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THE TRAGEDY OF THE COMMONS: THE CASE OF THE BLUE CRAB

CARL TOBIAS*

I. INTRODUCTION

The blue crab has achieved iconic status throughout the Chesapeake Bay area, while the pugnacious crustacean and the majestic estuary are national treasures. The shallow waters provide optimal habitat for the species that has been deeply woven into the bay's economic and cultural fabric. Last year, after a respected committee ascertained that the crab was in jeopardy, anticipated future deterioration, and proffered extreme recommendations, Virginia and Maryland imposed draconian strictures which could reduce harvests by one third and help ameliorate the creature's depletion. A recent Executive Order, ambitiously designed by President Barack Obama to safeguard and restore the Chesapeake, illuminates the problem's significance and offers promising strategies. The attempts to halt precipitous decline—which exemplifies the “Tragedy of the Commons” and illustrates numerous acute complications that undermine the ailing watershed's health—constitute bold experiments in aquatic species resource management. These propositions demonstrate that the new efforts merit scrutiny, which this piece undertakes.

Section two traces the history of the venerable blue crab as well as the crustacean's regulation, fall, and perhaps imminent demise. The third part assesses the nascent rules and critically evaluates, and derives lessons from, recent actions. It finds that multiple sources—notably overharvesting and grave pollution—contribute to the organism's dire straits, and the remedies afford helpful immediate protection, but burden commercial crabbers and have unclear long-term effects. The final section details measures to prevent the impending requiem for the last substantial estuarine fishery.

II. THE BLUE CRAB'S HISTORICAL PROMINENCE AND ITS RECENT DECLINE

The blue crab and additional diverse creatures—in particular, oysters, striped bass, and shad—prospered and sustained the region for eons prior to Jamestown.¹ Across the next three centuries, those species were plentiful

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¹ HOWARD R. ERNST, *CHESAPEAKE BAY BLUES: SCIENCE, POLITICS AND THE STRUGGLE TO SAVE THE BAY* (2003); TOM HORTON, *TURNING THE TIDE: SAVING THE CHESAPEAKE BAY* (2003); JOHN MCPHEE, *THE FOUNDING FISH* (2002); WILLIAM WARNER, *BEAUTIFUL SWIMMERS: WATERMEN, CRABS AND THE CHESAPEAKE BAY* (1976). For the science and some history, see Exec. Order, No. 13,508, 74 Fed. Reg.

and virtually unregulated, yet occasional litigation fostered specific judicial decisions that accorded the creatures a modicum of protection.² The two adjacent states began controlling harvests around 1940. The restrictions which covered mollusks, anadromous finfish, and crustaceans obviously differed. The practices' number and rigor gradually increased as the twentieth century unfolded. The mechanisms only became stringent after 1980 when a plethora of species experienced multiplying threats.

Oysters initially confronted problems. The annual 1970s take was several million bushels.³ However, parasites, sizable catches, and pollution endangered the bivalve, so during 2003 the harvest registered 53,000,⁴ necessitating drastic measures.⁵ Although immense sums have been expended on restoration, oysters did not, and may not ever, recover.⁶ That fate is doubly ironic: the mollusk was the bay's natural water filter, and aquaculture might hold the greatest promise for commercial revival.⁷ In the 1980s, overfishing and rising pollution levels decimated striped bass and prompted moratoria,⁸ yet the striped bass staged a remarkable comeback, which terminated the bans⁹ and now apparently jeopardizes crabs.¹⁰ By the

23,099 (May 15, 2009); THE BLUE CRAB (Victor Kennedy & Eugene Cronin, eds. 2007); J.A. GULLAND, THE MANAGEMENT OF MARINE FISHERIES (1974).

² See, e.g., Commonwealth v. Newport News, 164 S. E. 689 (Va. 1932); Hampton v. Watson, 89 S. E. 81 (Va. 1916). See also LYNDA LEE BUTLER & MARGIT LIVINGSTON, VIRGINIA TIDAL AND COASTAL LAW (1988); HORTON, *supra* note 1, at 151-61, 163. See generally DAVID FAULKNER, THE OYSTER WARS (2008); JOHN WENNERSTEN, THE OYSTER WARS OF CHESAPEAKE BAY (2007). Virginia and Maryland imposed few restrictions.

³ See Carl Tobias, *Around the Chesapeake, an Uncertain Recovery on the Half Shell*, WASH. POST, Dec. 3, 2006, at B8. See also Garrett Power, *More About Oysters Than You Wanted to Know*, 30 MD. L. REV. 199 (1970).

⁴ HORTON, *supra* note 1, at 166-72; Tobias, *supra* note 3. See also MARK KURLANSKY, THE BIG OYSTER: HISTORY ON THE HALF SHELL (2006); Michael A. Heller, *The Rose Theorem*, 18 YALE J.L. & HUMAN. 29 (2006).

⁵ See, e.g., MD. CODE ANN., NAT. RES. § 4-1001 et seq. (2009); VA. CODE ANN. § 28.2-500 et seq. (2009). See also MD. CODE REGS. 8.02.04.06 (2009); 4 VA. ADMIN. CODE § 20-720-10 et seq. (2009). See generally BUTLER & LIVINGSTON, *supra* note 2, at 603-78, 793-97.

⁶ HORTON, *supra* note 1, at 170; Alison Rieser, *Oysters, Ecosystems, and Persuasion*, 18 YALE J.L. & HUMAN. 49, 49 (2006); David Fahrenthold, *Despite Rescue Efforts, Bay Blue Crab at Ebb*, WASH. POST, Nov. 17, 2007, at A1 [hereinafter *Bay Blue Crab at Ebb*]; Timothy B. Wheeler, *Army Favors Testing Sterile Asian Oysters in Bay*, BALT. SUN, Mar. 21, 2009, at 5A. See generally U.S. Army Corps of Engineers, *Draft of Environmental Impact Statement for Oyster Restoration in Chesapeake Bay, Including the Use of a Native and/or Nonnative Oyster* (Sept. 19, 2008), http://www.nao.usace.army.mil/OysterEIS/documents/OAP_Comments_full_10-10.pdf; VIRGINIA MARINE RESOURCES COMM'N, BLUE CRAB FISHERY RESOURCE DISASTER RELIEF PLAN 9 (2009), http://www.ksmithre.com/Crab%20Grant%20Disaster_Relief_Assistance__Ver1%20_2_.pdf [hereinafter VMRC PLAN].

⁷ See Jeremy B. Jackson et al., *Historical Overfishing and the Recent Collapse of Coastal Ecosystems*, 293 SCIENCE 629 (2001). See also David A. Fahrenthold, *Asian Oyster Now Banned From Bay*, WASH. POST, Apr. 7, 2009, at B1; Christy Goodman, *Where Have All The Oysters Gone?*, WASH. POST, Oct. 12, 2008, at SM1; Michael Lipford, *Local Bivalves Have a Large Natural Advantage in Bay*, RICHMOND TIMES-DISPATCH, Feb. 1, 2009, at F-4. See generally KURLANSKY, *supra* note 4; Carol Rose, *Introduction: Property and Language*, 18 YALE J.L. & HUMAN. 1, 11 (2006) (discussing common ownership of beaches and recreational areas and the self-contradictory nature of acts that affect the public adversely).

⁸ HORTON, *supra* note 1, at 153-60. See also DICK RUSSELL, STRIPER WARS (2005); Tom Horton, *Rockfish Comeback Offers Hope*, BALT. SUN, June 25, 1994, at 1B; Angus Phillips, *Maryland Tightens Controls on Rockfish Catch*, WASH. POST, Jan. 13, 1984, at B4. See generally Meredith Cohn, *Rockfish Warning is Widened*, BALT. SUN, June 4, 2009, at 1A; Matt Zapotosky, *Judge Sentences Men Who Overfished to Prison*, WASH. POST, May 3, 2009.

⁹ Virginia only adopted a ban after a federal statute passed. 16 U.S.C. § 1851 (2006); MD. CODE REGS. § 8.02.15.01 (2009). See MD. CODE ANN., NAT. RES. §§ 4-2A-05.1, 4-731 (2009); 4 VA. ADMIN. CODE § 20-252-10 et seq. (2009). See also *Bay Blue Crab at Ebb*, *supra* note 6.

1980s, gigantic harvests, pollution, and the reduction in spawning as a result of dams have endangered shad.¹¹ These developments provoked moratoria like those needed for striped bass.¹² Unfortunately, the creature has failed to rebound, so the bans persist.¹³

Until recently, the crab's natural resilience may have postponed difficulties that these species faced. During the 1980s, the crustacean thrived, annual catches approximated 140 million, and few rules existed.¹⁴ However, public officials, scientists, crabbers, and environmentalists articulated powerful and growing concerns witnessed by the annual dredge surveys; thus, Virginia instituted a 1994 management plan with restrictions for enhancing bay-wide stock.¹⁵ Yet, the threat intensified and persuaded the Commonwealth to assemble numerous experts from Maryland, Virginia, North Carolina, and South Carolina¹⁶ who issued a report last year.¹⁷ The multijurisdictional group found no evidence that the plan increased abundance or take; concluded that substantial harvests, predators, losses of submerged aquatic vegetation ("SAV")—a pivotal estuarine species—as well as pollution from development, industry, wastewater treatment and farming jeopardized the creature;¹⁸ and recommended drastic

¹⁰ See, e.g., HORTON, *supra* note 1, at 159-61; Craig Timberg, *For Resurgent Rockfish, the Special is Bay Crab*, WASH. POST, Mar. 16, 2001, at A1. See also ERNST, *supra* note 1, at 94; RUSSELL, *supra* note 8.

¹¹ HORTON, *supra* note 1, at 172-75; Walter Nicholls, *Spring's Iconic Shad Still Struggles for a Comeback*, WASH. POST, Mar. 21, 2007, at F6; Timothy Wheeler, *Shad's Frenzied Spring Spawn is Missing From MD. Waters: Will Congress Intervene?*, BALT. SUN, July 4, 1993. See also MCPHEE, *supra* note 1; Fredrick Kunkle, *Kaine Touts Progress, Seeks Federal Help for More*, WASH. POST, Mar. 19, 2009, at B5.

¹² MD. CODE REGS. 8.02.05.05 (2009); 4 VA. ADMIN. CODE §§ 20-530-10 to 20-530-40 (2009); Rona Kobell, *Officials Say Ban Won't Be Lifted on Catching Shad in Md.*, BALT. SUN, Mar. 7, 2006, at 5B; Rex Springston, *American Shad Aren't Coming Back in Va.*, RICHMOND TIMES-DISPATCH, May 25, 2009. See MD. CODE ANN., NAT. RES. § 4-737 (2009); VA. CODE ANN. § 29.1-531 (2009); *supra* note 9 and accompanying text.

¹³ See, e.g., Nicholls, *supra* note 11; Tom Pelton, *Numbers of Migrating Shad Dip: Conowingo Dam Counts Down 90% over 7 Years*, BALT. SUN, MAY 27, 2008, at 1A. See generally Springston, *supra* note 12; Carl Tobias, *Fish Story: Hundreds of Thousands of Shad Aficionados Eagerly Await the Annual Arrival of a Mid-Atlantic Delicacy*, WASH. POST, Apr. 17, 2005, at B8.

¹⁴ Blue Crab Regulatory Review Comm., *The Virginia Marine Resources Commission's Management Plan for the Blue Crab 4* (2008) [hereinafter Blue Crab Report]; WARNER, *supra* note 1; *Bay Blue Crab at Ebb*, *supra* note 6; Carl Tobias, *Another Crisis for the Bay*, WASH. POST, Mar. 16, 2008, at B8. In 1942, Virginia did address shortages with a crab sanctuary that is now larger. See VA. CODE ANN. § 28.2-709 (2009). See also *infra* note 52 and accompanying text.

