Developing an Indicator System for the New York Bight: Workshop Summary and Recommendations for Next Steps

Prepared for the New York State Department of Environmental Conservation by:

Anthony Dvarskas
Lesley Thorne
Brian Berg
Mary Arnold

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1. Introduction and Background

Marine ecosystems provide a wide range of goods and services to local communities, including food resources, protection from storms, waste detoxification, and tourism income (Worm 2006, Palumbi 2008). However, dramatic climate-driven changes to physical, chemical and biological components of marine systems have been observed in recent years, and these changes are predicted to intensify in future years (Hays 2005, Harley 2006, Hoegh-Guldberg 2007, IPCC 2007, Cheung 2009, Hoegh-Guldberg and Bruno 2010). Understanding and detecting changes to marine ecosystems requires appropriate monitoring to provide a baseline against which further change can be measured (Lindenmayer 1999, Niemi and McDonald 2004, Magurran 2010). As both marine and terrestrial ecosystems continue to experience effects of a wide variety of natural and anthropogenic pressures, detecting changes in the status and dynamics of these systems is critical for mitigation and management.

The New York State Department of Environmental Conservation (NYS DEC) released its Ocean Action Plan (OAP) in 2017 (NYS DEC 2017). The OAP identified four major goals for New York waters:

1. Ensure the ecological integrity of the ocean ecosystem;
2. Promote growth, coastal development, and human use of the ocean in a manner that is sustainable and consistent with maintaining ecosystem integrity;
3. Increase resilience of ocean resources to impacts associated with climate change; and
4. Empower the public to actively participate in decision-making and ocean stewardship.

A detailed understanding of the baseline or current status of ecosystem health (the *state* of the system) is required to track progress on completing actions and meeting objectives associated with the goals of the OAP. Developing a system of ocean indicators for the New York Bight is therefore a major objective for the NYS DEC in implementing the OAP. Since it is impossible to measure all aspects of the system given time and budgetary constraints, representative indicators of key components and processes of the New York Bight are needed. With this in mind, the NYS DEC sponsored an initial expert workshop in collaboration with scientists at Stony Brook University to gain insight from scientists, resource managers, and non-governmental organizations into potential features of an ocean indicator system in the New York Bight. Since development of indicator systems in other regions has involved dedicated effort of multiple staff over many years, this workshop is only the first step of a substantial long-term collaborative and deliberative process.

Before convening the workshop, well-developed indicator programs from other ecosystems in the U.S. were examined to frame broad indicator categories for workshop discussions and to inform workshop participants about the structure and components (e.g., guiding principles, indicator scope and scale) of other indicator systems. Data sources and previous or current monitoring programs providing relevant long-term data for the New York Bight were also examined and provided to meeting participants in advance of the workshop. This permitted an assessment of existing long-term data sets and will assist in future identification of indicators that

would require new field monitoring activities and funding.

This report outlines information gathered from other U.S. coastal and marine systems (Section 2) and long-term data monitoring programs potentially relevant to the New York Bight (Section 3); highlights discussions and outcomes from the indicators workshop (Section 4); summarizes findings from a participant survey aimed at developing a "long list" of potential indicators and prioritizing broad categories of indicators (Section 5); and provides recommendations to the NYS DEC regarding further actions required in developing a set of ocean indicators for the New York Bight (Section 6). Appendices include detailed participant survey information as well as minutes from the indicators workshop.

2. Indicator Systems in the United States

Ecological indicators are measurable properties of the environment, which, if analyzed correctly, can reveal important information and trends occurring in the ecosystem (Dale and Beyeler 2001, Niemi and McDonald 2004). Indicators can assist in developing and implementing relevant management plans and can inform environmental policy by revealing connections between policy decisions and subsequent shifts in ecosystem health. For ecological indicators to be effective in assessing the current and future health of an ecosystem, they must represent and quantify key features related to its structure and function (Cairns 1993; Dale and Beyeler 2001).

There is a tradeoff between simplicity and representativeness in developing an indicator system: too few indicators will fail to grasp the full complexity of the system, while too many indicators will be difficult to fund, monitor, and model. Indicators that are accessible and readily available for measurement allow for more rapid and thorough data collection. Ideally, ecosystem indicators are environmental or socioeconomic variables that are easily measurable, sensitive to environmental stresses, responsive to these stresses in a predictable and timely manner, useful for anticipating ecological changes that can be countered or alleviated by effective management, and have low variability in their response to change. In addition, integration of the varied set of indicators should provide a full picture of the ecological and socioeconomic shifts within the system of interest.

Ecosystem indicators can be grouped into several different categories based on the type of ecosystem component that they monitor. There is no universally accepted set of divisions when categorizing ecological indicators, with different approaches in each ecosystem assessment programs (as discussed below). For the purposes of this report's evaluation of existing U.S. indicator systems, ecosystem indicators were grouped into three categories: biological, chemical and physical, and socio-economic. These categories also formed the basis for the targeted working groups at the indicators workshop.

Biological indicators are variables that reflect and measure the well-being of the organisms living in the ecosystem. Examples of biological indicators include general abundance and density of key species, also called indicator species, acreage of natural wetland, and spawning stock biomass of target species. Biological indicators, particularly indicator species that are sensitive to environmental change, can act as early warning signals to ecosystem changes.

Physical and chemical indicators are variables that pertain to the physical or

chemical composition of the environment or the physical or chemical processes affecting the environment. Examples of physical indicators include air or water temperature, wave height, or water clarity present at site. Dissolved oxygen levels, nutrient input from agricultural runoff, and levels of persistent toxins accumulated within the ecosystem are examples of chemical indicators. Physical indicators are important for determining the status, health, and productivity of particular habitats, and may also have important implications for human safety (e.g., natural geographical buffers preventing river runoff and protecting against storm surges). Quantifying physical variables such as the chemical inputs and outputs of an ecosystem can assist in understanding the limiting nutrients in a system, as well as identifying sources of toxic waste and other pollution that may be harming the ecosystem.

Finally, socioeconomic indicators are variables that measure the state or products of interactions between humans and the ecosystem. Socioeconomic indicators include annual catch statistics of harvested species, the proportion of coastal land usage for human activity, or revenues from commercial activities related to or occurring within the ecosystem. Socio-economic indicators are important to consider so that integrated assessment and management can benefit both the environment and human interests.

A brief summary of existing indicator systems is provided below for six extensively-studied marine and estuarine ecosystems in the United States: Chesapeake Bay, the Oregon Watershed, Puget Sound, the California Current, the Gulf of Mexico, and the Gulf of Maine. Comparing these different systems assists in identifying commonly used indicators for assessing the physical, biological, chemical, and socioeconomic health of coastal and ocean ecosystems and in informing indicator selection for the New York Bight. A detailed table of the indicators used in these systems is provided in Appendix I.

