

OCEAN TIPPING POINTS

Statutory Requirements Relevant to Threshold-Based Decision Making Under Selected U.S. Environmental Laws

This table breaks down the substantive and procedural provisions that facilitate threshold-based decision making in certain U.S. environmental statutes. The table's color scheme identifies the existence or absence of best available science, cumulative impact, and cost-benefit analysis requirements, while the footnotes provide limited examples of such provisions. An additional column identifies specific areas of the current management regime where threshold targets are used or could be integrated.

	Human Health v. Environmental Protections	Ambient v. Species Specific Protections	Risk v. Technology Based Protections	Best Available Science	Cumulative Impacts	Cost-Benefit Analysis	Example of Current Threshold Management
Clean Air Act	Human Health	Ambient	Both	Yes ¹	No ²	Yes/No ³	NAAQS and Dose-Response Relationships ⁴
Clean Water Act	Both	Ambient	Both	Yes ⁵	No ⁶	Yes/No ⁷	Tahoe Regional Planning Agency ⁸
Endangered Species Act	Environmental	Species Specific	Risk	Yes ⁹	Yes ¹⁰	Yes/No ¹¹	Analyses of Population Viability and Likelihood of Recovery ¹²
Marine Mammal Protection Act	Environmental	Species Specific	Risk	Yes ¹³	~No, but in practice ¹⁴	Yes ¹⁵	Single Species Assessments – OSP ¹⁶
Magnuson Stevens Act	Environmental	Species Specific	Risk	Yes ¹⁷	~No, but in practice ¹⁸	Yes ¹⁹	Single Species Assessments – OY and MSY ²⁰
National Environmental Policy Act	Both	Both	Risk	~Yes ²¹	Yes ²²	Yes ²³	CEQ Draft Guidance on Climate Change ²⁴
Safe Drinking Water Act	Human Health	Ambient	Both	Yes ²⁵	No ²⁶	Yes ²⁷	Maximum Contaminant Levels ²⁸
Coastal Zone Management Act	Environmental	Ambient	Both	~No, but at state level ²⁹	~No, but at state level ³⁰	Yes ³¹	Coastal Zone Management Performance Measurement ³²
National Marine Sanctuaries Act	Environmental	Ambient	Risk	~No, but at the sanctuary level ³³	Yes ³⁴	Yes ³⁵	Sanctuary Performance Metrics and Evaluation Action Plan ³⁶

The Ocean Tipping Points project is a collaboration of natural and social scientists, lawyers, environmental managers, and stakeholders working to understand what drives abrupt ecological shifts, and how they might be prevented or reversed. www.oceantippingpoints.org.

For more information please contact: Ashley Erickson, Assistant Director for Law & Policy, Center for Ocean Solutions, ashleye1@stanford.edu; Don Gourlie, Early Career Law & Policy Fellow, Center for Ocean Solutions, dgourlie@stanford.edu. The views expressed in this table and its associated footnotes are solely those of the Center for Ocean Solutions, Stanford University. Nothing in this document should be construed as conveying legal advice. Nothing in this document purports to apply law to specific situations or to provide a comprehensive picture of the law. We make no claims, assurances, or guarantees as to the accuracy or completeness of the information in this document. One should consult legal counsel for up-to-date information about the law or legal advice.

Footnotes

1 The Clean Air Act's risk based standards are called National Ambient Air Quality Standards (NAAQS). The designation of NAAQS must be based on the "latest scientific knowledge." 42 U.S.C. § 7408(a)(2) (2014) (emphasis added). The Clean Air Act also contains a number of formal requirements to incorporate the most up-to-date technology into technology-based standards. See, e.g., id. § 7475(a)(4) (under the Prevention of Significant Deterioration Program, newly constructed major emitting facilities must include the "best available control technology" for each pollutant subject to regulation that is emitted from the facility); id. § 7412 (major sources of Hazardous Air Pollutants that undergo modifications must use the "maximum achievable control technology").

