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"SAV" the Bay: Achieving the Chesapeake Bay Program's Submerged Aquatic Vegetation (SAV) Restoration Goals Through Law

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"SAV" THE BAY: ACHIEVING THE CHESAPEAKE BAY PROGRAM'S SUBMERGED AQUATIC VEGETATION (SAV) RESTORATION GOALS THROUGH LAW

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I. INTRODUCTION

Down the hill, off the old pier behind my grandparents' house, I spent every childhood summer swimming with my sister in a narrow tributary of the Upper Chesapeake off Middle River. I remember apprehensively wading through the creek bed, taking note of the submerged meadows my family described to me as "seaweed." The abundance of these meadows meant I had no choice but to walk through them, where I remember feeling the webs of roots in the sandy substrate under my feet and long leaves brushing past my legs. By the end of the summer, these meadows would grow so dense that they prevented even our small kayaks from reaching the shallower points of the creek.

However, when we could make our way across, we would encounter an abundance of wildlife on that creek: ospreys and herons patrolling the water's edge, ducks and geese dabbling for food below the surface of the water, young blue crabs scuttling under piers, turtles the size of dinner plates basking on logs, and fish, both big and small, darting past our legs with every step through the sand. Many of these charismatic species persist in this tributary today, as do the meadows, and their connection is no coincidence. These meadows create one of the most important yet vulnerable habitats in the entire Chesapeake Bay, and their presence may determine the health of an entire tributary's ecosystem.

Scientists refer to these underwater meadows of various plant species collectively as submerged aquatic vegetation (SAV).[1] Beds of SAV historically existed across over 200,000 acres of the estuary[2]

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1. *See Underwater Grasses*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/issues/whats-at-risk/underwater-grasses [https://perma.cc/5WUT-NH9T].
2. *See* DAVID JASINSKI ET AL., SMALL-SCALE SAV RESTORATION IN CHESAPEAKE BAY 5 (2021),

and, where present, provide countless ecosystem services[3] and abundant habitat for Bay wildlife.[4] Although humans have lived and worked along the waters of the estuary for thousands of years, SAV and the benefits associated with it only became salient in the 1970s when scientists recorded widespread losses.[5] The Chesapeake Bay Program (CBP), a multi-state and federal collaborative agreement, established an intergovernmental SAV Workgroup ("the Workgroup") that continues to address these losses, working to restore the habitat to its historic levels.[6] Today, the Workgroup aspires to restore and maintain 185,000 acres of SAV of the Chesapeake Bay's likely 200,000 acre historic levels,[7] with a benchmark goal of reaching 130,000 acres of SAV in the estuary by 2025.[8] Recent aerial surveys demonstrate that the Bay will not meet this benchmark target, raising concerns for long-term SAV restoration.[9] Given the increasing instability of natural resources in light of climate change, scholars and policymakers seek innovative

https://www.chesapeakebay.net/channel_files/44657/chesapeake_bay_sav_restoration_manual_cbp_sav_wg_online.pdf [https://perma.cc/PQT7-T8BN].

3. Ecosystem services refer to specific ecosystem functions, or "the chemical, physical, and biological interactions associated with ecosystems," with secondary benefits to human society, such as carbon sequestration by submerged aquatic vegetation. *See* Avigdor Abelson et al., *Upgrading Marine Ecosystem Restoration Using Ecological-Social Concepts*, 66 BIOSCIENCE 156, 161 (2016).
4. *See* SAV WORKGROUP, SUBMERGED AQUATIC VEGETATION OUTCOME: MANAGEMENT STRATEGY 2015–2025, v. 4, at 1 (2023) https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/2022-2023-SAV-Management-Strategy_FINAL.pdf [https://perma.cc/H2PH-PDZH] [hereinafter MANAGEMENT STRATEGY].
5. *See* Robert J. Orth & Kenneth A. Moore, *Distribution and Abundance of Submerged Aquatic Vegetation in Chesapeake Bay: An Historical Perspective*, 7 ESTUARIES 531, 533–34 (1984) (describing seminal findings regarding the value of SAV that emerged in the 1970s).
6. *See Our History*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/who/bay-program-history [https://perma.cc/X6EV-2F62].
7. *See Submerged Aquatic Vegetation (SAV)*, CHESAPEAKE PROGRESS, https://www.chesapeakeprogress.com/abundant-life/sav [https://perma.cc/GGY7-LFJ5].
8. CHESAPEAKE BAY PROGRAM, CHESAPEAKE WATERSHED AGREEMENT 6 (2022), https://d18lev1ok5leia.cloudfront.net/chesapeakebay/Chesapeake-Bay-Watershed-Agreement-Amended.pdf [https://perma.cc/SFH9-MHW2].
9. *See* CHESAPEAKE BAY PROGRAM, NARRATIVE ANALYSIS: SUBMERGED AQUATIC VEGETATION 1 (2021), https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/II.b_Submerged_Aquatic_Vegetation_Narrative_Analysis1.pdf [https://perma.cc/4M86-X2M6].

resource management strategies that will preserve invaluable biodiversity and increase resilience to climate change, such as the restoration of buffer habitats like wetlands.[10] However, complex challenges continue to impede the Chesapeake Bay Program's SAV restoration goals, and no legal scholarship to date has sought to address the role of the law in historic and future SAV management efforts in the Chesapeake Bay.

Through an analysis of federal and state law affecting SAV management[11] in the Chesapeake Bay, this comment applies principles from ecosystem management scholarship and presents opportunities for policymakers to improve progress towards these acreage goals by strengthening the laws that protect SAV (referred to as "protective SAV management") and by innovating in the areas of law that govern the restoration of SAV (referred to as "restorative SAV management").[12] Specifically, this comment provides suggestions on how state and local policymakers may use the law to overcome existing technical, political, and organizational barriers to restorative SAV management.[13]

First, this comment discusses the ecology, distribution, historical trends, and administrative governance of SAV in the Chesapeake Bay, and identifies the need for improved legal tools for protective and restorative SAV management.[14] Next, this comment synthesizes major principles from ecosystem management theory[15] and uses them to analyze the federal and state laws that currently govern SAV protection[16] and restoration.[17] Finally, this comment provides suggestions for how state and local policymakers, in collaboration with local resource managers, scientists, and citizen groups, can further progress towards the CBP's Bay-wide SAV acreage goals using existing regulatory frameworks.[18]

10. *See* J. B. Ruhl & Robin Kundis Craig, *4°C*, 106 MINN. L. REV. 191, 232–36 (2021) (discussing the resistance and resilience strategies that motivate modes of climate governance).
11. For the purposes of this comment, "SAV management" refers to the governance ("the means through which collective goals are chosen, decisions are made, and actions are taken to achieve those goals") of SAV habitats over time towards the CBP's restoration goals. *See* Barbara A. Cosens et al., *The Role of Law in Adaptive Governance*, 22 ECOLOGY & SOC'Y 30, 30 (2017).
12. *See infra* Part III.
13. *See infra* Section III.B.
14. *See infra* Part II.
15. *See infra* Part III.
16. *See infra* Sections III.A, III.B, and III.C.
17. *See infra* Section III.B.
18. *See infra* Part IV.

II. SUBMERGED AQUATIC VEGETATION IN THE CHESAPEAKE BAY

Because SAV provides irreplaceable ecosystem functions and services with significant value for coastal resilience to climate change, preserving and enhancing the health of the estuary demands effective SAV management, with the CBP's 185,000 acre goal representing an ideal benchmark.[19] Diverse communities of SAV species can be found across the Bay's salinity regions, but the habitat's characteristic presence in shallow tidal creeks and coves exposes them to compounding pressures from human land use and water-dependent activities.[20] Present management efforts for SAV developed after scientists documented severe losses in the 1970s,[21] but despite some progress, effective SAV management in the twenty-first century remains a major challenge for scientists, managers, and policymakers.

A. Ecology of SAV in the Chesapeake Bay

Submerged aquatic vegetation (SAV) refers to rooted, flowering plant species that have adapted to life completely underwater.[22] Although SAV species frequently grow in marine environments, researchers and scientists use the term "SAV" to distinguish the species that inhabit the Chesapeake Bay's fresh, brackish, and saltier waters from exclusively marine "seagrasses."[23] Despite colloquial references to these estuarine plants as "seaweed," SAV differs greatly from true seaweeds and algae.[24] Unlike their algal neighbors, SAV species evolved from terrestrial plants and therefore possess true roots, vascular systems for nutrient transport, and flowering appendages, which allow them to reproduce using fruits and seeds like their land-dwelling relatives.[25] Large swaths of SAV species, referred to as "beds,"[26] historically existed across the majority of the Chesapeake's shallow water areas.[27]

19. *See infra* Section II.A.
20. *See infra* Section II.B.
21. *See infra* Section II.C.
22. *See* JASINSKI ET AL., *supra* note 2, at 3.
23. *See id.*
24. *See id.*
25. *See id.*
26. The term "SAV bed" refers to an expanse of SAV species growing in a singular area and constituting a continuous habitat. *See* CHESAPEAKE BAY PROGRAM, *supra* note 1.
27. *See* Orth & Moore, *supra* note 5, at 538.