Chesapeake Bay

The Chesapeake Bay region has long been subject to a wide variety of environmental issues, including marine 'dead zones' of depleted oxygen concentration, large fish kills, overloading of nitrogen and phosphorus leading to hypoxic algal blooms, and depletion of the bay's oyster fishery (Kemp et al. 2005). The Chesapeake Bay Program, the regional partnership that directs the management of the Chesapeake Bay ecosystem, was originally created in 1983 with the goal of restoring and maintaining the ecological health of the watershed (Bay Barometer 2014). This program performs annual measurements of over 30 different ecological indicators to identify zones for improvement, set ecosystem health targets, and work with Maryland, Pennsylvania, and Virginia to implement restoration plans to meet these targets. The ecosystem indicators currently measured by the Chesapeake Bay Program primarily assess the stocks of key fish species within the watershed, and also measure the effectiveness of ongoing efforts to curb nitrogen and phosphorus inputs into the Chesapeake Bay.

The biological indicators assessed in the Chesapeake Bay Program assess the abundance of various indicator species that are either important to ecosystem health or are particularly relevant to commercially important fisheries. The program focuses on three fish species, the American shad (*Alosa sapidissima*), Atlantic

menhaden (*Brevoortia tyrannus*), and striped bass (*Morone saxatilis*), and blue crabs (*Callinectes sapidus*) and measures annual spawning stock biomass from fish passage data in rivers that are critical for fish movement and gill net fish abundance. Juvenile abundance from fishery-independent survey data is also used to assess Atlantic menhaden and striped bass, important species for commercial and recreational fishing. Blue crabs are monitored by tracking the abundance of spawning-age female blue crabs from annual dredge surveys. The abundance of bay grasses, or submerged aquatic vegetation, is measured from aerial survey photography to estimate total acreage annually. Benthic health is measured both in the Bay itself and in the riverine inputs to the Bay using the Benthic Index of Biotic Integrity, which estimates benthic organism diversity.

Chemical indicators for the Bay focus on tracking the sources of nitrogen and phosphorus. The input of these nutrients is measured by assessing their concentration in rivers that feed into the Bay, as well as continually measuring daily concentrations to determine if they exceed Total Maximum Daily Load (TMDL) limits. Presence of toxic pollutants within the Bay is assessed by measuring the percent of the watershed that is either partially or fully impaired by chemical contaminants, including pharmaceuticals, pesticides, and PCBs. Additionally, dissolved oxygen, chlorophyll *a*, and water clarity are measured and compared with the Water Quality Standards set by the program.

Physical indicators currently being assessed in the Chesapeake Bay Program include bay watershed forest cover and tidal wetland abundance, measured by analyzing forest cover surveys by the U.S. Forest Service and NOAA's Coastal Change Analysis Program to determine wetland abundance by acreage. Both of these geographical resources are vital for animal habitat and also serve as critical buffer zones to reduce pollution and nutrient runoff. Other physical indicators measure progress towards restoring the natural watershed habitats and riverine pathways, including acres of conserved land in the region, acres of restored wetland, restored oyster reefs, and reopened fish passageways previously closed by dams or other manmade obstructions.

The socioeconomic indicators of the Chesapeake Bay Program assess the current quality of fishery management in the Bay by measuring annual fishing mortality of Atlantic menhaden and striped bass stocks and comparing them to fishing mortality limits set by the program. The potential social benefits from the Bay to the population are measured by annually counting the number of public access points. The watershed population is measured annually as a means of assessing potential ties between the health of the Bay and the resident population.

Oregon Watershed

Since 1999, the Oregon Watershed Enhancement Board has collected and organized ecological data from the twelve separate watershed councils that monitor the region's riparian systems. These data are then used in a framework of Watershed Health Indicators. The stated goal of the indicator system was to compile an annual report reviewing the health of each of the 12 watershed council systems, helping to direct effective planning and policy (Bauer et al. 2008). While it is unclear if the plan has been fully implemented for all indicators, reviewing the proposed structure is informative.

The indicators are grouped into categories by habitat type: aquatic, riparian, tidal, and sub-tidal. All indicator data are submitted directly to the Oregon Enhancement Board Website through either the Oregon Watershed Restoration Inventory (OWRI) or the Oregon Plan for Salmon and Watersheds (OPSW). Each ecological indicator is graded on a scaling system from Limiting (L), to Moderate (M), to Adequate (A), based on each system's individual goals.

The two major biological indicators proposed in this integrated ecosystem assessment are annual salmon abundance and the abundance of any potential invasive species. Chemical indicators monitor the daily load of nitrogen and phosphorus from run-off and riverine input to determine whether or not these nutrients are at acceptable levels. The only socioeconomic indicator monitored in this program is the number of hydro-modified areas, or areas altered by human-made water channels, in the watershed.

Physical indicators relate to the sediment composition and inputs into the watershed system. These indicators include the daily water, nutrient and sediment input from riparian systems, as well as the spawning sediment quantity and quality for the local salmon populations. Other physical indicators track the percent of preserved wetland, tidal flat, and sub-tidal habitat through use of aerial survey data. Water quality and water temperature from each of the estuaries of the system are also measured.

Puget Sound

The Puget Sound Partnership is the state agency responsible for directing restoration efforts for the Puget Sound, with the goal of rebuilding the ecosystems of the past and providing benefits for both the environment and the resident community through effective management of the Sound's natural resources (Kershner et al. 2011). The Partnership directs its funding and support efforts based on six major ecosystem recovery goals: (1) healthy human populations, (2) improved quality of life assisted by a healthy ecosystem, (3) thriving species and restored food webs, (4) protected and restored habitat, (5) abundant water quantity, and (6) healthy water quality. The indicators or "Vital Signs" used by the Puget Sound Partnership are grouped into one of these six ecosystem recovery goals and are used to assess whether the major ecosystem targets are met. The state of these vital signs are published annually in the "Report on the Puget Sound Vitals: State of the Sound" report (Hamel et al. 2015).

Almost all of the biological indicators measure the abundance of the various ecologically or commercially important or charismatic fauna present in Puget Sound. Annual spawning stock biomass of Pacific herring, an ecologically important forage fish, and Chinook salmon, a traditionally valuable species for commercial fishing, is measured through independent surveys. The at-sea densities of several bird species common to the Puget Sound are measured to analyze whether or not their population health may be indicative of other factors in the environment. Southern resident killer whales (*Orcinus orca*), which support a profitable whale-watching industry and act as indicators of ecosystem health, are counted via an annual census by the local Center for Whale Research. Shellfish and eelgrass beds are also assessed annually.

The physical indicators measured in the State of the Sound report are

primarily focused on meeting goals for acres of habitat restored. Changes in acreage from riparian restoration, floodplain restoration, and wetland restoration from tidal flooding are measured annually. Shoreline anthropogenic armoring, which can lead to habitat erosion, is also tracked by miles of shoreline armoring gained or lost each year.