¹⁵ Blue Crab Report, *supra* note 14, at 4. Maryland and Virginia have a mixed crab cooperation record. See HORTON, *supra* note 1, at 162; Annecoos Wiersema, *A Train Without Tracks: Rethinking the Place of Law and Goals in Environmental and Natural Resources Laws*, 38 ENVTL. L. 1239, 1278 (2008). The 1990 harvest equaled the existing bay population. CHESAPEAKE BAY FOUNDATION, *BAD WATER AND THE DECLINE OF BLUE CRABS IN THE CHESAPEAKE BAY 4* (Chesapeake Bay Found. 2008).

¹⁶ Blue Crab Report, *supra* note 14, at 29-30. See Scott Harper, *Changes Recommended to Restore Bay's Blue Crabs*, VIRGINIAN-PILOT (Norfolk), Jan. 23, 2008, at B8 [hereinafter *Changes Recommended*]; Lawrence Latané III, *Va. Struggles to Save Blue Crab Population*, RICHMOND TIMES-DISPATCH, Feb. 3, 2008, at B4; *infra* notes 27-60 and accompanying text (evaluating 1980-2009 developments).

¹⁷ See Blue Crab Report, *supra* note 14. See also *Bay Blue Crab at Ebb*, *supra* note 6. See generally Patrick Lynch, *Stricter Crabbing Rules Could be on Horizon*, DAILY PRESS, Jan. 23, 2008; *infra* note 47 and accompanying text.

¹⁸ Blue Crab Report, *supra* note 14; CHESAPEAKE BAY PROGRAM, *UNDERWATER GRASSES AND THE CHESAPEAKE BAY* (Chesapeake Bay Prog. 2002); Editorial, *Bay Blues*, DAILY PRESS, Sept. 26, 2008, at B6; Rona Kobell, *Tainted Waters*, BALT. SUN, Sept. 28, 2008, at 1A; Lynton A. Land, *Dramatically Reducing Nutrients is Clear First Step to Recovery*, RICHMOND TIMES-DISPATCH, Oct. 12, 2008, at E5; Mary Ellen Slayter & Dorcas Taylor, *Nutrients, Bay Changes Linked*, BALT. SUN, Dec. 2, 2005, at 4G. Health of SAV did improve in 2008. See CHESAPEAKE BAY PROGRAM, *BAY BAROMETER: A HEALTH*

yield limitations.¹⁹ Maryland similarly ascertained that worsening Chesapeake health aggravated the crab's perilous existence.²⁰ Its survey results and the Virginia endeavor propelled actions to lessen deterioration.²¹ In short, the crustacean's recent depletion epitomizes the overfishing and pollution which severely threaten additional bay creatures.

III. THE RISE AND GROWTH OF BLUE CRAB RESTRICTIONS

A. DESCRIPTIVE ANALYSIS

Perceived abundance obviated the necessity for regulation, and most crabbers harvested all they desired until 1940 when the states began to restrict catches.²² Virginia's General Assembly prescribes the seasons for crustacean winter dredging and areas pinpointed as sanctuaries; miscellaneous controls over pragmatic aspects, namely licenses, females and sizes,²³ and industry representation on the Virginia Marine Resources Commission ("VMRC"), the entity that promotes the seafood industry and adopts rules governing notions like crab pot and pound use, size, and location as well as peeler pot mesh size.²⁴ Maryland law is analogous, but its Department of Natural Resources ("DNR") exercises more power than the VMRC over harvests, sizes, pots, seasons, and techniques.²⁵ A few practical considerations suggest why the jurisdictions do not administer their programs similarly. One is the VMRC composition and mandate and others are Virginia's comparative reluctance about decreasing pollution because of costs and receptivity to agriculture, development, and industry, notably seafood, while thirty-three percent of Maryland's take is females and its crabbers use greater numbers of, and more diverse, approaches.²⁶

AND RESTORATION ASSESSMENT OF THE CHESAPEAKE BAY AND WATERSHED IN 2008 19 (Chesapeake Bay Prog. 2009).

¹⁹ See, e.g., Blue Crab Report, *supra* note 14, at 13, 16, 18, 20, 23, 25. See generally *Changes Recommended*, *supra* note 16.

²⁰ See, e.g., HORTON, *supra* note 1, at 162–63; Peter Goodman, *Not-So-Sick Bay*, WASH. POST, Oct. 27, 1997, at B1; Rona Kobell, *Betting on a Comeback*, BALT. SUN, Apr. 20, 2008, at 1A. See also Exec. Order, *supra* note 1, pt.1. See generally *supra* notes 14–15, *infra* text accompanying notes 39–42, 54–58.

²¹ David A. Fahrenthold, *Md. Crab Harvest Dropped in 2007*, WASH. POST, Feb. 5, 2008, at B3; Rona Kobell, *Crabs Rise Up to Be Counted*, BALT. SUN, Jan. 29, 2008, at 1B; *supra* text accompanying notes 16–19, *infra* notes 50–55. See also Rona Kobell, *Watermen Caught in Pinch of Rising Costs, Scarce Crabs*, BALT. SUN, May 2, 2007, at 1B; Timothy Wheeler, *Harvest Pinched*, BALT. SUN, Oct. 18, 2008 [hereinafter *Harvest Pinched*]; *infra* notes 48–55 and accompanying text.

²² ERNST, *supra* note 1, at 101; HORTON, *supra* note 1, at 154–55, 161–62. See also *supra* notes 1–2, 14 and accompanying text. See generally BUTLER & LIVINGSTON, *supra* note 2; THE BLUE CRAB, *supra* note 1, at 681–82.

²³ VA. CODE ANN. § 28.2-700-713 (2009). See *supra* note 14, *infra* note 52 and accompanying text. Pots catch most crabs. Virginia dredgers use scoops to scrape mainly females off the bottom with boats that have limited utility for other fishing. WARNER, *supra* note 1, at 33–61. See *infra* notes 24–25, 48–55, 59, 63 and accompanying text.

²⁴ VA. CODE ANN. § 28.2-701 (2009); 4 VA. ADMIN. CODE § 20-370-20 (2009). See S.B. 1087, 2009 Leg., Reg. Sess. (Va. 2009) (proposing 3 of 9 commissioners represent the industry); JAMES M. ACHESON, *THE LOBSTER GANGS OF MAINE 138* (1988) (analyzing similar lobster rules).

²⁵ See MD. CODE ANN., NAT. RES. § 4-803 (2009). See generally *infra* notes 49–55, 58–60 and accompanying text.

²⁶ MD. CODE ANN., NAT. RES. § 4-803 (2009); ERNST, *supra* note 1, at 107–25; HORTON, *supra* note 1, at 164. See WARNER, *supra* note 1; Lynda L. Butler, *State Environmental Programs: A Study in Political Influence and Regulatory Failure*, 31 WM. & MARY L. REV. 823, 826 (1990); David Fahrenthold,

Both changed systems at various junctures yet had altered them little by century's end.

In the 1980s, public officers, scientists, watermen, and others voiced concerns regarding the decline of the bay and many species apart from crabs. A 1983 U.S. Environmental Protection Agency ("EPA") initiative, with conclusions that matched an Army Corps of Engineers study performed ten years before, galvanized support for change.²⁷ The EPA analysis²⁸ prompted leaders of the region's jurisdictions to design a concord for watershed health restoration.²⁹ In 1987, leaders signed a pact unleashing a series of actions with goals and commitments.³⁰ The leaders vowed to draft a bay-wide assessment plan, implement criteria that would safeguard the habitat, protect and restore wetlands, and adopt a schedule for developing a fisheries management plan.³¹ Believing water quality to be crucial, they agreed to fashion a regime for significantly curbing pollutants, slowing nutrient loads, and minimizing toxics from point and non-point sources, pervasive bottom sediments, and government outlets that might enter the watershed.³² In the 1990s, the jurisdictions drafted pacts with strategies for addressing tributary problems. The strategies proposed relatively concrete metrics, but funds did not always resemble commitments.³³ The two-decade exercise in reaching accords and federal-state cooperation yielded measureable pollution decreases.³⁴ Nonetheless, the bay region encountered huge annual population influxes and the seventeen million current occupants probably eroded those advances; impervious surfaces, namely parking lots, have grown five times more

Scenes of an Effort Impeded Unfold Across Chesapeake Watershed, WASH. POST, Dec. 27, 2008, at A8 [hereinafter *Scenes of an Effort Impeded*].

²⁷ Each of the studies consumed many years. HORTON, *supra* note 1, at 162–66; Gerald Baliles, *Preserving the Chesapeake: Law, Ecology, and the Bay*, 41 U. RICH. L. REV. 615, 616 (2007). See also David Fahrenthold, *Optimism Over Saving the Bay Bonded Local Jurisdictions*, WASH. POST, Dec. 26, 2008; Land, *supra* note 18.

²⁸ Senator Charles Mathias (R-Md.) instigated the analysis that led to the Chesapeake Bay Program. See EPA, CHESAPEAKE BAY PROGRAM: FINDINGS AND RECOMMENDATIONS (1983). See also Baliles, *supra* note 27, at 616.

²⁹ See CHESAPEAKE BAY PROGRAM, 1983 CHESAPEAKE BAY AGREEMENT (1983); Baliles, *supra* note 27, at 617; Wiersema, *supra* note 15, at 1269; David Fahrenthold, *Broken Promises on the Bay*, WASH. POST, Dec. 27, 2008, at A1 [hereinafter *Broken Promises*].

³⁰ CHESAPEAKE BAY PROGRAM, 1987 CHESAPEAKE BAY AGREEMENT (1987). See Baliles, *supra* note 27, at 618; James Tripp, *The Restoration of the Chesapeake Bay*, 47 MD. L. REV. 425, 425 (1988); *Broken Promises*, *supra* note 29.

³¹ MD. CODE ANN., ENVIR. § 16-301 (2009); VA. CODE ANN. § 28.2-1300–1320 (2009); Baliles, *supra* note 27; Wiersema, *supra* note 15. See also Denis J. Brion, *Virginia Natural Resources Law and the New Virginia Wetlands Act*, 30 WASH. & LEE L. REV. 19, 19 (1973); James Titus, *Rising Seas, Coastal Erosion and the Takings Clause*, 57 MD. L. REV. 1279 (1998).

³² They vowed to limit nutrients 40% by 2000 and toxics. Baliles, *supra* note 27, at 619. See Exec. Order, *supra* note 1, pt. 1; Ruth Berlin, *Bay Cleanup Effort Must Tackle Harmful Chemicals*, BALT. SUN, Jan. 15, 2009.

³³ See CHESAPEAKE BAY PROGRAM, JOINT TRIBUTARY STRATEGY STATEMENT, Dir. 93-1 (1993); CHESAPEAKE BAY PROGRAM, CHESAPEAKE BAY AGREEMENT: 1992 AMENDMENTS (1992). See also Baliles, *supra* note 27, at 619.