SAV species have been described as keystone species because they characterize critical habitats within the Chesapeake Bay, provide countless ecosystem functions, and affect the productivity and health of the entire estuary.[28] As primary producers, SAV beds provide food for species of all sizes in the Bay, from microscopic plankton and macroinvertebrates like barnacles to the nearly thirty species of migratory ducks and geese that inhabit the Bay.[29] Countless species of anadromous finfish[30] and crustaceans like the blue crab depend on the presence of SAV as a source of physical cover within their habitats in shallow tributaries for spawning purposes and for protection from predation within the dense underwater meadows.[31] In fact, Bay scientists have recorded over thirty times more juvenile blue crabs in Chesapeake tributary waters with SAV beds than in waters without.[32]

SAV beds also provide important ecosystem services through their physical and chemical functions.[33] Within the water column, the plants lock sediment down with their roots and subsequently improve water clarity and prevent shoreline erosion.[34] SAV beds also buffer and dissipate wave energy so as to slow and even halt the erosion of shoreline habitats.[35] The plants also capture and process excess

28. *See* RICHARD A. BATIUK ET AL., CHESAPEAKE BAY SUBMERGED AQUATIC VEGETATION WATER QUALITY AND HABITAT-BASED REQUIREMENTS AND RESTORATION TARGETS: A SECOND TECHNICAL SYNTHESIS 1 (2000), https://archive.chesapeakebay.net/pubs/sav/savreport.pdf [https://perma.cc/9UE9-8265].

29. *See* CHESAPEAKE BAY PROGRAM, *supra* note 1; *see also* Matthew C. Perry & Amy S. Deller, *Review of Factors Affecting the Distribution and Abundance of Waterfowl in Shallow-Water Habitats of Chesapeake Bay*, 19 ESTUARIES 272, 276 (1996) (describing the significant correlation between SAV beds and waterfowl presence in the Chesapeake, emphasizing habitat restoration as the solution to declining waterfowl populations).

30. Anadromous finfish include bony fish species that migrate from deeper, marine waters into the Chesapeake's estuarine and fresh waters to spawn. Examples include the striped bass (commonly known as the rockfish, *Morone saxatilis*), hickory shad (*Alosa mediocris*), and the shortnose sturgeon (*Acipenser brevirostrum*). *See Field Guide: Fish*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/discover/field-guide/critters?fieldGuideType=Fish [https://perma.cc/7FSD-5R7Y].

31. *See* CHESAPEAKE BAY PROGRAM, *supra* note 1.

32. *Id.*

33. *See* BATIUK ET AL., *supra* note 28, at 3.

34. *See id.*; JASINSKI ET AL., *supra* note 2, at 3.

35. *See generally* Daniel J. Nowacki et al., *Spectral Wave Dissipation by Submerged Aquatic Vegetation in a Back-Barrier Estuary*, 62 LIMNOLOGY & OCEANOGRAPHY 736, 751 (2017) (describing the significant wave dissipation observed from SAV beds in Chincoteague Bay, Virginia).

nutrients like nitrogen and phosphorus that, when introduced in large quantities as a result of human agricultural and industrial practices, can lead to harmful algal blooms and spur infamous bay "dead zones."[36] Finally, SAV beds absorb carbon dioxide and generate necessary aquatic oxygen through their photosynthetic processes.[37]

These functions not only solidify the importance of SAV for aquatic species, but also demonstrate the utility of SAV habitats as adaptive tools to build resilience to climate change and ocean acidification.[38] When considering the impact of increased carbon dioxide in the estuary, these ecosystem services make SAV restoration both a necessary restorative process as well as an adaptive process for sequestering "blue carbon."[39]

B. Historic Acreage and Distribution of SAV in the Chesapeake Bay

Scientists estimate that SAV beds likely sprawled across more than 200,000 acres of the Chesapeake Bay's submerged lands prior to human settlement.[40] Since the loss of SAV beds rose to salience in regional management policy in the 1970s,[41] scientists from Maryland and Virginia have used aerial mapping technology to record annual "SAV acreage," or the yearly total amount of acres of the Bay and its

36. *See* JASINSKI ET AL., *supra* note 2, at 6; Luke W. Cole & Karen J. McGlathery, *Nitrogen Fixation in Restored Eelgrass Meadows*, 448 MARINE ECOLOGY PROGRESS SERIES 235, 244 (2012) (describing the capacity of restored SAV beds to fixate nitrogen in the water column).

37. *See* JASINSKI ET AL., *supra* note 2, at 6.

38. *See* MD. DEP'T OF ENV'T, MARYLAND'S PHASE III WATERSHED IMPLEMENTATION PLAN: 2022/2023 MILESTONES 19 (2022), https://mde.maryland.gov/programs/water/TMDL/TMDLImplementation/Documents/Milestones/2022_2023.Maryland.CB.Milestones_2.1.22.pdf [https://perma.cc/5K4P-BZ24] (discussing Maryland's SAV restoration, climate research, and ocean acidification goals); Off. of Habitat Conservation, *Protecting Coastal Blue Carbon Through Habitat Restoration*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (Oct. 25, 2022), https://www.fisheries.noaa.gov/national/habitat-conservation/protecting-coastal-blue-carbon-through-habitat-conservation [https://perma.cc/U4B9-QXK7] (discussing the role of coastal habitats in absorbing and storing carbon dioxide); Jianzhong Su et al., *Chesapeake Bay Acidification Buffered by Spatially Decoupled Carbonate Mineral Cycling*, 13 NATURE GEOSCIENCE 441, 441 (2020) (discussing SAV bed capacity for carbon uptake and reduction of ocean acidification).

39. *See* MD. DEP'T OF THE ENV'T, *supra* note 38.

40. *See* JASINSKI ET AL., *supra* note 2, at 5.

41. *See* Orth & Moore, *supra* note 5, at 532–33 (describing seminal findings regarding the value of SAV that emerged in the 1970s).

tributaries that contain SAV beds.[42] As of 2021, scientists recorded only 68,091 acres of SAV present in the estuary; in 2022, surveys revealed another slight increase to 76,462 acres.[43] While these upward trends bear promise for the future of SAV abundance compared to previous years,[44] the 2022 figure still constitutes just slightly over half of CBP's benchmark target of 130,000 acres by 2025.[45]

Restoration experts identify seventeen SAV species consistently populating these bed habitats in the Chesapeake, noting higher species diversity in the tidal fresh and oligohaline (lower salinity) regions.[46] These regions encompass the mouth of Susquehanna River in Maryland's Cecil and Harford Counties to Kent Island in Queen Anne's County, Maryland.[47] However, SAV presence across the Chesapeake Bay has significantly decreased since the arrival of European colonists in the early 1600s.[48] Paleoecologists have uncovered fossil seed distributions that reflect much more widespread and diverse populations of SAV within the estuary prior to colonization, supporting the theory that significant and consistent declines in SAV followed the increases in population density and

42. *See Submerged Aquatic Vegetation (SAV)*, *supra* note 7.

43. *Id.*

44. 2021's acreage record represented a 9% increase from 2020's acreage record. *See* Chesapeake Bay Program, *Chesapeake Bay Program Notes Slight Increase in Underwater Grass Abundance*, THE BAYNET (July 21, 2022), https://thebaynet.com/chesapeake-bay-program-notes-slight-increase-in-underwater-grass-abundance/ [https://perma.cc/R9TZ-EGUF].

45. *See id.*

46. Although as many as nineteen species may be found within the Chesapeake Bay, restoration experts outline seventeen of most common native and introduced* SAV species present within the Chesapeake Bay. These, from fresher to saltier distribution, include water starwort (*Callitreche spp.*), water stargrass (*Heteranthera dubia*), hornwort (*Ceratophyllum demersum*), Canadian waterweed (*Elodea canadensis*), hydrilla* (*Hydrilla verticillata*), naiads (*Najas spp.*), curly pondweed* (*Potamogeton crispus*), wild celery (*Vallisneria americana*), Eurasian watermilfoil* (*Myriophyllum spciatum*), horned pondweed (*Zannichellia palustris*), redhead grass (*Potamogeton perfoliatus*), sago pondweed (*Potamogeton pectinatus*), widgeon grass (*Ruppia maritima*), and eelgrass (*Zostera marina*). *See* JASINSKI ET AL., *supra* note 2, at 5; *Field Guide: Submerged Aquatic Vegetation*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/discover/field-guide/critters?s=&fieldGuideType=Submerged+Aquatic+Vegetation [https://perma.cc/7P6D-9EQ5].

47. *See* JASINSKI ET AL., *supra* note 2, at 4–5.