Chemical indicators measure the dissolved oxygen in the Puget Sound surface waters, as well as sediment analysis for specific chemicals to see if they exceed sediment quality standards. Persistent toxin levels are assessed annually by measuring Pacific herring tissue accumulation. Socioeconomic indicators include fishing pressure on local populations, measured by annual crab sales and fishing licenses, and the total poundage of commercial salmon landings. The number of sewage systems adequately inspected and assessed is used to track land-based pollution.

California Current

The California Current ecosystem is one of five systems currently participating in the Integrated Ecosystem Assessment (IEA) Program undertaken by NOAA (Harvey 2013). In the California Current, key pressures assessed by the IEA include potential effects from climate change, pressures from commercial fishing, and potential offshore drilling impacts. The indicators used in the California Ecosystem Assessment are grouped into six categories based on the type of general ecosystem impact they cause: Habitat loss, habitat modification, non-physical disturbance, toxic contamination, non-toxic contamination, and biological disturbance. An online portal (http://www.noaa.gov/iea/regions/california-current-region/indicators/climate- and-ocean-drivers.html) details the indicators used in assessing the California Current.

The biological indicators in the IEA track the annual abundance of several key species, including groundfish, Pacific hake, various crab species, shellfish, and salmon. The abundance of each of these species is estimated from data taken from trawl surveys. Invasive species abundance and the likelihood that further invasive species will be transferred into the ecosystem (based on the number of active shipping ports and the average shipping cargo volume for the ecosystem) are also assessed. Chemical indicators include dissolved oxygen as well as levels of both inorganic toxic pollutants and nutrient pollutant from fertilizer runoff from riparian inputs. Atmospheric pollution is measured via concentrations of deposited sulfates.

Physical indicators include sea level and upwelling frequency, measured by water surface height and wind velocity, and the timing and frequency of El Nino related effects. Total dredging volume and quantities of marine debris in the California Current (estimated from coastal trash cleanup program results) are also assessed. Sea surface temperature is continuously measured using existing ocean buoy systems.

Socioeconomic indicators assess annual commercial landings of a variety of species, including groundfish, shrimp, tuna, billfish, and dorado. Annual trawl and trap captures and the total amount of species consumed in the region are also measured (to assess demand). Oil drilling pressures are tracked by the number of benthic oil and gas wells in the region, as well as the percent of shoreline modified for commercial energy harvest.

Gulf of Mexico

The Gulf of Mexico is also part of NOAA's IEA Program. Indicators are grouped into six categories: (1) climate drivers, (2) physical pressures, (3) benthic habitat status, (4) trophic level status (for both upper and lower trophic levels), (5) fishing indicators, and (6) socioeconomic indicators (Karnauskas et al. 2013).

The indicators used in the Gulf of Mexico IEA are similar to those used in the California Current IEA, with exceptions related to unique physical and biological properties of the Gulf. For example, unique meteorological and marine cycles that affect the Gulf are assessed by measuring the annual northern latitudinal extent of the Loop Current, which is a dominant oceanographic feature of the Gulf of Mexico, as well as the weekly heat transport between the Yucatan Channel and the Gulf of Mexico.

Biological indicators include larval abundance of selected fish species such as Bluefin tuna. Sea turtle populations are measured annually, with total nest counts conducted each year for the endangered Kemp's ridley sea turtle. Chemical indicators include mercury and cadmium concentrations in bivalve tissue samples. Socioeconomic indicators focus on the overfishing status of all commercially fished species within the Gulf as well as dockside revenues to estimate local demand.

Gulf of Maine

The Ecosystem Indicator Partnership (ESIP) is a multi-institutional body formed to develop an approach for tracking the health of the Gulf of Maine region (Ecosystem Indicator Partnership 2014). Indicators are grouped into one of seven categories based on the ecosystem component they assess: (1) aquaculture, (2) aquatic habitats, (3) climate change, (4) coastal development, (5) contaminants, (6) eutrophication, and (7) fisheries. Biological indicators include dominant species matrix, American lobster settlement index, and the extent of eelgrass and salt marsh habitat. Chlorophyll *a* and nitrogen and phosphorus inputs are chemical measures included in the indicator system, and physical indicators include sea level, precipitation, and air temperature trends. Socioeconomic indicators are focused on jobs in aquaculture and fisheries and populations of coastal regions. ESIP provides an online portal for reporting and access to data on the available indicators (http://www.gulfofmaine.org/2/esip-homepage/).

Common Indicators Across Ecosystems

Table 1 provides an overview of indicators that are shared across these highlighted coastal and ocean systems. Indicators are grouped into broad categories (see Appendix I for a more detailed listing). Each indicator is also classified as either a Pressure (P), Response (R), or State (S) indicator based on its anticipated role in the system dynamics; some indicators may cross these boundaries. Broadly speaking, state indicators provide information about current conditions, pressure indicators provide information on factors that may change the state of the system, and response indicators relay information on how the system responds to changes in its state. While initial focus in the New York Bight may be on state indicators, correlated pressure and response indicators may also be useful for evaluating

management actions and their impact upon state indicators.

Table 1. Shared indicators across evaluated U.S. ecosystems

Indicator	CBP	OR	PSP	CC	GOMEX	GOM
Water Temperature (S)		X		X	X	
Sediment Load From Outside Sources (P)	X	X		X	X	
Local Weather Activity (P, S)				X	X	X
Percent Restored Habitat Types (R)	X	X	X			X
Enterococcus Bacterial Load (P, S)			X		X	
Abundance of Key Ecological/ Commercial Species (S)	X	X	X	X	X	X
Invasive Species Abundance (P)		X		X		
Nutrient (N/P) Load from Outside Sources (P)	X	X	X	X	X	X
Toxic Chemical Concentrations (P, S)	X		X	X	X	X
Pollutant Concentration Levels (P, S)	X		X	X	X	X
Annual Fisheries Catch (P, R)	X		X	X	X	
Use of Environmental Resources (Habitat/ Other) (P,R)	X	X	X	X	X	X
Local Population Size (P)	X			X		X

CBP = Chesapeake Bay Program, CC = California Current, GOM = Gulf of Maine, GOMEX = Gulf of Mexico, OR = Oregon Watershed Enhancement Board, PSP = Puget Sound Partnership
P= Pressure, R = Response, S = State

As shown in the table, nutrient loads, the abundance of key ecologically or commercially important species, and the use of environmental resources are collected in some form across all of the evaluated indicator systems. Some indicators are less commonly included (e.g., bacterial loading, invasive species), which may be driven by specific concerns or goals for the ecosystem and by whether it is a coastal- or open ocean-oriented indicator system. Clearly, local and regional needs and objectives are important drivers of the design of an indicator system.