³⁴ The Chesapeake Bay Program was illustrative. Baliles, *supra* note 27, at 619–20. See *supra* note 28. But see Wiersema, *supra* note 15; *Broken Promises*, *supra* note 29; Land, *supra* note 18; *infra* text accompanying note 38.

swiftly than humans and undercut the natural capacity to absorb pollutants and rainwater, so the complications have been myriad and daunting.³⁵

By the 1990s, accelerating concerns about the crustacean, which related mostly to oxygen deprivation from pollution, spurred Virginia's adoption of the twenty-two rule plan for enlarging stocks and harvests and the Chesapeake Bay Commission's ("CBC") formation of the Bi-State Blue Crab Advisory Committee ("BBCAC").³⁶ In the 1980s, Maryland effectuated a few protections; but, during 1995, when the Governor actively championed additional measures, commercial interests and the Assembly resisted.³⁷ A dearth of scientific consensus on the problems' extent, satisfactory remedies, and nominal interstate cooperation jettisoned an unprecedented opportunity for action prior to the crustacean's endangerment.³⁸

At the century's turn, the watershed had so deteriorated that the United States, Maryland, and Virginia formally agreed to revive imperiled Chesapeake species by 2010 as well as efficaciously address the crab with proposal of harvest targets, adoption of "complementary state fisheries management strategies [b]aywide," and promotion of "healthy spawning biomass, size and age structure" by 2001.³⁹ Nevertheless, the jurisdictions missed pertinent deadlines.⁴⁰ In six of the nine years preceding 2007, the catch exceeded optimal scientific protective quotas.⁴¹ The 2001 BBCAC report, which ascertained the creature was in decline and suggested a fifteen percent stock pressure reduction, eventually triggered actions to secure this decrease over three years.⁴² In 2001, when Maryland's Administrative, Executive, Legislative Review Committee did not agree

³⁵ Baliles, *supra* note 27, at 620–21; Erik Stokstad, *Obama Moves to Revitalize Chesapeake Bay Restoration*, 324 SCIENCE 1138, May 29, 2009; Lisa Rein, *Md. Seeks to Preserve Land Along Shoreline*, WASH. POST, Dec. 4, 2008 [hereinafter *Preserve Land*]. See Exec. Order, *supra* note 1, pt.1; KRISTEN CROSSETT, POPULATION TRENDS ALONG THE COASTAL U.S.: 1980-2008 (2004); THOMAS L. FRIEDMAN, HOT, FLAT AND CROWDED (2008); David A. Fahrenthold, *Evaluation of Chesapeake Goals Killed*, WASH. POST, May 4, 2009 (hereinafter *Evaluation of Chesapeake Goals*); Timothy Wheeler, *Weak Laws*, BALT. SUN, Sept. 29, 2008 [hereinafter *Weak Laws*] (finding 100 wooded acres are bulldozed daily).

³⁶ See Blue Crab Report, *supra* note 14, at 4; *supra* note 18 and accompanying text. The BBCAC had CBC members, scientists and stakeholders from each state, which asked it to study stocks and the crab's state. Wiersema, *supra* note 15, at 1276. See also VA. CODE ANN. § 30-240 (2009); CHESAPEAKE BAY COMM'N, TAKING ACTION FOR THE BLUE CRAB: MANAGING AND PROTECTING THE STOCK AND ITS FISHERIES (2001) [hereinafter CHESAPEAKE BAY COMM'N]; *Scenes of an Effort Impeded*, *supra* note 26.

³⁷ HORTON, *supra* note 1, at 162; *Scenes of an Effort Impeded*, *supra* note 26; *infra* text accompanying notes 43, 92–94.

³⁸ HORTON, *supra* note 1, at 162; Anita Huslin, *States Diverge on Blue Crabs*, WASH. POST, Apr. 25, 2001, at B1. See *supra* text accompanying notes 3–13. But see *supra* text accompanying note 36, *infra* notes 56–58 and accompanying text.

³⁹ CHESAPEAKE BAY PROGRAM, CHESAPEAKE 2000 (2000). See *Am. Canoe Ass'n., Inc. v. EPA*, 54 F. Supp. 2d 621 (E.D.Va. 1999); Timothy Wheeler, *O'Malley Vows to Speed Rivers Cleanup*, BALT. SUN, May 12, 2009. But see *infra* text accompanying note 75–76.

⁴⁰ See David Fahrenthold, *Bay Advocates Sue EPA*, WASH. POST, Jan. 6, 2009; David A. Fahrenthold, *Bay Cleanup Officials Back Off Long-Term Deadlines*, WASH. POST, Nov. 21, 2008, at B3; Ashley Halsey III, *Obama Orders EPA to Take the Lead in Bay Cleanup*, WASH. POST, May 13, 2009; Shari Wilson, *What Maryland Can Do to Help Clean Up the Bay*, WASH. POST, Jan. 25, 2009. CBF sued seeking new deadlines which the jurisdictions now want to be 2025.

⁴¹ Huslin, *supra* note 38.

⁴² Wiersema, *supra* note 15, at 1278; Huslin, *supra* note 38. See generally CHESAPEAKE BAY COMM'N, *supra* note 36.

with proposed harvest limitations, the Governor instituted restrictions on hours and closed the season a month early,⁴³ while Virginia promised to lower the yield by five percent.⁴⁴

Over the next few years, however, support for protection dwindled. In 2003, the Blue Crab Technical Advisory Committee (“BCTAC”), the BBCAC’s successor, found that the population had stabilized but was at historic lows.⁴⁵ Yet, over the ensuing years, particular metrics illustrated the species flourished.⁴⁶ This perspective heartened observers by showing the crustacean apparently turned a corner during 2006 when resource deficiencies precluded an evaluation; however, during the subsequent year, pertinent indicia revealed that females were depleted and juvenile abundance was the second lowest on record.⁴⁷

These data underlay the special committee’s 2007 establishment, and the entity issued a report in January 2008 that included bleak predictions and dramatic recommendations, sparking expeditious actions.⁴⁸ In February of that year, the VMRC introduced several changes. The VMRC required that each pot include two escape hatches to improve the survival rate for undersized females;⁴⁹ enlarged the minimum peeler size, which now duplicates Maryland rules;⁵⁰ authorized one individual crabber apart from owners to work pots;⁵¹ and capped dredge boats at fifty-five, the existing number.⁵² By April, VMRC imposed reductions of fifteen percent for hard crab pots, and thirty percent for peeler crab pots. Moreover, on May 1,

⁴³ Wiersema, *supra* note 15, at 1278–79. *See also* Anita Huslin, *Governor Imposes Crabbing Limitations*, WASH. POST, Apr. 28, 2001, at B1; Joel McCord, *Glendening Sets Limits, Trims Blue Crab Season*, BALTIMORE SUN, Apr. 28, 2001, at 1A.

⁴⁴ *See* Wiersema, *supra* note 15, at 1279–80. *See generally* Huslin, *supra* note 38; McCord, *supra* note 43.

⁴⁵ CHESAPEAKE BAY STOCK ASSESSMENT COMM., BLUE CRAB ADVISORY 2003 (NOAA Chesapeake Bay Office, Annapolis, MD.), 2003, at 1, available at <http://chesapeakebay.noaa.gov/docs/2003BCAR.pdf>. *See generally* Anita Huslin, *Md. Moves to Ease Restrictions on Crab Harvests*, WASH. POST, Mar. 14, 2003, at B3.

⁴⁶ Wiersema, *supra* note 15, at 1279; David Fahrenthold, *Bay Crab Population Up, Study Says*, WASH. POST, June 4, 2004, at B4; David Fahrenthold, *Blue Crab Conservation Strategy is Paying Off, Study Finds*, WASH. POST, Aug. 9, 2006, at B3. *See also* Rona Kobell, *Bay’s Juvenile Blue Crabs Reach Their Highest Levels Since 1997*, BALTIMORE SUN, Apr. 2, 2005, at 1B.

⁴⁷ CHESAPEAKE BAY STOCK ASSESSMENT COMM., CHESAPEAKE BAY BLUE CRAB ADVISORY REPORT 2007 (NOAA Chesapeake Bay Office, Annapolis, MD), Sept. 26, 2007, at 1, available at <http://chesapeakebay.noaa.gov/docs/2007bluecrabadvisorreport.pdf>; NOAA CHESAPEAKE BAY STOCK ASSESSMENT COMM., 2008 CHESAPEAKE BAY BLUE CRAB ADVISORY REPORT (2008) (finding the 2008 numbers lower than 2007).

Wiersema, *supra* note 15, at 1279; *Bay Blue Crab at Ebb*, *supra* note 6. *See* Exec. Order, *supra* note 1, pt. 1.

⁴⁸ *See* Blue Crab Report, *supra* note 14. *See generally supra* notes 16–19, 27–28 and accompanying text.

⁴⁹ *See* 4 VA. ADMIN. CODE § 20-370-20 (2009). I rely here and *infra* text accompanying notes 50–52 on Scott Harper, *Virginia Tightens Up on Crab Harvests as Season Nears*, VIRGINIAN-PILOT (Norfolk), Feb. 27, 2008, at B1; Lawrence Latané III, *Strict Crabbing Limits Imposed*, RICHMOND TIMES-DISPATCH, Feb. 27, 2008, at B1. *See* ACHESON, *supra* note 24, at 137–39.

⁵⁰ *Compare* 4 VA. ADMIN. CODE § 20-270-55 (2009) with MD. CODE REGS. § 8.02.03.14 E (6) (2009). *See generally* sources cited *supra* note 49.

⁵¹ 4 VA. ADMIN. CODE § 20-1040-20 (2009). *See also infra* note 53 and accompanying text (eliminating open agency).

⁵² Patrick Lynch, *State of Virginia Tightens Crab Harvesting*, DAILY PRESS, Mar. 26, 2008. *See* sources cited *supra* note 23. Fishing was not allowed in the crustacean sanctuary before March. *See* 4 VA. ADMIN. CODE § 20-752-30 (2009). *See also infra* note 53 and accompanying text (eliminating the season). *See generally* Scott Harper, *Safe-Zone Gap Undermines Crackdown on Harvests*, VIRGINIAN-PILOT (Norfolk), May 10, 2008, at B1.

2008, the agency declared October 27 the end of the female harvest and eliminated dredging. By November 2008, VMRC barred reliance on 865 dormant licenses until the population remained acceptable in three consecutive years, although the regulation included some hardship exceptions.⁵³ Maryland acted less comprehensively and nimbly through issuance of proposals on the season's eve and August 2008 final prescriptions,⁵⁴ which gradually diminished the female take between September 1 and the October 23, 2008 closure.⁵⁵

In April 2008, Governors Martin O'Malley of Maryland and Tim Kaine of Virginia pledged to resuscitate the creature by decreasing annual yields by one third.⁵⁶ On November 18, 2008, their requests that the United States Department of Commerce ("DOC") recognize the crustacean's health as a federal disaster to support watermen garnered prompt approval.⁵⁷ This cooperation is atypical; the jurisdictions have infrequently coordinated efforts, while the states' agencies and regulations differ and crabbers rely on divergent techniques and possess somewhat adverse interests, which Maryland's paucity of females helps explain.⁵⁸ The concerted attempts to rejuvenate the crustacean signify not only its enormous pragmatic and symbolic importance for watermen, estuary inhabitants, and additional users as cultural, fiscal, and environmental matters, but also the creature's profound intrinsic value and as a striking exemplar for practically all watershed life.

⁵³ 4 VA. ADMIN. CODE §§ 20-270-40, 20-880-10, 20-1140-20 (2009); Scott Harper, *800-plus Watermen in License Limbo*, VIRGINIAN-PILOT (Norfolk), Nov. 27, 2008, at A1 [hereinafter *License Limbo*]. Scott Harper, *Blue Crab Population Rebounds in the Bay*, VIRGINIAN-PILOT (Norfolk), Apr. 18, 2009, at A1; Lawrence Latané III, *State Approves Measures on Crabs*, RICHMOND TIMES-DISPATCH, Apr. 23, 2008, at A1; *supra* note 52; *infra* note 55 and accompanying text. See also VMRC PLAN, *supra* note 6, at 12.