48. *See* Grace S. Brush & William B. Hilgartner, *Paleoecology of Submerged Macrophytes in the Upper Chesapeake Bay*, 70 ECOLOGICAL MONOGRAPHS 645, 647, 663 (2000).

deforestation since colonization.[49] Since the 1960s, data consistently reflects and documents a decline in SAV[50] and scientists identify two key anthropogenic pressures as the primary causes of SAV loss.[51] First, influxes of sediment in tidal waters represent the primary stressor to SAV beds.[52] Deforestation and shoreline development loosen sediment from adjacent land, causing it to flow into nearby tidal creeks and coves where it impairs water clarity and inhibits SAV growth by blocking the sunlight necessary for photosynthesis.[53] Second, excess nutrient runoff, most often nitrogen and phosphorus utilized in agricultural practices, inhibits SAV growth when influxes of these organic materials drive widespread algal blooms and similarly limit sunlight.[54]

C. Administrative Responses to SAV Losses

CBP established the SAV Workgroup in 1976 to provide technical expertise to natural resource managers working to implement SAV restoration and protection at the state and regional levels.[55] The Workgroup, currently chaired by the Maryland Department of Natural Resources (DNR), now facilitates collaboration across state, federal, and nongovernmental stakeholder groups like the Virginia Department of Environmental Quality (DEQ), the Virginia Institute of Marine Science (VIMS), the U.S. Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA), among others.[56]

The Workgroup serves as space for the primary governing entities affecting SAV in the Chesapeake Bay to convene and share data and

49. *See id.* at 663.
50. *See* BATIUK ET AL., *supra* note 28, at iii.
51. *See* U.S. ENV'T PROT. AGENCY, REPORT ON THE ENVIRONMENT: SUBMERGED AQUATIC VEGETATION IN CHESAPEAKE BAY 1 (2021), https://cfpub.epa.gov/roe/indicator.cfm?i=42 [https://perma.cc/29SE-N9J3].
52. *See id.*
53. *See id.*
54. *See id.*
55. The CBP first included SAV restoration as a policy goal in its 1987 Chesapeake Bay Agreement and incorporated its first numeric SAV acreage goals in 2000. *See* CHESAPEAKE BAY PROGRAM, *supra* note 6; CHESAPEAKE BAY PROGRAM, CHESAPEAKE 2000 AGREEMENT 4 (June 28, 2000), http://www.chesapeakebay.net/content/publications/cbp_12081.pdf [https://perma.cc/D3YD-KTQH] (describing first SAV acreage goal of 114,000 acres across the estuary).
56. MANAGEMENT STRATEGY, *supra* note 4, at 3–4.

management strategies;[57] it represents one of the most comprehensive SAV monitoring groups in the world.[58] The Workgroup has identified a "Submerged Aquatic Vegetation (SAV) Outcome" as a means to achieve the CBP's "Vital Habitats Goal" of "restor[ing], enhanc[ing] and protect[ing] a network of land and water habitats to support fish and wildlife, and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed."[59] This Outcome will "[s]ustain and increase the habitat benefits of SAV . . . in the Chesapeake Bay" by "[a]chiev[ing] and sustain[ing] the ultimate outcome of 185,000 acres of SAV Bay-wide."[60] To reach this Outcome, the Workgroup set a benchmark goal of 130,000 recorded acres of SAV in the Bay by 2025, but still remains largely off track from doing so.[61]

In its most recent report, the SAV Workgroup identifies both the protection of existing SAV beds from anthropogenic pressures and the restoration and replacement of lost SAV beds as the two management approaches necessary to achieve the SAV outcome.[62] Due to the habitat's characteristic presence in tidal creeks adjacent to coastal lands,[63] such necessary protective and restorative SAV management practices must occur at the nexus of various legal and regulatory schemes and at various levels of government.[64] The three broad areas of law most directly affecting SAV include water quality regulation, submerged lands and dredging regulation, and fisheries regulation.[65] As a result, effective SAV management towards CBP acreage goals will require policymakers and resource managers to

57. *See id.* at 11.
58. *Id.*
59. *Id.* at 2.
60. *Id.*
61. *See id.*; *see also Submerged Aquatic Vegetation (SAV)*, *supra* note 7.
62. *See* MANAGEMENT STRATEGY, *supra* note 4, at 9–10.
63. *See* JASINSKI ET AL., *supra* note 2, at 5.
64. For a summary of the laws and regulations affecting SAV in the Chesapeake Bay watershed, including summaries of the District of Columbia and Delaware's few SAV laws, the author highly recommends the seminal report published by the Chesapeake Legal Alliance and incorporated by the CBP SAV Workgroup. *See* CHESAPEAKE LEGAL ALL., EXISTING CHESAPEAKE BAY WATERSHED STATUTES AND REGULATIONS AFFECTING SUBMERGED AQUATIC VEGETATION (2019), https://www.chesapeakelegal.org/guides-resources/report-existing-chesapeake-bay-watershed-statutes-and-regulations-affecting-submerged-aquatic-vegetation/ [https://perma.cc/SL4E-N8MN]. In accordance with the most recent SAV Workgroup management strategy, this comment seeks to supplement this report towards the management goal of making "recommendations . . . in the regulatory review where feasible." MANAGEMENT STRATEGY, *supra* note 4, at 11.
65. *See* U.S. ENV'T PROT. AGENCY, *supra* note 51.

utilize various areas of law and to further coordination across levels of government. This comment describes the role that different federal, state, and local laws currently play in the protective and restorative management of SAV in the Chesapeake Bay, and, through an analysis of Maryland law,[66] provides policy recommendations for managers and policymakers at all levels of government to improve progress towards SAV restoration goals.[67]

III. THE ROLE OF LAW IN SAV MANAGEMENT

Law shapes the governance of SAV beds in the Chesapeake Bay and can therefore improve or impair the achievement of CBP SAV acreage goals; accordingly, it is necessary to understand how law, at various levels of government, currently affects SAV management practices.[68] Principles from ecosystem management theory provide useful lenses for analyzing these laws, clarifying the key actors in these complex, overlapping regulatory schemes, and illuminating opportunities to modify and improve laws to achieve Bay-wide SAV restoration goals.[69] Specifically, this analysis reveals that federal and state policymakers can improve progress toward SAV acreage goals by strengthening and expanding specific regulations of the Clean Water Act (CWA) Sections 402[70] and 404,[71] as well as Maryland's state fisheries laws[72] that protect existing SAV beds. Moreover, this analysis highlights gaps in the law where state and local policymakers can further actualize an adaptive, systems-based approach to SAV management by using the law to address existing technical, political, and organizational barriers to restorative practices like SAV replanting.[73]

66. Maryland's tidal waters in the Chesapeake Bay and adjoining tributaries account for a large amount of the Bay's oligohaline and mesohaline tidal regions, which contain much of SAV habitats found growing in the Bay. *See* JASINSKI ET AL., *supra* note 2, at 8. Accordingly, this comment specifically focuses on the state laws of Maryland but recognizes that effective SAV management will need to transcend jurisdictional boundaries. Accordingly, the author hopes that this analytical framework could be applied to parallel jurisdictions like Virginia and Delaware in future research.
67. *See infra* Part III.
68. *See infra* Section III.A.
69. *See infra* Section III.A.
70. *See infra* Section III.B.1.
71. *See infra* Section III.B.2.
72. *See infra* Section III.B.3.
73. *See infra* Section III.C.

A. Ecosystem Management Principles for SAV Management

Ecosystem management theorists posit three broad principles that provide useful lenses for discerning the role of the law in successful SAV management. These principles emphasize achieving: (1) a systems-based approach to governance; (2) adaptivity; and (3) collaboration between four key actor-groups.[74]

As opposed to traditional natural resource management, which often pursues the conservation of a single target resource through implementation of regulation (i.e., imposing catch limits on a specific fish sought by a commercial fishery),[75] ecosystem management pursues "ecosystem integrity over the long term"[76] through a systems-based approach, and instead presents an interconnected system of resources as the appropriate target of management practices.[77]

In addition to reframing the focus and scale of management practices, ecosystem management demands adaptivity in governance, or a "reject[ion] [of] decision making based on rigid standards and comprehensive rational planning, relying instead on experimentation using continuous monitoring, assessment, and recalibration."[78] Ecosystem management's focus on adaptivity elevates the theory's utility in light of climate change because drastically changing atmospheric conditions will demand natural resource management practices that can constantly readjust and recalibrate.[79]

Finally, ecosystem management's systems-focused, adaptive management describes the targeted coordination of four specific actor-groups as a means to its implementation; these include scientists, policymakers, natural resource managers, and citizens.[80]

74. *See* R. Edward Grumbine, *What is Ecosystem Management?*, 8 CONSERVATION BIOLOGY 27, 27, 29 (1994).

75. *See* Howard S. Schiffman, *Moving From Single-Species Management to Ecosystem Management in Regional Fisheries Management Organizations*, 13 ILSA J. INT'L & COMPAR. L. 387, 387–88 (2007).

76. Mary Jane Angelo & J. W. Glass, *Integrated Estuary Governance*, 45 WM. & MARY ENV'T. L. & POL'Y REV. 455, 478 (2021) (describing the evolution and application of ecosystem management to various ecosystem settings).

77. *See* Grumbine, *supra* note 74, at 27, 29.

78. J.B. Ruhl, *General Design Principles for Resilience and Adaptive Capacity in Legal Systems – with Applications to Climate Change Adaptation*, 89 N.C. L. REV. 1373, 1390 (2011). Due to their similar origins and largely overlapping principles, the concepts of "ecosystem management" and "adaptive management" are used interchangeably by some scholars. *See id.*

79. *See id.*

80. *See* Grumbine, *supra* note 74, at 32; Norman L. Christensen et al., *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem*

These actor-groups exist across federal, state, and local government, and, due to the cross-jurisdictional nature of the Chesapeake Bay, actor-groups at all levels of government must be involved in the management of SAV in this estuary.[81]

These principles provide a rubric for analyzing current laws affecting SAV management and provide particular value for understanding the management challenges associated with habitats like SAV beds that sprawl and defy jurisdictional vacuums.[82] Successful SAV management towards the CBP's restoration goals will require cross-governmental collaboration and the coordination of these four actor-groups at the federal, state, and local levels.[83] Take, for example, the existing SAV Workgroup: this body consists primarily of scientists and managers and incorporates these aforementioned ecosystem management principles of adaptivity in its work.[84] However, the Workgroup alone cannot effectively manage SAV goals under this framework and depends on effective channels of collaboration with policymakers and citizens to achieve its management goals.[85] Policymakers bear the onus of incorporating the technical findings of scientists and managers into the laws that shape, alter, and prevent human activities related to these target habitats.[86] To reach the CBP's Bay-wide SAV acreage goals, federal, state, and local policymakers will need to strengthen and better intertwine the various laws that currently shape SAV management.[87]

B. Policymakers Can Improve Protective SAV Management Through Revisions and Innovations in Federal and State Law

Water quality determines the prevalence and success of SAV growth and restoration projects;[88] therefore, an analysis of law affecting SAV management must consider state and federal water

Management, 6 ECOLOGICAL APPLICATIONS 665, 680 (1996) (discussing the necessity for managers to accept scientific community input to actualize ecosystem management).