2 The Clean Air Act contains no formal cumulative impact analysis. Additionally, all actions taken by the Environmental Protection Agency under the Clean Air Act are expressly exempted from the National Environmental Policy Act's environmental impact analysis requirement, which includes a cumulative impact analysis. 15 U.S.C. § 793(c)(1).

3 Certain Clean Air Act actions require cost-benefit analyses, while others forbid them or make them optional. For example, the Environmental Protection Agency (EPA) is not allowed to consider the economic or technological feasibility of controlling criteria pollutants when determining whether they should be listed. *Whitman v. American Trucking Ass'ns*, 531 U.S. 457 (2001); 42 U.S.C. § 7408(a)(1)(A). In contrast, the EPA was instructed to consider the cost of achieving certain emission reductions during its initial development of "standards of performance" for new stationary sources. 42 U.S.C. § 7411(a)(1). Similar considerations of cost are required in many other Clean Air Act programs. See *Whitman v. American Trucking Ass'ns*, 531 U.S. 457, 467 (2001) (listing examples of Clean Air Act provisions that explicitly permit or require economic costs to be considered).

4 The Clean Air Act requires the Environmental Protection Agency to set National Ambient Air Quality Standards for pollutants that cause identifiable adverse effects on public health or welfare. 42 U.S.C. § 7408(a)(1)(A). These air quality standards have taken the form of maximum pollution concentrations deemed to prevent measurable adverse human health effects. See 40 C.F.R. part 50. If pollutant concentrations in the ambient air exceeded these thresholds, pollution reduction and other management efforts are triggered.

5 The Clean Water Act requires the incorporation of the "latest scientific knowledge" when developing water quality criteria. 33 U.S.C. § 1314(a)(1).

6 Actions taken by the Environmental Protection Agency (EPA) under the Clean Water Act generally do not require a National Environmental Policy Act environmental impact analysis. 33 U.S.C. § 1371(c)(1). EPA is only obligated to prepare an environmental impact statement—thereby conducting a cumulative impact analysis—under the Clean Water Act when issuing new source discharge permits or providing grants for publicly-owned treatment works. Id.

7 Several sections of the Clean Water Act require the Environmental Protection Agency (EPA) to conduct cost-benefit analyses. See e.g., 33 U.S.C. § 1314(b)(1)(B) (The Clean Water Act requires EPA to consider "[f]actors relating to the assessment of best practicable control technology currently available. . . includ[ing] consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved."). In other circumstances, EPA is authorized—but not required—to utilize cost-benefit analyses. Even sections of the Clean Water Act that make no mention of cost-benefit analyses have been interpreted to give EPA authority to conduct them if deemed appropriate. See *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009) (holding that the Best Available Technology Standard in the Clean Water Act was ambiguous and that the EPA was allowed to conduct a cost-benefit analysis while setting [best available control technology] regulations).

8 The Tahoe Regional Planning Agency sets various numeric threshold standards for deep waters, nearshore waters, tributaries, surface waters, groundwater, and other lakes. See Lake Tahoe Regional Planning Agency, 2011 Threshold Evaluation – Water Quality 4-1 (2011), available at http://www.trpa.org/wp-content/uploads/TEVAL2011_Ch4_WaterQua

lity_Oct2012_Final.pdf. For example, the nitrogen-loading threshold standard for the near-shore waters of Lake Tahoe is to reduce dissolved inorganic nitrogen loading from all sources to 25% of what the annual average load was between 1973-1981. Id. at 4-6.

9 The Endangered Species Act requires the Secretary of Interior or Commerce to determine whether a species should be listed as endangered or threatened "solely on the basis of the best scientific and commercial data available." 16 U.S.C. § 1533 (b)(1)(A) (emphasis added).

