears based on an American design.").

295. ROADMAP FY2017, *supra* note 6, at 4.

But where environmental laws and regulations are used almost frivolously in litigation by environmental groups to prevent the U.S. Navy from testing and training with newer technology, the United States as a whole suffers from both an environmental and national security perspective. One case, *Wisconsin v. Weinberger*,[296] highlights this very real concern. In that case, Wisconsin filed for injunctive relief against the U.S. Navy for upgrading an existing submarine communications facility without filing a supplemental EIS.[297] The U.S. Navy provided affidavits from the Secretary of the Navy and the specific program manager, who stated that the Soviet Union had similar technology and the U.S. Navy would be at a significant military disadvantage if prevented from completing the program.[298] Nonetheless, the trial judge issued an injunction against the U.S. Navy,[299] putting the entire United States submarine force at risk due to lack of a technological advantage.[300] Though the U.S. Navy ultimately prevailed on appeal,[301] the decision of a single trial judge could have ultimately put the United States at a military disadvantage during the Cold War.

To prevent these concerns from becoming reality, the United States at a minimum should exempt various UMV research and development programs from NEPA analysis and MMPA permitting using various national security exemptions. "NEPA cannot be construed to elevate automatically its procedural requirements above all other national considerations."[302] Though the U.S. Navy is currently conducting a great deal of land-based initial testing for UMVs,[303] the best way to determine full capabilities of UMVs is to test them in the maritime environments that they will operate in. U.S. Navy leadership recently stressed to Congress the importance of unhindered testing of UMVs by requesting the U.S. begin "putting unmanned prototypes in the water, learning from them, wrapping lessons learned into acquisition plans for the next round of prototypes, and then eventually moving into acquisition of program of record UUVs and USVs."[304] Without a flexible ability to test new technologies in realistic environments, the U.S. Navy cannot

296. Wisconsin v. Weinberger, 582 F. Supp. 1489 (W.D. Wis. 1984).
297. *Id.* at 1491.
298. *Id.* at 1492.
299. *Id.* at 1497.
300. *Id.* at 1492.
301. *See* Wisconsin v. Weinberger, 745 F.2d 412, 428 (7th Cir. 1984).
302. *Id.* at 425.
303. *See* Eckstein, *supra* note 14.
304. *Id.*

effectively and efficiently integrate UMVs into the fleet for operational use.

Additionally, if the U.S. Navy relies on procuring commercial off-the-shelf UMVs, in particular those with modular designs that offer multiple configuration options depending on the mission and maritime environment, the current legal field is ill-equipped to handle these types of UMVs. For example, an environmental impact analysis would need to account for each and every module that *could* be used with the particular UMV procured.[305] As a result, military readiness planning would be far more complicated and would need to contemplate a larger assortment of technologies just to account for each individual module that could be deployed. Without more carefully crafted legal frameworks to allow faster and more effective UMV development and implementation, the United States will be unable to keep pace with developing threats.[306]

D. International and Environmental Law Concerns if Unmanned Maritime Vehicles Are Not Considered Vessels

Though there are several benefits to treating UMVs differently than traditionally manned vessels under environmental legal analysis, there may be additional implications if UMVs are not considered "vessels" in both environmental and international law. Not only is there a lack of consensus among countries and international legal communities as to how UMVs should be classified, there is no indication that customary international law is forming either. The United States could, and should, be leading the way with developing at least a domestic UMV legal regime that formally and consistently recognizes UMVs as distinct from manned vessels, but which formally recognizes sovereign immunity of UMVs.

The U.S. Navy has begun this process by at least identifying the sovereign immunity of UMVs within the U.S. Navy Commander's Handbook on the Law of Naval Operations, but the U.S. federal government still has not implemented laws or regulations that specifically define UMVs, their unique design and legal applications, or their status in the international community. Without legally identifying UMVs and their status, other countries or international legal entities will do so in the United States' place, thereby excluding U.S. policy and interests from UMV classification development.

305. *See* Showalter, *supra* note 34, at 81 (noting that it is the individual sensor equipment that triggers the application of MMPA, not the UMV itself).

306. *See* U.S. DEP'T OF THE NAVY, STRATEGIC ROADMAP FOR UNMANNED SYSTEMS (SHORT VERSION) 5 (2018). The full-length version of this report is not available to the public.