81. *See infra* Section III.B.
82. *See* Christensen et al., *supra* note 80, at 683.
83. *See supra* note 80 and accompanying text.
84. *See* MANAGEMENT STRATEGY, *supra* note 4, at 11 (discussing adaptive management approaches implemented by the Workgroup).
85. *See supra* note 78.
86. *See* Grumbine, *supra* note 74, at 32.
87. *See infra* Sections III.B, III.C.
88. MANAGEMENT STRATEGY, *supra* note 4, at 5.

quality regulations.[89] The federal Clean Water Act (CWA) and Maryland's statutes implementing its water quality programs constitute the primary regulatory frameworks that shape the limited legal considerations for SAV protection in the Chesapeake Bay.[90] However, state fisheries management laws also provide considerations for SAV management and fall under this analysis, accordingly.[91]

Ecosystem management theory highlights policymakers and managers from the agencies with regulatory authority under these laws as those with the capacity to change and further improve management practices.[92] Specifically, these agencies include: (1) the Environmental Protection Agency (EPA), which maintains authority to approve or modify water quality standards set by states under the CWA's Section 402 National Pollutant Discharge Elimination System (NPDES) permit program across the country;[93] (2) the Maryland Department of the Environment (MDE), which possesses primary authority to issue and enforce NPDES permits in Maryland;[94] (3) the Army Corps of Engineers (the Corps), which reviews proposed dredging or water-dependent construction projects affecting SAV in consultation with the National Oceanic and Atmospheric Administration (NOAA) and issues regulations and permits for the dredging or filling of jurisdictional waters under the CWA's Section 404 program;[95] and (4) the Maryland Department of Natural Resources (DNR), which governs and issues permits related to SAV mowing, fisheries practices, and SAV protection zones in Maryland.[96]

89. *See generally* CHESAPEAKE LEGAL ALL., *supra* note 64 (comparing state and federal treatment of SAV management).

90. *See* 33 U.S.C. § 1311; MD. CODE ANN., ENV'T § 9-301 (West 2023).

91. *See infra* Section III.B.3.

92. *See* Grumbine, *supra* note 74, at 33.

93. 33 U.S.C. § 1314(b) (delegating the EPA, through its Administrator, the authority to set effluent limitations for NPDES in consultation with the states).

94. MD. CODE ANN., ENV'T § 9-302(c)(1) (West 2023) (requiring MDE to carry out the state's policy on water pollution control).

95. 33 U.S.C. § 1344(e) (delegating the Corps the authority to issue permits for discharges of dredged or fill material); *Why is Submerged Aquatic Vegetation Designated as Essential Fish Habitat?*, NOAA FISHERIES, https://www.fisheries.noaa.gov/southeast/habitat-conservation/why-submerged-aquatic-vegetation-designated-essential-fish-habitat [https://perma.cc/CF76-CUXQ] (describing NOAA's role in SAV management under the Magnuson-Stevens Fishery Conservation and Management Act).

96. MD. CODE ANN., NAT. RES. § 4-203 (West 2023) (transferring rights, powers, duties, and obligations related to fisheries management in the state to DNR); *Id.* at § 4-213 (describing requirements for SAV removal and mowing for navigational purposes).

1. Strengthening Protective SAV Management Under the Clean Water Act, Section 402

The EPA and MDE implement NPDES permits under CWA Section 402[97] and therefore both agencies shape the protection of SAV in the Chesapeake. Congress enacted the CWA to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters"[98] and, through Section 301(a), prohibited any unauthorized discharge of pollutants into the waters of the United States unless in accordance with Section 402's NPDES permitting program or other provisions of the Act.[99] Maryland applied for and received authority to implement NDPES permits within its borders in 1974, and Congress recodified Maryland's authority in 1989.[100]

Under the Section 402 permitting framework, state authorities like MDE set "technology-based effluent limitations," which consist of numeric limitations on how much, if any, of various pollutants permitholders may legally discharge.[101] State authorities determine these numeric limitations based on "water quality standards," or criteria the states develop based on waterbody uses and goals, which the EPA reviews and approves for specific waterbodies.[102] This process involves a designation of use for a body of water (i.e. drinking water, swimming and recreation, fishing), "water quality criteria" for each designated use (including numeric maxima for pollutants and narrative goals), and a general antidegradation policy.[103] Once the EPA approves these water quality standards, states work to meet the water quality goals by adjusting the stringency of Section 402 NPDES permits to control point sources and by coordinating regional programs like total maximum daily loads (TMDLs) to control nonpoint source, or runoff, pollution.[104] Regular monitoring and assessment of compliance with permit

97. *See* 33 U.S.C. § 1312.
98. *Id.* § 1251(a).
99. *See id.* § 1311(h).
100. *See generally* MEMORANDUM OF AGREEMENT BETWEEN EPA AND STATE OF MARYLAND (1989), https://www.epa.gov/sites/default/files/2013-09/documents/md-npdes-moa.pdf [https://perma.cc/R69A-H6JD] (detailing the Maryland NPDES permit issuing authority).
101. *Cf.* 33 U.S.C. §§ 1311–1330 *and* MD. CODE ANN., ENV'T §§ 9-322–9-333 (West 2023) (showing Maryland's water pollution control provisions align with federal water pollution control provisions).
102. 33 U.S.C. § 1313(a), (c).
103. *Id.* § 1313(c)–(d).
104. *Id.* §§ 1312(a), 1313(d).

limitations allows states to measure progress towards these water quality standards.[105]

Due to the demonstrated relationship between runoff pollution (containing sediment and excess nutrients) and SAV abundance, managers implementing TMDLs and scientists monitoring compliance with NPDES permits can significantly impact the success of SAV presence and restoration.[106] SAV protection requires stringent reduction of pollution through runoff and point sources, and, therefore, the regulators must consider these habitats when making water quality criteria decisions that translate to NPDES permit terms and TMDL implementation.[107]

MDE has provided specific consideration for SAV beds by creating a designated use class for waters that are in "[s]upport of [e]stuarine and [m]arine [a]quatic [l]ife and [s]hellfish [h]arvesting."[108] Within this designated use class, "tidal freshwaters" and the "low salinity waters" of the Chesapeake Bay that "have the potential for or are supporting the survival, growth, and propagation of rooted, underwater bay grasses in tidally influenced waters from April 1 to October 1" receive specific water quality criteria.[109] These criteria include comparatively more stringent narrative water clarity criteria and incorporate the CBP SAV restoration acreage goals by region.[110]

These regulations reflect principles of ecosystem management by directly considering habitats like SAV in the hopes of preserving the systemic integrity of aquatic resources.[111] At the same time, effective implementation requires the incorporation of scientists, managers, policymakers, and citizens; in other words, these regulations will only result in improved progress towards SAV restoration goals when all four actors play their requisite roles.[112] Considering these actors in the ecosystem management framework, two specific gaps

105. *See* MD. DEP'T OF THE ENV'T, MARYLAND'S FINAL COMBINED 2020-2022 INTEGRATED REPORT OF SURFACE WATER QUALITY 44 (2022), https://mde.maryland.gov/programs/water/TMDL/Integrated303dReports/Documents/Integrated_Report_Section_PDFs/IR_2020_2022/MD_Combined2020_2022_Final_Approved_Integrated_Report_2_25_22.pdf [https://perma.cc/F8NL-U4HN].

106. *See* U.S. ENV'T PROT. AGENCY, *supra* note 51; MANAGEMENT STRATEGY, *supra* note 4, at 7 (attributing recent increases in SAV acreage to Bay TMDL success).

107. *See* MANAGEMENT STRATEGY, *supra* note 4, at 7.

108. MD. CODE REGS. § 26.08.02.02(B)(3) (2023).

109. *Id.* § 26.08.02.02-1(D).

110. *See id.* § 26.08.02.03-3(C)(9).

111. *See* Grumbine, *supra* note 74, at 29.

112. *See supra* note 80 and accompanying text.

left in the law become apparent,[113] and through their remedy, progress towards SAV acreage protection will accelerate.