10 The Endangered Species Act requires cumulative impact analyses through the Section 7 consultation process. The Section 7 consultation process refers to the cooperation between Federal action agencies and Federal resource protection agencies to ensure that action agency projects do not jeopardize the existence of any listed species or adversely modify critical habitat. 16 U.S.C. § 1536(a)(2). If a listed species is present in the vicinity of an action agency's proposed project, the required process begins with the action agency preparing a biological assessment, which must determine whether the proposed action is likely to adversely affect a listed species. Id. § 1536(c). If the biological assessment concludes that the action is likely to adversely affect a listed species, the action agency must then enter into formal consultation with either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Id. § 1536(a)(2). The relevant wildlife agency must then issue a biological opinion. Id. § 1536(b)(3)(A). Both the biological assessment and the biological opinion must include a cumulative impacts analysis. 50 C.F.R. §§ 402.12(f)(4) and 402.14(g)(4). The Act defines cumulative effects as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." 50 C.F.R. § 402.02.

11 Under the Endangered Species Act, cost is not a consideration when deciding whether to list a species, but can be considered when designating critical habitat. 16 U.S.C. § 1533 (b)(1)(A) and (b)(2). Additionally, the Supreme Court has held that the Endangered Species Act prohibits agencies from considering costs when deciding to issue a section 7 jeopardy finding. *Tennessee Valley Authority v. Hill*, 437 U.S. 153, 185 (1978).

12 Threshold dynamics of biological populations enter into ESA implementation in a few ways. The first is the listing decision itself, through which the U.S. Fish and Wildlife Service and the National Marine Fisheries Service can designate animal and plant species as "endangered" or "threatened." 16 U.S.C. § 1532(6). This is an opportunity for prospective threshold-based management, in which the agencies consider species' likelihoods of extinction, which is closely tied to population viability and, in turn, to population size. Mark S. Boyce, *Population Viability Analysis*, 23 *Ann. Rev. Ecol. Syst.* 481, 493 (1992). Consequently, agencies or consulting scientists commonly conduct population viability analyses, *Population Viability Analysis 9* (Steven R. Beissinger & Dale R. McCullough eds., 2002), although these are not statutorily required. Once a species is listed, the Act requires a second set of threshold-relevant decisions by prohibiting federal agencies from acting in a way that may jeopardize the continued existence or recovery of a threatened or endangered species. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.02. The jeopardy analysis is designed to identify government actions that will most likely push endangered species beyond their "tipping point," or population viability threshold. 50 C.F.R. § 402.02. One might see the jeopardy analyses as incorporating both prospective and retrospective threshold-based management, given that these consultations must include an assessment of the likelihood that an action will adversely affect the recovery of the listed species; by contrast, the §4 listing decision only analyzes the likelihood of future extinction. 50 C.F.R. § 402.02 (2013) (to "[j]eopardize the continued existence of means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild.").

13 Under the Marine Mammal Protection Act, "[t]he Secretary [of Interior or Commerce], on the basis of the best scientific evidence available . . . shall prescribe such regulations with respect to the taking and importing of animals from each species of marine mammal . . . as he deems necessary and appropriate to insure that such taking will not be to the disadvantage of those species and population stocks . . ." 16 U.S.C. § 1373(a) (emphasis

added). Agency guidance also dictates the use of best available science in other circumstances. See, e.g., National Marine Fisheries Service, Revisions to Guidelines for Assessing Marine Mammal Stocks 5–6 (2005) available at <http://www.nmfs.noaa.gov/pr/pdfs/sars/gamms2005.pdf> (requiring the use of best available science when estimating the number of marine mammals in a stock).

14 The Marine Mammal Protection Act has no formal requirement to consider cumulative impacts in any of its management processes. However, agency staff are moving towards the analyses of cumulative impacts when completing certain tasks. For example, when calculating the Potential Biological Removal Level for a stock of marine mammals, agency staff consider the cumulative effects of all human activities on the stock including noise impacts, direct interactions with fisheries, indirect interactions (e.g., prey reduction, habitat impacts), and any other human activities that may be causing a decline or impeding recovery of the stock. National Marine Fisheries Service, Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS III Workshop 59–60, 78–80 (2011) available at http://www.nmfs.noaa.gov/pr/pdfs/sars/gamms3_nmfsopr47.pdf.