Though the U.S. Navy claims that customary international law recognizes unmanned vessels "owned or operated by a State" as being entitled to sovereign immunity, it caveats this claim as temporary.[307] UMVs are sovereign, but only as "craft,"[308] not "vessels," and therefore, the U.S. Navy may impliedly not recognize UMVs as having all sovereign immunity rights as vessels. Though the U.S. Navy claims that UMVs enjoy the right of innocent passage,[309] it is unclear what other navigational rights (or exemptions) UMVs may receive without formal recognition.[310] That being said, the U.S. government should be wary to extend too many navigational rights to UMVs, which may limit UMV use via various navigational restrictions.[311]

Additionally, not all states recognize this claim nor agree that customary international law currently exists for UMV sovereign immunity status. Given the United States is at the forefront of developing and implementing UMVs in its naval fleet—especially as compared to other countries—the United States is best primed for leading the way in developing UMV international legal recognition and status in not only international law of the sea principles, but in environmental ones as well.[312]

If UMVs are formally recognized as non-vessels under international law, UMVs would have far more technical design freedom compared to manned vessels. For example, COLREG requirements

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307. COMMANDER'S HANDBOOK, *supra* note 102, § 2.1.

308. *Id.* § 2.3.6.

309. *Id.* § 2.5.2.5.

310. *See generally* Daum, *supra* note 55, at 89–96. The author argues that UMVs do not have a right to innocent passage under UNCLOS.

311. *See* Schmitt, *supra* note 25, at 578.

> If UMSs do enjoy navigational rights, they will be bound by the conditions associated with those rights. For example, during innocent, transit and archipelagic sea lanes passage, a UMS would be required to proceed continuously and expeditiously, and to refrain from any activities other than those incident to its passage, especially the threat or use of force against the coastal State. Innocent passage carries further restrictions—those of most relevance to UMSs include prohibitions on exercises or practice with weapons; the collection of information to the prejudice of the coastal State; acts of propaganda; the launching, landing or taking on board of any military device; research and survey activities; and interference with communications systems, a category that would include underwater communications cables. Furthermore, while UMSs entitled to exercise transit or archipelagic passage would be allowed to do so in their normal mode, which may be submerged for a UUV, during innocent passage all underwater vehicles must be on the surface.

Id.

312. *See id.* at 578 ("The position taken by the United States is likely to encourage other States to follow suit.").

would not apply and UMVs would therefore not require various design aspects that could significantly hamper its operational uses (if not make the operation of a UMV impossible for its designated use), such as lighting and maintaining onboard registration documents.[313] The current gaps in the legal applications of vessel rights and restrictions to UMVs exemplifies why a unique legal scheme is necessary. For example, the lack of "vehicles" or UMVs in UNCLOS Article 236 indicates that unless UMVs are specifically granted unique legal status (or, in the less preferable alternative, considered vessels under UNCLOS), UMVs would be strictly required under international law to abide by all environmental protections—they arguably would not be exempt even if used strictly for military purposes. While environmental protectionists may applaud this outcome, it would severely restrict military use and operation of UMVs in the maritime environment. Nonetheless, due to the international community's more recent focus on precautionary principles, UMVs have a considerable advantage over manned vessels with regard to environmental protections, as previously discussed. Without proper legal status, UMV use would be stifled and therefore frustrate the international community's desire to move toward a precautionary implementation of environmental protections.

One interesting wrinkle previously mentioned is that if UMVs are not considered vessels and do not receive the full range of sovereign immunity or navigational rights under international law, their undesignated status may result in foreign countries using environmental law violations as a pretense for capturing and retaining the UMV as a violation of local environmental laws.[314] As a result, States could enact strict, very tailored environmental protections against "non-vessel water devices" that would allow them to detain a UMV. One example could consist of forbidding unmanned lithium or diesel-powered devices from entering a State's territorial seas under the auspices of pollution control by reducing the risk of hazardous waste dumping.

Within the domestic scope of environmental law, if UMVs are formally classified as non-vessels and receive their own legal status, they would not have nearly as many technical or practical limits as

313. *See generally* Swain, *supra* note 64, at 134–45.

314. *See, e.g.*, Kathy Chen & Keith Wallis, *China to Introduce Tough Emissions Controls for Ships*, REUTERS (Dec. 10, 2015, 3:57 AM), https://reut.rs/3C1oGjL [https://perma.cc/GQH4-WBVF]. Though current laws only apply to merchant ships, the increased use of UMVs could encourage other countries to apply pollution laws to foreign UMVs as well.

manned vessels. Not only that, but a carefully crafted legal scheme would allow lawmakers and agencies to develop tailored rules and regulations that can further UMV development, training, and operation while still ensuring environmental goals are met. For example, while exempting or reducing NEPA requirements solely for UMV use while still requiring [a general, rather than individual] MMPA incidental take permits with Offshore Biologically Important Areas (OBIAs) mitigation method for UMV testing and training, the U.S. Navy would be able to streamline and reduce administrative burdens to speed implementation of UMVs and protect marine mammals where sonar technologies are used. It is simply impractical or impossible to apply current mitigation measures to UMVs where those mitigation measures were designed for manned aircraft, as discussed above. Even if the international community chooses to collectively refer to UMVs as "vessels," the U.S. government can and should differentiate UMVs from vessels in domestic environmental laws and regulations to assist agencies in determining the scope of applicable permitting and NEPA requirements. With more carefully crafted UMV definitions and classifications, the U.S. Navy will have clear guidance as to the legal limits of UMVs.