First, in accordance with the principle of adaptivity, which requires managers and scientists to frequently monitor, reassess, and reinform decisions like water quality criteria,[114] state policymakers can ensure that water quality monitoring receives adequate funding across the state.[115] Recent reports exhibit how MDE has begun to rely more on monitoring data provided by nongovernmental and volunteer organizations to supplement its own water quality reporting.[116] Additionally, nearly 140 square miles of the state's 675 square miles of waters that have been classified under the SAV designated use remain insufficiently monitored.[117] Increased funding and support for technical agencies like MDE could lead to more widespread reporting, tracking, and monitoring of estuarine waters where SAV restoration needs to occur to meet acreage goals.[118] Advocates have pushed Maryland policymakers on this issue in recent years, and continued pressure to increase staffing and funding for environmental inspections in the state could increase the adaptive capacity of protective SAV management in the Upper Bay by increasing the quantity and quality of monitoring efforts.[119]

Second, regulations to increase protections for SAV should expand the consideration of economic impact to include ecosystem service values.[120] Ecosystem management scholars have argued that restoration efforts targeting intertidal ecosystems should be informed by "social-ecological elements rather than solely on ecological-restoration ones" due to the dependence of coastal communities on these resources.[121] Because "[t]he overexploitation of marine

113. *See infra* notes 114–24 and accompanying text.
114. Ruhl, *supra* note 78, at 1389–90.
115. MDE receives most of its annual budget from state general and special allocated funds. *See Department of the Environment: Budget*, MD. STATE ARCHIVES ONLINE, https://msa.maryland.gov/msa/mdmanual/14doe/html/doeb.html [https://perma.cc/U76S-CUGK].
116. *See* MD. DEP'T OF ENV'T, *supra* note 105, at 73.
117. *Id.* at 63.
118. *See id.*
119. Bay Journal, *New Leadership in Chesapeake Bay States Raises Hopes for Action in 2023*, MD. MATTERS (Jan. 12, 2023), https://www.marylandmatters.org/2023/01/12/new-leadership-in-chesapeake-bay-states-raises-hopes-for-action-in-2023/?eType=EmailBlastContent&eId=9481db99-f3dc-46ed-817a-5218eef52492 [https://perma.cc/J3YK-D94E].
120. *See* Abelson et al., *supra* note 3, at 158, 161.
121. *Id.* at 159.

ecosystems and natural resources can degrade life-supporting systems" and "dramatically influence the quality of life and well-being of associated communities," ecosystem management scholars argue that policymakers and managers must ground efforts to restore these ecosystems in social and economic benefit targets as well as purely ecological targets.[122] Taking this principle one step further, consider Maryland's Administrative Procedure Act (APA), which requires that regulations proposed by agencies like MDE include a statement of "estimated economic impact" related to state and local government expenditures, consumers, and industry groups.[123] Given the demonstrated value of SAV habitats for climate adaptation and estuary productivity, traditional economic impacts of more protective or stringent regulations could be balanced against the significant social and economic values provided by the presence of SAV communities.[124]

2. Improving Protective SAV Management Under Clean Water Act, Section 404

While point and nonpoint pollution sources greatly impact water quality and determine the health of SAV beds, dredging and filling activities threaten to permanently eliminate SAV beds by altering the topography of the Bay's submerged lands.[125] Accordingly, CWA Section 404 prohibits any unauthorized discharge of dredged or fill material into the navigable waters of the United States.[126] This section applies more narrowly than Section 402, only preventing the

122. *Id.* at 159–60 (discussing seagrass restoration projects in light of eutrophication).

123. MD. CODE ANN., STATE GOV'T § 10-112(a)(3)(i) (West 2023).

124. *See* Abelson et al., *supra* note 3, at 158, 161.

125. *See* 40 C.F.R. § 230.43(b) (2022) (describing the potential for "discharge[s] of dredged or fill materials [to] smother vegetation").

126. 33 U.S.C. § 1344. The Supreme Court's 2023 decision in *Sackett v. Env't Prot. Agency* (*Sackett II*) narrowed the definition of "waters of the United States" to include only those with "continuous surface connection[s]" to traditionally navigable waters like rivers, streams, and creeks. Sackett v. EPA, 598 U.S. 651, 684 (2023). While this misguided decision bears significant consequences for the preservation and management of more isolated, non-tidal wetland habitats and climate adaptation through aquatic resources more broadly, the management of SAV in tidal creeks of the Chesapeake Bay will likely remain unchanged from this narrowing decision due to the continuous connections with navigable waters where SAV persists.

discharge of dredged materials[127] and materials used for filling and altering submerged landscapes[128] into jurisdictional waters.[129]

In Maryland, the Corps administers permits for the dredging and discharging of fill material in conjunction with MDE and NOAA.[130] Both the Corps and MDE have incorporated specific protections for SAV beds into the review process for proposed dredging and filling activities.[131] Furthermore, dredging projects affecting tidal habitats to certain fisheries require review and consideration from NOAA.[132] Federal regulations include an assumption of practicable alternatives for proposed dredging and filling activities deemed non-water dependent but which still impact special aquatic sites.[133] For example, the Corps regulations regard "vegetated shallows" as "special aquatic sites," providing a precautionary approach to destructive dredging and discharging activities in areas populated by SAV.[134] Sites that receive this distinction attach a presumption of practicable alternatives to dredging and filling activities, meaning that the Corps assumes better sites exist for the proposed dredging and filling activity.[135] This approach provides unique and targeted protections for SAV bed habitats by placing the burden on applicants seeking to dredge or discharge fill material to demonstrate the necessity of the site for their specific activities.[136] However, this specific presumption does not apply to water-dependent activities,

127. These include "material that is excavated or dredged from waters of the United States." 33 C.F.R. § 323.2(c) (2022).
128. "Fill material" includes any "material placed in waters of the United States where the material has the effect of (i) [r]eplacing any portion of a water of the United States with dry land; or (ii) [c]hanging the bottom elevation of any portion of a water of the United States." *Id.*§ 323.2(e)(1).
129. *Id.*§ 323.2(a) (describing 404's applicability to strictly "waters of the United States").
130. *See* 33 U.S.C. § 1344(t) (granting states the authority to cooperatively regulate dredging and filling in their jurisdictional waters); *see also* MD. CODE ANN., ENV'T § 16-101 (West 2023) (granting MDE the authority to issue dredge and fill permits and regulations).
131. *See, e.g.*, 40 C.F.R. § 230.43(a) (2022); MD. CODE REGS. § 26.24.03.05(D)(7) (2023) (describing policies of reducing and minimizing harm to waters where submerged aquatic vegetation is present).
132. 16 U.S.C. § 1853(a)(7).
133. 40 C.F.R. § 230.10(a)(3).
134. *Id.* § 230.43(a).
135. *Id.* § 230.10(a)(3).
136. *See id.*

and therefore leaves a lower bar for the protection of SAV beds against dredging and filling activities that require water access.[137]

Similarly, MDE's regulations for dredging and filling activities in the state include protections for SAV.[138] Applicants seeking to dredge or maintain previously dredged structures (with the exception of "emergency" activities[139]) must submit information regarding the presence of SAV in potential sites.[140] Any disposal of dredged or fill materials into the open waters of the state must minimize "adverse impacts on vegetated tidal wetlands, submerged aquatic vegetation, charted natural oyster bars, and anadromous fish spawning and nursery grounds."[141]

Although the existing regulations contain protections for existing SAV beds, two improvements could result in more systems-based benefits and adaptivity. First, to preserve the system-wide benefits of SAV, the Corps could expand the federal rule for the presumption of alternatives for vegetated shallows to apply to water-dependent activities.[142] Broadening this presumption of alternatives to include any project proposing to dredge or fill where vegetated shallows persist could prevent water-dependent activities from lawfully damaging SAV beds that would otherwise receive protection from non-water dependent dredging activities.[143]

Second, in accordance with the principle of adaptivity, mitigation requirements for lost SAV beds could be increased and targeted using models proposed by other states.[144] Ecosystem management, specifically iterations of the principles of adaptive management,[145] involves disincentivizing maladaptive behaviors and incentivizing

137. *Cf.* James City Cnty. v. EPA, 758 F. Supp. 348, 351–52 (E.D. Va. 1990), *rev'd*, 12 F.3d 1330 (4th Cir. 1993) (explaining that the presumption of alternatives only applies to projects that are not water-dependent).

138. *See* MD. CODE REGS. § 26.24.03.02(A)(4) (2023) (describing the requirement of SAV maps for all dredging activities); *id.* § 26.24.03.01(A)(7) (describing that requirement that maintenance dredging, unless approved as emergency dredging, must include SAV maps as well).

139. *See id.* § 26.24.03.02(A)(4) (describing the requirement of SAV maps for all dredging activities); *id.* § 26.24.03.01(A)(7) (describing that requirement that maintenance dredging, unless approved as emergency dredging, must include SAV maps as well).

140. *Id.* § 26.24.03.02(A)(4).

141. *Id.* § 26.24.03.05(D)(7).

142. *See James City Cnty.*, 758 F. Supp. At 351–52.

143. *See* 40 C.F.R. § 230.10(a)(3) (2022).

144. *See* H.R. 349, 2022 Leg., Reg. Sess. (Fla. 2022) (describing proposed Florida legislation from 2022 that would have established mitigation banks specifically for seagrass restoration projects).

145. *See* Ruhl, *supra* note 78.

adaptive behaviors.[146] Because SAV habitats increase coastal resilience to climate change,[147] management efforts should seek to incentivize SAV-restorative activities as a means to increasing socio-ecological resilience. This means finding ways to incentivize restorative practices and working to disincentivize and minimize destructive activities.[148] Improved mitigation requirements, or increasing the amount of damaged habitat permittees must legally restore under permit requirements, represent avenues through which policymakers can incentivize and even mandate the restoration of SAV beds. For example, MDE's existing mitigation policy requires the restoration of forested tidal wetlands, emergent tidal wetlands, and scrub-shrub tidal wetlands on a two to one ratio, while open water tidal wetlands must only be mitigated on a one-to-one ratio.[149]

In addition to policymakers at MDE increasing mitigation ratios or providing specific, more stringent requirements for losses to tidal wetlands containing SAV,[150] state policymakers could also consider mitigation banking authority for MDE to streamline SAV restoration practices.[151] Mitigation banking, if enacted along with additional protective measures,[152] could allow scientists and restoration experts

146. Robin Kundis Craig, *"Stationarity is Dead" – Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENV'T L. REV. 9, 48 (2010).