15 When regulations to govern taking and importing of marine mammals were developed, economic feasibility of regulatory implementation was a required consideration. 16 U.S.C. § 1373(b)(5). Economic considerations also come into play when analyzing the feasibility of a zero mortality goal in a fishery. *Id.* § 1387(f)(2).

16 Optimum Sustainable Population (OSP) is defined as “a population size which falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem to the population level that results in maximum net productivity.” 50 C.F.R. § 216.3. “Maximum net productivity is the greatest net annual increment in population numbers or biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality.” *Id.* OSP represents an example of existing threshold-based management because it “establishes a threshold for determining when certain activities are prohibited or may be authorized or restricted.” Donald C. Baur et al., *The Law of Marine Mammal Conservation*, in *Ocean and Coastal Law and Policy* 518 (Donald C. Baur et al. eds., 2008).

17 The Magnuson Stevens Act’s requirement that “[c]onservation and management measures shall be based upon the best scientific information available” is implemented through National Standard 2 on Scientific Information. 16 U.S.C. § 1851 (a)(2); 50 C.F.R. § 600.315 (emphasis added).

18 The Magnuson Stevens Act has no formal requirement to consider cumulative impacts in any of its management processes. However, the calculation of reference points includes an analysis of cumulative impact similar to that of the Marine Mammal Protection Act. Input restrictions such as limiting days at sea and output restrictions such as quotas are invariably based on the agencies Maximum Sustainable Yield (MSY) and Optimum Yield (OY) calculations for each fishery. 50 C.F.R. § 600.310(b)(2)(i). A calculation of MSY determines how many fish can be caught while not jeopardizing a stock considering “prevailing ecological, environmental conditions and fishery technology characteristics (e.g., gear selectivity), and the distribution of catch among fleets.” *Id.* § 600.310(e)(1)(i)(A). The subsequent calculation of OY is based on MSY “as reduced by any relevant economic, social, or ecological factor” *Id.* § 600.310(e)(3)(i)(A). Relevant ecological factors to be considered include forage fish stocks, impacts of other fisheries, predator-prey or competitive interactions, manmade changes in wetlands or nursery grounds, impacts of pollutants, and many more. *Id.* § 600.310(e)(3)(iv)(C). This analysis of factors that cumulatively impact a species can be considered a “cumulative impacts analysis.”

19 The national standards of the Magnuson Stevens Act require the balancing of costs and benefits in developing fisheries regulations. For example, national standard seven requires that conservation measures shall “minimize costs and avoid unnecessary duplication.” 16 U.S.C. § 1851(a)(7). National standard eight also requires that conservation and management measures should minimize adverse economic impacts on fishing communities. *Id.* § 1851(a)(8). However, both of these requirements are qualified by practicability, and judicial interpretation of the Act establishes that conservation measures should receive priority over short-term economic interests. See *NRDC v. Daley*, 209 F.3d 747, 753 (D.C. Cir. 2000); *NRDC v. NMFS*, 421 F.3d 872, 879 (9th Cir. 2005). In addition, several Magnuson Stevens Act metrics include economic factors in their calculations. For example, Optimum Yield (OY) is calculated as Maximum Sustainable Yield (MSY) reduced by “any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, that provides for rebuilding to a level consistent with producing MSY in such fishery.” 50 C.F.R. § 600.310(e)(3)(i)(A).

20 16 U.S.C. § 1802(33–34). Maximum Sustainable Yield (MSY) is “the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions and fishery technological characteristics (e.g., gear selectivity), and the distribution of catch among fleets.” 50 C.F.R. § 600.310 (e)(1)(i)(A) (2013). In theory, MSY and its associated reference points (e.g., Optimum Yield (OY)) represent a straightforward example of environmental threshold-based management. In reality,

where data are scarce or unavailable, MSY may be estimated by other means. Note also that, because the decline of a particular species’ fishery is assumed to be reversible, MSY can be used for either prospective or retrospective threshold-based management: the MSY threshold can allow over-exploited stocks to rebuild, and can set targets for the harvest of species that have not yet experienced a population crash due to overexploitation.