E. Tension Between Environmental Law and National Security

The United States will need to carefully balance the environmental and national security policy goals of UMV development and use, both domestically and internationally. Part of this balance will be determining how the United States wants UMVs treated in both the short term and long term. For short-term considerations, environmental concerns should cater to the development and testing of UMV technologies, given the environment will benefit in the long term from full implementation and integration of UMVs in the fleet. The international and national security policy considerations are more difficult to discern for UMVs—if UMVs are recognized as vessels and receive full navigation rights, UMVs may be subject to additional restrictions to comply with various international laws (such as COLREGs) while at the same time be exempt from strict international environmental laws if they are considered vessels of the armed forces under UNCLOS or MARPOL.

The U.S. Navy shall "be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea,"[315] and the overarching purpose of environmental protection laws is to "encourage productive and enjoyable harmony between

315. 10 U.S.C. § 8062(a).

man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man."[316] Despite the tension between national security interests and, in particular, protecting marine wildlife, U.S. military services are nonetheless tasked with considering and implementing environmental protections in military operations wherever possible. In each of the cases discussed above involving challenges to the military's readiness activities, the plaintiffs based their challenges more on procedural issues, rather than substantive, environmental protections. In other words, environmental protection groups were only able to litigate NEPA-related deficiencies, such as the lack of alternative analysis or improper basis of scientific studies used during the NEPA process. But, in each example, the U.S. Navy *did* consider and implement environmental protections in its military readiness activities. Though the focus in the U.S. Navy's mission is to train and be equipped in order to respond to combat (which is an inherently destructive action for the environment),[317] it takes pains to abide by all international and domestic environmental legal standards for UMVs,[318] and this should not be overlooked. In fact, the U.S. Navy is the "number one supporter of marine mammal research in the world by far,"[319] which further exemplifies the U.S. military's dedication to long-term protections.

Indeed, one scholar has suggested that environmental protections can complement, rather than interfere with, military readiness and operations:

> [T]his comes back to the *way* the military pursues its ends. A military that consumes less fuel, for example, may be less vulnerable and more resilient to attacks on its supply line . . . a military that has more efficient and sustainable resource use incorporated . . . may have more range and endurance on the battlefield . . . and less cleanup and retrograde of equipment when the mission is complete.[320]

This is especially true for UMVs, where increasing the U.S. Navy's ability to reduce risk to human life and increase its ability to

316. 42 U.S.C. § 4321.

317. *See* Sharon E. Burke, *No Such Thing as a Green War or a Bad Peace*, 45 ENV'T L. REP. 10,770, 10,772 (2015).

318. ROADMAP FY2013, *supra* note 268, at 82 (UMVs "must comply with other rules and regulations, such as . . . environmental restrictions covering the operation of sonars and underwater acoustic instruments").

319. John C. Cruden et al., *The Local Environment at the U.S. Department of Defense*, 43 ENV'T L. REP. 11,057, 11,064 (2013).

320. Burke, *supra* note 317, at 10,772.

conduct anti-submarine warfare perfectly aligns with reducing its environmental footprint by diminishing reliance on manned vessels.

The balancing of national security and environmental protections reflects a constant tension between both interests, an ongoing battle that has tipped the scales back and forth over the last few decades. Ideals of environmental protection must, in the end, bow to national security interests to include training and military readiness activities where necessary, as highlighted in *Winter v. NRDC*. However, a carefully tailored legal regime for UMV testing, development, and implementation can resolve concerns from both sides, effectively meeting changing technological national security issues while furthering environmental protections in the oceans.

CONCLUSION

UMVs are *the* environmentally friendly alternatives to traditionally manned vessels, especially when UMVs can help prevent harm to human life and the environment. As a result, UMVs should be granted more flexibility in both testing and training and, hopefully, eventual deployment with less environmental oversight. This is not to say that they should always be treated more leniently than manned vessels, but at this time, they are the technologically advanced and environmentally superior option, and their use should be encouraged. This also should not limit the U.S. Navy (or others at large) from continuing to improve UMV and other maritime technology simply because UMVs should be favored at this time. Technology is constantly changing and improving, and UMV technology is no different. In particular, the U.S. Navy should continue exploring new or improved detection technology that has less of an impact on marine mammals than currently employed low- and mid-range frequency active sonar, especially since ocean noise is the biggest concern of UMV use among environmental protection groups. But, without more flexibility for using UMVs in military readiness activities, the U.S. Navy will not be able to uncover the true depths of technological UMV capabilities. Nor should a more lenient approach discourage the U.S. Navy from complying with environmental laws and regulations wherever possible. Whether justifying compliance under a "good faith" doctrine or in order to avoid litigation by an environmental protection NGO, the U.S. Navy still has adequate incentives to continue complying UMVs with environmental protections as best as possible.