147. *See supra* Section II.A.

148. Craig, *supra* note 146, at 48.

149. *Tidal Wetland Mitigation Overview*, MD. DEP'T OF ENV'T, https://mde.maryland.gov/programs/water/WetlandsandWaterways/AboutWetlands/Pages/tidalmitigation.aspx [https://perma.cc/BS3U-7MJB?type=image].

150. MDE requires mitigation at a ratio of three-to-one for tidal wetlands that serve as "habitat for rare, threatened, or endangered species, or species in need of conservation." *Id.* SAV could be added to this specific list, or a similar carve-out could be established for tidal wetlands containing certain amounts or species of SAV. *See id.*

151. *See* Althea S. Hotaling et al., *Comprehensive Seagrass Restoration Planning in Southwest Florida: Science, Law and Management*, SEA GRANT L. & POL'Y J., Summer 2011, at 76 (describing proposed legislation to create mitigation banks for seagrass in southwest Florida); *see also* H.R. 349, 2022 Leg., Reg. Sess. (Fla. 2022) (proposed legislation from 2022 that would have established mitigation banks specifically for Florida seagrass restoration projects).

152. Mitigation banking for SAV does not represent a silver-bullet solution to SAV loss, especially given the need for widespread SAV restoration to meet CBP goals. Moreover, parallel attempts at mitigation banks for seagrass in Florida have been challenged as an avenue for developers to pay out their destruction of established habitats to the detriment of functioning ecosystems. *See, e.g.*, Randy Fine, *Reckless Bill Could Further Endanger Manatees by Destroying Local Seagrass*, FL. TODAY (Jan. 10, 2022, 7:01 AM),

in the SAV Workgroup to delineate ideal sites in the state and receive funding from pay-ins from those whose permitted activities lead to SAV damage to conduct expansive plantings.[153] This adaptive practice could serve to protect SAV through increased mitigation requirements and could also help alleviate SAV restoration barriers associated with cost and labor.[154]

3. Expanding Protective SAV Management Under Maryland's Fisheries Laws

In addition to MDE, EPA, and the Corps's involvement in SAV management through the Clean Water Act,[155] SAV management in the Chesapeake occurs through fisheries management laws and regulation as well. These various laws and regulations implicate the Maryland Department of Natural Resources (DNR).[156] DNR maintains authority to adopt regulations and oversees the permitting procedures for SAV removal.[157] DNR also delineates SAV protection zones, which constitute areas where certain clam dredging, aquaculture, and leasing practices are prohibited.[158] DNR has established these zones within the coastal waters of nine Maryland counties[159] to limit fishing activities that disrupt benthic or bottom-

https://www.floridatoday.com/story/opinion/2022/01/10/reckless-bill-could-endanger-manatees-destroying-local-seagrass/9115312002/ [https://perma.cc/MXS3-VQQ7] (arguing that Florida's then-proposed seagrass mitigation bill would permit further destruction of seagrass by making it easier to simply pay-in to off-site efforts).

153. *See* Hotaling et al., *supra* note 151, at 76.

154. *See* MANAGEMENT STRATEGY, *supra* note 4, at 6 (describing labor and funding as major barriers to SAV restoration projects).

155. *See* discussion *supra* Sections III.B.1–2.

156. MD. CODE ANN., NAT. RES. § 4-213 (West 2023).

157. *Id.* At the time of this comment's publication, the Maryland General Assembly passed amendments to this section of the Natural Resource Article that (1) reduced the area of SAV adjacent landowners could trim for navigational purposes from sixty feet in width to twenty feet in width and (2) now require, instead of recommend, receipt of approval from DNR for any SAV trimming or removal exceeding these permissible navigational channels. The author applauds the passage of this bill, as state departmental oversight and approval authority for significant SAV removal in the tidal waters of the Bay will allow managers and scientists to better monitor and coordinate progress towards the CBP's acreage goals. These amendments will take effect on October 1, 2024. H.D. 109, 2024 Leg., 446 Sess. (Md. 2024).

158. MD. CODE ANN., NAT. RES. § 4-1006.1 (West 2023).

159. *See* MD. CODE REGS. § 08.02.01.12 (2023) (describing SAV protection zones, recently reduced in October 2023, to include, by county: Somerset County (12, formerly 33), Dorchester County (2, formerly 5), Talbot County (5, formerly 22), Saint Mary's County (4, formerly 9), Worcester County (9, formerly 15), Anne Arundel County (1), Calvert County (4, formerly 6), Kent County (2, formerly 5), and Queen Anne's County (2, formerly 4)).

dwelling organisms like clams, as these practices tend to severely damage SAV beds as well.[160] Although these designated zones provide protections for existing, designated SAV beds against practices like dredging, aquaculture,[161] and leasing,[162] SAV habitats otherwise remain subject to the broader permitting processes for removal.[163] No statute within Maryland's Natural Resources Article to date addresses SAV restoration or replanting.[164]

Ecosystem management theory applied to aquatic resource management often draws connections between habitats and target fisheries, and when used to analyze SAV management, clearly demonstrates the importance of incorporating fisheries managers in SAV restoration goals.[165] Attempts to effectively manage fisheries in regional, national, and international contexts have frequently incorporated ecosystem management principles.[166] Scholars formulated theories under the concept of "ecosystem-based fisheries management" (EBFM) in response to traditional management approaches that tended to tunnel-focus on harvested species alone.[167] EBFM similarly seeks more holistic, systems-based practices using legal and regulatory tools for fisheries management.[168] The three practical goals for EBFM include (1) protecting the target species' habitat, (2) reducing bycatch or loss of other species through destructive practices, and (3) increasing scientific study to better understand complex biological relationships within aquatic ecosystems.[169]

Considering these goals for Maryland's most lucrative fisheries, the connection each shares with SAV becomes apparent, with the blue crab as a paradigmatic example of a struggling target fishery

160. NAT. RES. § 4-1006.1. *See also* Robert J. Orth et al., *Identification and Management of Fishing Gear Impacts in a Recovering Seagrass System in the Coastal Bays of the Delmarva Peninsula, USA*, 37 J. COASTAL RSCH. 111, 126 (2002) (describing the damage of hydraulic dredging and other fishing practices cause to benthic communities and SAV beds in coastal bays of the Chesapeake).
161. MD. CODE ANN., NAT. RES. § 4-11A-06 (West 2023).
162. MD. CODE ANN., § 4-11A-07 (West 2023).
163. NAT. RES. § 4-11A-06.
164. *See* CHESAPEAKE LEGAL ALL., *supra* note 64.
165. *See* Schiffman, *supra* note 75, at 387–88.
166. *Id.*
167. *Id.* at 388.
168. *Id.* at 387–88.
169. *Id.* at 389.

that depends on SAV.[170] A recent and salient portrait of these inseparable management challenges came to the public eye in May 2022 when scientists and managers from Maryland and Virginia reported the lowest blue crab population within the Chesapeake in modern history.[171] The 2022 Baywide Blue Crab Winter Dredge Survey estimated that around 227 million blue crabs resided within the estuary, representing a notable decrease from 2021's estimated 282 million and constituting less than half of the average annual population.[172] This steady decline in the crab population since 2019, when paired with official reports of overall compliance with catch limits and harvesting rules, demonstrates how target species do not exist within a vacuum; rather, fisheries bend to ecosystem-wide pressures like habitat loss.[173] Moreover, current proposed solutions to the crab problem fail to match the complexity of the issue, at no fault of those challenged with fisheries management in the states.[174] When many factors likely determine crab populations, it is hard to expect catch limits alone to solve the problem.[175] EBFM scholarship would suggest that policymakers and fisheries managers consider habitat restoration and invasive species management practices with the same

170. *See 2023 Blue Crab Winter Dredge Survey*, MD. DEP'T OF NAT. RES., https://dnr.maryland.gov/fisheries/Pages/blue-crab/dredge.aspx [https://perma.cc/AN8V-2U45?type=image].

171. *See id.*

172. *Id.*

173. *See* Timothy B. Wheeler & Jeremy Cox, *Decline in Chesapeake Crab Population Sparks Hunt for Answers*, BAY J. (July 18, 2022), https://www.bayjournal.com/news/fisheries/decline-in-chesapeake-crab-population-sparks-hunt-for-answers/article_51549c88-0686-11ed-ad99-ab837fee4752.html [https://perma.cc/9Y78-DWRR].

174. *See* Jacob Baumgart, *Md. Blue Crab Count Falls to Lowest Total Ever Recorded in Chesapeake Bay*, MD. MATTERS (May 21, 2022), https://www.marylandmatters.org/2022/05/21/md-blue-crab-count-falls-to-lowest-total-ever-recorded-in-chesapeake-bay/ [https://perma.cc/DA6L-FZUH].