⁵⁴ Md. Dep't of Nat. Res., Press Release, Maryland Proposes Regulations to Rebuild Blue Crab Population (Apr. 21, 2008); David Fahrenthold, *Md. Proposes Restrictions on Blue Crab Catch*, WASH. POST, Apr. 10, 2008, at B2. See also E. B. Ferguson III, *Crab Rules Take Effect*, ANNAPOLIS CAPITAL-TIMES, Aug. 30, 2008, at A1; Rona Kobell, *Maryland Proposes a New Set of Crabbing Rules*, BALTIMORE SUN, Apr. 22, 2008, at 6B.

⁵⁵ MD. CODE REGS. § 08.02.03.14 E (3)-(6) (2009); NOAA CHESAPEAKE BAY STOCK ASSESSMENT COMM., *supra* note 47 (finding the 2008 numbers lower than 2007); David Fahrenthold, *A Baby Boom of Blue Crabs*, WASH. POST, Apr. 18, 2009, at B1; Brigid Schulte, *Va. Extends Blue Crab Harvest Restrictions*, WASH. POST, May 27, 2009, at B3 (Maryland permits no winter dredging); Interview with Lynn Fegley, Md. DNR, Oct. 21, 2008 (same). See also Md. Dept. of Nat. Res., DNR Announces 2009 Blue Crab Regulations (for 2009 restrictions).

⁵⁶ David Fahrenthold, *Alarm Over Blue Crab Decline*, WASH. POST, Apr. 16, 2008, at B1; Scott Harper, *Maryland, Virginia Blue Crab Harvest to be Cut 34%*, VIRGINIAN-PILOT (Norfolk), Apr. 16, 2008, at A1. See generally Stephanie Desmon, *Bay Dredging Shows Blue Crabs Comeback*, BALTIMORE SUN, Apr. 18, 2009, at 1A.

⁵⁷ Letter from Martin O'Malley, Governor, State of Md., to Carlos M. Gutierrez, Sec'y, U.S. Dept. of Commerce (May 2, 2008) (on file with Office of Benjamin L. Cardin, U.S. Senator, State of Md.); Nat'l Oceanic and Atmospheric Admin., U.S. Dept. of Commerce, Press Release, NOAA Announces Up to \$20 Million for Blue Crab Disaster in Chesapeake Bay (Nov. 18, 2008). See Letter from Timothy M. Kaine, Governor, Commonwealth of Va., to Carlos M. Gutierrez, Sec'y, U.S. Dept. of Commerce (May 2, 2008) (on file with Office of the Governor, Commonwealth of Va.). See also 16 U.S.C. § 1864 (2006); VMRC PLAN, *supra* note 6; Md. Dep't of Nat. Res., Press Release, Governors O'Malley and Kaine Announce Increase in Bay Blue Crab Population (Apr. 17, 2009). See generally Scott Harper, *Watermen Fear for Livelihoods with Season off the Water*, VIRGINIAN-PILOT (Norfolk), Nov. 8, 2008 [hereinafter *Watermen Fear for Livelihoods*]; *infra* notes 116-17 and accompanying text.

⁵⁸ ERNST, *supra* note 1, at 11-12, 107-25; HORTON, *supra* note 1, at 161-65. See WARNER, *supra* note 1. See generally THE BLUE CRAB, *supra* note 1, at 656-79; Desmon, *supra* note 56; *supra* note 26 and accompanying text.

In 1990, several hundred boats dredged, yet the fishery's vicissitudes and costs have left fifty-five participants. Thus, terminating the harvest, which almost exclusively comprised females, affected a somewhat minuscule number of crews while it achieved half of the thirty-three percent reduction designated and ostensibly enabled Virginia to realize last year's goal.⁵⁹ The scheme that Maryland devised had impacts on a few crabbers principally near the border over a short time, and the 2008 landings apparently resembled the catch the year before.⁶⁰

This May, President Obama developed an Executive Order to safeguard and restore the bay through water quality protection and improvement, and the estuarine jurisdictions simultaneously vowed to prescribe goals and attain the objectives "not later than 2025" with the use of biennial cleanup milestones for decreasing nutrients to help revive the organism.⁶¹ The administration specifically instituted a Federal Leadership Committee of upper-echelon officials in many departments and agencies; imposed a number of practices for, and reporting strictures on, watershed protection and restoration; supported collaboration among participants through extensive federal consultation with state partners; mandated development of strategies for restoring water quality and adapting to climate change impacts; and prescribed nuanced endeavors to safeguard the bay against complications that agriculture creates and to ameliorate water pollution that federal lands and installations emit. The six states and the District of Columbia ("D.C.") published "milestone fact sheets," which included the quantity of nitrogen and phosphorous pollution each jurisdiction will reduce by 2011, the sources that will help achieve the limitations, the projected funding to secure decreases, activities that will curb pollution in satisfying milestones, and additional options which could be pursued, if necessary, to realize milestones.

B. CRITICAL ANALYSIS AND LESSONS

This descriptive account reveals that the crustacean faces many severe problems. Virginia decisively reacted to the scientific group's empirical data and prescriptions, and Maryland similarly addressed those notions and its own findings. Both imposed rather drastic controls, especially on harvest magnitude which they intended to reduce by a third and protect the species, but the approaches' effectiveness lacks clarity and the actions had palpable, deleterious impacts on a number of crabbers. The restrictions apparently furnish efficacious immediate safeguards that would decrease the current threat were the rules to limit the yield by thirty-three percent; however, the long-term dynamics essentially remain unclear.

⁵⁹ I rely primarily in this and the next sentence on sources cited *supra* notes 23, 53–57, *infra* notes 65–67.

⁶⁰ *Id.*

⁶¹ I rely in this paragraph on Exec. Order, *supra* note 1; *2011 Milestones for Reducing Nitrogen and Phosphorous* (Chesapeake Bay Prog.), May 2009; Halsey, *supra* note 40; Timothy Wheeler, *States Vow to Speed Bay Cleanup*, BALT. SUN, May 13, 2009. See Rena Steinzor & Shana Campbell Jones, *Reauthorizing the Chesapeake Bay Program: Exchanging Promises for Results* (Center for Progressive Reform, June 2009), available at <http://www.progressivereform.org/articles/chesbayfinal.pdf>.

Insufficient data exist to ascertain whether the one third reduction was secured; even if the reduction were secured, there is still the question of whether this would dramatically enhance the crustacean's permanent situation and, thus, if the measures afford the best protection and honor other values, including equitable stakeholder treatment. It is not clear that the pertinent entities (1) gathered, inspected, and synthesized the maximum relevant empirical information on bay pollution sources which destroy SAV and endanger crabs, or (2) prescribed the finest alternatives by investigating the widest spectrum of constructive remedies that attack the complications, deftly matching the problems with solutions and fairly allocating burdens through precise correlation of responsibility for the difficulties and the expenses imposed. The federal and state governments may have cooperated less fully than possible with each other to address the creature's deterioration, and their scientific and regulatory agencies could have lacked the authority or political will to stanch important pollution, concerns that the new Executive Order implicitly acknowledged and for which it specifically provided.⁶² Moreover, the states emphasized the crustacean and the harvest within their geographic purview.⁶³ It is also unclear why the jurisdictions delayed acting and eventually instituted these relatively circumscribed, near-term, less equitable approaches. Data have long suggested the crustacean was threatened and overfishing bore partial responsibility, as demonstrated by the increased effort used to land the same quantity, although pollution and substantial crabber opposition actually played roles.⁶⁴ In fairness, the creature's state might be degraded enough, agency power sufficiently confined, and alternatives so few and constricted that those restrictions instituted were necessary to protect stocks and the best devices.

Ardent waterman resistance is understandable. By lowering the catch, most of the burden is borne by commercial, and Virginia, crabbers and areas not primarily causing decline. For example, the limitations seemed to reduce by thirty-three percent the yield and individual crabbers' earnings, but few data verify the ideas, which may reflect factors, such as the kind of gear deployed and relevant job opportunities that depend on the remoteness of areas where watermen labor. Eliminating the dredge season in Virginia rather abruptly deprived fifty-five boats of their principal livelihood at a time in which other employment is scarce,⁶⁵ disproportionately affecting

⁶² Exec. Order, *supra* note 1. See *supra* notes 38, 49–55 and accompanying text. See also *supra* note 61, *infra* note 121 and accompanying text. But see *supra* notes 27–34, 36, 39, 42–43, 56–58 and accompanying text. Slow governmental action can complicate crabbers' planning. See generally *supra* notes 54–55 and accompanying text.

⁶³ Indeed, the notion that striped bass deplete crabs more than yields elucidates the need for intensive, particularly multispecies and ecosystem, inquiry and response.

⁶⁴ ERNST, *supra* note 1, at 22, 94–96; CHESAPEAKE BAY FOUNDATION, *supra* note 15, at 2; WARNER, *supra* note 1, at 256–61. See also *supra* notes 15–21, 27–44 and accompanying text; *infra* text after sentence in text accompanying note 71.

⁶⁵ Bill Geroux, *As Livelihood Dries Up, an Island Town Dies*, RICHMOND TIMES-DISPATCH, Nov. 30, 2008, at A1; Scott Harper, *Judge Limits State's Ban on Crab Dredging*, VIRGINIAN-PILOT (Norfolk), Apr. 7, 2009, at B7 [hereinafter *Judge Limits State's Ban*]. A state judge upheld the ban. See also *License Limbo*, *supra* note 53. See *supra* notes 23, 51, 53, 59 and accompanying text.

particular locales, such as Tangier Island.⁶⁶ Closing both female seasons early had predictable, similar impacts.⁶⁷ These problems exacerbated numerous watermen's financial situations that the demise of the oyster industry had previously eviscerated and, therefore, undermined a vanishing way of life.

The activities scrutinized illustrate multiple related, but less than fully consistent, notions. One potent explanation is the tragedy of the commons, which suggests that private actors, such as crabbers and agricultural and industrial operations, exploit public resources by harvesting too many crustaceans or using the bay for waste disposal.⁶⁸ A second explanation is intergenerational justice that ponders whether the existing generation should preserve limited natural resources for subsequent ones.⁶⁹ The crab and pollution analogously illuminate externalities. For instance, when developers essentially convert farms and wooded areas to shopping centers, parking lots, and residences, thus modifying surfaces in ways that negatively affect the creature with minimal accountability, this construction does not reflect its actual expense, which citizens in fact usually pay and society absorbs.⁷⁰

The crustacean also exemplifies the dynamics of fishery politics.⁷¹ Watermen have long vociferously rejected controls, blaming other individuals or phenomena and decrying the limitations or their enforcement. Had jurisdictions resisted that importuning and gradually adopted measures earlier, they could have alleviated the necessity for drastic measures. Natural variation means stocks inexorably fluctuate, even in times of negligible pollution, so restrictions must decrease crabber effort over all the years to safeguard the crustacean. Therefore, regulation's dominant purpose is arguably stock protection, rather than deciding whether a cure is fair or assigning responsibility.

The developments similarly illustrate the related notions of polycentricity and unintended consequences. Myriad sources foster

⁶⁶ Desmon, *supra* note 56; Geroux, *supra* note 65; Lawrence Latané III, *It's Tough Times for the Chesapeake's Shrinking Fleet of Crab Dredgers*, RICHMOND TIMES-DISPATCH, Mar. 31, 2008, at B1; *Watermen Fear for Livelihoods*, *supra* note 57. See also Anita Huslin, *Watermen Fight the Tide*, WASH. POST, Sept. 2, 2001, at C1.