21 The National Environmental Policy Act requires the preparation of an environmental impact statement for major federal actions significantly affecting the environment. In theory, these environmental impact statements are based on “high quality” science. See *Sierra Club v. Marita*, 46 F. 3d 606, 616, 620 (7th Cir. 1995). If obtaining certain scientific information is found to be too difficult, expensive, or time consuming, the responsible agency is not required to obtain the information, and instead must provide a summary of existing credible scientific information and use the existing information to estimate impacts. 40 C.F.R. § 1502.22(b). In other words, the agency is called upon to use “credible available science.”

22 Both the environmental assessment and environmental impact statement requirements of the National Environmental Policy Act (NEPA) call for an analysis of cumulative impacts to determine whether the total effect of action is significant, even if the project’s individual impact is slight. 40 C.F.R. §1508.27(7). See also Erin E. Prahler et al., *It All Adds Up: Enhancing Ocean Health by Improving Cumulative Impacts Analyses in Environmental Review Documents*, 33 *Stan. Envtl. L.J.* 351 (2014) (describing the what, when, and how of cumulative impacts analysis under NEPA and highlighting statutory challenges and recommendations for improvement within cumulative impact assessments).

23 The National Environmental Policy Act requires the Federal Government to “identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations.” 42 U.S.C. § 4332(B).

24 In February of 2010, the Council on Environmental Quality (CEQ) released draft guidance outlining when and how Federal agencies must consider greenhouse gas emissions and climate change in their proposed actions. Council on Environmental Quality, *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (Feb. 2010) available at <http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf>. The guidance develops a presumptive threshold of 25,000 metric tons of carbon dioxide. *Id.* at 1–2. Thus, if a proposed project would result in more than 25,000 metric tons of carbon dioxide emissions annually, climate change impacts would be a mandatory consideration in the project’s Environmental Impact Statement. No further action has been taken on this guidance and the proposed threshold may never become law. Jean Chemnick, *No Sign of NEPA Climate Standards 4 Years After CEQ Guidance*, *Greenwire* (Feb. 25, 2014), <http://www.eenews.net/greenwire/stories/1059995082>. Nevertheless, domestic application of thresholds within the NEPA framework is possible and the practice is common internationally. See European Union Network for the Implementation and Enforcement of Environmental Law, *The Implementation of the Environmental Impact Assessment on the Basis of Precise Examples* 5, 20–29 (2012) available at <http://ec.europa.eu/environment/eia/pdf/IMPPEL-EIA-Report-final.pdf>.

25 Maximum contaminant levels in drinking water must be based on “the best available, peer-reviewed science and supporting studies conducted in accordance with sound and objective scientific practices; and data collected by accepted methods or best available methods.” 42 U.S.C. § 300g-1(b)(3)(A).

26 The Safe Drinking Water Act (SDWA) contains no formal cumulative impact analysis requirement and analysis of the synergistic effects of multiple contaminants is not undertaken. Academics have noted that the Environmental Protection Agency “has developed very little capability to assess synergistic effects” when setting maximum contaminant levels. Robert V. Percival, *Environmental Regulation: Law, Science, and Policy* 214 (5th ed. 2006). Accordingly, SDWA thresholds for contaminants are frequently based on analyses of the impact of single contaminants, which ignore the cumulative or synergistic effects of multiple contaminants on human health. *Id.* As a result, the potential exists for maximum contaminant levels that cannot adequately protect human health.

27 Under the Safe Drinking Water Act, when setting national primary drinking water regulations, the Environmental Protection Agency (EPA) is first required to set a “maximum contaminant level goal” (MCLG) for each contaminant at which “no known or anticipated adverse effects on the health of persons occur.” 42 U.S.C. § 300g-1(b)(4)(A). EPA then determines a “maximum contaminant level” (MCL) for each pollutant that is as close as feasible to the MCLG. *Id.* § 300g-1(b)(4)(B). The MCL becomes the enforceable standard, unless EPA determines that the strictest feasible standard “would not justify the costs of complying with the level.” *Id.* § 300g-1(b)(3)(C) and (b)(6)(A).

