Hypoxia in the Gulf of Mexico:
A Legal and Practical Analysis.

"[Over the past century] overfishing was the leading environmental issue affecting our seas. In the new millennium, it's going to be oxygen."

- Robert J. Diaz, Virginia Institute of Marine Sciences[1]

Each year, a large area of the Gulf of Mexico is seasonally depleted of life-giving oxygen. Called hypoxia, the phenomenon threatens to bring about a collapse of the Gulf's marine ecosystem,[2] harming commercial fisheries with an annual economic worth estimated at $2.8 billion.[3] The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force is a voluntary regime formed to address this and other threats to the Gulf of Mexico and is comprised of federal, state, and tribal representatives.[4] The Task Force has set a year 2015 goal of considerably reducing the size of the Gulf hypoxic area to less than 5,000 square kilometers by 2015.[5] Implementation of this goal will entail an estimated reduction in nitrogen loading to the Gulf of at least thirty percent.[6]

This note analyzes the conceptual transformation of this voluntary regime into a regulatory one. Such a regulatory regime would be based on the development of federal "Total

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[1] Janet Raloff, *Dead Waters: Massive oxygen-starved zones are developing along the world's coasts,* 165 SCI. NEWS 360 (2004), *available at* http://www.sciencenews.org/articles/20040605/bob9.asp.

[2] *See Id*.

[3] US NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES, *An Integrated Assessment of Hypoxia in the Northern Gulf of Mexico*, May, 2000, at 7. [*hereinafter,* INTEGRATED ASSESSMENT].

[4] *See* Mississippi River/Gulf of Mexico Watershed Nutrient Task Force web page *at* http://www.epa.gov/msbasin/members.htm.

[5] MISSISSIPPI RIVER/GULF OF MEXICO WATERSHED NUTRIENT TASK FORCE, ACTION PLAN FOR REDUCING, MITIGATING, AND CONTROLLING HYPOXIA IN THE NORTHERN GULF OF MEXICO (2001), *available at* http://www.epa.gov/msbasin/actionplan.pdf. [*hereinafter*, ACTION PLAN].

[6] *See infra* note 43 and accompanying text.

Maximum Daily Loads" (TMDLs or "pollution budgets") for the parameters of nitrogen and phosphorus under the framework established by section 303(d) of the Clean Water Act,[7] and implementation of nutrient reductions through a pollution trading program. Because the CWA only permits regulation of "point sources" of pollution, a term that specifically exempts agricultural run-off,[8] the U.S. Environmental Protection Agency (EPA) could not implement a Mississippi River Basin nutrient TMDL through direct federal regulation of agricultural non-point sources of pollution. [9] However, a TMDL-based, regulatory regime for the Mississippi River watershed, implemented through a pollution trading program, would give state and federal agencies leverage to effectively "bargain" for non-point source reductions.[10]

This note analyzes the Clean Water Act (CWA or "the Act") and finds that the statute itself does not expressly answer the question of the extent to which the EPA may regulate upstream *point sources* of pollution that degrade federal ocean waters beyond the "territorial seas" - a term defined in the statute as a "belt of the seas... extending seaward [from shore] a distance of three miles."[11] Nonetheless, it concludes that the most reasonable reading is that the statute does confer to the EPA discretionary authority under the Act to develop and implement a

[7] *See* 33 U.S.C. § 1313(d) (2000). *See also* text accompanying notes 109 to 112.

[8] The CWA defines a "point source" as any "discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture." 33 U.S.C. § 1362(14) (2000).

[9] *See Pronsolino v. Nastri*, 291 F.3d 1123 (9th Cir. 2002) (discussing the lack of a mandate in the CWA for the implementation of TMDLs through reduction of nonpoint sources of pollution).

[10] *See* William F. Pederson, *Using Federal Environmental Regulations to Bargain for Private Land Use Control*, 21 YALE J. on REG. 1 (2004) (Discussing the value of the federal government replacing regulations with "bargaining entitlements" which can be used to negotiate with private parties to influence land use in order to achieve environmental improvement.)

[11] *See* 33 U.S.C. § 1362(8) (2000).

regulatory regime to restore those waters of the Gulf of Mexico beyond the territorial seas. Furthermore, it concludes that the broad mandate of section 301(b)(1)(C) of the Act,[12] considered in conjunction with the requirements of the Endangered Species Act[13] and the Magnuson Stevens Fishery Conservation and Management Act,[14] reinforces this conclusion. Nonetheless, it recommends that Congress amend the Clean Water Act, expressly delegating authority to the EPA to provide for the stewardship of the quality of U.S. ocean waters, and revising the Act's marine jurisdictional lines in order to make them consistent with general U.S. jurisdiction over adjacent marine waters. This note then considers whether, as a practical matter, a regulatory regime is preferable to a voluntary one. It concludes that a regulatory regime is indeed preferable, particularly if a pollution-trading framework is used to grant regulated entities some flexibility and to permit the regime to attain the most cost-effective reductions through a combination of point source and non-point source reductions.

This note is divided into the following sections. Part IA discusses the phenomenon of hypoxia generally. Part IB gives an overview of hypoxia in the Gulf of Mexico. Part IC discusses the existing regime to control Gulf hypoxia, briefly outlining the contours of a proposed regulatory regime. Part ID outlines five elements of Gulf hypoxia that make both legal and practical analysis of the problem particularly challenging. Part IIA considers the EPA's authority to regulate Gulf pollution under the Clean Water Act. Part IIB argues that the Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act, when read in light of section 301(b)(1)(c) of the Clean Water Act, confer additional responsibilities upon the

[12] 33 U.S.C. § 1311(b)(1)(C) (2000).

[13] 16 U.S.C. §§ 1531-1543 (2000).

[14] 16 U.S.C. §§ 1801-1883 (2000).

Administrator of EPA with respect to Gulf hypoxia. Part IIC considers two potential opportunities to interject into Congressional debate consideration of the value of amending the Clean Water Act. The two specific opportunities discussed are Congressional consideration of the ratification of UNCLOS) and the proposed "Clean Water Authority Restoration Act of 2005." Part III engages in a practical analysis regarding development and implementation of an enforceable pollution control regime for the Gulf. Finally, Part IV concludes with recommended actions to reverse the trend of a growing hypoxic area in the Gulf of Mexico.

I. An Overview of Gulf Hypoxia

A. The Phenomenon of Hypoxia

In a fine example of "too much of a good thing," nutrient over-enrichment is starving marine waters across the globe of life-giving oxygen.[15] While minor increases in nutrient levels generally correlate with increased productivity in aquatic ecosystems,[16] excessive nutrient inputs initiate a biological chain reaction called eutrophication. Eutrophication entails multiple aquatic ecosystem responses, often including decreased dissolved oxygen concentrations.[17] Average dissolved oxygen concentrations of approximately 5 milligrams per liter (mg/l) are generally required to support healthy aquatic ecosystems.[18] Low dissolved oxygen conditions are referred

[15] *See* Robert J. Diaz, *Overview of Hypoxia Around the World*, 30 J. ENVIRON. QUAL. 275 (2001), *available at* http://jeq.scijournals.org/cgi/reprint/30/2/275.

[16] *Id.*at 276. However, it is important to note that even as increased nutrients may lead to increased productivity, biodiversity of the affected system may be decreased through simplification of the food web. For more information see the US EPA Eutrophication web site *at* http://www.epa.gov/maia/html/eutroph.html.

[17] The chain reaction essentially works as follows: increased nutrient inputs result in the proliferation of algal growths, which then sink into the heavier and more saline waters that are stratified below, robbing these waters of oxygen as the plant biomass decays.

[18] *See, e.g.,* US ENVIRONMENTAL PROTECTION AGENCY (EPA), NATIONAL RECOMMENDED WATER QUALITY CRITERIA (2002) at 6 ("For many fish and shellfish, extended periods of D.O. below 5 mg/l can cause adverse

to as *hypoxia* when levels drop below 2 mg/l. [19] Hypoxic waters are sufficiently depleted of dissolved oxygen that most marine life cannot survive in them for more than short durations.[20] Hypoxia tends to occur where anthropogenic nutrient inputs meet a stratified water column.[21] Areas where large freshwater inflows meet relatively calm marine environments are susceptible to hypoxia due to the level of stratification naturally occurring in these systems.[22] While increased levels of phosphorus (and, to a small extent, silica) can cause or contribute to hypoxic conditions, nitrogen loading is usually the primary culprit. [23] These nutrients are being introduced into aquatic ecosystems in increasing amounts through agricultural practices (especially the use of synthetic fertilizers); increased discharges from municipal sewage treatment plants and septic systems, industrial discharges, and other sources such as deposition from air pollutants – all of which may be viewed as a function of human population growth.[24]

B. Hypoxia in the Gulf of Mexico

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effects to larval stages."), *available at* http://www.epa.gov/waterscience/pc/revcom.pdf; *See also,* US EPA, AMBIENT WATER QUALITY CRITERIA FOR DISSOLVED OXYGEN (SALTWATER): CAPE COD TO CAPE HATTERAS (2000) (defining multiple dissolved oxygen criteria, and generally finding that survival of juvenile and adult marine species requires that D.O. levels not drop below 2.3 mg/L for 24 hours or more, and that prevention of adverse effects on growth of adult and juvenile species requires that D.O. levels not drop below 4.8 mg/l for 24 hours or more.), *available at* http://www.epa.gov/waterscience/standards/dissolved/docriteria.pdf The precise levels of oxygen required to support healthy marine ecosystems is a matter that continues to be debated.

[19] The related phenomenon of *anoxia* occurs when waters are completely devoid of oxygen.

[20] See Diaz *supra* note 15, at 276.

[21] Stratification occurs when warmer, less saline waters essentially float on top of denser, more saline waters.

[22] *See* Diaz, *supra* note 15, at 276.

[23] *Id.*

[24] *Id.*

In late spring of each year, an area of hypoxic water begins to form in the Gulf of Mexico, expanding in size over the summer, and disappearing again in the fall.[25] Because the benthos and lower water column in the vast area affected by seasonal hypoxia are mostly devoid of life during times when hypoxia is occurring, Gulf hypoxia is often popularly called "the dead zone."[26] Gulf hypoxia was first documented in 1972.[27] The aerial extent of hypoxia differs from year to year, as a function of varying nutrient levels and freshwater inflows into the Gulf in the spring and summer months, but the clear trend has been an increase over time.[28] The spatial extent of Gulf hypoxia more than doubled in size after the Mississippi River flood of 1993, covering an area of over 18,000 km², and remaining about that size each year through midsummer 1997.[29] In 1999 the Gulf hypoxic area covered about 20,000 km² (about 8,000 square miles);[30] and in 2002 it reached its maximum extent of about 22,000 km² - an area larger than the state of Massachusetts.[31] Gulf hypoxia occurs primarily off the shores of Louisiana,

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[25] *See* Nancy N. Rabalais et al., *Hypoxia in the Gulf of Mexico* 30 J. ENVIRON. QUAL. 320, 321 (2001).

[26] This term is more appealing than "hypoxia" because it articulates the seriousness of the problem in common language. However, the term is somewhat misleading for at least three reasons. First, it implies a fixed area; however, the aerial extent of Gulf hypoxia varies dramatically both intra and inter-annually. Second, unlike in some other areas of the world where hypoxia occurs, the phenomenon in the Gulf is seasonal. During much of the year fish and aquatic life are able to make use of the areas which experience Gulf hypoxia. As hypoxia begins to occur, more mobile species are able to escape hypoxic waters, while populations of less mobile species perish. However, even these less mobile species are able to seasonally re-colonize benthic habits, at least to some extent, as oxygen levels again rise in the seasonally affected areas. *See, e.g.*, US NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES, *An Integrated Assessment of Hypoxia in the Northern Gulf of Mexico*, May, 2000, at 31. Thus, the Gulf hypoxic area is not truly a "dead zone;" rather, it is a complex, variable ecosystem response to increased nutrient loading.

[27] *See* Rabalais, *supra* note 25, at 321.

[28] *See Id.*

[29] *See* NOAA, National Centers for Coastal Ocean Science, Gulf of Mexico Hypoxia Assessment web page *at* http://www.nos.noaa.gov/products/pubs_hypox.html#Intro.

[30] *See* ACTION PLAN *supra* note 5.