175. *See id.* At the time of this comment's publication, federal policymakers have initiated promising efforts to utilize federal resources to spur scientific and industrial progress in invasive species management, particularly for the blue catfish (*Ictalurus furcatus*) in Maryland's tidal waters of the Chesapeake Bay. See Megan Walburn Viviano, *U.S. Senators, Maryland Celebrate $4.5 Million In Commercial Blue Catfish Funding*, CHESAPEAKE BAY MAG. (Mar. 19, 2024), https://www.chesapeakebaymagazine.com/u-s-senators-maryland-celebrate-4-5-million-in-commercial-blue-catfish-funding/ [https://perma.cc/M6E3-J4JP]. These efforts align with principles of EBFM, recognizing that the effective management of target fisheries like blue crabs demands consideration of other ecosystem factors like invasive species and habitat preservation. Schiffman, *supra* note 75, at 389.

vigor that they impose catch limits and other traditional management practices to achieve sustainable blue crab yields.[176]

EBFM principles suggest increasing protective measures for critical habitats like SAV using the fisheries management tools available in Maryland to benefit target species like the blue crab.[177] Currently, state law requires DNR to prepare and implement fisheries management plans for twenty-five species of finfish and shellfish the agency deems in need of specific consideration, including blue crabs.[178] For these and other species in need of conservation,[179] DNR must adopt conservation measures to prevent overfishing.[180] A primary consideration for whether a species requires a management plan involves its "habitat needs."[181]

The demonstrated relationship between blue crabs and SAV beds[182] confirms that fisheries management plans should include protective considerations for SAV to supplement existing protection zones.[183] For example, policymakers could expand SAV protection zones under Maryland fisheries regulations to include portions of the oligohaline region of the Bay to limit destructive activities beyond merely hydraulic clam dredging or aquaculture, since beds in this region provide crucial habitat for the depleted male blue crabs,[184] and to further integrate the conservation of target fisheries with the management of SAV habitats. This would require policymakers at DNR to amend existing regulations for SAV protection zones and therefore involve the public through the notice and comment process.[185]

However, in October 2023, despite the demonstrated decline of blue crabs, DNR proposed a significant reduction on existing SAV protection zones to expand "additional harvest areas available to clammers" in the lower Bay, justifying this action on the basis that it will "open[] additional areas for clammers to harvest razor clams . . .

176. Schiffman, *supra* note 75, at 388.
177. *See id.*
178. MD. CODE ANN., NAT. RES. § 4-215(b) (West 2023).
179. DNR, in consultation with the Tidal Fisheries and Sport Fisheries Advisory Commissions, can determine the necessity of management plans for additional species based on their population, distribution, habitat needs, and other factors. *See id.* § 4-215(c).
180. *Id.* § 4-215(d)(1)(i).
181. *Id.* § 4-215(c)(3).
182. *See supra* note 1; *see also supra* text accompanying note 32.
183. *See supra* note 158 and accompanying text.
184. *See 2023 Blue Crab Winter Dredge Survey*, *supra* note 170.
185. *See supra* note 158 and accompanying text.

a primary bait for crabbers."[186] This action, which took effect at the end of December 2023, opened approximately 8,000 acres of formerly protected SAV beds to hydraulic dredging, reducing total SAV protection zones by 5,000 acres.[187] This action regressed the progress made under the agency's addition of over 14,000 acres of protected SAV beds in 2020.[188] In essence, DNR greenlit the destruction of critical blue crab habitat in an effort to somehow improve the blue crab fishery. While these "shallow water resource use conflicts" will inevitably arise in aquatic resource management decisions,[189] this proposed reduction could not be more anomalous with EBFM principles and progress towards SAV restoration goals.

Furthermore, given DNR's backtracking on protective activities at the nexus of fishery and SAV management, managers and scientists could target areas for replanting and other restorative activities based on the historical presence of crabs and other target species. Directly connecting management and conservation of target fisheries species with efforts to restore and protect SAV beds would align with EBFM principles, to the benefit of both components of the Bay's ecosystem.

C. State and Local Policymakers Can Implement Restorative SAV Management Through Regulations Addressing Existing Technical, Political, and Organizational Barriers

While the law currently maintains piecemeal regulatory frameworks affecting the protection of SAV,[190] the law's role in restorative SAV management, or the process of replacing lost SAV habitats through seed dispersal and replanting efforts, remains elusive. Three broad categories of barriers become clear from the Workgroup's existing management challenges to implementing SAV restoration projects.[191] These include: (1) technical barriers, including the physical, labor, cost, and environmental variables impacting the efficacy of SAV restoration projects;[192] (2) political barriers,

186. 50 Md. Reg. § 890–91 (Oct. 6, 2023) (codified at MD. CODE REGS. § 08.02.01.12 (2023)).

187. *Id.*

188. Elle Bassett, *More SAV is Key to River Health*, SHORERIVERS, https://www.shorerivers.org/news//more-sav-is-key-to-river-health [https://perma.cc/VX34-C545].

189. *See* CTR. FOR COASTAL RES. MGMT., SHALLOW WATER RESOURCE USE CONFLICTS: CLAM AQUACULTURE AND SUBMERGED AQUATIC VEGETATION 1, 20 (1999), http://ccrm.vims.edu/publications/pubs/clamaqua_sav.pdf [https://perma.cc/UWQ8-XLND]; *see also* MANAGEMENT STRATEGY, *supra* note 4, at 2, 11.

190. *See supra* Sections III.B.1–2.

191. *See* MANAGEMENT STRATEGY, *supra* note 4, at 5–6.

192. *See infra* Section III.C.1.

specifically the lack of enthusiasm for SAV as a legislative agenda item and lack of political will to protect SAV in comparison to other Bay species;[193] and (3) organizational barriers, including the challenges associated with layered governance and jurisdiction.[194] Using ecosystem management principles, this comment presents strategies for the law to begin to address these broad categories of barriers to achieving restorative SAV management.[195]

1. Law Addressing Technical Barriers to Restorative SAV Management

Technical barriers to restorative SAV management include the specific, hands-on challenges associated with replanting SAV beds.[196] According to the Workgroup, "[d]irect restoration of SAV by planting whole plants or seeds is a multi-step, labor-intensive and expensive venture."[197] Moreover, variable site characteristics and water quality can make or break the success of these projects.[198] The law must address technical barriers related to labor, cost, and environmental conditions for these restoration efforts to increase.

Ecosystem management requires scientific capacity and monitoring, which in turn requires adequately staffed and funded implementing agencies.[199] Although technical challenges related to water quality variables require specific interventions through law as previously described,[200] and others like extreme weather events inevitably fall out of the control of managers and policymakers,[201] policymakers can pursue increased funding opportunities to address technical barriers like labor and cost.

Currently, citizens and groups can leverage various grant programs for habitat restoration purposes,[202] but this independent-sourcing method alone remains inadequate for Bay-wide SAV restoration goals. Groups can access federal funding through grants awarded by

193. *See infra* Section III.C.2.
194. *See infra* Section III.C.3.
195. *See infra* Section III.C.
196. *See* MANAGEMENT STRATEGY, *supra* note 4, at 6.
197. *Id.*
198. *Id.*
199. *See* Grumbine, *supra* note 74, at 33 (describing the need for agency managers to be able to hire more staff scientists to implement ecosystem management).
200. *See supra* Section III.B.
201. *See* MANAGEMENT STRATEGY, *supra* note 4, at 6.
202. *See Grants & RFPs*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/what/grants [https://perma.cc/65A5-9RWQ].

CBP itself, the Chesapeake Bay Trust, NOAA, and EPA.[203] Grants through these programs have led to successful SAV projects in previous years, including efforts to expand community-science programming to monitor SAV.[204] In this regard, federal policymakers who determine the budget allocated to federal agencies like the EPA's Chesapeake Bay Program may increase the caps on awards permitted through these types of grant programs.[205] While recent increases in federal budgetary decisions for Chesapeake Bay restoration efforts have excited environmental advocacy organizations,[206] Maryland's reported spending on watershed restoration programs has remained somewhat stagnant in recent years.[207] Accordingly, state policymakers can further increase funding for expanded SAV restoration, research, and monitoring programs through state budgetary decisions. Finally, federal and state policymakers can address the lack of laboratory and research capacity available at managing agencies alone[208] by working to foster collaboration between implementing agencies, workgroups, research institutions, universities, and community groups, many of which depend on state and federal program funds to operate.

2. Law Addressing Political Barriers to Restorative SAV Management

Related to the technical barriers to restorative SAV management are political barriers, primarily the reality that this habitat remains largely misunderstood and underappreciated by watershed

203. *Id.*

204. *See Chesapeake Bay Program Goal Implementation Team (GIT) Funding Program: Awarded Projects*, CHESAPEAKE BAY TR., https://cbtrust.org/grants/git/ [https://perma.cc/DZH9-3SXU] (describing the success of Waterkeepers Chesapeake in expanding citizen SAV monitoring programs through regional waterkeeper organizations).

205. *See Grants & RFPs*, *supra* note 202.

206. Lisa Caruso, *CBF Welcomes Increase for Bay Program in Biden's Fiscal 2023 Budget*, CHESAPEAKE BAY FOUND. (Mar. 29, 2022), https://www.cbf.org/news-media/newsroom/2022/federal/cbf-welcomes-increase-for-bay-program-in-bidens-fiscal-2023-budget.html [https://perma.cc/7ZWA-XBC8].

207. *Funding*, CHESAPEAKE PROGRESS, https://www.chesapeakeprogress.com/funding#:~:text=In%20November%20of%202022%2C%20the,watershed%20restoration%20in%20fiscal%202022 [https://perma.cc/C2VH-XCKH] (describing the trend of increased federal grants and spending on Chesapeake Bay restoration efforts, as opposed to Maryland's state budget for Chesapeake Bay restoration efforts, which has been significantly lower in years since 2017).