28 The Safe Drinking Water Act requires the Environmental Protection Agency (EPA) to set standards for the regulation of contaminants at a “level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety.” 42 U.S.C. § 300g-1(b)(4)(A). These “maximum contaminant level goals” are all

numeric threshold limits. See 40 C.F.R. § 141.61–66; Environmental Protection Agency, National Primary Drinking Water Regulations (2009) available at <http://water.epa.gov/drink/contaminants/upload/mcl-2.pdf>. If the numeric thresholds are exceeded, various compliance efforts and reporting requirements—as chosen by the relevant state enforcement agency—may be invoked. 42 U.S.C. § 300g-3.

29 The Coastal Zone Management Act is an entirely voluntary and non-regulatory funding mechanism and contains no formal best available science requirement. The purpose of the Act is to provide guidance and funding for states to implement whatever coastal regulatory and management measures are appropriate within the state. 16 U.S.C. § 1455. However, state programs implemented pursuant to the Coastal Zone Management Act can include best available science requirements, such as California's informal "sound and timely" science requirement. Cal. Pub. Res. Code § 30006.5.

30 The Coastal Zone Management Act contains no formal cumulative impact analysis requirement. However, state programs implemented pursuant to the Act frequently contain such requirements. See e.g., Cal. Code Regs. tit. 14, § 13511(a); Cal. Pub. Res. Code § 30250 (prohibiting new development in coastal areas where the development will have significant cumulative effects on coastal resources). See also N.C. Gen. Stat. § 113A-120(a) (10) (permit applications for projects in the coastal zone shall be denied if "the proposed development would contribute to cumulative effects" impacting productivity, public rights, local land-use, or historic, cultural, scientific, environmental, or scenic values).

31 Informal cost-benefit analyses emerge in several areas of coastal zone management. The Coastal Zone Management Act (CZMA) calls upon each coastal state to develop a management plan for coastal uses and resources. For each state, development of a Coastal Zone Management Program necessarily entails the weighing and balancing the costs and benefits of different coastal uses such as ecological, cultural, esthetic, and economic development. 16 U.S.C. § 1452(2). CZMA regulations recognize this fact, stating that the policies of the Act require a balancing of sometimes conflicting interests including "[t]he achievement of wise use of coastal land and water resources with full consideration for ecological, cultural, historic, and aesthetic values and needs for compatible economic development." 15 C.F.R. § 923.50(a)(2). As a result, many states outline informal balancing of costs and benefits in their Coastal Zone Management Programs. See e.g., Cal. Pub. Res. Code § 30001.5 (one of California's basic goals for the state coastal zone is to "[a]ssure orderly, balanced utilization and conservation of coastal zone resources taking into account the social and economic needs of the people of the state."); N.C. Gen. Stat. § 113A-120(a)(9) (permit applications for coastal zone projects are denied if, when "considering engineering requirements and all economic costs there is a practicable alternative that would accomplish the overall project purposes with less adverse impact on the public resources.").

32 The National Coastal Zone Management Program monitors and evaluates the success of all state coastal management programs through the Coastal Zone Management Act Performance Measurement System (CZMAPMS). National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, Coastal Zone Management Act Performance Measurement System: Coastal Management Program Guidance 3 (2011) available at <http://coastalmanagement.noaa.gov/backmatter/media/czmapmsguide11.pdf>. The CZMAPMS consists of "performance measures to assess how well programs are achieving the goals of the [Act]," and "contextual indicators to provide information on social, economic, and environmental factors influencing program actions." National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, Coastal Zone Management Act Performance Measurement System: Contextual Indicators Manual 1 (2010) available at http://coastalmanagement.noaa.gov/success/media/contextual_indicator_manual.pdf. Most currently used performance measures are regulatory goals designed mainly as a tool for communication with stakeholders. See CZMA Performance Measurement System Pamphlet, available at <http://coastalmanagement.noaa.gov/resources/docs/czmpoverview.pdf>. Nonetheless, threshold-based management could be incorporated into performance measurement, increasing the ecological defensibility of the state management program actions.