[31] *See* USGS, Gulf of Mexico Hypoxic Zone web site *at* http://toxics.usgs.gov/hypoxia/hypoxic_zone.html.

though some years it extends west to the coast of Texas. The hypoxic waters extend from near shore environments seaward to between 55 and 130 km from shore.[32] Also, when the Mississippi River's flow is high and summer currents distribute more of its nutrient-laden waters to the east, related (but distinct) areas of hypoxia may appear in bathymetric lows off the coast of Alabama.[33] There is considerable debate regarding the extent to which increased nutrient levels are effectively the sole cause of Gulf hypoxia, or whether hydrological alteration or other factors are significant.[34] However, it is clear, at least, that nutrient pollution is the *primary* cause of Gulf hypoxia. A three-fold increase in the nitrogen load to the Gulf over the past three decades or so is generally viewed as the primary culprit.[35] However, phosphorus loading is also an important factor,[36] and a recent EPA Region 4 analysis suggests that phosphorus may indeed be more important than previously believed, particularly in the eastern portion of the hypoxic area.[37]

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[32] *See* Rabalais, *supra* note 25, at 322. (Noting also that gulf hypoxia extends to about 55 km from shore where the continental shelf slopes more steeply, and to about 130 km where the gradient is more gradual.) 55 km is equivalent to about 29.6 nautical miles. 130 km is equivalent to about 70.2 nautical miles.

[33] *Id.*

[34] *See, e.g.,* Nancy N. Rabalais, *Hypoxia in the Gulf of Mexico*, 12 TUL. ENVTL. L.J. 321 (1999) (Arguing water quality degradation as the cause and discounting importance of hydrologic modification); *but see*, the Fertilizer Institute web site *at* www.tfi.org. (arguing that there are multiple causes, and thus nitrogen loading is not the sole culprit).

[35] *See* Donald Scavia, Nancy N. Rabalais et. al., *Predicting the response of Gulf of Mexico hypoxia to variations in Mississippi River nitrogen load*, 48(3) LIMNOL. OCEANOGR. 951, 951 (2003).

[36] *See* Rabalais, *supra* note 25, at 322.

[37] *See* US ENVIRONMENTAL PROTECTION AGENCY, REGION 4, EVALUATION OF THE ROLE OF NITROGEN AND PHOSPHORUS IN CAUSING OR CONTRIBUTING TO HYPOXIA IN THE NORTHERN GULF (August, 2004) (on file with author), *available at* http://www.epa.gov/msbasin/region4report.htm. (calling for reductions in both nitrogen and phosphorus loading as the proper strategy for reducing gulf hypoxia). *See also* U.S. EPA, *Final Meeting Summary: Eleventh Meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force,* September 1, 2004 *at* https://www.epa.gov/msbasin/meet_summ11.pdf (Containing the following summary of the presentation of Mr. Jim Giattina, EPA Region 4: "The eastern part of the hypoxia region of the Gulf is phosphorus limited and the western zone is nitrogen limited, which suggests that a dual nitrogen and phosphorus reduction strategy would be appropriate.").

C. The Current Voluntary Regime and a Concept for a Regulatory Regime.

Congress enacted the Harmful Algal Bloom and Hypoxia Research and Control Act on November 13, 1998.[38] The statute required the President to create an "Inter-Agency Task Force on Harmful Algal Blooms and Hypoxia" and charged the Task Force with the duty to complete an assessment of Gulf hypoxia and submit a report to Congress within twelve months.[39] Pursuant to the statute, the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force convened for the first time in the fall of 1997.[40] The Task Force submitted to Congress its *Action Plan for Reducing, Mitigating and Controlling Hypoxia in the Northern Gulf of Mexico* on January 18, 2001.[41] The plan set the goal of reducing the five-year running average of the overall size of the Gulf hypoxic area to less than 5,000 square kilometers by 2015.[42] In order to achieve this goal, the plan estimates that a 30% reduction in nitrogen discharges to the Gulf will be necessary; however, more recent analyses conclude that even greater reductions may be necessary.[43] The plan calls for attainment of its goals through voluntary nutrient reduction strategies and the use of existing regulatory programs.[44] The task force is currently working with the EPA Gulf of Mexico program and stakeholder groups to implement a regime that includes monitoring Gulf of Mexico hypoxia and encouraging voluntary controls.

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[38] Public Law 105-383, 16 U.S.C. § 1451 note (2000).

[39] *Id.*

[40] *See* ACTION PLAN *supra* note 5, at 34.

[41] *Id.*

[42] *Id*. at 12.

[43] *Id.* (The baseline for this targeted reduction is established using the average of nitrogen discharge from 1980 to 1996.) *See also,* Donald Scavia, *supra* note 35 (concluding that 30% reductions might not be sufficient, and that nitrogen reductions between 35% and 45% may be necessary).

[44] *Id.*

As an alternative to this voluntary regime, a regulatory regime could be created under the framework of the Clean Water Act's Total Maximum Daily Load (TMDL) requirements.[45] In such a regime, the EPA would develop two TMDLs, one each for nitrogen and phosphorus. Ideally, EPA would subsequently work with states to implement the requisite reductions through a combination of oversight of state actions, including standards-setting and permitting, and through the administration of a Mississippi River basin nutrient-trading program.[46] A pollution trading program would allocate required reductions among point sources, and then permit trading among both point sources and non-point sources as an alternative means of achieving them.

In envisioning such a system, assume that a 30% reduction from point sources is feasible. Given that point sources only comprise an estimated 10% of the nutrient problem, this would only result in a 3% reduction in Gulf of Mexico nutrient loading. However, consider a system where point sources could trade with nonpoint sources at a 10:1 ratio (for trading purposes, ten units of nonpoint source reduction would be equal to 1 unit of point source reduction). Under such a system, if we assume that nonpoint source reductions would be substantially less expensive than point source reductions in most cases, then the 30% reduction target would nearly be achieved. At least two conditions should be placed on such trades. First, the point source would have to be able to continue to discharge without causing or contributing to a local violation of water quality standards. Second, any trading with non-point sources would have to include sufficient assurances that reductions would be achieved. Ideally, such trading agreements should explicitly provide that any citizen with standing to sue the point source discharger itself under the Clean Water Act would constitute an intended, third-party beneficiary of the

[45] *See* 33 U.S.C. §1313(d) (2000).

[46] *See* U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUE PRINT FOR THE 21ST CENTURY, Washington, D.C. (2004) at 495 (endorsing pollution trading as a strategy to reduce nutrients in ocean waters).

contractual agreement through which the pollutant trade was conducted. Thus, if the non-point source project were not implemented within a reasonable time, citizens could sue the point source (*and not* the non-point source) both to enforce the contract and to correct a violation pursuant to section 505 of the Act.[47] However, as long as the non-point source reduction project was faithfully implemented, the point source should not be vulnerable to suit, even if the anticipated reductions were not actually achieved.

Such a federal, interstate TMDL would be unprecedented. While EPA has developed interstate TMDLs in a few instances, including a TMDL for dioxin in the Columbia River Basin restricting industrial discharges of the pollutant in Oregon, Washington and Idaho,[48] an interstate TMDL for the Mississippi River basin would far exceed any interstate TMDL effort undertaken to date by the agency. Such a TMDL would cover thousands of pollution sources within territories covering 31 states - or a land area constituting 41% of the continental United States. A federal nutrient pollution trading framework for the Mississippi River basin would also be unprecedented.[49] Most, if not all, of the nutrient pollution trading programs to date have been much smaller-scale and relatively ineffective.[50] However, a Mississippi River basin trading program, implemented on the federal level, might have a better chance at success than these

[47] 33 U.S.C. § 1365 (2000).

[48] *See, e.g., Dioxin/Organochlorine Center v. Clarke*, 57 F.3d 1517 (9th Cir. 1995); *See also* EPA Region 4 TMDL web site (containing information on the Coosa River Basin TMDL in Alabama and Georgia), *at* http://www.epa.gov/region4/water/tmdl/alabama/#coosa; and EPA Region 3 TMDL web site (containing information on a TMDL for the Christina Basin in Maryland, Pennsylvania, and Delaware), *at* http://www.epa.gov/reg3wapd/christina/pdf/execsumm.pdf.

[49] *See* Ann Powers, *The Current Controversy Regarding TMDLs: Contemporary Perspectives, "TMDLs and Pollutant Trading,"* 4 RES COMMUNES: VT.'S J. ENV'T 2 (2002-2003) (Discussing various pollution trading programs, including a useful appendix of "well-known water quality trading programs," all of which could be accurately described as relatively small-scale and ineffective in that little pollution trading has actually occurred under the programs).

[50] *See Id.*

programs due to the size of the "market" for trades and coordination through a central authority.[51] Such a program could effectively give point sources a market incentive to identify and implement cost-effective reductions in the agricultural non-point source loading that is primarily responsible for Gulf hypoxia. Oversight of state level implementation could conceivably include allocation of total permissible loads to each state.[52] States would be required to modify their water quality standards and permitting practices accordingly to limit nutrient discharges. Such a state-by-state system of setting nutrient standards based on both intrastate conditions and interstate pollution concerns might be more palatable to EPA than federal promulgation of uniform, basin-wide water quality standards for nutrients in all Mississippi River basin states – a concept recently proposed to the EPA in a petition for rulemaking submitted by the Ozark Chapter of the Sierra Club, and rejected by the agency in June 2004.[53]

D. The Five Practical and Legal Challenges Presented by Gulf Hypoxia

From both the standpoints of practical and legal analyses, hypoxia in the Gulf of Mexico presents a mammoth environmental challenge. Five aspects of Gulf hypoxia make it uniquely difficult to address. First, Gulf hypoxia is a challenge because the adverse impacts often occur in locations far distant from the source of the pollutants. The nutrient pollution that causes the problem is transported great distances through freshwater rivers, becoming disproportionately

[51] One variable which could conceivably "shrink the market" for trades is found in the Farm Bill programs allocating funding under programs such as the Conservation Reserve and Environmental Quality Incentives Program (EQIP). If funding under these programs expanded considerably enough, there could conceivably be little demand left for non-point source reduction projects on agricultural lands.

[52] *See* text accompanying notes 109 to 112. Normally, states develop TMDLs and then implement point source reductions through their permitting programs. However a federal, interstate TMDL would likely set limits for each state and require the states to meet such reductions.

[53] *See EPA Response to Sierra Club Petition Regarding Defined Portions of the Mississippi and Missouri Rivers* (June, 2004) *at* http://www.epa.gov/waterscience/standards/sierra-supp.pdf.

more biologically available to support primary production upon reaching the affected ocean waters.[54] Approximately 90% of the nitrate load transported to the Gulf is believed to stem from sources upstream of the confluence of the Mississippi and Ohio Rivers.[55] Because these states are not directly adversely affected by Gulf hypoxia, they may have little incentive to incur the costs associated both with administration of the regime and implementation of pollution reductions.

Second, a myriad of point and non-point sources of nutrientsare the c ause of Gulf hypoxia. As such, any one source is inevitably "insignificant" when viewed only as a single source. While estimates vary, approximately ninety percent of the pollution load causing hypoxia is believed to result from non-point sources.[56] The remainder is contributed by point sources including an estimated 12,400 sewage treatment plants and 3,900 industrial nutrient dischargers.[57]

Third, the adverse impacts to the Gulf ecosystem are hard to quantify for purposes of cost/benefit analysis, making it difficult to determine the most "economically efficient" level of investment in a pollution control regime. Brown shrimp yields, measured in terms of catch per unit effort, have been trending down since the seventies; with the overall (dollar) yield also trending down since a record high in 1990.[58] Other than these trends for the shrimp fishery,

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[54] *See Id. quoting and citing* Alexander, R.B. et al. *Effect of stream channel size on the delivery of nitrogen to the Gulf of Mexico*, NATURE 403 (2001) at 758-761 (concluding that over 90% of the nitrate that reaches the Mississippi River is transported downstream to the Gulf of Mexico).

[55] *Id. See also,* ACTION PLAN, *supra* note 5, at 8.

[56] *See* INTEGRATED ASSESSMENT, *supra* note 3, at 3.

[57] Mary L. Belefeski & Larinda Tervelt Norton, *Hypoxia in the Gulf of Mexico: A Historical and Policy Perspective*, 12 TUL. ENVTL. L.J. 331, 349 (1999).