⁶⁷ Scott Harper, *Blue Crabbers Catch a Break*, VIRGINIAN-PILOT (Norfolk), Oct. 8, 2008, at B4; Rona Kobell, *Living with the Crab*, BALT. SUN, Apr. 28, 2008, at 1A; *Harvest Pinched*, *supra* note 21. See David Fahrenthold, *Way of Life Slipping Away Along Chesapeake's Edge*, WASH. POST, Dec. 28, 2008, at A1; *supra* notes 53, 55 and accompanying text.

⁶⁸ JAMES M. ACHESON, CAPTURING THE COMMONS (2004); ERNST, *supra* note 1, at 38–39; ELINOR OSTROM, GOVERNING THE COMMONS (1990); Barton H. Thompson, *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241 (2000). See Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

⁶⁹ See *Symposium Intergenerational Equity and Discounting*, 74 U. CHI. L. REV. 1 et seq. (2007); *Symposium New Analyses of Intergenerational Justice for a New Century*, 77 GEO. WASH. L. REV. 1135–1671 (2009).

⁷⁰ Baliles, *supra* note 27, at 620. See *supra* text accompanying notes 18, 35. See generally Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972). Agricultural, wastewater treatment, industrial and governmental operations could have analogous impacts.

⁷¹ For the concepts below, I rely mainly on ACHESON, *supra* note 24; GULLAND, *supra* note 1; Wiersema, *supra* note 15; Interview with Professor Joshua Eagle, University of South Carolina School of Law (Jan. 5, 2009).

deterioration, thus attacking one has effects, which can be virtually impossible to anticipate, on a number. Preliminary estimates indicate the Virginia endeavors reduced last year's harvest by one third, but the Maryland initiatives did not, suggest its crabbers essentially reacted by increasing effort or over-reporting, perhaps to inflate the baseline data that would apparently underlie future controls. The material examined indicates nuanced regulation is more art than science, the compelling need to apply the best procedures and substantive objectives as well as the complexities entailed in gleaning trustworthy empirical data on which to premise selection of the finest practices, implementing and enforcing the techniques and accurately calculating what the approaches realized. The developments also reveal that only when crabs sustain acute depletion may the political will to safeguard them permanently surmount immediate economic pressures. This story about the crustacean and related bay denizens is the quintessential cautionary tale which asks the provocative question of whether the crab will recover, like the ubiquitous striped bass, or experience oysters' pervasive decline.

In sum, the preceding review ascertains that deterioration of the crustacean is attributable to various sources, namely overharvesting and pollution. Moreover, numerous efficacious solutions could be invoked that would treat the plight suffered by the crab and additional watershed organisms. Therefore, a comprehensive array of pragmatic remedies deserves extensive investigation. Emphasis is on state-level concepts because the jurisdictions have major authority for the crustacean and other natural resources. Yet, the EPA does exercise ultimate responsibility over air and water pollution and coordinates many substantive actions through the Chesapeake Bay Program, while the Interior Department Fish and Wildlife Service and the DOC National Oceanic and Atmospheric Administration ("NOAA") have the power to manage fisheries and the responsibilities discharged by certain related agencies, crucially the United States Departments of Agriculture ("USDA") and Defense ("DOD"), can affect crabs.

IV. SUGGESTIONS FOR THE FUTURE

A. AREAS FOR RECONSIDERATION

1. *Cooperation*

The federal and state governments ought to expeditiously reconsider how they treat depletion. For instance, all should reassess cooperation among the legislatures, the chief executives, and the agencies as well as the branches individually and each other watershed jurisdiction. This has peculiar importance, given (1) cooperation's historical dearth and even competition between the two states and their relatively diverse fishing methods and limitations, (2) the comparatively thorough and prompt Virginia activity last year, (3) the problematic bay record of the United

States, and (4) the desperate need to restore the species.⁷² If cooperation has been deficient, the governments must assiduously work together, canvassing and perhaps forging accords or a watershed crustacean entity, ideas the new White House Order recognized and addressed through encouragement of greater direct federal-state consultation and planning.⁷³

2. Resources, Data and Approaches

The federal and state governments should guarantee that the agencies possess sufficient resources and considerable authority to, and in fact, collect, analyze, and synthesize the maximum empirical data that precisely identify the crab's status and a number of actions that best ensure improvement while choosing among them, views that the Executive Order generally favored. DNR and VMRC understandably reduced the yield because its magnitude effectively appeared to be one prominent, immediate cause of deterioration, and this alternative could have seemed efficacious and was readily available and felicitously implemented.

However, pertinent scientific evidence indicates that overfishing is not the primary source of the crustacean's dilemma.⁷⁴ In fact, substantial contributors to decline are the growing bay water and air pollution, and rampant SAV depletion. Because agencies—notably water and air control boards—exercise authority over important causes of pollution and SAV loss, the agencies should reconsider whether present measures safeguard the crustacean sufficiently. If the measures do not, the agencies should increase the rigor of their practices. Moreover, if the legislatures and chief executives ascertain the devices are overly lenient, they could pass and institute stricter controls and even broaden agency power to reach sources that injure crabs, activities that the current administration's estuarine vision could implement. Finally, notwithstanding the modern explanations for deterioration, populations' sharp depletion arguably necessitates harvest limitations to protect the stock.

B. SOLUTIONS

The jurisdictions affected by these issues must first consider the broadest practicable spectrum of public, private, and quasi-governmental solutions. They ought to next adopt a finely calibrated mix that includes numerous remedies, tailoring approaches to the difficulties that efficiently and economically maximize protection while providing fair treatment to all

⁷² For Virginia, see *supra* notes 48–55, 59 and accompanying text. *But see supra* notes 27–34, 39, 42–43, 56–58. For the U.S., the recent suit by CBF and the watermen suggests EPA might control pollution and coordinate better. See *supra* note 40, *infra* notes 82, 93, 95–96. See also *supra* note 34; *supra* text accompanying note 39.

⁷³ Exec. Order, *supra* note 1. There are a few similar entities, the Bay Program, CBC, BCTAC and the 2007 committee, but most regulate little. 33 U.S.C. § 1267 (2006); MD. CODE ANN., NAT. RES. § 4-306 (2009); VA. CODE ANN. §§ 28.2-1001, 30-240 (2009). The menhaden and oyster disputes exemplify inter state and governmental tensions. Lawrence Latané III, *Va. Town is Small in Size but Big on Fish*, RICHMOND TIMES-DISPATCH, Aug. 2, 2008, at B1; *supra* note 7. See H. BRUCE FRANKLIN, THE MOST IMPORTANT FISH IN THE SEA (2007); see also *supra* text accompanying notes 16, 34, 36.

⁷⁴ See *supra* notes 18-21 and accompanying text. See also ERNST, *supra* note 1, at 53-105; HORTON, *supra* note 1, at 43-139, 161-66.

stakeholders. Indeed, the equitable allocation of responsibilities and burdens may decrease the need for the thirty-three percent reduction that strongly affects crabbers. Insofar as the options explored below apply, they deserve reexamination to determine whether the ideas warrant change, modernization, or refinement.

1. Public

a. Agriculture

The governments now have a promising array of “public” solutions. Numerous examples treat farming. The overwhelming majority of these solutions are voluntary programs. Because agriculture significantly affects watershed pollution—especially by injecting nutrients that absorb oxygen which bay creatures need—the remedies that address them merit a careful and thorough evaluation.

One solution is limiting fertilizer application, a principal source of poor watershed health. For instance, the states could prescribe split fertilizer that enhances the nitrogen and phosphorous absorbed by crops, decreasing amounts lost into the environment or impose bans on poultry waste and sewage sludge—the least efficient fertilizers—which release practically half the applied phosphorous into the environment without benefiting crops.⁷⁵ Neither Maryland nor Virginia mandates the actions, but the states definitely ought to consider the alternatives as they could reduce the detrimental effect of fertilizer. A cogent illustration of regulation is the recent Maryland decision to increase restrictions governing chicken operation pollution, notably implicating the treatment and storage of manure around tributaries, an essential cause of watershed decline. The EPA has subsequently announced that it will prescribe stricter controls, although Virginia has yet to create stronger limitations.⁷⁶

The watershed jurisdictions have multiple non-compulsory efforts related to farming. Illustrative is the Maryland system which enables agricultural interests to develop and enforce their own runoff plans.⁷⁷ Buffers—whether naturally created, like wetlands, or artificial, such as the 100-foot zones of mature trees and ground cover that insulate the Chesapeake from agriculture along the estuary’s shorelines—are effective,

⁷⁵ For split, and the analogous notion of time-released, fertilizer, see Land, *supra* note 18. For least efficient, see *id.*; Kobell, *supra* note 18. See also ERNST, *supra* note 1, at 72–74; HORTON, *supra* note 1, at 43–69.

⁷⁶ MD. CODE REGS. § 26.08.03.09 (2009); Paul Sorisio, Note, *Poultry, Waste and Pollution: The Lack of Enforcement of Maryland’s Water Quality Improvement Act*, 62 MD. L. REV. 1075 (2003); David Fahrenthold, *Md. Gets Tough on Chicken Farmers*, WASH. POST, Sept. 12, 2008, at A1; Ted Shelsby, *Farmers Make Case for the Bay*, BALT. SUN, Dec. 14, 2008, at 2G; Ian Urbina, *Maryland is Turning Pollution Spotlight on its Huge Poultry Industry*, N.Y. TIMES, Nov. 29, 2008, at A14; Timothy Wheeler, *Chicken Farmers Face Strict EPA Rules*, BALT. SUN, Mar. 15, 2009, at 1A. See Timothy Searchinger, *Cleaning Up the Chesapeake Bay: How to Make an Incentive Approach Work for Agriculture*, 16 SE. ENVTL. L. J. 171, 198 (2007).

⁷⁷ MD. CODE ANN., ENVIR. §§ 5-501–516 (2009). See Sarah Brull, *An Evaluation of Nonpoint Source Pollution Regulation in the Chesapeake Bay*, 13 U. BALT. J. ENVTL. L. 221 (2006); *Weak Laws*, *supra* note 35. These involve runoff as a general matter and fertilizer specifically.

yet inexpensive, water quality protections that decrease fertilizer and other runoff pollution.⁷⁸

Relatively analogous, but less intrusive, are endeavors that compensate farmers. Maryland pays individuals annually to grow cover crops, such as oats, which absorb fertilizer left after the primary crop harvest and to employ a number of best management practices (BMPs), while Virginia underwrites fences that bar animals, namely cattle, from tributaries.⁷⁹ BMPs, which include a multitude of devices analyzed earlier—such as buffers, cover crops, and fertilizer administration plans—as well as contour farming, conservation tillage, and retirement of erodible land, may diminish agricultural runoff's harmful effects by decreasing nutrient amounts placed on farmlands or creating storage, buffering and filtering regimes, which directly limit migration of nutrients to the watershed.⁸⁰ These voluntary programs have engendered minimal farmer support.⁸¹ Thus, the jurisdictions ought to reevaluate the initiatives and decide whether changes would facilitate participation and, if not, examine mandatory alternatives or a combination of those and voluntary approaches.