3. Potential Data Sources for Indicators in the New York Bight

To assess priorities for future monitoring programs, it is important to first understand what data currently exist and are currently being monitored in the New York Bight. Table 2 shows existing sources of long-term monitoring data for assessing trends in the New York Bight system. Note that this is not a comprehensive table, as there are short-term and research-based activities that have produced more intermittent data on potentially relevant indicators. Data from such research studies may be of limited use in developing an indicator system, however, if they are not publicly available, easily accessible, and carried out

consistently over time.

The Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS) and NOAA's National Data Buoy Center both have extensive records of physical and chemical indicators, including sea temperature, sea level, salinity, turbidity and ice formation. In addition, ocean satellites provide a resource for a number of physical indicators such as sea surface temperature, ocean currents, wind speed and direction, and sea surface height. Satellite data provides long-term and continuous datasets over large spatial scales at increasingly high resolutions, though temporal resolution is often limited (e.g., daily, weekly, or monthly).

Long-term monitoring of biological indicators conducted to date in the New York Bight includes the Northeast Fisheries Science Center (NEFSC) autumn and spring multispecies bottom trawl surveys from Cape Lookout to the Scotian Shelf. Winter Bottom Trawl surveys were also conducted from 1992-2007 for the region extending from Cape Hatteras to Georges Bank. The NEFSC also conducts scallop and surfclam surveys in the New York Bight; scallop surveys are conducted annually while surfclam surveys are conducted every three years (annually for a subset of the area). The Protected Species Branch (PSB) of the NEFSC has conducted shipboard and aerial marine mammal surveys in the NY Bight since 1991. Seabirds have been monitored within the New York Bight by a number of academic and non-academic organizations since the late 1970s, though on a more intermittent basis.

Table 2. Examples of long-term monitoring activities conducted in the New York Bight

Indicator Type	Activity Description	Data Type	Years of Data
Biological	NOAA Autumn Multispecies Bottom Trawl	Abundance	1963-present
	NOAA Spring Multispecies Bottom Trawl	Abundance	1968-present
	NOAA Winter Multispecies Bottom Trawl	Abundance	1992-2007
	NOAA Scallop Survey	Abundance	Late 1970s - present
	NOAA Surfclam Survey	Abundance	1982 - present
	Seabird sighting surveys (various sources)	Frequency, abundance	1978-present
	Marine mammal sighting surveys (NEFSC)	Frequency, abundance	1991-present
Physical/Chemical	NOAA National Data Buoy Center	Salinity, temperature, wave height and direction, currents, salinity, atmospheric pressure, turbidity, ice	1975 – present (depending on buoy and specific data type)
	New York Bight Water Quality Monitoring Program (EPA)	Water quality, nutrient concentrations (coastal waters)	1974-present
Socioeconomic	NMFS Landings surveys	Fisheries catches	1950s to present (depending on species)
	Vessel trip report data/Vessel monitoring system data	Commercial fishing location/intensity	Variable - present

Landings data from commercial fisheries are available for multiple species over several decades from the National Marine Fisheries Service (NMFS), which can be used in combination with price data to evaluate socioeconomic conditions. These include herring, surfclams, haddock, and mackerel. NMFS vessel trip report (VTR) and vessel monitoring system (VMS) data can also be used to evaluate areas of the New York Bight subject to commercial fishing pressure by different types of fishing gear. The Mid-Atlantic Regional Council on the Ocean (MARCO) and the New York Department of State have produced mapping products summarizing these potential socioeconomic indicators. Other types of human uses are expected to be more limited in open ocean waters, though population density in coastal areas (available through the United States Census Bureau) may serve as an indicator of pressure on ecological components of the New York Bight ecosystem and has been used as an indicator in some of the ecosystem indicator approaches discussed in section 2.

4. Developing an Indicator System for the New York Bight: Workshop Summary

A 1.5-day workshop was held from June 9-10, 2016 at the School of Marine and Atmospheric Sciences at Stony Brook University with the aim of establishing a list of potential ocean indicators to be used in monitoring the health of the New York Bight ecosystem. The workshop was attended by participants from a range of organizations, including the NYSDEC, Stony Brook University, the NYS Department of State, the Nature Conservancy, the Wildlife Conservation Society (WCS), the National Resources Defense Council (NRDC), the Bureau of Ocean Energy Management (BOEM), and New York SeaGrant (Appendix II includes a list of attendees).

The first part of the meeting was dedicated to discussing the objectives of indicators systems, an overview of existing indicator systems and the types of indicators used in those systems and to discussing available data in the New York Bight (as described above). For the remainder of the meeting, participants divided into groups based on four categories (biological, chemical/physical, socioeconomic, and policy) to discuss potential ocean indicators. At the conclusion of the meeting, the groups reported back on their recommendations for the development of an indicator system for the New York Bight.

Each breakout group provided a summary of the ecosystem components and associated indicators that were recommended for the New York Bight. Unfortunately, time constraints did not permit further discussions of the prioritization of indicators or the scale and scope of monitoring needed for each indicator in this initial 1.5-day meeting. The ecosystem components and indicators discussed by breakout groups at the meeting formed the basis for the survey development and are described in section 5 below. Key feedback from each of the breakout groups included:

(1) Biological

- Indicator categories included resilience, system productivity, fishery production, species of concern, habitat quality and ecosystem health.
- Prioritizing species to be monitored will be important in the development of the system.

(2) Physical/Chemical

- A detailed review of other indicator systems and reports would be beneficial.
- Meteorological and climate data are of significant importance.
- A central data portal for indicators would be highly beneficial.

(3) Socioeconomic

- Fishing-related data are key for pelagic environments.
- Appropriate categories for evaluation could include recreational, commercial, community well-being, coastal development, ocean engagement, infrastructure, and transportation.

(4) Policy

- Civic ocean engagement should have a strong role as the indicator system develops.
- Delineating important categories would help to ensure the success of system.

Drawing on discussions from the meeting, we drafted a list of 17 ecosystem components that could be assessed using relevant ocean indicators and categorized proposed indicators into these components (Tables 3 and 4). Given the short duration of the meeting and the general task of identifying ocean indicators, components generated were very broad, and a long list of potential indicators was generated. The workshop was viewed as an important starting point for future targeted discussions of indicators pertaining to specific actions and objectives in the OAP; such targeted discussions were seen as being necessary before a more workable list of specific indicators could be developed.