[58] *See* US NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES, AN INTEGRATED ASSESSMENT OF HYPOXIA IN THE NORTHERN GULF OF MEXICO (2000) at 25.

there is relatively little quantified evidence of adverse impacts to the Gulf fishing industry.[59] The most serious concern involves the risk of a "collapse" of the Gulf's $2.8 billion fishery in the future,[60] such as has occurred in Eastern Europe's Black Sea,[61] and in the North Sea (separating Norway, Denmark and Sweden) in 1979.[62] Such an ecosystem collapse could occur as a result of the synergistic effect of hypoxia and growing fishing pressure. For example, hypoxia can "herd" commercial species into areas with higher oxygen levels along the edge of a hypoxic zone.[63] Concentrated fishing efforts along this edge can thus produce large yields of seafood in the short term, depleting fish stocks to dangerously low levels in the process. Obviously, a collapse of Gulf of Mexico fisheries would be extremely hard to reverse.[64]

Fourth, science suggests that any reductions that are implemented today may not consistently yield higher oxygen levels in the Gulf of Mexico for many years. There is often a delay of a decade or more between the increased or decreased inputs of nitrogen fertilizers and the ecological response of increased or decreased dissolved oxygen levels in coastal waters.[65] This is, in part, due to the fact that many agricultural lands are "saturated" with nutrients from past and ongoing fertilizer use.[66]

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[59] *See* Belefeski, *supra* Note 57, at 338.

[60] *See* INTEGRATED ASSESSMENT, *supra* note 3, at 7.

[61] Downing, J.A., J.L. Baker, R.J. Diaz, T. Prato, N.N. Rabalais, R.J. Zimmerman, GULF OF MEXICO HYPOXIA: LAND AND SEA INTERACTIONS: COUNCIL FOR AGRICULTURAL SCIENCE AND TECHNOLOGY TASK FORCE REPORT (1999).

[62] *See* Raloff, *supra* note 1.

[63] *Id.*

[64] *Id.*; *See also* MARK MURLANSKY, COD: A BIOGRAPHY OF THE FISH THAT CHANGED THE WORLD (Penguin Books 1997) (discussing depletion of cod fish stocks and various successes and failures in restoring stocks over time).

[65] *Id.*; *See also* Mark Clayton, *Dead Zones Threaten Fisheries*, THE CHRISTIAN SCIENCE MONITOR, May 27, 2004.

[66] *See* Belefeski, *supra* note 57, at 346.

Fifth, and finally, Gulf hypoxia occurs primarily in waters that are more than three miles seaward of the shoreline and thus beyond the reach of the "territorial seas" as defined by the Clean Water Act.[67] Thus, the problem waters are found mostly in an area of exclusively federal jurisdiction, beggaring analysis under the "cooperative federalism" framework of the Clean Water Act.[68] The geographic location of Gulf hypoxia, together with the Clean Water Act's inconsistency with general U.S. jurisdiction over its marine waters, collectively raise difficult questions regarding which CWA provisions apply to the affected waters.

II. A Legal Analysis of Gulf Hypoxia

A. The Clean Water Act

The over-arching goal of the Clean Water Act (CWA or the Act) is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[69] The CWA prohibits all point source discharges of pollution unless they are permitted pursuant to its requirements.[70] While the Act created a system of pollution controls that has often been described as "comprehensive,"[71] Gulf hypoxia has effectively eluded the Act's carefully constructed system of regulatory controls.

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[67] While the Clean Water Act just uses the term "mile" - a distance which, when used to refer to distances on land, refers to a distance equal to 1.609 kilometers, this note assumes that the term "mile" as used in the Act means "nautical mile." A "nautical mile" – also called a "geographic mile" – is a distance which is equal to 1.852 kilometers. *See* RANDOM HOUSE COLLEGE DICTIONARY, REVISED EDITION (1988). Likewise, whenever this note uses the term mile, the term "nautical mile" is intended.

[68] 33 U.S.C. §§ 1291-1386 (2000).

[69] 33 U.S.C. § 1251(a) (2000).

[70] 33 U.S.C. § 1311(a) (2000).

[71] *See Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159, 179 (2001) (Stevens, J. dissenting). ("The shift in the focus of federal water regulation from protecting navigability toward environmental protection reached a dramatic climax in 1972, with the passage of the CWA. The Act, which was

In order to effectively harness the CWA's regulatory provisions to reach the upstream sources of pollution that impair the Gulf, the following steps are required. First, some ambient standards must apply to the affected waters that can be invoked to require regulation of upstream sources. Second, hypoxia must constitute a violation of the applicable ambient standards. Third, a Total Maximum Daily Load (TMDL) - or other mechanism for creating a "pollution budget" - must quantify upstream loads and prescribe necessary reductions. Fourth, the TMDL (or other mechanism) must be implemented to reduce pollution from distant upstream sources.

The first step in this analysis is to ascertain which, if any, ambient standards apply to the affected Gulf of Mexico waters, and to determine whether any such applicable standards may form the legal basis for a regulatory pollution control regime. The Act creates four systems of often overlapping standards, which may be applicable in limiting point source discharges through one of two permitting systems: the National Pollutant Discharge Elimination System (NPDES) created by section 402,[72] or the "dredged or fill material" permitting program created by section 404.[73] The primary ambient standards in the Act are the water quality standards of section 303.[74] In addition, the Act contains ocean discharge criteria (section 403(c))[75] and

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passed as an amendment to the existing FWPCA, was universally described by its supporters as the first truly comprehensive federal water pollution legislation. The 'major purpose' of the CWA was 'to establish a *comprehensive* long-range policy for the elimination of water pollution.' S.Rep. No. 92-414, p. 95 (1971), 2 Legislative History of the Water Pollution Control Act Amendments of 1972 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1, p. 1511 (1971)(emphasis added). And '[n]o Congressman's remarks on the legislation were complete without reference to [its] 'comprehensive' nature ...." *Milwaukee v. Illinois* [citation omitted].")

[72] 33 U.S.C. § 1342 (2000).

[73] 33 U.S.C. § 1344 (2000).

[74] 33 U.S.C. § 1313 (2000).

[75] 33 U.S.C. § 1343 (2000).

guidelines for the discharge of dredge or fill material (section 404(b)(1)).[76] These section 404(b)(1) guidelines are clearly only applicable to "section 404" permits, and thus cannot be harnessed to reach upstream and regulate distant sources of pollution.[77] Finally, the Act contains technology-based effluent limits (sections 301, 304(b) and 306) which are established for dischargers without consideration of ambient water quality.[78] Thus, the section 303 water quality standards and the section 403 ocean discharge criteria comprise the two sets of standards in the Act that could form the basis for regulatory controls of NPDES permitted discharges upstream.

The question of court deference to agency interpretations of statutes: the *Chevron* analysis.

The analyses of EPA authority under sections 303 and 403 of the Clean Water Act must proceed pursuant to the analytical framework created by the Supreme Court in *Chevron U.S.A. v. Natural Resources Defense Council* [79] In *Chevron*, the Court set out a two-step analytical process that applies when a court reviews an agency interpretation of a "statute which it administers."[80] This "*Chevron* two step" is to proceed as follows:

> First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress. If, however, the court determines Congress has not directly

[76] 33 U.S.C. § 1344(b)(1) (2000).

[77] *See* 33 C.F.R. § 320.4 (containing the US EPA's 404(b)(1) guidelines). These guidelines are clearly focused on the criteria to be used to guide individual permitting decisions. Because the subsection 404(b)(1) guidelines are applicable only to the issuance of "Section 404" permits, and do not set quality standards for ambient waters, these guidelines may not be used to control 402 discharges. However, section 404 permitted discharges are not to cause or contribute to water quality standards violations, though state certification of a project under section 401 of the CWA is considered conclusive on this matter. *See* 33 C.F.R. § 320.4(d), *See also Friends of the Earth v. Hintz*, 800 F.2d 822, 834 (9th Cir. 1986).

[78] 33 U.S.C. §§ 1311(a), 1314(b), 1316 (2000).

[79] *Chevron U.S.A. v. Natural Resources Defense Council*, 467 U.S. 837 (1984).

[80] *Id*. at 842.

> addressed the precise question at issue, the court does not simply impose its own construction on the statute, as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute."[81]

If the Congress did not speak to the precise question at issue, the delegation to the agency may be either explicit or implicit: in either case, a court is to extend deference to the agency interpretation as long as it is a reasonable one.[82]

The Ocean Discharge Criteria of section 403.

Section 403(a) states "no discharge under section 1342 [§ 402] of this title *for a discharge into the territorial sea, the waters of the contiguous zone, or the oceans* shall be issued, after promulgation of guidelines established under subsection (c) of this section, except in compliance with such guidelines."[83] Particularly in light of the broad definition of "the oceans" in section 502(10) to include "any portion of the high seas beyond the contiguous zone,"[84] the ocean discharge criteria of section 403 clearly apply to all marine waters over which the United States exercises jurisdiction, and even extend into international waters for an indeterminate distance. The line of U.S. jurisdiction over surrounding ocean waters is now established by the

[81] *Id.* at 842-843.

[82] *Id.* at 843-844. ("If Congress has explicitly left a gap for the agency to fill, there is an express delegation of authority to the agency to elucidate a specific provision of the statute by regulation. Such legislative regulations are given controlling weight unless they are arbitrary, capricious, or manifestly contrary to the statute. Sometimes the legislative delegation to an agency on a particular question is implicit rather than explicit. In such a case, a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency.")

[83] 33 U.S.C. § 1343(a) (2000) (emphasis added).

[84] 33 U.S.C. § 1362(10) (2000).

U.S. Exclusive Economic Zone (EEZ), as a band of the seas extending two hundred miles from shore.[85]

Section 403(c) is generally entitled "Guidelines for determining degradation of waters."[86] Pursuant to subsection 403(a), these guidelines are to be applied in the issuance of NPDES permits authorizing point source discharges to ocean waters. Subsection 403(c) itself, however, *does not* contain any language *expressly* limiting the ocean discharge criteria to discharges directly to the waters listed in 403(a).[87] Subsection 403(c) is, in fact, silent on this subject. This silence is properly interpreted as an implicit delegation of authority to the EPA under the *Chevron* analytical framework. While the very title of section 403, stating simply "ocean discharge criteria," may be read as implicitly limiting the section to discharges directly to ocean waters, such an interpretation is certainly not the only reasonable way to read the statute. [88] While legislative history establishes that regulation of such discharges directly to ocean waters was, at least, the intended focus of this section,[89] the legislative history does not suggest that this is the only permissible application of the subsection 403(c) criteria. Thus, the remaining question

[85] United Nations Convention on the Law of the Sea, December 10, 1982, art. 57, 21 I.L.M. 1261 (1982) (*Hereinafter,* UNCLOS); *see also* Proclamation No. 5030, 48 Fed. Reg. 10,605 (Mar. 14, 1983) (establishing 200 mile EEZ).

[86] 33 U.S.C. § 1343(c) (2000).

[87] *Id.*

[88] *See* Robin Kundis Craig & Sarah Miller, *Ocean Discharge Criteria and Marine Protected Areas: Ocean Water Quality Protection Under the Clean Water Act*, 29 B.C. ENVTL. AFF. L. REV. 1, 25-26 (2001) (Analyzing Section 403 and concluding that, because section 403 and the water quality standards provisions of section 303 both apply to the territorial seas, that these sections, "cannot be treated as regulatory equivalents," and noting that "because the TMDL provisions, section 302, and the interstate provisions all refer to 'water quality standards' alone, these provisions do not automatically apply in the contiguous zone and the ocean when EPA establishes ocean discharge criteria for those water bodies.").

[89] *See* S. REP. NO. 92-414 (1971), 1972 U.S.C.C.A.N. 3668, 3740. ("The disposal of pollutants into ocean waters is regulated under this bill when it involves a discharge from any outfall beyond the shoreline of the United States or any discharge into the territorial sea from a vessel.")

under *Chevron* is whether or not an EPA interpretation of sections 403 and 301(b)(1)(C) would constitute a reasonable exercise of agency authority to fill a "gap" left by the statute.

The plain statutory language of subsection 403(c), read in light of the overall goals of the Act, may reasonably be interpreted to delegate authority to the EPA to invoke its 403(c) criteria as a basis for regulation of upstream discharges. In light of the aggressive goal of the Clean Water Act to "restore and maintain…*the Nation's waters*,"[90] this interpretation would clearly be consistent with the purposes of the Act. Furthermore, the language of section 301(b)(1)(c), requiring all pollution discharges to comply, not only with the water quality standards provisions, but also with "any other federal law or regulation," is very reasonably read to incorporate the subsection 403(c) ocean discharge criteria. After all, by its plain language, the phrase "any other federal law or regulation" reaches outside of the CWA. As such, it would be imminently reasonable for the agency to conclude that this section also may link up with another section of the same statute.

Finally, any such EPA decision to set federal water quality standards under section 403 would be particularly reasonable in light of the considerable expansion of U.S. jurisdiction over its adjacent marine waters since the Clean Water Act passed in 1972. While the provisions of the CWA regarding marine waters made sense in 1972, they make little sense today in light of this jurisdictional expansion. When the Clean Water Act passed Congress, waters beyond three miles from shore were considered part of "high seas."[91] The U.S. assertion of exclusive economic rights to waters extending to 200 miles into the ocean (including exclusive fishing rights) make

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[90] 33 U.S.C. § 1291(a) (2000) (emphasis added).