At the federal level, considerable activity is warranted. To satisfy a court order, the EPA is drafting a new agricultural runoff control protocol based substantially on the total maximum daily load ("TMDL") of watershed and tributary pollution by 2011.⁸² The agency should consider adopting a bay-wide TMDL concept next year that would be eighty percent implemented by 2012 and fully effectuated three years later and would incorporate the allocations used for the earlier tributary strategy process and Maryland Chesapeake water quality standards.⁸³ Obama has also instructed the USDA to guarantee that its working lands and land retirement efforts invoke priority conservation notions which most efficiently decrease nutrients and sediment loads.⁸⁴ If the progress involving agriculture that estuarine jurisdictions make lacks sufficiency, the

⁷⁸ HORTON, *supra* note 1, at 41; Stokstad, *supra* note 35; Land, *supra* note 18. See Searchinger, *supra* note 76, at 202; Wilson, *supra* note 40; *Scenes of an Effort Impeded*, *supra* note 26; *infra* notes 99, 114 and accompanying text.

⁷⁹ MD. CODE ANN. § 8-701 et seq. (2009); VA. CODE ANN. §§ 10.1-104.3, 58.1-339.3 (2009); Kobell, *supra* note 18; *Scenes of an Effort Impeded*, *supra* note 26; Stokstad, *supra* note 35. See Md. Dept. Ag., Cover Crop Program (2008); Va. Dept. Ag., Va. Agricultural Cost Share BMP Manual (2009); Searchinger, *supra* note 76, at 194; *Evaluation of Chesapeake Goals*, *supra* note 35.

⁸⁰ For comprehensive evaluations of these concepts and the measures, see ERNST, *supra* note 1, at 73 - 74; HORTON, *supra* note 1, at 43 - 69.

⁸¹ See, e.g., ERNST, *supra* note 1, at 74; *Evaluation of Chesapeake Goals*, *supra* note 35.

⁸² *Am. Canoe Ass'n. v. EPA*, 54 F. Supp. 2d 621 (E.D. Va. 1999). See OLIVER HOUCK, *THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION* (1999); James McElfish et al., *Inventing Nonpoint Controls: Methods, Metrics and Results*, 17 VILL. ENVTL. L.J. 87, 176 (2006); J.B. Ruhl, *Agriculture and Ecosystem Services: Strategies for State and Local Governments*, 17 N.Y.U. ENVTL. L.J. 424 (2008); Editorial, *Those Who Can't, Study*, WASH. POST, Mar. 22, 2008, at A12; *supra* notes 33, 39-41 and accompanying text.

⁸³ The Order appeared to envision this possibility. The Chesapeake Bay Foundation (CBF), in settlement negotiations with EPA on its deadline litigation, is urging this view. Interview with Jon Mueller, Chesapeake Bay Foundation (Apr. 2, 2009).

⁸⁴ Exec. Order, *supra* note 1. See Tom Vilsack, Commentary, *A Partnership With Farmers to Heal the Bay*, BALT. SUN, May 14, 2009.

EPA could invoke federal authority by exercising power over concentrated animal-feeding operations or implementing various sanctions.⁸⁵

b. Related Nutrients

Additional concepts implicate related nutrients. For example, recent Maryland legislation provided that new or replacement septic systems within 1000 feet of the bay and its tributaries must have nitrogen-removal capacity.⁸⁶ This measure will diminish nutrients, although they contribute a tiny percentage as compared to other sources like farming. Mandatory inspection and upkeep of all existing Chesapeake septic systems also merit consideration. Moreover, requiring that sewage treatment plant upgrades approximate the best current technology would greatly limit nitrogen and phosphorous discharges. However, Maryland and Virginia have not effectuated either approach.⁸⁷

The federal government has long supplied pecuniary resources for many state-level wastewater treatment facility improvement projects, of which the stimulus package is a valuable, timely example.⁸⁸ If the watershed jurisdictions continue failing to attain sufficient nutrient reductions, the federal government might evaluate punitive concepts, such as prohibitions on new sewage plant discharges or revocation of federal dollars.⁸⁹

c. Related Water Pollution

Stricter regulation of water discharges and runoff from private industrial operations, localities, and government agencies and installations, such as military bases, ought to decrease bay pollution. Maryland counters the effects of stormwater runoff by requiring developers to rely on procedures for environmental site design which treat runoff. Maryland also helps densely-populated government subdivisions retrofit particular areas, establish strategies to diminish trash, and create pollution restrictions that

⁸⁵ Stokstad, *supra* note 35; Steinzor & Jones, *supra* note 61. See sources cited *supra* note 76. See also *infra* notes 90, 92 and accompanying text.

⁸⁶ MD. CODE ANN., ENVIR. § 9-1108 (2009); Editorial, *Saving the Bay: Maryland's Septic-Tank Law Will Help Clean the Great Waterway*, WASH. POST, Apr. 23, 2009, at A18; Timothy Wheeler, *Passage of Septic Measure Hailed Bay-Protection Bill Requires Many to Upgrade Systems*, BALT. SUN, Apr. 15, 2009, at 1A. Maryland used upgrade grants and a user "flush tax" to fund cover crop payments. *Scenes of an Effort Impeded*, *supra* note 26.

⁸⁷ MD. CODE ANN., ENVIR. § 9-1605.2 (2009). Federal resources, local bonds and fees could fund upgrades. Baliles, *supra* note 27, at 621-22. See Paula C. Hollinger & Maggie L. McIntosh, *Genesis of the Bay Restoration Fund*, 12 U. BALT. J. ENVTL. L. 55 (2004).

⁸⁸ American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, div. A, tit. I (2009); Meredith Cohn, *Funds Flow for Md. EPA Gives State \$122 Million in Stimulus for Water Quality, Treatment, Cleanup Projects*, BALT. SUN, June 3, 2009, at 3A; Jim Nolan, *Grants Will Help Va. Reduce Runoff into Chesapeake Bay: Project at Capitol Square Will Include New Plants and New Stone Walkways*, RICHMOND TIMES-DISPATCH, June 2, 2009, at B2.

⁸⁹ See William C. Baker, *EPA to the Rescue: Only a Holistic Approach Can Save the Bay, and Only Washington Can Provide It*, BALT. SUN, May 6, 2009, at 15A. See also *supra* note 85 and accompanying text; *infra* notes 92-93 and accompanying text.

meet standards for impaired waters.⁹⁰ Virginia deploys analogous notions, even though the Commonwealth assigns localities greater responsibility.⁹¹

If present state-level water pollution efforts seem inadequate, the EPA has several tools at its disposal. First, the EPA could halt the issuance of estuarine permits for new or greater industrial nutrient discharges having effects on impaired waters that lack offsets. The EPA might also capitalize on specific emergency and residential designation powers when addressing stormwater. Moreover, the EPA could prescribe stronger municipal separate storm sewer system (“MS4”) permits to slow construction and urban runoff. The EPA may even withdraw states’ delegated regulatory authority or funding.⁹² The Chesapeake Bay Program says it has a draft plan for eliminating toxics, if the jurisdictions would act, yet they spend only half a percent of the restoration budget on decreasing toxics.⁹³ The Executive Order requested the DOD to ensure that “agencies with land, facilities or installation management responsibilities” that can have effects on ten or greater acres of land implement a number of stormwater deterrents to protect the watershed and its streams.⁹⁴

d. Air Pollution

A pressing, although less obvious, reason for plummeting species health, is the deposit of air pollution into bay waters and onto estuarine region lands, an issue which the White House has recognized. More stringent control of vehicle tailpipe emissions as well as air pollutants from industrial sources, electric plants, and government institutions should enhance bay water quality. However, air pollution sources in the Clean Water Act’s phraseology are not point sources, leaving them basically unregulated, and the EPA has comparatively insubstantial authority to regulate existing sources under the Clean Air legislation.⁹⁵ The EPA devised the Clean Air Interstate Rule (“CAIR”) for curtailing airborne pollutants and a cap and trade system for lowering mercury pollution,

⁹⁰ Maryland also helps developers improve treatment in construction, while the retrofitted areas are ones developed before contemporary practices’ advent. MD. CODE ANN., ENVIR. § 4-201 (2009); MD. CODE REGS. 26.03.06.01, .05 (2009); Wendy E. Wagner, *Stormy Regulation: The Problems that Result When Stormwater Regulatory Programs (and Others) Neglect to Account for Limitations in Scientific and Technical Information*, 9 CHAP. L. REV. 191 (2006). See Stokstad, *supra* note 35; Wilson, *supra* note 40; *infra* notes 94, 98-104 and accompanying text.

⁹¹ VA. CODE ANN. § 10.1-603.2 (2009); 4 VA. ADMIN. CODE §§ 50-60-10 to -1240. See sources cited *supra* note 90.

⁹² The EPA may use 40 C.F.R. § 122.4(i) (2009), and *Friends of Pinto Creek v. EPA*, 504 F.3d 1007 (9th Cir. 2007) for permit powers; 33 U.S.C. § 1364 (2006) for emergency powers; and 40 C.F.R. § 122.26 for residential designation, stormwater, and MS4 permit powers. Exec. Order, *supra* note 1. See Mueller Interview, *supra* note 83; *supra* notes 85, 89 and accompanying text; *infra* note 123 and accompanying text.

⁹³ MD. CODE ANN. ENVIR. § 4-201 (2009); Berlin, *supra* note 32. See also 15 U.S.C. § 2601 (2006); EPA, *Toxics Release Inventory* (2009), available at <http://www.epa.gov/TRI>; Juliet Eilperin, *EPA Seeks Rules for Utilities’ Runoff*, WASH. POST, May 3, 2009, at A3; David A. Farenthold, *Environmental Protections Take Hit In Fiscal Crunch*, WASH. POST, Jan. 26, 2009, at B1.

⁹⁴ Exec. Order, *supra* note 1. See also *supra* notes 61, 84 and accompanying text.

⁹⁵ 33 U.S.C. § 1362 (2006); 42 U.S.C. § 7411 (2006). See also WILLIAM RODGERS JR., ENVIRONMENTAL LAW 294 (2d ed. 1994); Jonathan Cannon, *Checking in on the Chesapeake: Some Questions of Design*, 40 U. RICH. L. REV. 1131 (2006); David Schoenbrod et al., *Air Pollution: Building on the Successes*, 17 N.Y.U. ENVTL. L. J. 284 (2008). The EPA could arguably mandate stricter control of toxics. Mueller Interview, *supra* note 83. See also *supra* note 82, *infra* note 96.

although the D.C. Circuit found its endeavors deficient.⁹⁶ Furthermore, state-level avenues, particularly the transit-oriented redevelopment effort at Tysons Corner, could actually decrease commuter vehicle use, airborne pollutants (which settle in the estuary and its tributaries) and polluted urban runoff.⁹⁷

e. Population Increase and Land Use

Additional concepts explicitly treat the skyrocketing growth and attendant development in the watershed. For example, the Maryland Critical Area Act and Virginia's Chesapeake Bay Preservation Act restrict land uses that harm great numbers of crabs and additional organisms. Maryland limits development within 1000 feet of the estuary and its tidal streams and prohibits construction and vegetation removal within 200 feet. However, the initial stricture has permitted development on some pristine waterfront property and local enforcement has been relatively inconsistent and not especially stringent.⁹⁸ The Virginia Assembly cedes local governments power for safeguarding water quality through designation of "bay preservation areas;" however, this grant could have impeded the law's effectiveness.⁹⁹ A related measure is the Maryland Smart Growth Act, which purportedly contains sprawl by asking that localities carefully identify "growth areas" to channel building and development.¹⁰⁰ Nonetheless, local governments have delineated many such places in ways that overrun farms and woods and use statutory loopholes to avoid the statute's rigorous demands.¹⁰¹

⁹⁶ For CAIR, see 70 Fed. Reg. 25,162 (May 12, 2005); *North Carolina v. EPA*, 531 F.3d 896 (D.C. Cir. 2008); Jamie Pleune, Note, *Do We CAIR about Cooperative Federalism in the Clean Air Act?*, 2006 UTAH L. REV. 537; Stokstad, *supra* note 35; Felicity Barringer, *In Reversal, Court Allows a Bush Plan on Pollution*, N.Y. TIMES, Dec. 24, 2008, at A13. For the regulation of mercury, see 70 Fed. Reg. 28,606 (May 18, 2005); *New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008); John Broder, *From a Theory to a Consensus on Emissions*, N.Y. TIMES, May 17, 2009, at A1; Editorial, *Chesapeake Bay Watch*, WASH. POST, Nov. 8, 2008, at B6 [hereinafter *Chesapeake Bay Watch*]; Cornelia Dean, *Environmentalists Advance on Emissions*, N.Y. TIMES, Feb. 24, 2009, at A16.