208. MANAGEMENT STRATEGY, *supra* note 4, at 8 (describing the lack of funding for SAV research that has contributed to gaps in restoration progress).

residents.[209] With the analogous value of target species like crabs,[210] efforts to protect and restore SAV to historic levels have not received nearly as much political attention as target fisheries.[211]

Ecosystem management theory suggests that improvements in citizen ecological literacy and environmental advocacy must occur for effective management actions to follow.[212] In this respect, managers' and scientists' efforts to engage the public in SAV projects could facilitate personal connections and concern for this biotic community.[213] While current projects like the Chesapeake Bay SAV Watchers strive to engage the public in SAV monitoring projects, the Workgroup identifies that these efforts "must be more effectively funded and supported."[214]

In accordance with the need for funding to overcome technical barriers, policymakers and political leadership at the local, state, and federal level can ensure that such efforts receive legislative support.[215] Coordinated efforts by managing agencies to ensure publicly-accessible SAV monitoring sites can also achieve ecosystem management aims of collaboration and improved monitoring.

209. *See id.* at 9; CHESAPEAKE BAY PROGRAM, *supra* note 9, at 5 (describing the public's negative perceptions of SAV as a nuisance rather than a necessary habitat).

210. *See, e.g.*, Rep. Jamie Raskin, *Maryland Congressional Delegation Urges Administration to Kick-Start New Chesapeake Bay Blue Crab Stock Assessment*, JAMIE RASKIN (Sept. 21, 2022), https://raskin.house.gov/2022/9/maryland-congressional-delegation-urges-administration-to-kick-start-new-chesapeake-bay-blue-crab-stock-assessment [https://perma.cc/J72F-D92B] (describing congressional leadership from Maryland urgently seeking legislative action to respond to recorded blue crab stock losses in the Chesapeake Bay).

211. *See, e.g.*, Elle Bassett, *Underwater Bay Grasses Need Better Protection*, DELMARVA NOW (July 3, 2019, 10:00 AM), https://www.delmarvanow.com/story/opinion/columnists/2019/07/03/underwater-bay-grasses-need-better-protection/1557992001/ [https://perma.cc/G2LK-39GY] (describing at length the importance of SAV protection in the Chesapeake Bay yet the minimal attention traditionally paid to the habitats as opposed to target fisheries).

212. *See* Grumbine, *supra* note 74, at 33.

213. MANAGEMENT STRATEGY, supra note 4, at 10 (describing the goals to incorporate the public in monitoring and restoration efforts).

214. *Id.* at 9; *see also Chesapeake Bay SAV Watchers*, CHESAPEAKE MONITORING COOP., https://www.chesapeakemonitoringcoop.org/chesapeake-bay-sav-watchers/ [https://perma.cc/U7QC-97CT].

215. *See* Caruso, *supra* note 206.

3. Law Addressing Organizational Barriers to Restorative SAV Management

Finally, ecosystem management recognizes the transboundary nature of resource systems and examines the organizational relationships between scientists, agency managers, policymakers, and broad citizen stakeholder groups in the implementation of management practices.[216] Restorative SAV management, like any cross-jurisdictional management practice, faces organizational barriers due to the involvement of multiple levels of governance and community stakeholders.[217] Ecosystem management scholars have described a more place-based approach to management as one that can incorporate local stakeholders in management practices targeting the broader ecosystem's resources.[218] By meaningfully incorporating various levels of government and the communities impacted by SAV loss, the law can alleviate some of these organizational barriers to implementing restorative SAV management practices.

One way that the law can facilitate more connected, place-based management of SAV for the purpose of developing successful, small-scale restoration projects[219] could be through a more meaningful division of roles between state and local governments. The Workgroup identifies the need to expand small-scale restoration efforts, which have been successful in recent years.[220] Based on this demonstrated success, a place-based approach to implementing small-scale SAV restoration projects could involve the incorporation and coordination of local, coastal municipalities with state government agencies and workgroups.

One current example of natural resource management in this substate structure is Maryland's Critical Area Commission (CAC) for the Chesapeake and Atlantic Coastal Bays. This state-managed Commission works to prevent the degradation of the land immediately adjacent to Maryland's Chesapeake and coastal tributaries through county and municipality-led mitigation and

216. *See* Grumbine, *supra* note 74, at 33.

217. *See id.* at 35; Angelo & Glass, *supra* note 76, at 489 (describing the need for participatory and collaborative governance and organizational change to manage estuaries and other cross-jurisdictional ecosystems).

218. Angelo & Glass, *supra* note 76, at 491.

219. *See* MANAGEMENT STRATEGY, *supra* note 4, at 8 (describing the success of small-scale SAV restoration projects in recent years).

220. *See id.*

permitting efforts.[221] The CAC incorporates DNR, citizen-stakeholders, and municipal and local government planning offices to ensure that coastal development projects comply with resource area conservation laws guided by the state but written and enforced by the municipality.[222] For example, projects that destroy terrestrial vegetation like forest and shrub species in specific buffer areas along tidal tributaries must meet mitigation requirements determined by local governments.[223] Currently, the CAC only briefly addresses SAV, with regulations that merely require projects comply with existing MDE and DNR protections for SAV in potential sites.[224]

Incorporating small-scale SAV restoration practices into municipal CAC requirements for mitigation could streamline and increase the implementation of restorative SAV management by utilizing an existing formal governance framework to require and oversee restoration projects at the local level. Policymakers at the CAC and local officials on municipal legislatures could amend regulations and ordinances governing land use rules and permitting requirements for activities like deforestation and bulkhead construction in the buffer region, both of which directly contribute to SAV loss,[225] to require SAV restoration or mitigation.

In practice, such a requirement could bring local, state, and federal planners to the same table earlier to prevent, reduce, or mitigate impacts to SAV in coastal development. Local planning offices and environmental protection commissions in coastal municipalities could work to connect landowners with regional organizations to assist in restorative actions through small-scale SAV restoration near private waterfront homes.[226] The potential for seed-dispersal or small-scale replanting efforts across small creeks and coves in developed, waterfront communities of the Upper Bay to restore SAV makes waterfront landowners and nearby commercial developers, often culprits for SAV destructive activities, the primary stakeholders in the success of SAV and possibly part of the solution

221. *See Critical Area Commission: Background and History*, MD. DEP'T OF NAT. RES., https://dnr.maryland.gov/criticalarea/Pages/background.aspx [https://perma.cc/AX96-XU5L?type=image].

222. *Id.*

223. *See Critical Area Commission: Frequently Asked Questions*, MD. DEP'T OF NAT. RES., https://dnr.maryland.gov/criticalarea/Pages/faqs.aspx#1 [https://perma.cc/G67A-YHM5?type=image].

224. *See* MD. CODE REGS. § 27.01.02.06-1(A)(6)(e) (2023).

225. *See supra* Section II.A.

226. *See* JASINSKI ET AL., *supra* note 2, at 8.

under such a program.[227] Incorporating community groups and private property owners in the restoration of SAV will be necessary for restoration to reach the many small tributaries where such projects could increase Bay-wide acreage goals. Additionally, such projects would also involve community stakeholders in the process of restoring SAV and improve ecological literacy on the habitat's importance.[228] Ultimately, centering SAV restoration practices in local governance with support from state and federal oversight agencies would further increase coastal resilience to climate change in Maryland's developed watershed areas.[229]

IV. CONCLUSION

Sustaining the Chesapeake Bay's natural resources in the face of increased anthropogenic pressures and climate change requires the protection and restoration of historic SAV beds.[230] However, the law constitutes only one of many factors that will determine the success of management practices towards CBP's SAV acreage goals.[231] Progress through formal and informal governance towards these goals will depend on the relationship between lawmakers, scientists, managers, and citizen stakeholders.[232] Nonetheless, a clear understanding of the role that law has played and should play, with guidance from ecosystem management principles and a focus on adaptivity, could improve this relationship and change our region's progress towards these lofty goals.[233]

To achieve SAV restoration goals through law, protective management through existing regulatory frameworks like the CWA must be strengthened[234] and restorative management must be adequately supported by policymakers and managers at local, state,

227. *See id.*; *see also* Timothy B. Wheeler, *A Maryland River Turns Orange, Bay Grasses Disappear*, BAY J. (Sept. 29, 2023), https://www.bayjournal.com/news/growth_conservation/a-maryland-river-turns-orange-bay-grasses-disappear/article_0eb7fdfc-5eeb-11ee-b0d3-07364673369e.html [https://perma.cc/RQ65-QDVU] (describing how communities on the Upper Chesapeake Bay have directly connected sediment runoff from housing developments in the watershed to massive SAV die-offs).

228. *See* MANAGEMENT STRATEGY, *supra* note 4, at 9 (describing negative public perceptions of SAV as a nuisance rather than a necessary habitat).

229. *See* sources cited *supra* note 38.

230. *See supra* Part II.

231. *See supra* Part III.

232. *See supra* Section III.A.

233. *See supra* Sections III.B, III.C.

234. *See supra* Section III.B.

and federal levels of government.[235] However, changes to existing laws and regulations will require advocacy efforts to increase the political salience of SAV loss and the necessity for increased protections and restorative management.[236] Accordingly, the law must also seek to engage citizen stakeholders in monitoring and management efforts, because doing so will increase public literacy and value for SAV management efforts, and in turn spur the advocacy necessary to improve the law towards effective SAV management.[237]

235. *See supra* Section III.C.
236. *See supra* Section III.C.
237. *See supra* Section III.C.