[91] *See* OCEAN BLUE PRINT FOR THE 21ST CENTURY, *supra* note 46, at 73.

these waters no longer a part of the "global commons."[92] The waters of the EEZ are now clearly a part of "the Nation's waters," and it would be imminently reasonable for the EPA to exercise an implicitly delegated authority to provide for their stewardship through the promulgation and implementation of federal water quality standards.

Despite these arguments, the EPA has thus far only applied Section 403(c) to direct discharges to ocean waters. [93] In 1980, the EPA adopted ocean discharge regulations which are clearly applicable only to discharges directly to ocean waters.[94] The EPA recently considered the creation of new, section 403 ocean discharge criteria that would function more like water quality standards. [95] Called "healthy ocean waters," these proposed "hybrid" standards, as informally proposed, were also clearly limited to direct discharges to ocean waters, applying within the band of seas between 3 and 200 miles from shore.[96] The three-mile inner limit corresponded with the reach of state jurisdiction under the CWA in light of the Act's concerns regarding federalism and preservation of state authority.[97] The outermost limit was also reasonable, corresponding with the outer limit of the U.S. Exclusive Economic Zone. EPA informally considered these standards in response to President Clinton's May 26, 2000, Executive Order No. 13158 for Marine Protected

[92] *See* 16 U.S.C. § 1811 (2000) ("Except as provided in section 1812 of this title, the United States claims, and will exercise in the manner provided for in this chapter, sovereign rights and exclusive fishery management authority over all fish, and all Continental Shelf fishery resources, within the exclusive economic zone.")

[93] *See* 45 Fed. Reg. 65953 (Oct. 3, 1980); 40 C. F. R. §§ 125.120-125.12.

[94] *Id*.

[95] US EPA, *Ocean Discharge Criteria: Revisions to Ocean Discharge Regulations*, *40 C.F.R. Parts 122, 123 and 125* (Copy of proposal on file with the author); *see also* Public Hearing Notice, 65 Fed. Reg. 42936-01 (July 12, 2000); *See also* Robin Kundis Craig, *supra* note 88, at 29 (summarizing the EPA proposal).

[96] *See* Robin Kundis Craig, *supra* note 88, at 29.

[97] *But see*, *Id*. at 30 (arguing compellingly that EPA's rule effectively limiting the application of section 403 to the exclusively federal waters constituted a violation of the statute). In light of this concern, a more reasonable solution would have been to create two different sets of section 403 regulations, applying essentially the current 403 standards to state waters, and applying the strengthened standards only to the exclusively federal waters as proposed.

Areas.[98] While the Bush administration has kept this executive order in place,[99] the EPA has not again proposed strengthened section 403 standards.

The EPA should proceed with adoption of strengthened section 403 standards for all U.S. ocean waters. Because subsection 403(c) is not properly viewed as imprisoned within the section of the statute within which it is housed, this section, particularly when linked with section 301(b)(1)(C), reaches well beyond the requirements of subsection 403(a). Thus, EPA should also explicitly provide that these standards may be invoked, at the agency's discretion, in order to regulate land-based sources of pollution upstream.

The Water Quality Standards provisions of section 303.

Water quality standards are defined in the Act as consisting of "designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses."[100] The EPA considers an antidegradation policy to also constitute an element of water quality standards.[101] Water quality standards must be established by the states and approved by the EPA, with disapproval triggering a mandatory duty for the EPA to promulgate federal standards.[102] States are to establish "fishable and swimmable" use classifications for their waters consistent with the section 101(a)(2) goals of the Act that "wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife

[98] Exec. Order No. 13,158, 65 Fed. Reg. at 34,911 (May 26, 2000) (mandating that the EPA, "relying upon existing Clean Water Act authorities, shall expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment.").

[99] See Robin Kundis Craig, *supra* note 88, at 7, *citing* to a Press Release, Donald. L. Evans, Secretary of Commerce.

[100] 33 U.S.C. § 1313(c)(2)(A) (2000).

[101] *See* 40 C.F.R. § 131.12; 33 U.S.C. § 1313(d)(4)(B) (2000).

[102] *See* 33 U.S.C. §§ 1313(a) to 1313(c) (2000).

and provides for recreation in and on the water be achieved by July 1, 1983."[103] Specific water quality criteria for each use classification are set with the support of "information and guidelines" developed by the U.S. EPA under section 304(a).[104] EPA may cite its 304(a) criteria as a basis for disapproving state-established criteria.[105] States are required to consider revision of their standards at least once every three years, holding public hearings for this purpose.[106] This standards review process is often referred to as the "triennial review" of water quality standards; however, states frequently allow more than three years to elapse without conducting the required triennial reviews.[107]

Where water quality standards are not met, the Act requires the states and the EPA to develop Total Maximum Daily Loads (TMDLs) to restore ambient conditions to levels meeting or exceeding applicable standards.[108] A TMDL is essentially a "pollution budget" for a particular pollutant that is causing a water body to violate its applicable water quality standards.[109] A TMDL is comprised of a Waste Load Allocation (WLA) for all point sources, a Load Allocation (LA) for all nonpoint sources, and a margin of safety.[110] Generally, the states and tribes develop

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[103] 33 U.S.C. § 1291(a)(2) (2000). S*ee also* US EPA, WATER QUALITY STANDARDS HANDBOOK, SECOND EDITION (EPA, 1994), *available at* http://www.epa.gov/waterscience/standards/handbook/.

[104] 33 U.S.C. § 1314(a) (2000).

[105] *See Mississippi Commission on Natural Resources v. Costle*, 625 F.2d 1269 (5th Cir. 1980) (Upholding EPA's disapproval of Mississippi's state water quality criteria for dissolved oxygen based in part on the inconsistency of Mississippi's criteria with EPA's 304(a) criteria).

[106] *See* 33 U.S.C. § 1313(c)(1) (2000); 40 C.F.R § 131.20.

[107] *See* River Network's Clean Water Act website *at* www.rivernetwork.org.

[108] *See* 33 U.S.C. § 1313(d) (2000).

[109] *See* 33 U.S.C. § 1313(c) (2000); 40 CFR § 131.

[110] *See* 40 C.F.R. § 130.7; *See also* EPA TMDL Website *at* http://www.epa.gov/owow/tmdl/.

TMDLs subject to EPA approval or disapproval. TMDLs are pollutant-specific and apply to all sources of a problem pollutant contributing to a violation, including nonpoint sources.[111]

The water quality standards analysis of Gulf hypoxia encounters trouble at step one: it is not clear whether water quality standards *apply at all* to most of the waters affected by Gulf hypoxia. The CWA concerns itself with the integrity of "the Nations waters,"[112] and proceeds to divide these waters into three categories: 1) the "navigable waters" (which includes the "territorial seas"), [113] 2) the "contiguous zone,"[114] and 3) "the oceans."[115] At the time the CWA was enacted, as is generally the case today, states had jurisdiction over a band of the seas extending three miles from the shoreline.[116] The Clean Water Act likewise defines the territorial seas as "the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending a seaward distance of three miles."[117] Section 303(c), in turn, requires the states to set water quality standards for its waters, referring to "the navigable waters

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[111] *See Pronsolino v. Nastri*, 291 F.3d 1123 (9th Cir. 2002) (holding that TMDLs are to be developed for waters impaired exclusively by nonpoint sources).

[112] 33 U.S.C. § 1291(a) (2000).

[113] 33 U.S.C. § 1362(7) (2000) (defining the term "navigable waters" as "the waters of the United States, including the territorial seas.").

[114] 33 U.S.C. § 1362(9) (2000).

[115] 33 U.S.C. § 1362(10) (2000).

[116] *See* Submerged Lands Act of 1953, 43 U.S.C § 1312 ("The seaward boundary of each original coastal state is approved and confirmed as a line three geographical miles distant from its coast line.") *but see U. S. v. Florida*, 425 U.S. 791, 792 (1976) (holding that Florida possesses expanded maritime jurisdiction: "As against the United States, the State of Florida is entitled to all the lands, minerals, and other natural resources underlying the Gulf of Mexico extending seaward for a distance of 3 marine leagues from its coastline or its historic coastline, whichever is landward, but for not less than 3 geographic miles from its coastline"); *see also U.S. v. States of La., Tex., Miss., Ala. and Fla*., 363 U.S. 1 (1960) (also holding that the Submerged Lands Act granted to Texas the submerged lands in the Gulf of Mexico within three marine leagues from her coast, but that the Act did not grant Louisiana, Mississippi or Alabama any rights in submerged lands beyond three geographic miles from their coasts.).

[117] 33 U.S.C. § 1362(8) (2001).

involved."[118] As discussed in more detail below, while section 303's use of this phrase does not expressly limit the application of water quality standards to these waters, the clear implication of this section's silence regarding "the oceans" and "the contiguous zone" is that water quality standards are indeed confined to the "navigable waters" as that term is defined in the Act.

While the water quality standards provisions of sections 303 do not appear to reach beyond "the navigable waters," this section does provide the most promising statutory source of authority for a regulatory regime to address that portion of Gulf hypoxia that occurs within the navigable waters. Federal regulations require point source discharges to comply with "the applicable water quality requirements of all affected States."[119] Thus, if a portion of Gulf hypoxia occurs within the "navigable waters" in the State of Louisiana, a regulatory regime could be based upon the violation of water quality standards in these waters.

Water Quality Standards Analysis of Gulf hypoxia in Louisiana Jurisdictional Waters.

The Louisiana Department of Environmental Quality (LDEQ) has established water quality standards for the coastal waters within its jurisdiction.[120] Louisiana's dissolved oxygen criteria establish enforceable numeric standards of 4 mg/l in estuarine waters and 5 mg/l in coastal waters "except when natural conditions cause this value to be lower."[121] LDEQ has also

[118] *See* 33 U.S.C. §§ 1313(c)(2)(A) & 1313(c)(4) (2001).

[119] *See* 40 C.F.R. § 122.4(d); *See also*, *Arkansas v. Oklahoma*, 503 U.S. 91 (1992) (upholding 40 C.F.R. § 122.4(d)).

[120] *See* LA. ADMIN. CODE tit. 33, § 1123(C)(3) (April, 2005) (Louisiana classifies "Atchafalaya Bay & Delta and Gulf Waters to the State Three-Mile Limit" and "Mississippi River Basin Costal Bays and Gulf Waters to the State Three-Mile Limit" with the following four use classifications: Primary Contact Recreation; Secondary Contact Recreation; Propagation of Fish and Wildlife; & Oyster Propagation."), *available at* http://www.deq.state.la.us/planning/regs/title33/33v09.pdf.

[121] *See* LA. ADMIN. CODE tit. 33, § 1113(C)(3)(c) (April, 2005).

adopted a narrative nutrient criterion for its waters. [122] Unfortunately, however, this standard is rather toothless.

Although Gulf hypoxia (DO levels < 2 mg/l) would appear to clearly constitute a violation of Louisiana's dissolved oxygen criteria,[123] neither the State of Louisiana nor the EPA has found that a portion of the Gulf hypoxic area occurs in Louisiana jurisdictional waters. Despite compelling evidence that a portion of Gulf hypoxia does extend into Louisiana waters,[124] LDEQ has not listed any of its coastal waters as impaired,[125] nor has the EPA disapproved the state list and promulgated a federal 303(d) list recognizing the impairment of these waters.[126] In fact, LDEQ staff believe that low dissolved oxygen conditions in portions of Louisiana marine waters are either improving, or are distinct from Gulf hypoxia.[127] Thus, the State of Louisiana

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[122] *See* LA. ADMIN. CODE tit. 33, § 1113(B)8 (April, 2005) ("The naturally occurring range of nitrogen-phosphorous ratios shall be maintained. This range shall not apply to designated intermittent streams. To establish the appropriate range of ratios and compensate for natural seasonal fluctuations, the administrative authority will use site-specific studies to establish limits for nutrients. Nutrient concentrations that produce aquatic growth to the extent that it creates a public nuisance or interferes with designated water uses shall not be added to any surface waters.").

[123] One explanation for how a 4 or 5mg/l DO water quality criterion could theoretically coexist with hypoxia without it being recognized as a violation is provided by the possibility that the standards only require monitoring for dissolved oxygen levels near the surface. This illustrates the importance of insuring that dissolved oxygen standards explicitly apply throughout the water column and that monitoring be conducted at depth.

[124] This argument is based upon unpublished water quality data (provided by Dr. Nancy Rabalais, on file with the author) and personal communications with Dr. Nancy Rabalais.