⁹⁷ See Richard A. Etlin, Professor, University of Maryland, *The Future of Tysons Corner: A Fifteen-Point Blueprint for the New "Downtown" of Northern Virginia* (Oct. 21, 2004), http://www.smartgrowth.umd.edu/research/pdf/Etlin_TysonsCorner_DateNA.pdf. See generally *Chesapeake Bay Watch*, *supra* note 96; Lisa Rein, *Tysons Will Need \$15 Billion - 'with a B'*, WASH. POST, Oct. 30, 2009, at B1.

⁹⁸ See MD. CODE ANN., NAT. RES. § 8-1801 (1984). See also Solomon Liss & Lee R. Epstein, *The Chesapeake Bay Critical Area Commission Regulations: Process of Enactment and Effect on Private Property Interests*, 16 U. BALT. L. REV. 54 (1986); McElfish, *supra* note 82; Richard H. McNeer, *Nontidal Wetlands Protection in Maryland and Virginia*, 51 MD. L. REV. 105, 123 (1992). See generally Searchinger, *supra* note 76; Kobell, *supra* note 18; Mueller Interview, *supra* note 83; *supra* note 86.

⁹⁹ VA. CODE ANN. § 10.1-2100 (2009). See W. Todd Benson & Philip O. Garland, *Legal Issues Affecting Local Governments in Implementing the Chesapeake Bay Preservation Act*, 24 U. RICH. L. REV. 1 (1989); *The Chesapeake Bay Preservation Act: The Problem with State Land Regulation of Interstate Resources*, 31 WM. & MARY L. REV. 735 (1989); W. Tayloe Murphy, Jr. & Michael McKenney, *Response to Legal Issues Affecting Local Governments in Implementing the Chesapeake Bay Preservation Act*, 24 U. RICH. L. REV. 385 (1990). The reasons for impairment seem akin to those witnessed in Maryland. See *supra* note 98 and accompanying text.

¹⁰⁰ MD. CODE ANN., NAT. RES. § 5-9A-01 (2009). See Gerrit-Jan Knaap & John W. Frece, *Smart Growth in Maryland: Looking Forward and Looking Back*, 43 IDAHO L. REV. 445 (2007). See generally Jerry Markon, *Bringing Development Into Focus: A Documentary Chronicles the History of Arlington's 'Smart Growth' Planning and the Ascendance of Metro*, WASH. POST, Apr. 23, 2009, at VA12; *Weak Laws*, *supra* note 35; Mueller Interview, *supra* note 83.

¹⁰¹ *Weak Laws*, *supra* note 35. See John W. Frece, *Twenty Lessons From Maryland's Smart Growth Initiative*, 6 VT. L. REV. 106 (2005); Lisa Rein, *Md. Town's Bid for Economic Stimulus Starts Fight*;

Other examples include wetlands acts that limit modifications implicating the specific areas. However, implementation of the laws may have been complicated by Virginia's delegation of permitting authority to local subdivisions and Maryland's distinction between public and private wetlands.¹⁰² Both states ought to conscientiously review the laws and their application while designing pragmatic improvements because wetlands furnish essential crustacean habitats and operate as natural buffers—somewhat like the 100-foot riparian areas investigated earlier—making them inexpensive, efficacious ways to preserve water quality and the crab.

The jurisdictions should also buy, or provide tax incentives for leaving undeveloped, environmentally-sensitive areas that protect the crustacean, including forests and wetlands. Both states' Assemblies empower local subdivisions to create Purchase of Development Rights initiatives, which apparently safeguard these places.¹⁰³ Maryland's Transfer of Development Rights system has proven successful, and Virginia has authorized local governments to prescribe similar endeavors, although their recent character leaves unclear whether implementation will protect the crustacean.¹⁰⁴

The states administer nearly all the land use and population growth ideas surveyed. However, federal enactments—including the Clean Water Act, the Coastal Zone Management Act, the National Forest Management Act, and the National Environmental Policy Act—delegate specific land use planning and management responsibilities to agencies, and considerable federal government behavior directly and indirectly affects the watershed and crabs, as the Executive Order specifically recognized.¹⁰⁵ Thus, federal institutions need to anticipate their decisions' potentially harmful effects on both the bay and the crustacean and minimize the impacts. Across many years, a complex web of federal statutes that authorize land purchases and transfers has essentially safeguarded habitat and water quality important to the estuary and to the creature.¹⁰⁶ Although these federal programs, the state-level projects mentioned above, and some

U.S. Funds Sought for Development Project's Sewage Plant, WASH. POST, May 11, 2009, at B1 [hereinafter *Economic Stimulus*]; Shelsby, *supra* note 76; Timothy Wheeler, *O'Malley Seeks Modest Changes to Smart Growth*, BALTIMORE SUN, Jan. 12, 2009, at 3A.

¹⁰² See MD. CODE ANN., ENVIR. §§ 5-901 to 16-101 (2009); VA. CODE ANN. § 28-2-1300 (2009). See also McNeer, *supra* note 98. See generally sources cited *supra* note 31; *supra* notes 98-101 and accompanying text.

¹⁰³ MD. CODE ANN. art. 24, § 20-101 (2009); VA. CODE ANN. § 15.2-5158 (2009). See also Greg Edwards, *Tax Bill May Affect Land Protection*, RICHMOND TIMES-DISPATCH, Aug. 25, 2006, at B9; Kunkle, *supra* note 11; *Preserve Land*, *supra* note 35; Robert Suydam, *Virginia Law Offers Innovative Land Conservation Tools*, RICHMOND TIMES-DISPATCH, Nov. 9, 2008, at E4; Commonwealth of Virginia, Press Release, Governor Kaine Announces \$500,000 in Farmland Preservation Grants (Dec. 30, 2008). Maryland's Program Open Space, which is financed through the taxation of land transfers, helps to conserve land. See *Chesapeake Bay Watch*, *supra* note 96.

¹⁰⁴ MD. CODE ANN. § 11.01 (2009); VA. CODE ANN. § 15.2-2316 (2009). See also Rick Pruetz & Erica Pruetz, *Transfer of Development Rights Turns 40*, 59 PLANNING & ENVTL. L. 3. 3-5 (2007); Suydam, *supra* note 103.

¹⁰⁵ National Forest Management Act, 16 U.S.C. § 1600 (2006); Coastal Zone Management Act, 16 U.S.C. § 1451 (2006); Clean Water Act, 33 U.S.C. § 1251 (2006); National Environmental Policy Act, 42 U.S.C. § 4321 (2006). See RODGERS, *supra* note 95. See also Exec. Order, *supra* note 1; *supra* notes 61, 94 and accompanying text.

¹⁰⁶ See Edward Heisel, Comment, *Biodiversity and Federal Land Ownership: Mapping a Strategy for the Future*, 25 ECOLOGY L. Q. 229, 279-307 (1998). See, e.g., 16 U.S.C. §§ 669, 718 (d) (2006).

private concepts addressed below are effective, fiscal realities will likely constrain all of those schemes.

f. Fishery Health

The crab's grave deterioration indicates that the approaches evaluated could necessitate prolonged application before they have substantial impact and even then may not permanently save the fishery. Therefore, rather draconian policies might be necessary and merit review, but they should not be instituted until decisionmakers have exhausted the remaining workable prospects and have fairly distributed the costs among relevant stakeholders.¹⁰⁷ One possibility is catch shares that afford watermen a partial stake in the creature and, thus, essentially provide incentives against overharvesting. More drastic could be applying the fishery's economics and recalibrating the number of crustacean licenses to insure that, even in lean years, harvests actually support crabbers, many of whose operations now appear financially marginal. That notion might be a valuable way to help the creature over the long term, although the device would require political will and leadership as the solution eliminates jobs. Analogous are "waterman" permits, not licenses for discrete fisheries that states would issue to people who mostly earn income fishing and grant them some priority vis-à-vis recreational users and large boat owners, who harvest different species. VMRC partially endorsed the specific ideas by paying crabbers who vowed to quit reimbursement through the disaster funds.¹⁰⁸

2. Private

When practical, jurisdictions should encourage and implement "private" alternatives. One private option is to safeguard or remove from development privately-owned areas, such as wetlands and forests, that protect the species with conservation easements, land trusts, and related devices. The thirty-five-year-old initiative of the Nature Conservancy, that preserved the Virginia Eastern Shore Atlantic barrier islands, is a classic, albeit rare, example.¹⁰⁹ In fact, the acreage that perpetual conservation easements safeguard across the lower bay doubled, reaching 274,358, over the twenty-first century's initial half decade, while the measures protected

¹⁰⁷ For nearly all of the ideas in this sentence and the remainder of this paragraph, I rely on ERNST, *supra* note 1; sources cited *supra* note 68. For catch shares, see Christopher Costello et al., *Can Catch Shares Prevent Fisheries Collapse?*, 321 SCIENCE 1678 (2008); Rita Heimes, *Managing a Fishery Through Contract*, 14 OCEAN & COASTAL L. J. 17 (2008). See generally Cornelia Dean, *U.S. Acts to Modify New England Fisheries*, N.Y. TIMES, Apr. 9, 2009, at A13; Juliet Eilperin, *Finding Space for All in Our Crowded Waters*, WASH. POST, May 4, 2009, at A1; Douglas Lipton & Thomas Miller, *Saving the Crab-and the Watermen*, WASH. POST, May 11, 2008.

¹⁰⁸ VMRC PLAN, *supra* note 6, at 12; *Judge Limits State's Ban*, *supra* note 65. See also *infra* text accompanying notes 116-17.

¹⁰⁹ The Nature Conservancy, *The Virginia Coast Reserve*, <http://www.nature.org/wherework/northamerica/states/virginia/preserves/art1244.html> (last visited Sep. 25, 2009). See also STEVEN CARROLL ET AL., WILD VIRGINIA (2002); KIRK R. MARINER, OFF 13: THE EASTERN SHORE OF VIRGINIA GUIDEBOOK 66-72 (Miona Publ'ns 8th ed. 2002); Amy H. Moorman, *Let's Roll: Applying Land-Based Notions of Property to the Migrating Barrier Islands*, 31 WM. & MARY ENVTL. & POL'Y REV. 459 (2007); William Funk, *Conservation Easements Protect Open Land*, RICHMOND TIMES-DISPATCH, Apr. 26, 2009, at E1.