Table 3. Draft ecosystem components included in survey of workshop participants

Component Category	**New York Bight Ecosystem Components**
Biological	Species of Concern
	Invasive Species
	Habitat Quality
	Habitats of Concern
	Biodiversity
	Ecosystem Maturity
	Ecosystem Resilience
Physical and Chemical	Ecosystem Productivity
	Oceanographic and Atmospheric Trends
	Climate Indicators
	Terrestrial Inputs
	Nutrients (e.g., Levels of N, P, silica in open ocean)
	Contaminants and Pollutants
Socioeconomic	Public Access
	Resource-Based Industries
	Coastal Communities
	Ocean Awareness and Engagement

Key messages from the meeting included the need for future meetings to build upon the discussions and proposed sets of indicators and the importance of matching indicators to objectives and goals as outlined in the New York Ocean Action Plan. Participants remarked on the enormity of the task of developing a suite of ocean indicators, and noted that this project is one that should be addressed thoroughly with appropriate resources in order to develop a monitoring program that accurately reflects and assesses the status of the New York Bight. Participants also mentioned the need for more detailed guidelines and priorities and a timetable for future steps developed by DEC that could be shared with meeting participants. Existing data should be analyzed in greater detail to determine what "new" monitoring activity is needed (for more detailed information, see meeting minutes included in Appendix III).

Table 4. Draft ecosystem components and associated potential indicators proposed during the workshop, along with additional considerations suggested in a survey of workshop participants (survey described in Section 5.

New York Bight Ecosystem Component	Potential Indicators	Additional Indicators (from participant survey)
Species of Concern	• Presence • Abundance estimates • Age structure • Population trends • Bycatch • Strandings (marine mammal) • Ship strikes (marine mammal) • ESA trends	• Health parameters (e.g., bioaccumulation of toxins) • Life history • Susceptibility to impacts from human activity • Absence in suitable habitats • Genetic diversity within and between populations • Population health • Number of species with vulnerability assessments • Number of strategies implemented for species of concern
Invasive Species	• Presence • Abundance • Taxonomy • Trends	• Competition with native species, impacts on ecological niche • Number of native species impacted • Climate impacts on invasive species • Degree of harm caused by invasive species (e.g., area impacted) • Prevention/elimination of invasive species in sensitive habitats
Habitat Quality	• Shoreline composition • Acreage of usable habitat • Abundance • Species density • Species distribution • Residence time of transient species	• Temperature, salinity, other physiochemical properties • Absence of species present historically • Functional services provided to the ecosystem • Acreage • 3-dimensional habitat envelope (e.g., total volume for key species/ groups in thermal niches) • Protection/conservation of ecologically rich areas
Habitats of Concern	• Species diversity • Essential fish habitat • Disturbance	• Relative abundance of invasive species • Functional services provided to the ecosystem

	• Residence time • Spatial extent of corals • Contact with human activities	• Structure (complex vs. simple) • Natural disturbance regime (e.g., bottom current energy, surficial sediment stability; lower natural disturbance, higher concern) • Number of habitats with vulnerability assessments • Implementation of strategies for addressing habitats of concern • Area protected/restored annually
Biodiversity	• Species diversity • Resident vs migratory species • Stock status • Sustainability (defined by stock assessment) • Landings • Fisheries closures • Relative abundance of gelatinous species	• Genetic diversity, alpha, beta, gamma diversity • Diversity within trophic groupings or feeding guilds, or benthic/ epibenthic, pelagic • Management effectiveness of keystone species • Number and identity of depleted fish stocks
Ecosystem Maturity	• Ratios of trophic levels • Number of interactions and complexity of food web	• Beta diversity/ habitat diversity
Ecosystem Resilience	• Relative abundance of cold vs warm water species • Species abundance • Species diversity • Productivity • Age and size structure • Distribution	• Habitat types evaluated by condition/ status • Existence, status of keystone species • Functional diversity/ redundancy • Conservation of important migratory corridors • Aerial extent of coastal wetlands
Ecosystem Productivity	• Chlorophyll a • Annual number of algal blooms • Phytoplankton assemblages • Timing of bloom	• Zooplankton assemblages • Harmful algal blooms • Secondary productivity • Phenology • Relative abundance of gelatinous species, cold vs. warm water species • Threshold indicator that should trigger management action
Oceanographic and Atmospheric Trends	• Current speed, direction (e.g., in Gulf Stream) • Tidal height	• Cycling of dissolved oxygen • Indicators of ocean acidification (e.g., pH, CO2, dissolved inorganic carbon, total alkalinity)

	• Nearshore/offshore temperature • Temperature change • Dissolved oxygen	• Oceanic indicators at various spatial scales (e.g., AMO, Gulf Stream Index, volume of Labrador slope water, SST, BT) • Atmospheric indicators (e.g., NAO, AO, ENSO, PDO, Icelandic low, Azores high, Jet Stream) • Salinity • Number/ intensity of windy days • Use distribution and size of anomalous areas (e.g., areas that are recently and persistently different that long-term averages)
Climate Indicators	• Gulf Stream North Wall • Nearshore/Offshore temperature	• Indicators of climate variability (e.g., Gulf Stream North Wall Index, AMO, NAO, AO, ENSO, PDO) • Wind direction, speed, wind and storm events, precipitation, storm tracks • Gulf of Main "cool pool" water supply on the mid-Atlantic shelf (size, shape, temporal dynamics) • Julian dates of events such as "ocean fall" and "ocean spring"
Terrestrial Inputs	• Total river flow • Time of peak river flow • Marsh elevation • Hudson River plume • Levels of N, P, Silica • Levels of river flow • Notable runoff locations/concentrations	• Hydrographs of river flow with temperature, nutrients, contaminants
Nutrients (e.g., N,P, silica in open ocean)	• Levels of N, P, Si, dissolved inorganic carbon, nutrients of concern in open ocean	
Contaminants and Pollutants	• Levels of contaminants of concern within sediment • Contaminants of emerging concern • EPA sediment metals • Fish tissue levels of chemicals of concern	• Contaminant levels in protected species, upper trophic level species • Microplastics • Endocrine disrupters • Remediation of ocean dumping sites

Public Access	• Annual number of access sites created • Annual number of access sites enhanced • Annual numbers of new shoreline construction permits	• Overall public use over time • Beach tourism (e.g., number of visits/ people using beaches) • Percentage of days beaches open and safe for swimming
Resource-Based Industries	• Gross total income of local fisheries by species • Total annual catch of fisheries by species • Total income of offshore development • Total area used by offshore development • Number of fishing trips • Number of saltwater fishing licenses • Shoreline community income levels • Number of vessels transiting in NYB • Ecosystem health within fished areas/ types of gear used within fished areas • Number and type of oil/chemical spill incidents • Abundance of marine debris by type and trends in abundance by type	• Measure of wildlife viewing (e.g., whale watching) • Total economic impact of fishing activities (e.g., number of jobs including processors, vendors) • Number, areal extent of resource exploitation restrictions based on conservation efforts and non-fisheries human uses • Conflicts between uses or between uses and the environment (e.g., ship strikes, gear entanglement) • Number and identity of depleted fish stocks • Rebuilding trends of fish stocks Implementation of adaptation strategies by businesses • Footprint of active sand and gravel borrow sites • Annual sand dredged
Coastal Communities	• Shoreline population and income • Number of towns implementing CRRA Guidance into their laws • Housing permits	

	considering sea level rise	
Ocean Awareness and Engagement	• Acceptance by public of alternative structures and laws • Number of people taking Ocean Health Management classes • Awareness of risks to ocean well-being • Important offshore areas considered in decision-making processes • Number of volunteers for beach cleanup programs • Number of volunteers for ocean education and outreach programs • Volunteers for marine animal rescue and rehabilitation	