[125] Louisiana Department of Environmental Quality, *Final 2004 303(d) List*, *available at* http://www.deq.state.la.us/technology/tmdl/TMDL%202004IRCat%205_revised0604.pdf.

[126] *See* Louisiana Department of Environmental Quality (LDEQ) web site *at* http://www.deq.state.la.us/planning/wqireports/2004wqireports.htm (last visited, April 3, 2005). According to the (LDEQ) web site, The final 2004 303(d) list was submitted to the US EPA for approval on October 19, 2004; and EPA has yet to approve or disapprove this list.

[127] An E-mail from Dugan Sabins, LDEQ to Brad McLane, dated May 18, 2005, stated as follows: "Louisiana currently lists subsegment 050901 – Mermentau River Basin Coastal Bays and Gulf Waters to State three-mile limit as being impaired by low dissolved oxygen. However, Louisiana's ambient water quality monitoring network sampled this subsegment and found the dissolved oxygen criterion was being met. Due to documented presence of some hypoxic conditions during recent shelf wide summer hypoxia monitoring, Louisiana elected to include this subsegment as impaired for low dissolved oxygen. Research on the hypoxic zone issue has indicated that most of the zone is outside of Louisiana jurisdictional waters; therefore, with the exception of 050901 the zone does not need to be considered on Louisiana's §303(d) List. While some estuarine waters within Louisiana are listed for low

and the EPA have not yet found that Gulf hypoxia occurs in Louisiana jurisdictional waters. As such, Louisiana is not in a strong position to complain about pollution discharges in upstream states.

In light of the legal and practical importance of determining whether or not hypoxia extends into Louisiana jurisdictional waters, the Louisiana DEQ, EPA, and stakeholders, should carefully consider whether Lousiana waters should be listed on the state's 303(d) list due to hypoxia.[128] At the same time, it would be appropriate for Louisiana to review its water quality standards.[129] Particularly if hypoxia is found to occur in Louisiana waters, LDEQ should consider developing numeric nitrogen and phosphorus criteria and reevaluate the dissolved oxygen criteria applicable to its marine waters.[130] The combination of the adoption of stronger water quality standards, and official recognition of hypoxia as an ambient condition which violates those standards, would place LDEQ and the EPA in a stronger position to challenge pollution discharges in upstream states.

Beyond the "navigable waters:" do sections 303 and 304(a) grant EPA authority to set standards for Gulf hypoxia occurring in waters beyond the territorial seas?

Turning now to consider the applicability of the water quality standards sections of the Act beyond the territorial seas, the following three questions are presented. First, does Section 304(a)

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dissolved oxygen, the sources of these impairments are not related to the Gulf of Mexico hypoxic zone. This assessment is expected to remain the same for Louisiana's 2006 §303(d) List."

[128] If EPA believes that hypoxia occurs in Louisiana waters, despite an LDEQ determination to the contrary, EPA could disapprove LDEQ's 2004 303(d) list and promulgate an expanded list with Gulf hypoxia affected waters included.

[129] Louisiana completed its last "triennial review" in 1999. *See* River Network web site *at* http://www.rivernetwork.org/cleanwater/cwa_search.asp.

[130] *see* US EPA, AMBIENT WATER QUALITY CRITERIA FOR DISSOLVED OXYGEN (SALTWATER): CAPE COD TO CAPE HATTERAS (2000) (providing an example of marine dissolved oxygen criteria published by EPA pursuant to section 304(a) of the CWA).

of the Clean Water Act give EPA independent authority to set enforceable water quality *criteria* for exclusively federal marine waters? Second, does the Act's silence in Section 303(c) regarding the EPA Administrator's authority to set water quality standards for exclusively federal waters, read in light of the statute as a whole, constitute a "plain language" limitation on EPA authority: or, does this Congressional silence constitute a delegation of discretionary authority to the Administrator to set federal water quality standards for these waters? Third, even if the statute was clear at the time of its passage, has evolving international law implicitly amended the Clean Water Act's definitions of the "contiguous zone" and/or the "territorial seas," thereby expanding the EPA's delegation of authority under the statute? These questions are answered in reverse order, keeping in mind the *Chevron* analytical framework.

Has evolving international law effectively amended the Clean Water Act?

At the time of the CWA's passage, there was a nice consistency between the extent of U.S. jurisdiction over the seas, the extent of state jurisdiction over the seas, and the CWA's definition of the territorial seas: all three extended three miles from shore.[131] While the CWA's definition of the territorial sea has not changed since 1972, this jurisdictional line has changed considerably since then as a function of the evolution of international law. Thus, the U.S. territorial seas now extend 12 nautical miles from shore.[132] Likewise, the CWA's definition of the contiguous zone

[131] *See* 43 U.S.C § 1312 ("The seaward boundary of each original coastal state is approved and confirmed as a line three geographical miles distant from its coast line."); *See also* 33 U.S.C. § 1362(8) (2000) (CWA definition of territorial seas); Convention on the Territorial Sea and the Contiguous Zone, Apr. 29, 1958, [1964] 15 U.S.T. 1606 (stating that states may claim sovereignty over a band of the territorial sea extending three miles from the baseline); *See also U.S. v. Alaska*, 521 U.S. 1, 8 (1997) (discussing the 3 mile extent of the U.S. territorial seas prior to the extension of the U.S. territorial seas to 12 miles pursuant to Proclamation 5928.).

[132] *See* UNCLOS, December 10, 1982, art. 3, 21 I.L.M. 1261 (1982)(stating that "Every state has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles."); *See also* Proclamation No. 5928, Territorial Sea of the United States of America, 54 Fed. Reg. 777. (December 27, 1988) (extending the US territorial sea "to 12 nautical miles from the baselines of the United States determined in accordance with

remains unchanged, while as a matter of international law, the contiguous zone now extends 24 nautical miles seaward.[133] These changes destroy the formerly existing, carefully-crafted coherence of the Clean Water Act's structure,[134] begging the question of how to match up these newly-created "exclusive federal" waters with the various provisions of the Act.[135]

There is a compelling argument that the evolution of international law has resulted in a modification of the CWA's definition of the contiguous zone, because the Act's definition of that term is itself based on international law.[136] The practical effect of such a definitional change would be relevant to only three sections of the Clean Water Act. First, the modification could expand the waters to which a waiver of secondary treatment standards for sewage discharges to the oceans may be secured under section 301(h),[137] likely having no practical effect on the implementation of the law. Second, the requirement that "any vessel of the Armed Forces subject to the regulations [promulgated by the Secretary of Defense, operating] in the navigable waters

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international law," and noting that nothing in it "extends or otherwise alters existing Federal or State law or any jurisdiction, rights, legal interests, or obligations derived therefrom.").

[133] *See* UNCLOS, December 10, 1982, art. 33(2), 21 I.L.M. 1261 (1982) ("The contiguous zone may not extend beyond 24 nautical miles from the baslines from which the breadth of the territorial seas is measured"); *See also*, 64 Fed. Reg. 48701 (Aug. 2, 1999) (Executive Order of President Clinton expanding the contiguous zone to 24 miles).

[134] *See* S. REP. NO. 92-414 (1971), 1972 U.S.C.C.A.N. 3668, 3743 ("The Committee has added definitions of the terms territorial seas, contiguous zone, and ocean to describe clearly the jurisdictional limits of the Act, and provide a basis for its relationship to other laws of the United States as well as to international law.").

[135] While this note uses the term "exclusively federal" waters as a shorthand term to refer to the band of the seas extending between three and two hundred nautical miles from shore, it should be noted that Texas and Florida have general jurisdiction over a 12 mile band of seas extending into the Gulf. *See* note 116. However, these states still have only a three mile jurisdiction over these waters for purposes of the CWA.

[136] *See* 33 U.S.C. § 1362(9) (2000) (Defining the contiguous zone as "the entire zone established or to be established by the United States under Article 24 of the Convention of the Territorial Sea and the Contiguous zone."); *See also* Convention on the Territorial Sea and Contiguous Zone, April 29, 1958, art. 24, 15 U.S.T. 1606 (defining the contiguous zone as "a zone of the high seas contiguous to its territorial sea…The contiguous zone may not extend beyond twelve miles from the baseline from the breadth of the territorial sea is measured."); *Also see* 64 Fed. Reg. 48701 (Aug. 2, 1999) (expanding US contiguous zone pursuant to UNCLOS).

[137] 33 U.S.C. § 1311(h) (2001) ("For the purposes of this subsection the phrase 'the discharge of any pollutant into marine waters' refers to a discharge into deep waters of the territorial seas or the waters of the contiguous zone,...").

of the United States or the waters of the contiguous zone [must be] equipped with any required marine pollution control device meeting standards established under this subsection…" would apply to this larger band of waters.[138] Third, and most importantly, section 311 regarding "Oil and hazardous substances liability" would apply within this expanded band of waters.[139]

With respect to the territorial seas, however, any argument that the expansion of this band of seas as a matter of international law has likewise expanded the term as defined in the Clean Water Act is tenuous at best. The CWA expressly defines the territorial seas as a "belt of the seas…extending seaward a distance of three miles" without reference to international law.[140] The fact that the contiguous zone is defined by reference to international law, while the territorial seas are defined explicitly in a manner corresponding with the extent of state jurisdiction over marine waters, suggests that this term was defined less with international law in mind.

In summary, while the evolution of international law expanding the contiguous zone may have modified the Act's definition of this term, the expansion of the "territorial seas" has clearly not changed this term as defined in the CWA.

Interpreting Congressional silence in Section 303: "plain language" or an "implicit delegation of authority"?

Section 303 of the CWA is silent with respect to those waters beyond the "navigable waters." Does this silence, read in light of the Act as a whole, mean that the EPA may set exclusively federal standards for these waters, or does it mean that Congress intended section

[138] 33 U.S.C. § 1322 (2001).

[139] *See* 33 U.S.C. § 1321(b)(1) (2001).

[140] *See* 33 U.S.C. § 1362(8) (2001).

303 to apply *exclusively* to the navigable waters, with sections 403 (ocean discharges) and 311 (oil and hazardous substances liability) providing the only means for ensuring the stewardship of more distant ocean waters? This presents a close question, and it should be noted that a court could easily find the statutes silence to constitute either ambiguity (thus inviting the agency to "fill the gap" left by the statute) or a clear limit on EPA authorityThe best answer to this question, however, is that the section's references to the navigable waters, combined with its silence regarding the contiguous zone and the oceans, constitutes a plain language limitation on the agency's authority under Section 303. In *Russello v. U.S.*, the Supreme Court stated that "where Congress includes particular language in one section of a statute but omits it in another section of the same Act… it is generally presumed that Congress acts intentionally… in the disparate inclusion or exclusion."[141]

A counter argument to this conclusion may proceed as follows. [142] Congressional silence in section 303(c) should be considered in light of the purpose of the Clean Water Act to "restore and maintain the chemical, physical and biological integrity of the Nation's waters." The drafters of the Act considered it to be a "comprehensive" statute to that end, and the hole that exists absent federal establishment of water quality standards for exclusively federal waters is inconsistent with this understanding of the Act as "comprehensive." Second, the CWA's "cooperative federalism" structure is a product of Congressional concern that the Act should respect the states' authorities to initially establish water quality standards for their waters, setting standards as stringent as desired, but not below minimally acceptable federal requirements. The very rationale for allowing states to set water quality standards first for waters within their

[141] *Russello v. U.S.*, 464 U.S. 16, 23 (1983).

[142] *See* Robin Kundis Craig, *supra* note 88, at 34-36 (Analyzing the Clean Water Act and reaching the conclusion that the EPA *does* have discretionary authority under the Act to set standards for these federal waters).

jurisdiction is obviously absent in the practice of EPA setting federal standards for federal waters: such an activity clearly does not infringe in any way on state authority.

This line of analytical reasoning begs the question of why, if federalism was its sole concern, did Congress not explicitly grant the EPA the power to set water quality standard for the "contiguous zone" and "the oceans" as well? The most likely answer is that such an exercise of the United States Power would have been an extraterritorial assertion of authority that would have made little sense under international law as it existed at the time. Why would Congress have established water quality standards for the "high seas," waterswhich were beyond its territorial jurisdiction? This suggests that "ocean discharge criteria" attach more to the "discharges" themselves than tothe "water s." The U.S. clearly had jurisdiction to regulate *discharges* into these international waters, even it did not have jurisdiction over the *waters* themselves. The U.S. could regulate such discharges by its nationals, as well as in any case where such discharge could cause a nuisance within the U.S. territorial waters.[143] Today, however, the U.S. not only maintains exclusive jurisdiction over the territorial seas, its jurisdiction over the waters of the EEZ is likewise extremely broad. For these reasons, Congressional silence could be construed as an implicit delegation of authority to the EPA to set federal water quality standards for waters beyond the territorial seas.