33 The National Marine Sanctuaries Act provides the Secretary of Commerce with the authority to designate certain areas of the marine environment as sanctuaries and to develop management plans to protect sanctuaries and their resources. 16 U.S.C. §§ 1433(a) and 1434(a)(2)(C). Similar to the Coastal Zone Management Act, the Sanctuaries Act lacks many of the congressionally mandated requirements found in other environmental statutes. Instead, the Act is a significant delegation of power—allowing the Secretary of Commerce to "issue such regulations as may be necessary" to implement the National Marine Sanctuary System. *Id.* § 1439. Thus, despite the lack of a best available science requirement, Sanctuary managers strive to include scientific research and monitoring requirements that ensure management decisions are based on relevant and up-to-date scientific information. For example, the Research and Monitoring Action Plan of the Hawaiian Islands Humpback Whale Marine Sanctuary Management Plan provides "strategies intended to help answer and clarify pressing scientific questions and unknowns." National Oceanic and Atmospheric Administration, Hawaiian Islands Humpback Whale National Marine Sanctuary Management Plan 69 (2002) available at http://hawaiihumpbackwhale.noaa.gov/documents/pdfs_mpr/HIHWNMS_FMP.pdf.

34 When proposing an area for sanctuary designation, a draft environmental impact statement must be prepared pursuant to the National Environmental Policy Act. 16 U.S.C. § 1434(a)(2). Thus, a cumulative impact analysis is required for each sanctuary designation. Additionally, when determining whether to issue a permit to conduct an otherwise prohibited activity in certain sanctuaries, the Director of the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management must find that the proposed activity will be compatible with protection of the Sanctuary resources, considering "any potential indirect, secondary, or cumulative effects of the activity." 15 C.F.R. §§ 922.74(c)(6), 922.83(c)(6), 922.93(d)(5), and 922.113(c)(4).

35 The National Marine Sanctuaries Act does not require formal cost-benefit analyses with regards to the management of individual sanctuaries. However, in determining whether an area merits designation as a Sanctuary, the public benefits, socioeconomic effects, and negative impacts on income-generating activities from sanctuary designation are all factors to be considered. 16 U.S.C. § 1433(b)(1)(G–I).

36 Performance Evaluation Action Plans are present in many sanctuary management plans. See e.g., National Oceanic and Atmospheric Administration, Florida Keys National Marine Sanctuary Revised Management Plan 222 (2007) available at <http://sanctuaries.noaa.gov/management/mpr/fknmsmp.pdf>; National Oceanic and Atmospheric Administration, Channel Islands National Marine Sanctuary Final Management Plan 203 (2009) available at <http://sanctuaries.noaa.gov/management/mpr/cinmsmp.pdf>; Office of National Marine Sanctuaries, Monterey Bay National Marine Sanctuary Final Management Plan 211 (2008) available at <http://montereybay.noaa.gov/intro/mp/fmp/101408mbnmsfmp.pdf>. As one example, the Monterey Bay Sanctuary Management Plan contains numerous action plans that address specific priority issues. Each action plan contains one or more performance measures by which progress will be evaluated. The Plan also includes a Performance Evaluation Action Plan that utilizes the aforementioned performance measures in routine performance evaluations, undertaken to "[p]rovide a clear mechanism to evaluate progress in implementing the [Monterey Bay Sanctuary Management Plan] and present a set of performance targets to demonstrate progress towards desired outcomes" Office of National Marine Sanctuaries, Monterey Bay National Marine Sanctuary Final Management Plan 211 (2008) available at <http://montereybay.noaa.gov/intro/mp/fmp/101408mbnmsfmp.pdf>. Through the performance review, "[a]ctivities deemed less than successful in achieving desired outcomes will be addressed to correct or improve the situation" while "[s]uccessful activities will be recognized with application of positive lessons learned to other programs." *Id.* at 213. A majority of the performance measures are qualitative; a minority are quantitative. See *id.* at 213–217. Although most currently used performance evaluation metrics are regulatory goals, thresholds could be incorporated into metrics, increasing their ecological defensibility.