5. Developing an Indicator System for the New York Bight: Summary of Participant Survey

Survey Process

Since additional meetings to discuss the output of the meeting were not feasible given budget constraints, an online survey was administered (between August 11 and September 7, 2016 using Survey Monkey) to workshop participants to solicit feedback on potential indicators for the New York Bight. Respondents were asked to prioritize the components (from Table 3 above) as being of high, medium, or low priority. Participants were then asked to examine specific indicators for each component (broken down by biological, physical/chemical, and socioeconomic groupings) and to provide comments on the suggested indicators and recommendations for additional indicators that should be considered for monitoring (see Table 4 above). Though the components and indicators included in the table are only draft and subject to future modification, Table 5 shows initial connections between these components and the NY Ocean Action Plan. The sections below describe the quantitative and qualitative results from the survey (A copy of the full survey and survey responses are included in Appendix IV).

Quantitative Results

A total of 19 respondents completed the survey, representing 51% of the number of people invited to complete the survey (37 attendees). Some of the responses represented combined comments from multiple individuals from the same organization.

Table 5. Proposed connection of ecosystem components from New York Ocean Indicators Workshop to Ocean Action Plan objectives.

ECOLOGICAL INTEGRITY		PROMOTE HEALTHY ECONOMIC GROWTH		CLIMATE RESILIENCE		EMPOWER THE PUBLIC	
Objective A: Protect and restore sensitive inshore, offshore and estuarine habitats.	- Habitat Quality - Habitats of Concern - System Maturity - Contaminants and Pollutants	**Objective D: Implement and advance offshore planning.**	- Resource-Based Industries - Ecosystem Productivity	**Objective F: Conduct climate change vulnerability assessments.**	- Climate Indicators - Oceanographic and Atmospheric Trends - Ecosystem Resilience	**Objective I: Increase stakeholder participation in resource management and offshore planning.**	- Ocean Awareness and Engagement - Coastal Communities
Objective B: Improve the management of ecologically and economically important species.	- Species of Concern - Invasive Species	**Objective E: Promote sustainable ocean-based industry and recreation.**	- Resource-Based Industries - Species of Concern - Contaminants and Pollutants	**Objective G: Adopt long-term climate adaptation and coastal planning strategies.**	- Coastal Communities - Climate Indicators	**Objective J: Advance ocean outreach and education.**	- Ocean Awareness and Engagement -Public Access
Objective C: Evaluate the ecological integrity of the ocean ecosystem off New York.	- Biodiversity - Ecosystem Resilience - Ecosystem Productivity			**Objective H: Implement ecologically sustainable inshore and offshore sediment resource management strategies.**	-Nutrient Inputs -Terrestrial Inputs -Contaminants and Pollutants	**Objective K: Support local and regional stewardship programs.**	- Ocean Awareness and Engagement - Coastal Communities

Table 6 displays the ecosystem components that received the highest rankings on a percentage basis by respondents to the survey, while Table 7 compares the average rating of each component, as assessed by survey. To calculate this average, we assigned a value of 3 to each high priority ranking, a value of 2 to each medium priority ranking, and a value of 1 to each low priority ranking.

Table 6. Top 5 High priority components by respondent percentage

Ecosystem Component	Percent Respondents Indicating High Priority
Habitat quality	72%
Habitats of concern	72%
Biodiversity	67%
Nutrients	67%
Contaminants and pollutants	67%

Table 7. Summary table of average ratings of ecosystem components

Ecosystem Component	Average Rating
Habitat quality	2.72
Habitats of concern	2.72
Biodiversity	2.61
Nutrients	2.61
Contaminants and Pollutants	2.61
Species of concern	2.59
Ecosystem resilience	2.56
Ecosystem productivity	2.39
Oceanographic and atmospheric trends	2.22
Ecosystem maturity	2.11
Climate indicators	2.11
Invasive species	1.94
Resource-based industries	1.94
Terrestrial inputs	1.89
Coastal communities	1.83
Ocean awareness and engagement	1.78
Public access	1.61

Biological components (e.g., habitat quality, habitats of concern, biodiversity, species of concern, and ecosystem resilience) received the highest prioritization from survey respondents, as did certain physical and chemical components (e.g., nutrients, contaminants and pollutants). Socioeconomic components were generally ranked lower overall. It is important to note that these results represent a small sample of respondents and that respondents may not have been evenly distributed across research fields (i.e., the results are driven by those who attended the meeting and decided to complete the survey). This may have biased the prioritization assigned to an ecosystem component. A broader survey approach may be appropriate to consider for future efforts and was used in developing the Gulf of Mexico indicator system. Additional figures showing study results broken out by priority level (rather than the highlighted summary data reported here) are included in Appendix V.

Qualitative Survey Results

Ecosystem components

In addition to the ecosystem components listed in Table 3, survey respondents also suggested that public use, including metrics such as visitation at beaches, recreational fishing trips, and ecotourism activity, be included as an ecosystem component. Another respondent noted that some of these components, such as oceanographic and atmospheric trends, climate indicators and terrestrial inputs, are really system drivers rather than emergent properties (system health indicators) and that this influenced how these components were ranked (these resulted in lower rankings). Survey responses also noted that the rankings were conducted specifically for ocean habitats, rather than estuary or freshwater habitats, and that a more accurate set of responses would require more in depth thought and discussion. The ranking of relative importance conducted here was felt to be subjective and likely biased towards respondents' specific interests and expertise.

Ecosystem indicators

Survey respondents suggested several additional indicators for each ecosystem component (included in Table 4), and provided additional comments regarding the indicators proposed. Multiple respondents noted that the indicators required further discussion and thought before being finalized, and that terms or concepts discussed as ecosystem components or indicators need to be carefully defined. One respondent found that some of the indicator categories were vague, which made it difficult to suggest appropriate indicators. For example, "coastal community" could reflect population growth, resilience to climate change, aesthetic or tourist value, and understanding which meaning was intended is necessary to identifying appropriate indicators. Similarly, another respondent noted that the process of identifying appropriate indicators should start by defining a purpose and objectives and attaching metrics to these. These comments highlight the need for a long-term time and funding commitment to the development of an indicator system for the New York Bight.