Under Section 303(c)(4)(B), the EPA is charged with the duty to "promptly prepare and publish proposed water quality standards for the navigable waters… in any case where the Administrator determines that a revised or new standard is necessary to meet the requirements of

[143] *See State of New Jersey v. City of New York*, 283 U.S. 473, 482 (1931) (holding as follows: "Defendant contends that, as it dumps the garbage into the ocean and not within the waters of the United States or of New Jersey, this Court is without jurisdiction to grant the injunction. But the defendant is before the Court and the property of plaintiff and its citizens that is alleged to have been injured by such dumping is within the Court's territorial jurisdiction. The situs of the acts creating the nuisance, whether within or without the United States, is of no importance.")

this chapter." The reference to the "navigable waters" need not be read as words of limitation, but rather as words of description explaining the section's provisions as they were to be applied in light of the snapshot of international law that Congress saw at the time it passed the CWA. Likewise, the preceding step of "disapproving" state standards before promulgating federal ones should not be viewed as the exclusive means of setting federal standards, but rather as a process informed by federalism concerns, concernswhich are irrelevant to the analysis of setting federal standards for federal waters.

Despite these compelling, purpose-based arguments, the premise that section 303 reaches beyond the "navigable waters" is hard to reconcile with section 303's use of that term. Because section 303 is silent regarding the contiguous zone and the oceans, if EPA has discretionary authority to set standards for these waters, such authority must be found either implicit within section 303(c), or must exist elsewhere in the statute. However, no other section of the Act may reasonably be read to grant the EPA the requisite authority to set standards for federal waters. While section 501(a) grants the EPA Administrator the authority to "prescribe such regulations as are necessary to carry out his functions under this chapter,"[144] such a general grant of authority to promulgate regulations does not empower the Administrator to promulgate regulations exceeding the grant of authority provided in the statute. This leaves only section 304(a) as a possible independent basis for the EPA to adopt water quality standards for federal waters.

[144] 33 U.S.C. § 1361 (2001).

Section 304(a): an independent source of authority for setting federal criteria?

Under section 304(a), EPA is charged with the duty to develop federal "criteria" and "guidelines," which have thus far been used exclusively both to guide states in setting water quality standards, and to guide the EPA in its review of such proposed standards. However, Congressional silence regarding the limits of section 304(a) could likewise be read as an implicit delegation of authority. The language of CWA section 304(a)(2)(A) clearly applies to all waters of the United States, including "the oceans."[145] Section 304(a)(1)(C) also clearly mandates the development of criteria regarding "the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication." Under section 304(a)(1), EPA must "from time to time thereafter revise [such criteria] accurately reflecting the latest scientific knowledge." EPA has not established such section 304(a)(1) criteria for the Gulf, nor has it explicitly published any of its Gulf hypoxia studies under authority of section 304(a)(2) as "information" to guide the restoration of these waters.

In order to find a basis in law for the agency to change course and publish such "information" and/or "criteria" as *enforceable standards*, this section must be sufficiently ambiguous that it may reasonably be found to constitute an "implicit" delegation of authority. However, legislative history suggests that Congress intended this section only as a form of guidance, not as a basis for regulation. The Senate Report states as follows: "The development of information which describes the relationship of pollutants to water quality is essential for carrying out the objective of the Act. *This information, known as criteria*, is required under Section 304(a) to be developed and published by the Administrator and issued to the states and

[145] *See* 33 U.S.C. § 1314(a)(2) ("The Administrator, after consultation..., shall develop and publish, within one year after October 18, 1972 (and from time to time thereafter revise) information (A) on the factors necessary to restore and maintain the chemical, physical, and biological integrity of all navigable waters, ground waters, waters of the contiguous zone, and the oceans....")

public."[146] The combination of the structure of the Act, the legislative history, and the EPA's long-followed practice of using this section only as an informational kind of section, suggests that it may not be invoked as a source of regulatory authority over federal waters. However, its use of the term "criteria" does present an argument to the contrary. To the extent that this section is ambiguous, an EPA interpretation of it as granting the agency authority to promulgate enforceable criteria for federal waters would likely constitute a "reasonable interpretation" entitled to deference from a court.[147]

Conclusion regarding ambient standards provisions of the Clean Water Act.

In conclusion, it is not clear whether sections 303 and 304(a) of the CWA grant the EPA authority to set water quality standards for federal waters. Section 303 is silent with respect to these waters. Although such a grant of authority may be found implicit within this section, no other section of the statute may be read to help fill the gap left by its silence with respect to the oceans beyond the "navigable waters." Section 304(a)'s use of the term "criteria" may be read to establish enforceable standards, or read as only authorizing the agency to establish guidelines. Nevertheless, this note concludes that these sections may not be read as granting the agency authority to set federal standards for federal ocean waters. Thus, the EPA would need to base a regulatory regime for the Gulf of Mexico hypoxic waters on the following three sources of authority: (1) the section 403 ocean discharge criteria; (2) section 301(b)(1)(C)'s broad mandate (discussed further below in the context of the ESA and MSA); and (3) water quality standards for the navigable waters of Louisiana established under section 303.

[146] S. REP. NO. 92-414 (1971), *reprinted in* 1972 U.S.C.C.A.N. 3668, 3716 (emphasis added), *available at* 1971 WL 11307.

[147] *See* Robin Kundis Craig, *supra* note 88, at 34-36 (finding that section 304(a) does grant EPA authority to set and enforce federal water quality criteria for federal waters)

TMDL Development and Implementation: Reaching for Upstream Point Source Dischargers

The next curve along this long and winding road to a regulatory regime would be for the EPA to establish nitrogen and phosphorus TMDLs for the Gulf of Mexico. The EPA, working in conjunction with Louisiana, may clearly establish such TMDLs based upon a finding that Louisiana waters are impaired pursuant to 303(d). Section 303(d) itself, however, is silent with respect to whether a TMDL may be created in order to address a violation of section 403 criteria. However, this silence is not fatal. Because section 301(b)(1)(C) requires discharges to comply with "any other federal law or regulation," and because regulations established pursuant to section 403 would constitute such "other regulations," it is reasonable to conclude that point source permits under section 402 may be based upon, if not a TMDL itself, then at least a "TMDL-like analysis," in order to ensure compliance with EPA regulations creating ocean discharge criteria under authority of section 403. As such, EPA may develop a federal TMDL for federal waters pursuant to sections 301(b)(1)(C) and 403, and, in conjunction with Louisiana, for the impaired navigable waters pursuant to section 303(d).

While implementation of TMDLs is not mandatory under the Act, it certainly would be a reasonable exercise of agency authority. Implementation could include a combination of the following three measures. First, EPA could review, and disapprove as appropriate, state water quality standards for upstream states under 303(c), promulgating federal criteria as necessary. However, in this process, EPA could only consider impairment of the navigable waters, not of the ocean discharge criteria downstream. Second, EPA could veto individual state-issued NPDES permits under its expressly delegated authority in sections 402(d)(2)(A) (in response to a request from a state) or 402(d)(2)(B) (an objection to a state-issued permit as "being outside the

guidelines and requirements of this chapter").[148] The broad authority granted to the Administrator under section 402(d)(2)(B) establishes that the Administrator may object to state-issued permits citing the fact that such permits cause or contribute not only to water quality standards downstream, but also to downstream ocean discharge criteria. Third, EPA could create a framework for federal implementation of a pollution trading program for nutrient discharges as already discussed in detail above. Finally, environmental groups could use citizen suits and permit appeals to try to ensure implementation of the regime. The extent to which the EPA's use of these implementation measures would withstand judicial review, as well as the ability of public interest groups to use citizen suits and permit appeals to keep agency implementation "on track," are both open questions.

It is not clear how judicial review of an EPA 402(d)(2) permit veto would proceed. Imagine a case where the EPA vetoed several permits in Illinois that were each responsible for an almost immeasurably small "portion" of Gulf hypoxia downstream. Should the standard for establishing a water quality standards violation in such cases of an EPA exercise of its veto authority be the same as where a citizen challenges a permit? The answer to this question is not clear, although presumably the agency decision to exercise its authority would receive *Chevron* deference.

Absent an EPA veto, however, environmental groups could appeal permits authorizing, or reauthorizing, point source discharges to upstream waters in state agency "quasi-adjudicative" proceedings. EPA has promulgated implementing regulations for the Clean Water Act providing that "No permit may be issued ... when the imposition of conditions cannot ensure compliance

[148] 33 U.S.C. § 1342(d) (2001).

with the applicable water quality requirements of *all affected States.*"[149] In the case of *Arkansas v. Oklahoma*, the Supreme Court upheld this regulation, as well as an EPA interpretation of it that a permit "should be upheld if the record shows by a preponderance of the evidence that the authorized discharges would not cause an actual *detectable* violation."[150] However, in *Arkansas v. Oklahoma*, the EPA was issuingfederal permits pursuant to Section 402(a) of the Clean Water Act. Today, all but one of the Mississippi River Basin states have been delegated NPDES permitting authority and are issuing permits under 402(b),[151] raising the question of whether or not the*Arkansas v. Oklahoma* holding applies to such state issued permits. The Court in *Arkansas v. Oklahoma* expressly declined to answer questions regarding the proper scope of this regulation in the context of state permitting.[152] At the same time, however, the Court concluded in a footnote that this restriction does apply "whether the permit is issued by the EPA or by an approved state program...."[153] Thus, the open question regards the meaning of this regulation in cases where the state issues an NPDES permit pursuant to section 402(b).[154]

[149] 40 C.F.R. § 122.4(d) (emphasis added).

[150] *Arkansas v. Oklahoma*, 503 U.S. 91, 97 (1992).

[151] *See* EPA web site *at* http://cfpub.epa.gov/npdes/statestats.cfm (As of the date of publication, only six states do not have "primacy" to issue permits under section 402(b) of the Act. These states are Alaska, Idaho, New Hampshire, Massachusetts, New Mexico, and Arizona. Thus, New Mexico is the only state without primacy with some territory within the Mississippi River basin.).

[152] *See* 503 U.S. 91, 104 (1992) ("Moreover, much of the analysis and argument in the briefs of the parties relies on statutory provisions that govern not only federal permits issued pursuant to §§ 401(a) and 402(a), but also state permits issued under § 402(b). It seems unwise to evaluate these arguments in a case such as these, which only involve a federal permit.").

[153] *See Arkansas v. Oklahoma*, 503 U.S. at 105, footnote 10.

[154] It should also be noted that Oklahoma's antidegration policy was at issue in this case, not a violation of a numeric water quality standard downstream, leaving open the question of the proper interpretation of the 40 C.F.R. § 122 "prohibitions" on discharges as applied to a permit challenge alleging contribution to an impairment of a numerical criterion.

Assuming, nonetheless, that this regulation at least retains a comparable meaning in the context of a state administrative appeal brought by an environmental group challenging a state-issued NPDES permit, the appellant would have an exceedingly slim chance of making the requisite showing of causation. As such, absent aggressive EPA use of its veto authority over state-issued permits that are not sufficiently stringent, permit appeals by environmental groups are not likely to yield tighter controls. This means that the role of environmental and citizen groups in pushing for implementation of any TMDL through permit appeals is not likely to be effective, and that any regulatory regime to restore the Gulf of Mexico would almost wholly depend upon an aggressive EPA exercise of delegated authority.

B. The Endangered Species Act (ESA) and the Magnuson –Stevens Fishery Conservation and Management Act (MSA).

The Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) each impose additional duties on the EPA to take actions to address Gulf hypoxia. Both statutes require the EPA to consult with the National Marine Fisheries Service (NMFS) where the agency takes actions that may contribute to Gulf hypoxia. Section 7 of the ESA requires EPA to consult with NMFS with respect to marine species, in order to ensure that actions "authorized, funded or carried out by such agency... [are] not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical habitat]."[155] The plain language of this section requires the EPA to consult with NMFS prior to approving upstream state water quality standards that fail to properly regulate nutrients that may impair the navigable waters

[155] 16 U.S.C. § 1536(a)(2) (2001).

downstream.[156] The MSA also requires each federal agency to "consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this chapter."[157] The ESA's section 9 prohibits the "taking" of endangered species;[158] and the SFA mandates measures to protect Essential Fish Habitat.[159]

The MSA, as amended in 1996, requires the Fishery Management Councils (Councils) to designate Essential Fish Habitat (EFH) as part of the development of Fishery Management Plans, and take measures to protect such EFH areas.[160] The Councils must "describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 1855(b)(1)(A) of this title, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat."[161] EFH for the Gulf of Mexico is defined to cover the entire Gulf, extending to "all marine waters and substrates…from the shoreline to the seaward limit of the

[156] *See* John W. Steiger, *Consultation Provision of Section 7(a)(2) of the Endangered Species Act and its Application to Delegable Federal Programs*, 21 ECOLOGY L.Q. 243, 246 (1994). (Considering whether or not the consultation requirements apply to delegable federal programs, and concluding "that the weight of authority and sound policy support applying section 7(a)(2) to all but a few delegable federal programs")

[157] 16 U.S.C. § 1855 (b)(2) (2001).