466,146 acres throughout the watershed's upper region in 2005.¹¹⁰ The Virginia Outdoors Foundation (“VOF”)—which the Assembly created to encourage, solicit, and receive private donations for conserving “natural, scenic, historic, open-space and recreational areas”—concomitantly helped preserve 65,000 acres primarily with conservation easements in 2008 and safeguarded greater acreage the last five years than it had over the preceding four decades.¹¹¹ These systems, like the “public” options, can generally be efficacious, although they are limited in scope and plagued by resource deficiencies.¹¹²

3. *Quasi-Public*

The states might also canvass and adopt numerous public-private or quasi-governmental solutions. One such prospect, although seemingly more private than governmental, is the “cap and trade” strategy, which is apparently a variant on the Chesapeake Bay Watershed Nutrient Exchange Program.¹¹³ This avenue imposes ceilings on most of Virginia sources’ nutrient effluents, primarily from sewage treatment and industrial operations, but authorizes their purchase of rights to discharge from specific people and groups, like farmers, who satisfy the caps. Last year, Maryland began implementing a similar project.¹¹⁴ Phase one uses an approach effectively for trading between point sources and involves the removal of particular onsite sewage disposal regimes, while phase two governs point source trading and offsets between point and nonpoint sources. Another mechanism is crustacean aquaculture, with which North Carolina has successfully experimented in regard to oysters.¹¹⁵

A third possibility is the employment of disaster resources to aid the creature and support watermen.¹¹⁶ Maryland and Virginia disbursed disaster funds essentially to have crabbers restore damaged wetlands and oyster habitat or retrieve ghost pots and to buy out individuals who stop fishing,

¹¹⁰ Nancy A. McLaughlin, *Amending Perpetual Conservation Easements: A Case Study of the Myrtle Grove Controversy*, 40 U. RICH. L. REV. 1031, 1034 (2006). See MD. CODE ANN. § 14-111 (2009); VA. CODE ANN. § 10.1-1009 et. seq. (2009); ELIZABETH BYERS & KARIN MARCHETTI PONTE, *THE CONSERVATION EASEMENT HANDBOOK* (2d ed. 2005).

¹¹¹ The 65,000 acres are in 64 localities. *Nearly 65,000 Va. Acres Protected*, RICHMOND TIMES-DISPATCH, Jan. 20, 2009, at A5. The private donations can include money, land, securities or related property, while VOF’s program might be considered quasi public. VA. CODE ANN. § 10.1-1800 (2009). See also *infra* notes 113–17 and accompanying text.

¹¹² See *supra* notes 103-04, 106 and accompanying text.

¹¹³ VA. CODE ANN. §§ 62.1-44.19:12–19:19 (2009). See also Editorial, *Fish Market*, RICHMOND TIMES-DISPATCH, Oct. 2, 2008, at A12; Scott Harper, *Virginia Crab Disaster Aid Would Buy Crab Licenses from Watermen*, VIRGINIAN-PILOT (Norfolk), Dec. 26, 2008, at A1; *License Limbo*, *supra* note 53; *supra* notes 75–95 and accompanying text.

¹¹⁴ I rely in this sentence and the next on MD. DEPT. OF THE ENV’T., MARYLAND POLICY FOR NUTRIENT CAP MANAGEMENT AND TRADING IN MARYLAND’S CHESAPEAKE BAY WATERSHED (2008), available at http://www.mde.state.md.us/assets/document/NutrientCap_Trading_Policy.pdf. See generally sources cited *supra* notes 75–95.

¹¹⁵ *Turning Freshwater Farm Ponds into Crab Farms*, SCIENCE DAILY, Oct. 15, 2008, <http://www.sciencedaily.com/releases/2008/10/081003191417.htm>; Timothy Wheeler, *Farming the Chesapeake*, BALT. SUN, Dec. 3, 2008, at 1A; sources cited *supra* note 7. See also VMRC PLAN, *supra* note 6, at 9; Mark Bittman, *A Seafood Snob Ponders the Future of Fish*, N.Y. TIMES, Nov. 16, 2008, at WK1; *Economic Stimulus*, *supra* note 101.

¹¹⁶ *Judge Limits State’s Ban*, *supra* note 65. See Goodman, *supra* note 7; *supra* notes 49-50, 56–57 and accompanying text.

but the affected jurisdictions could deploy the program grants to upgrade sewage treatment facilities and have watermen plant trees, establishing buffer zones near tributaries, or increase submerged grasses.¹¹⁷ These projects have proven successful and would benefit the creature, especially through water quality improvement.

C. A SPECIAL WORD ABOUT THE FEDERAL GOVERNMENT

Several earlier propositions suggest that the federal government possesses significant power over the species and the watershed. The EPA discharges much responsibility for air and water pollution, and it coordinates and supervises diverse estuarine actions under the Chesapeake Bay Program.¹¹⁸ Yet, the EPA seems to implement air and water pollution strictures and coordinate bay-wide projects less than robustly, while the federal government assumes a somewhat limited role in protecting natural resources, most notably the crustacean.¹¹⁹ In fairness, a measure of authority to control air and water pollution devolves upon the states, and they conventionally had broad power for addressing critical watershed organisms. Thus, the federal government should apply a number of pollution control and additional environmental statutes—including those enactments which implicate land use, purchase and transfer, and fisheries management—and coordinate estuarine activities with increased stringency; however, certain prior efforts have been disappointing and a few lack promise.

The Obama Administration has signaled receptivity to change in these distinct and related environmental law and policy fields,¹²⁰ while issuing the Executive Order, coordinating the national initiative and the state-level milestones program, and appointing an EPA official with bay duties, signifies the administration's commitment to estuarine protection and restoration.¹²¹ Some perceptive observers—who advert to the discouraging

¹¹⁷ VMRC PLAN, *supra* note 6, at 12; Bill Geroux, *No Longer Dredging, Crabbers Collect Pots*, RICHMOND TIMES-DISPATCH, Feb. 15, 2009, at B1; Scott Harper, *Blue Crab Crisis to Get \$7.5 Million in Relief Funds*, VIRGINIAN-PILOT (Norfolk), May 20, 2009, at B1; Rona Kobell, *Seeding the Bay*, BALTIMORE SUN, Dec. 17, 2006, at 1F; Kunkle, *supra* note 11. See Gene Mueller, *Watermen Take Up New Role*, WASH. TIMES, Nov. 26, 2008, at C8; Shannon Tompkins, *Ike Weaves a Tangled Mess*, HOUSTON CHRON., Feb. 14, 2009, at 12; *supra* notes 31, 87, 98–103 and accompanying text.

¹¹⁸ See *supra* text accompanying notes 34, 39, 93–96. See also CHESAPEAKE BAY PROGRAM, *supra* note 18; *supra* note 104.

¹¹⁹ See Donna Christie, *Living Marine Resources Management: A Proposal for Integration of United States Management Regimes*, 34 ENVTL. L. 107, 111–12 (2004). See also Stokstad, *supra* note 35; *supra* notes 40, 72–73, 78 and accompanying text. See generally CHESAPEAKE BAY FOUNDATION, *supra* note 15. The EPA possesses the authority to establish water quality standards for protecting fisheries. 33 U.S.C. § 1330 (2006). See also RODGERS, *supra* note 95, at 342–61. NOAA possesses fisheries management authority. See 16 U.S.C. § 1801 (2006). See generally PEW OCEANS COMMISSION, AMERICA'S LIVING OCEANS: CHARTING A COURSE FOR SEA CHANGE (2003).

¹²⁰ See, e.g., EPA, Proposed Rule Governing Greenhouse Gases, 74 Fed. Reg. 18,886 (Apr. 24, 2009); Broder, *supra* note 96; Dean, *supra* note 107; Juliet Eilperin, *Winds of Change Evident in U.S. Environmental Policy*, WASH. POST, Mar. 30, 2009, at A3; Mark Peters, *EPA Proposes Sharp Cuts in Air Pollution From Ships*, WALL ST. J., Mar. 30, 2009; Jim Tankersley, *Obama Overrides Bush on Endangered Species Act*, L.A. TIMES, Mar. 4, 2009, at A14.

¹²¹ For the Executive Order and milestones, see sources cited *supra* note 61. See Halsey, *supra* note 40; Editorial, *Federal Action on the Bay*, WASH. POST, May 13, 2009, at A18. See also Karl Blankenship, *EPA's Naming Bay Adviser Seen as a Greater Commitment to Cleanup Efforts*, BAY JOURNAL, Apr. 2009; Weak Laws, *supra* note 35; Kunkle, *supra* note 11; Timothy Wheeler, *Bay's Health Not Improving*, EPA REPORTS, BALTIMORE SUN, Mar. 20, 2009, at 3A.

watershed cleanup record—have questioned whether the nascent federal and state projects will suffice.¹²² Thus, the administration should monitor the actions of these jurisdictions and, if they do not make satisfactory progress, consult the solutions broached and respond, perhaps by invoking the federal authority or the sanctions previously discussed.¹²³ The White House and Congress should assess carefully whether federal agencies are rigorously enforcing President Obama's directive and require, urge, or encourage stricter implementation—even considering measures akin to certain sanctions—if they are not. I presume that federal agencies, namely the EPA, will conscientiously and vigorously institute and enforce the Order. However, this assumption might be unwarranted for some departments, while the Order could lack sufficient mandates or the proper emphasis.

D. RESOLUTION

In the end, numerous ideas analyzed should prove efficacious. The jurisdictions must coordinate better and will need to amass, inspect, and synthesize the largest quantity of relevant empirical data regarding the crab, particularly with respect to stubborn difficulties and productive remedies. They should develop a finely-honed process for selecting precisely the initiatives which maximize restoration at the lowest cost and equitably treat stakeholders. In the near term, depletion may necessitate harvest restrictions, probably together with specific approaches canvassed—especially ones that address pollution that injures the species—and the crustacean disaster funds. The avenues examined will require the sustained commitment of political will and ongoing dedication of resources. After the crab stabilizes and attains levels that will permanently support the fishery, it might be possible to eliminate or decrease the catch limitations and apply a nuanced mix of federal and state cooperative arrangements, regulatory controls, and incentive structures which directly address pollution and slow overharvesting. Finally, the court that resolves pending litigation which involves the enforcement of bay deadlines could impose the alternatives recounted, particularly if the federal and state governments disagree on how to effectively improve crustacean and watershed ailing health.¹²⁴

V. CONCLUSION

The recent experience with blue crabs provides valuable insights on their downward spiral, problems with efficaciously managing aquatic

¹²² For examples of observers, see ERNST, *supra* note 1; HORTON *supra* note 1; Baker, *supra* note 89; Steinzor & Jones, *supra* note 61. See also *supra* note 71.

¹²³ For solutions, see *supra* text accompanying notes 72-117. For sanctions, see Stokstad, *supra* note 35; Baker, *supra* note 89; Steinzor & Jones, *supra* note 61. See also *supra* notes 85, 89, 92 and accompanying text.

¹²⁴ The plaintiffs in this litigation are relying on 33 U.S.C. § 1267 (2006) to argue that Bay Agreements constitute interstate compacts, which are enforceable under federal law. See *supra* note 40. See also Noah Hall, *Toward a New Horizontal Federalism: Interstate Water Management in the Great Lakes Region*, 77 U. COLO. L. REV. 405 (2006); Olen Paul Matthews & Michael Pease, *The Commerce Clause, Interstate Compacts, and Marketing Water Across State Boundaries*, 46 NAT. RES. J. 601 (2006); Mueller Interview, *supra* note 83; *supra* notes 29-34, 61 and accompanying text.

resources and stemming pollution, and the significance of governmental cooperation. These developments illuminate the polycentric nature of the species' present malaise and nascent attempts to revitalize the organism. If the United States, Maryland, and Virginia work together creatively and align stakeholder responsibility for crustacean depletion with the expense of ameliorating it, the jurisdictions can best prevent another Tragedy of the Commons.