Along with the additional indicators suggested for invasive species, it was noted that it is important to define what makes a species invasive vs. exotic, and how specifically invasive species were influencing the environment. Some respondents felt that some of the biodiversity indicators proposed at the workshop (e.g., stock status, sustainability, fisheries closures) did not reflect biodiversity, and that the indicators proposed were very indirect. Indicators for ecosystem maturity and ecosystem resilience were noted to be difficult to define and measure. Several survey respondents commented that indicators of ecosystem productivity should include more than metrics of primary productivity, and should reflect how energy passes through the system rather than simply characterizing the base of the food web. With respect to indicators for oceanographic and atmospheric trends, comments reflected that indicators would need to be defined spatially and temporally (e.g., specifying which currents are to be measured, whether vertical or horizontal currents are to be measured rather than simply specifying "current speed" as an indicator). In addition to noting the need for additional detail on indicators proposed, several respondents indicated specifics of how sampling

should be performed (e.g., for nutrients, sampling could be stratified based on distances from ocean outfalls). For indicators of resource-based industries or communities, respondents felt that the indicator "Ecosystem health within fished areas/ types of gear used within fished areas" needed to specify how ecosystem health was defined and measured.

Broad suggestions from survey respondents on developing a set of indicators for the New York Bight

Feedback from the survey indicated that the process of identifying ocean indicators for the New York Bight should begin with a clearer purpose and objectives. For example, indicators needed for an ecosystem assessment might be different that those aimed at understanding if management and policy actions are effective. One respondent noted that the ecosystem components and indicators did not link as well as they could have to the objectives of the OAP (Table 5). In some cases, the respondent felt that components reflected the objectives well, but the indicators should be more focused on reporting on how metrics are (or are not) changing in order to inform decision makers and the public. Additional feedback from the survey indicated that it would be beneficial to focus more on identifying and organizing data that have already been collected and/or are readily available due to the capacity needs of monitoring a suite of indicators and publishing or using those indicators in a meaningful way.

Specific Recommendations for Linkages to Ocean Action Plan Objectives

While several comments focused on broad suggestions, as described above, one organization also suggested specific linkages between the Ocean Action Plan and ecosystem components. These included:

- Objective B (Improve the management of ecologically and economically important species) should also be connected to Biodiversity component;
- Objective C (Evaluate the ecological integrity of the ocean ecosystem off New York) should be connected to Contaminants and Pollutant component;
- Objective D (Implement and advance offshore planning) should be connected to Species of Concern, Habitat Quality, and Habitats of Concern components;
- Objective E (Promote sustainable ocean-based industry and recreation) should be connected to Public Access component;
- Objective F (Conduct climate change vulnerability assessments) should be connected to Species of Concern and Habitats of Concern as well as Invasive Species components;
- Objective G (Adopt long-term climate adaptation and coastal planning strategies) should be connected to Resource-Based Industries, Ecosystem Productivity, Species of Concern, Ecosystem Resilience, and Habitats of Concern components; and
- Objective H (Implement ecologically sustainable inshore and offshore sediment resource management strategies) should be connected to Resource-Based Industries components, given the importance of borrowing of sand in the region.

6. Conclusions and Recommendations

A review of indicator systems in U.S. marine systems revealed a range of approaches used to develop such systems, with different indicators selected based on management objectives and alternative strategies employed for organizing the components and associated indicators. There is typically a link between indicators selected and identified goals for the management of the system; upfront goals are important in ensuring that the developed indicator system can detect impacts of management actions (which should themselves be driven by those goals). Without a clear set of goals, narrowing to a set of consistent indicators can be challenging.

Following this initial workshop seeking expert opinions on ocean indicators for the New York Bight, we suggest that management goals need to be further defined before a more limited, prioritized list of appropriate indicators can be developed to meet those goals. The OAP includes broad objectives that provide an important starting point for discussions, but management goals will need to be further specified before a more targeted list of indicators can be developed. In addition, specific actions listed within the OAP do not lend themselves well to the development of such a system of indicators; some actions are narrowly focused (e.g., Action 8: Develop strategies to reduce pathogen and nutrient loads from onsite wastewater treatment systems in the Long Island South Shore Estuary Reserve and Action 9: Reduce bycatch in New York fisheries), while others are very broad (e.g., Action 32: Establish a baseline ocean monitoring system for the New York Bight and Action 35: Assemble and analyze resource and use data for offshore planning). Specific, focused actions are more amenable to selection of specific indicators and field data collection activities; the broader actions are less likely to be assessed through an indicator system, but rather are more simply assessed through tracking of completion of the action. Lastly, the OAP covers a range of ecosystems, from estuarine, coastal and offshore environments, and the system of interest will need to be carefully defined before a focused and appropriate list of indicators can be identified.

We suggest that indicators and ecosystem components proposed in this initial, broadly-focused workshop be further fleshed out in future expert meetings with more specific goals. While the survey results are from a small sample and may not be representative across the various ecosystem disciplines (biological, physical/chemical, and socioeconomic), they suggest a higher priority may initially be placed on biological components such as habitats, biodiversity, and species of concern.

Indicator systems developed in other well-studied ecosystems could be used to guide objectives for further workshops. For example, within the Chesapeake Bay Program, biological indicators focus on indicator species relevant to ecosystem health and commercially important fisheries, such as fish species, invertebrates, bay grasses, and benthic health. To develop an appropriate system of biological indicators for the New York Bight, we suggest that an in-depth effort first be conducted to compile and analyze previously collected biological data in order to provide a more comprehensive assessment of data availability and to identify recent biological trends. This research could then be used to inform two future workshops to further

define a monitoring plan for biological indicators within the New York Bight. A first workshop could focus on identifying broad types of indicators (e.g., indicators for commercial fisheries, forage fish, invertebrates and benthic health) that would best reflect the health of a particular ecosystem (e.g., pelagic waters of the New York Bight). A second workshop could then define specific indicators in more detail (e.g., species and benthic properties to be assessed), and assess how/ when/ where these metrics should be monitored. A similar strategy could be used to develop appropriate indicators and general monitoring plans for specific physical/ chemical, socioeconomic and policy management goals.

A continued focus on the overlap between the identified indicators and the objectives and goals of the New York Ocean Action plan will be important to ensuring that the developed system meets the needs of policymakers and resource managers.

We recommend the following specific next steps:

- Conduct an in-depth review and analysis of existing data sources to identify data gaps, assess ecosystem change from previously collected and/ or readily available data, inform priorities for monitoring work and build on the information provided in this report;
- Develop specific and well-defined objectives for future workshops based on management goals for specific ecosystems;
- Convene additional workshops to convey the findings from this process and to finalize and prioritize ecosystem components and indicators, separating meetings by component category (biological, physical and chemical, socioeconomic) to ensure good representation of experts in each field;
- Draft a timeline of next steps planned by the NYSDEC, including desired target dates for a final set of indicators; and
- Present/share draft indicator system with members of the public to obtain feedback on recommended indicators.