[158] 16 U.S.C. § 1538 (2001).

[159] *See* 16 U.S.C. § 1801(b)(7) (2001) (Establishing the goal **"**to promote the protection of essential fish habitat in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat."). *See also* 16 U.S.C. § 1855(b)(4)(A). (requiring the Secretary of Commerce to make recommendations to other state and federal agencies regarding activities which "would adversely affect" essential fish habitat.)

[160] *Id.*

[161] 16 U.S.C. § 1853(a)(7) (2001).

exclusive economic zone." [162] The Gulf of Mexico Fishery Management Council has stated that "hypoxia…is a direct threat to EFH."[163]

The Gulf of Mexico also provides habitat for five species of threatened or endangered sea turtles, including the Kemp's Ridley (*Lepidochelys kempii*),[164] and the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*).[165] The US Fish and Wildlife Service has found that, "in comparison to other fish species, sturgeon have a limited behavioral and physiological capacity to respond to hypoxia;" however, the area of the Gulf affected by hypoxia is not listed as critical habitat for the Gulf sturgeon.[166]

When considered in conjunction with the requirements of the Clean Water Act, these statutory requirements strengthen the agency's hand in enforcing an interstate TMDL for the Gulf of Mexico. The CWA specifically requires all pollution discharges to comply with all federal laws and regulations. Section 301(b)(1)(c) of the Act states: "In order to carry out the objective of this chapter there shall be achieved not later than July 1, 1977, any more stringent limitation including those necessary to meet water quality standards,... *or any other Federal law*

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[162] Marian Macpherson, "…*To the Gulf Stream Waters:" Stewardship for Essential Fish Habitat*, 18 TUL. ENVTL. L.J. 97, 119 (2004) *citing* Gulf of Mexico Fishery Management Council, *Generic Amendment for Addressing EFH Requirements in the FMPs of the Gulf of Mexico* (Oct. 1998) (codified at 50 C.F.R. § 622), *available at* http:// Galveston.ssp.nmfs.gov/efh/FINALEFH.PDF.

[163] Gulf of Mexico Fishery Management Council, *Draft Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the Fishery Management Plans of the Gulf of Mexico,* July, 2003 at 3-287, *available at* http://www.nmfs.noaa.gov/habitat/habitatprotection/eis/Full%20Gulf%20EFH%20EIS%20703.PDF; *See also* Gulf of Mexico Fishery Management Council, *Generic Amendment for Addressing EFH Requirements in the FMPs of the Gulf of Mexico*, *supra* note 160 at 174-99.

[164] 35 Fed. Reg. 18319 (December 2, 1970) (listing Kemp's ridley as endangered), *available at* http://ecos.fws.gov/species_profile/servlet/gov.doi.species_profile.servlets.Species_FRDoc#top (last visited May 17, 2005).

[165] *See* 56 Fed. Reg. 49653 (September 30, 1991) (listing the Gulf sturgeon as threatened), *available at* http://ecos.fws.gov/tess_public/servlet/gov.doi.tess_public.servlets.VipListed?code=V&listings=0.

[166] 68 Fed. Reg. 13369 (March 19, 2003) (listing critical habitat for the Gulf sturgeon).

or regulation...."[167] This subsection, by its plain language, prohibits upstream discharges which cause or contribute to degradation of marine waters downstream in violation of the goals of not only the CWA, but also of other federal laws such as the MSA and the ESA.

Surprisingly, research identified only one published case dealing with the "or any other federal law or regulation" language of section 301(b)(1)(C). While the Seventh Circuit rejected the argument that this phrase imposed additional requirements on an NPDES permit in the case of *Porter County Chapter of the Izaak Walton League of America, Inc. v. Costle*,[168] it did so because the federal law at issue in that case articulated no specific standard.[169] However, the broad mandate of Section 301(b)(1)(c) that point source discharges comply with all federal laws and regulations constitutes a powerful and rarely considered provision of the Act that arguably requires point source dischargers to comply with the provisions of the ESA and MSA. In addition, EPA approval of state water quality standards that fail to include nutrient criteria constitutes an action to allow discharges that contribute to the impairment of downstream "navigable waters." Because this impairment degrades essential fish habitat and could harm the continued existence of threatened and endangered species in the Gulf, the federal approval of state water quality standards triggers the consultation requirement under both the Magnuson-Stevens Act and the Endangered Species Act.

C. Looking to Congress for a Solution: The Debates Regarding Ratification of UNCLOS and the Proposed Clean Water Authority Restoration Act of 2005.

[167] 33 U.S.C. § 1311(b)(1)(c) (2001) (emphasis added).

[168] *Porter County Chapter of the Izaak Walton League of America, Inc. v. Costle*, 571 F.2d 359 (7th Cir. 1978).

[169] *Id.* at 367.

While this note concludes that EPA does possess discretionary authority to implement a regulatory regime to restore the impaired waters of the Gulf of Mexico, Congress should nevertheless amend the CWA, granting the EPA clear authority to provide for the stewardship of all US jurisdictional marine waters, and clarifying the marine jurisdictional lines drawn in the Act. Opportunities to draw attention to the value of amending the CWA are found in two matters of actual or likely debate in the 109th Congress: the proposed ratification of the United Nations Convention on the Law of the Sea, and the proposed Clean Water Authority Restoration Act of 2005.

The United Nations Convention on the Law of the Sea (UNCLOS) was negotiated in 1982 and entered into force on November 16, 1994. [170] UNCLOS has been called a "constitution for the oceans."[171] UNCLOS contains 59 environmental provisions, including Article 192, creating a broad obligation to protect and preserve the marine environment; Article 235, providing for liability for pollution of the marine environment; and Article 207, imposing a duty on parties to protect ocean waters through the regulation of land based sources of pollution.[172] Unfortunately, the U.S. Senate has not yet ratified UNCLOS. Ratification of UNCLOS would entail multiple benefits for the U.S., including improved national security, greater economic development opportunities, improved ecological stewardship of the oceans generally, and

[170] *See* UNCLOS, December 10, 1982, 21 I.L.M. 1261 (1982).

[171] *See, e.g.* Lakshman Guruswamy, *The promise of the United Nations Convention on the Law of the Sea (UNCLOS)Justice in Trade and Environment Disputes* 25 ECOLOGY L.Q. 189, 227.

[172] *See* UNCLOS, December 10, 1982, art. 207, 21 I.L.M. 1261 (1982) ("1. States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines and outfall structures, taking into account internationally agreed rules, standards and recommended practices and procedures. 2. states shall take other measures as may be necessary to prevent, reduce and control such pollution. 3. States shall endeavor to harmonize their policies in this connection at the appropriate regional level. 4. States, acting especially through competent international organizations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce, and control pollution of the marine environment from land based sources….")

possibly further-extended jurisdiction over marine waters.[173] As such, the U.S. Commission on Ocean Policy recently joined the chorus of voices recommending that the U.S. ratify UNCLOS.[174]

Throughout the history of its considerations, most commentators have expressed little concern that U.S. environmental laws would need to be modified to meet its obligations. In the *Message From The President of the United States and Commentary* accompanying UNCLOS' transmittal to the Senate, the Clinton administration expressed confidence in the adequacy of then existing environmental law, stating: "The United States already has national legislation addressing land-based sources of marine pollution…. U.S. laws include the Clean Water Act... which specifically addresses marine water quality."[175] On March 24, 2004, the U.S. Senate Committee on Environment & Public Works held a hearing to consider ratification of UNCLOS.[176] These debates are permeated with the presumption that current U.S. environmental laws clearly meet all of the obligations of UNCLOS and that there would be no need to enact or amend federal legislation as an incident of UNCLOS' ratification.[177]

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[173] *See Message From The President of the United States and Commentary Accompanying the United Nations Convention on the Law Of The Sea and The Agreement Relating To The Implementation Of The Part XI Upon Their Transmittal To The United States Senate For Its Advice And Consent.* S. TREATY DOC. 103-39, 103d Cong., 2d Sess. (1994), *reprinted in* 7 GEO. INT'L ENVTL. L. REV 77.

[174] *See* OCEAN BLUE PRINT, *supra* note 46.

[175] *See Message from the President, supra* note 173, 7 GEO. INT'L ENVTL. L. REV. at 123.

[176] *See "United Nations Convention on the Law of the Sea," Hearing Before the Senate Committee on Environment and Public Works,* 109th Congr. (2004), *available at* http://epw.senate.gov/hearing_statements.cfm?id=219579.

[177] *See, Id.* Statement of John F. Turner, Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State ("As a party, the United States would be able to implement Part XII through a variety of existing U.S. laws, regulations, and practices (including enforcement practices) that are consistent with the Convention and that would not need to change in order for the United States to meet its Convention obligations. For example, because our laws already provide for the protection of rare and fragile ecosystems and the habitat of depleted, threatened, or endangered species, no amendment to the Endangered Species Act or the Marine Mammal Act would be required. Nor would the Convention impose any restrictions or requirements on U.S. citizens in addition to what is already required by statute.")

The above analysis of the applicability of the Clean Water Act's provisions to marine waters, however, belies this assumption that the CWA does not need to be amended in order to adequately implement the environmental obligations of UNCLOS.[178] The U.S. Commission on Ocean Policy also pointed out the lack of clarity in the marine jurisdictional lines in multiple statutesand noted the need to "update federal laws" with respect to outdate marine jurisdictions.[179] Even if UNCLOS does not impose *additional obligations* on the U.S. to amend its laws, the Senate should both ratify UNCLOS and contemporaneously propose legislation to amend the CWA. The authority of the Congress to establish rules for the protection of the oceans is without doubt.[180] Such an amendment should require the EPA to establish water quality standards for all federal ocean waters between the "three mile limit" and the seaward extent of the EEZ within a reasonable period.

Yet another opportunity to remedy the lack of clarity in the Clean Water Act regarding its jurisdiction over marine waters may be found in the proposed Clean Water Authority Restoration Act of 2005.[181] The stated purposes of this legislation are to "reaffirm the original intent of Congress in enacting the Federal Water Pollution Control Act Amendments of 1972... to clearly define the waters of the United States that are subject to the Federal Water Pollution Control Act; [and] to provide protection to the waters of the United States to the fullest extent of the

[178] *See* Robin Kundis Craig *supra* note 88, at 43-44 (Concluding that the Clean Water Act has "gaping holes with respect to compelled ocean water quality protection. [And that] These holes are particularly cavernous regarding the relationship between pollution in the state-controlled navigable waters and the quality of ocean waters farther out to sea.").

[179] *See* OCEAN BLUE PRINT, *supra* note 46, at 73.

[180] *See, e.g. U.S. v. State of Cal.*, 332 U.S. 19, 34 (1947).

[181] HR 1356, 109th Congress (1st Session, 2005); S 912, 109th Congress (1st Session, 2005).

legislative authority of Congress under the constitution."[182] The proposed amendment would strike the term "navigable waters" wherever it occurs in the Act, replacing that term with the phrase "Waters of the United States." The term "Waters of the United States" would be defined broadly to extend to essentially all internal waters, but would not expand federal jurisdiction over federal marine waters.[183] The primary impetus for this proposed amendment was provided by the Supreme Court's decision in *Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers*, which held that the Clean Water Act did not confer authority to the U.S. Army Corps of Engineers to assert jurisdiction over an artificially created pond, because this water body did not possess the requisite "significant nexus" to "navigable waters."[184] It would be appropriate to amend this proposed legislation to also correct the jurisdictional issues regarding marine waters. At the very least, debate regarding this legislation provides an opportunity to raise awareness among Congressional leaders regarding the lack of clarity with respect to the Clean Water Act's jurisdiction over marine waters.

III. A Practical Analysis of a Regime for Gulf Hypoxia

In addition to considering the legal foundation upon which a regulatory pollution control regime could be constructed, it is necessary to consider the practical incentives and disincentives for the creation and implementation of a regulatory regime. Essentially, this inquiry considers whether the long road toward establishing a regulatory regime is really worth the trouble. Given the amount of energy and resources involved in creating a regulatory regime for Gulf hypoxia,

[182] *Id.*

[183] *Id.* at § 4.

[184] 531 US 159, 167 (2001).

proponents of such a regime will need to put forth a compelling argument that the benefits of such a regime are worth the effort and costs. Because much of the benefit of creating such a regime is found in the reduction of risks, the argument for a regulatory regime must rely heavily on the "precautionary principle."[185] This section analyzes Gulf hypoxia using three models: an interest group/political capital model; an analysis of the "structural features" of the underlying transboundary pollution problem; and a variant of cost/benefit analysis.

One form of practical analysis of the proposed pollution control regime is essentially a political one. Such an analysis attempts to anticipate the likely proponents and opponents of such a regime, and to ascertain both the political power and moral suasion on each side of the ledger. A regulatory regime for the Gulf of Mexico will not form without strong support from interest groups possessing sufficient "political capital" that they are willing to "expend" in exerting pressure on elected and appointed officials. Interests thatwill almost certainly resist further regulation include upstream states, farmers and fertilizer manufacturers, and industrial and municipal point sources of nutrients. In addition, agency inertia is not to be underrated as a powerful force to overcome. The transformation of the currently extant voluntary regime into a regulatory one would entail increased administrative costs at the U.S. EPA, which the agency may be loathe to undertake absent specific appropriations or a clear statutory mandate. Interests that would likely support a regulatory pollution control regime for the Gulf of Mexico include fishery-related businesses and environmental groups. However, if a sufficient faction of these groups prefers to work toward voluntary consensus, then the current regime is almost guaranteed

[185] *See* United Nations, Conference on Environment and Development, Rio Declaration on Environment and Development, Principle 15, June 14, 1992, 31 I.L.M. 874, 879 (1992) ("In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.").

to continue. Given the present lack of a statutory mandate for a Gulf hypoxia regulatory regime, a unified and well-organized effort by both Gulf of Mexico fishing and environmental interests will be necessary to create one.

Another mode of practical analysis is a "structural analysis" of the transboundary pollution problem itself. In his *Golden Rules for Transboundary Pollution,* Thomas Merrill discusses what he calls certain "unique," structural features of transboundary pollution that "may account for the general failure to achieve effective collective action" to deal with it.[186] For example, Gulf hypoxia is a clear case of what Merrill calls unidirectional, transboundary pollution, where the flow of pollution is one way: from upstream states to downstream waters.[187] The reluctance of the "polluting states" to assist the "victim" jurisdictions downstream is reinforced by the fact that the primary source states are *many miles and jurisdictions upstream* from the affected waters.

On the other hand, the upstream states do have an interest in reducing nutrient pollution for their own benefit, they just may not see any value added to participating in a regime that is focused on attaining an outcome in distant downstream waters. The nutrient pollution that causes Gulf hypoxia constitutes what Merrill calls "partial transboundary pollution." [188] While the degree of oxygen depletion in the downstream jurisdiction is particularly severe, significant localized adverse impacts do occur within the source states as a result of the same pollutants that cause Gulf hypoxia. In fact, the EPA concluded in 2002 that about 18% of America's stream miles and 22% of its lakes, reservoirs and ponds are impaired due to nutrient pollution, and the

[186] *See* Thomas W. Merrill, *Golden Rules for Transboundary Pollution*, 47 DUKE L.J. 931 (1997).

[187] *See Id.* at 971. For purposes of clarifying the contradistinction, the US/Canada border provides an example of "reciprocal transboundary pollution," as flowing waters tend to flow both North and South along this long border.

[188] *See Id.* at 970.

largest nutrient source states in the Mississippi River Basin are no exception.[189] The upstream states are more likely to participate in a regulatory regime to reduce nutrient pollution if they become convinced that participation would help them improve water quality at home.[190]

Another mode of analysis is the familiar "cost/benefit" model. Merrill analyses "the conditions that give rise to regimes of collective action in the multijurisdictional environmental context,"[191] concluding that "the general criterion for determining when any type of collective action regime will arise is that *the benefits of the regime in terms of reducing externalities must exceed the costs of creating and sustaining the regime*."[192] Perhaps better than any other, this relatively simple model explains why Gulf hypoxia is being addressed under a voluntary regime at present. Both the "start up" and "maintenance" costs of a regulatory regime to address Gulf hypoxia would be high.

Applying the structural and cost/benefit forms of analysis, the case of Gulf hypoxia may be juxtaposed with hypoxia in New York's Long Island Sound, where the problem is being addressed through a regulatory regime implemented through a pollutant trading framework.[193]

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[189] *See* US EPA, 2002 305(b) Water Quality Report to Congress, *Available at* http://www.epa.gov/305b/2000report/.

[190] On the other hand, as noted earlier, modest increases in nutrient loading are generally correlated with more productive fisheries. This raises the specter of a concern, that nutrient reductions required to support the Gulf could cut back so much on nutrient loading in the source states that fisheries would be become less productive. This concern arose on the Chattahoochee River which forms the border between Alabama and Georgia. Nutrient reductions were implemented to address eutrophication and oxygen concerns. These reductions were so successful that the bass fishery suffered adverse impacts from the perspective of anglers who wished to see the reservoirs teaming with large, fat, largemouth bass. (cite needed). While, on balance, reduced nutrient loadings should have mostly positive impacts on upstream ecosystems as well as reduce hypoxia in the Gulf of Mexico, the potential for some backlash must be acknowledged.

[191] *See* Merrill, *supra* note 185, at 972, *citing* Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967).

[192] *Id.* (emphasis added)

[193] *See* Professor Ann Powers, *The Current Controversy Regarding TMDLs: Contemporary Perspectives, "TMDLs and Pollutant Trading,"* 4 RES COMMUNES: VT.'S J. ENV'T 2 (2002-2003).

Gulf hypoxia is unlike Long Island Sound hypoxia in that: (1) the underlying hypoxia problems are structurally different in that the sources of Gulf hypoxia are further removed from the problems; (2) the costs of coordinating a regulatory regime involving thirty-one states would be much higher; (3) the adverse impacts of Gulf hypoxia may be more uncertain; and, (4) the majority of the nutrient pollution impairing Long Island Sound stems from point sources.[194]

A wild card in the cost/benefit analysis of the proposed regulatory regime for the Gulf of Mexico is found in the extent of uncertainty regarding the level of reductions which may reasonably be anticipated to occur as a result of currently existing regulatory programs. Existing regulatory requirements upstream and upwind will arguably lead to reductions in loading with or without another layer of regulation. For example, reductions of point sources should occur through ongoing implementation of the Clean Water Act, including TMDL development and implementation in upstream states. Also, regulation of pollutants such as nitrogen oxides under the recently promulgated Clean Air Interstate Rule (CAIR) [195] will further decrease air deposition of nitrogen. EPA estimates that CAIR will reduce nitrogen oxide emissions by 53%.[196] Given that atmospheric deposition accounts for an estimated fifteen to thirty percent of the nitrogen loading in most U.S. estuaries, such reductions may significantly reduce Gulf hypoxia.[197] These factors argue in favor of the voluntary, wait-and-see approach.

On the other hand, the idea of an ocean bottom larger than the size of Massachusetts that is unable to support fish and shellfish is troubling, and the possibility of rapid ecological collapse

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[194] *Id.*

[195] 40 C.F.R. §§ 51, 72, 73, 74, 77, 78, 96.

[196] *See*, US EPA, Clean Air Interstate Rule, Preamble at 17, *available at* http://www.epa.gov/cair/pdfs/cair_final_preamble.pdf.

[197] *See*, US EPA, Clean Air Interstate Rule Preamble, at 752.

is sobering. Furthermore, reductions in nutrients to benefit the Gulf will also bring net benefits to upstream state waters. While difficult or even impossible to quantify, these benefits could be substantial, including more healthy ecosystems and improved public health.[198] Strategies such as wetlands protection and restoration also yield multiple benefits in the form of increasing recharge of aquifers and reducing the severity and frequency of flooding impacts. Finally, a pollution trading program could reduce the costs of implementing the required pollution control reductions, making a regulatory regime more appealing under cost-benefit analysis from the perspective of regulated entities. On the other hand, administration of such a trading program will likely increase the EPA's costs of creating and maintaining a regime.

Ultimately, the question of how to respond to Gulf hypoxia is, at best, only partially answered by cost/benefit analysis. We must determine the level of risk that we are willing to take in reducing the risk of catastrophic ecosystem collapse, as well as the level of ecosystem degradation that we are willing to tolerate. If we view the risks to be acceptably low, or too uncertain to form a basis for action, then the current regime of study and voluntary reductions is appropriate. However, a risk-averse, precautionary approach is the more appropriate path given the extent of human alteration of the Gulf of Mexico's ecosystem, the uncertainty of the long-term consequences of hypoxia, the multiple benefits of solutions such as wetlands protection and creation. Such a precautionary approach calls for an enforceable, regulatory regime to compel action.

[198] For example, treatment byproducts, such as trihalomethanes, are common drinking water contaminants that are a byproduct of the disinfection of drinking water with chlorine or chlorinated compounds. Treatment byproduct formation is correlated with greater amounts of organic material in drinking water supplies. Thus, decreasing nutrients in drinking water source rivers, will lead to less eutrophication, resulting in less organic matter in these systems, which will yield less carcinogens in our drinking water supply. To the author's knowledge, and despite his best efforts, he has been unable to locate any studies estimating such benefits.

IV. Recommendations

In conclusion, the threats to the Gulf of Mexico's aquatic ecosystem imposed by hypoxia are serious, and they demand more aggressive action to restore these waters in light of the risk of ecosystem collapse. These actions should include the following:

1. Congress should amend the Clean Water Act in two ways. Congress should adjust the jurisdictional lines in the Act to clarify the law and to make the law consistent with general U.S. jurisdiction over marine waters. Ideally, all references to the "contiguous zone" should be replaced with the term "exclusive economic zone." The term "territorial seas," for the sake of clarity, should be replaced with the term "state marine waters," and should continue to apply to a three-mile band of waters. Congress should then clearly delegate to the EPA the duty to set water quality standards for all federal waters between the reach of the state marine waters and the furthest extent of the EEZ by an appropriate deadline. The ocean discharge criteria should be retained to provide an additional layer of protection for state and federal waters. The term "oceans" should be retained to provide the EPA with discretionary jurisdiction to regulate discharges of pollution beyond the EEZ.

2. Congress should instruct the EPA to study a pollution trading program for the Mississippi River basin and produce a report within a reasonable period of time. At the time such a report is completed, Congress should consider whether to mandate such a trading program, or leave the matter to resolution through the exercise of EPA discretion.

3. Irregardless of Congressional action, EPA should develop federal "healthy ocean waters" standards for exclusively federal waters under Sections 403 for federal waters generally along the lines that the agency previously suggested.. Such section 403 standards, however, should retain the existing level of protection provided within the "CWA 3-mile territorial seas," as well as apply a greater level of protection in federal waters extending from 3 to 200 miles from shore. EPA should also clearly require upstream dischargers to not cause or contribute to violation of these standards. Despite the lack of clarity in the law, EPA should also cite to sections 304(a) and 303 as alternative sources of authority.

4. EPA, LDEQ, and stakeholders should evaluate whether hypoxia occurs in Louisiana jurisdictional waters. EPA should consider disapproving the State of Louisiana's 303(d) list and promulgate a federal list including Louisiana state waters impaired due to Gulf hypoxia if such action is necessary and supported by adequate information.

5. Louisiana should propose stronger water quality standards for nutrients, and should also consider clarifying its dissolved oxygen criteria for marine waters, ensuring that appropriate dissolved oxygen standards apply throughout the water column. The EPA should review any resulting standards in consultation with NMFS and USFWS to make certain that LDEQ nutrient standards are protective of Gulf of Mexico waters.

6. The EPA should review water quality standards state by state for upstream states as each state conducts its triennial reviews. EPA should consult with NMFS in the process of reviewing these standards as required by the ESA and SFA. EPA should disapprove any state water quality standards that fail to include adequate nutrient water quality standards, and promulgate federal nutrient water quality standards to address these waters as appropriate.

7. EPA should immediately commence development of twointerstate TMDL s for the Gulf of Mexico for the parameters of nitrogen and phosphorus, considering an enforceable pollution-trading framework as one option for their implementation.

8. Finally, research and monitoring of Gulf hypoxia should be adequately funded. Because of the lack of clarity regarding the actual and potential ecological and fishery impacts of the continuing annual cycle of hypoxia in the Gulf of Mexico, sufficient funding for research is critical.