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Appendices

Appendix I: Indicators by category across selected US Ecosystem Assessment Programs (NOTE: Arguments may be made as to whether certain indicators should be considered in one category or another—for example, habitat may be classified as a physical measure or a biological measure)

Ecosystem Assessment Programs	Physical	Biological	Chemical	Socio-Economic
Chesapeake Bay Program	Bay Watershed Forest Cover	Key Fish Species Abundance (American Shad, Atlantic Menhaden, Striped Bass)	Percent of Watershed Partially/ Fully Impaired by Chemical Contaminants (Pesticides, pharmaceuticals, PCBs)	Fishery Management (Fishery Mortality) of Key Commercial Stocks (Atlantic Menhaden, Striped Bass)
	Acres of Conserved/ Protected Land	Juvenile Fish Species Abundance (Atlantic Menhaden, Striped Bass)	Dissolved Oxygen Content	Chesapeake Bay Residential Population
	Total Maximum Daily Load of Suspended Sediment	Abundance of Spawning-Age Blue Crab Females	Nitrogen Concentration in Chesapeake Bay Rivers (Short-Term/ Long-Term Trends)	Public Access Sites to Chesapeake Bay Spaces and Waterways
	Reopened Fish Passageways	Benthic Organism Health Based on Benthic Index of Biotic Integrity	Phosphorus Loads in Chesapeake Bay Rivers (Short-Term/ Long-Term Trends)	
	Restored Oyster Reefs	Abundance and Diversity of Benthic Macroinvertebrates Present in Freshwater Streams	Total Maximum Daily Load of Nitrogen and Phosphorus	
	Restored Wetlands	Underwater Bay Grass Abundance	Wastewater Flow into Chesapeake Bay	
	Tidal Wetland Abundance		Water Quality Standards (Chlorophyll a, Surface DO, Water Clarity)	
Oregon Watershed Enhancement Board	Water Temperature	Invasive Species Abundance	Daily Load of Nitrogen	Number of Hydro-modified Areas
	Water Quality	Salmon Abundance	Daily Load of Phosphorus	
	Daily Water Input from Rivers (Sediment, Nutrient, Water)			
	Spawning Sediment Quantity			
	Physical Barriers Present			
	Percent Preserved Wetland Habitat			
	Percent Preserved Tidal Flat Habitat			
	Percent Preserved Sub-Tidal Zone Habitat			

Puget Sound Partnership	Amount of Shoreline Armoring Gained/ Lost in Puget Sound Annually (2020 Goal to Remove More Miles of Armoring than Adding Miles of Armoring)	Beach Health, Measured by % of Puget Sound Beaches That Meet EPA Standard for *Enterococci* Bacteria	Dissolved Oxygen Content in Puget Sound	Onsite Sewage/ Septic Systems for Human Health, Measured by % of Sewage Systems Inspected and Inventoried
	Change in Land Cover From Riparian Restoration Projects Annually	Shellfish Health, Measured by # of Acres of Harvestable Shellfish Beds in Region	Percent of Chemical Measurements Exceeding Sediment Quality Standards	Recreational Fishing and Crabbing License Sales (WIP for Measurable Characteristic)
	Change in Area of Floodplain-Improved Terrain Projects	Chinook Salmon Population Health, Measured by Mean Chinook Salmon Spawner Abundance in Each Individual Population in Puget Sound	Levels of Persistent Toxins Observed in Pacific Herring	Pounds of Salmon Caught in Commercial Harvest (WIP for Acceptable Levels)
	Area of Estuarine Wetland Restored to Tidal Flooding	Number of Southern Resident Killer Whales in Puget Sound, Measured by End-of-Year Census by the Center for Whale Research		
		Biomass of Spawning Pacific Herring, Measured by Estimated Annual Tonnage of Spawning Stock		
		Population Abundance of Marine Birds, Measured by Spring/Summer at-Sea Densities of Rhinoceros Auklet, Pigeon Guillemot, and Marbled Murrelet		
		Acres of Eelgrass in Puget Sound		
California Current (NOAA)	Sediment Input, Measured by Suspended Sediment Loading	Abundance Estimate of Selected Species by Trawl Surveys (Groundfish, Pacific Hake, Crab, Shellfish, Salmon)	Atmospheric Pollution Level Measured by Concentration of Deposited Sulfate	Annual Landings of Groundfish
	Marine Debris, Results Gathered from Coastal Trash Cleanup Programs	Invasive Species Threat Level, Measured by Invasive Species #, Shipping Port #, and Avg. Shipping Cargo	Organic Pollution, Measured by Toxicity-Weighted Pesticide Concentration in Water	Annual Landings of Hake

	Volume		
	Dredging Level, Measured by Total Dredge Volumes and Dredge Dump Volumes	Nutrient Input by Nutrient/ Fertilizer Loading	Annual Landings of Coastal Pelagic Species
	Sea Level Rise, Measured by Water Surface Height	Inorganic Pollution, Measured by Total Inorganic Pollutant Toxicity	Annual Landings of Highly Migratory Species (HMS) in the CCLME from 1981 – 2011. HMS Include Tunas, Sharks, Billfish/Swordfish and Dorado *Coryphaena hippurus*
	Timing and Frequency of El Nino Events	Ocean Acidification, Measured by DO	Annual Landings of Salmon in the CCLME from 1981 – 2011
	Temperature Change Measured by Sea Surface Buoys		Annual Landings of Crab in the CCLME from 1981 – 2011
	Water Column Structure Measured by Pycnocline Depth/ Strength		Annual landings of shrimp in the CCLME from 1981 – 2011
	Timing and Strength of Upwelling Measured by Wind Velocity and Upwelling Index (UI) Variables		Annual Landings of Shellfish in the CCLME from 1981 – 2011
			Annual Landings of All Other species in the CCLME from 1981 – 2011
			Annual Trawl, Shrimp Trawl, Hook-and-Line, Net Gear, Pot and Trap, or Other Trap Captures
			Kilometers (km) Trawled by the Limited-Trawl Groundfish Fishery in CA, OR and WA by Habitat Type.
			Aquaculture Area Used, Finfish Production, Shellfish Production
			# of Benthic Oil and Gas Wells
			% of Shoreline Modified
			Tons of Cargo Moved, Volume of Water Displaced by

				Commercial Shipping Activity
				Seafood Demand by Total Amount Consumed and Amount Consumed Per Capita
				Power, Desalination Plants Water Withdrawal Volumes, Entrainment Mortality
				Population Size
Gulf of Mexico (NOAA)	AMO (Atlantic Multidecadal Oscillation) Index, Measured as the Mean of Sea Surface Temperatures Across the Mid-Atlantic	Bacterial Load of Select Species (*Enterococcus*) Measured as Colonies Forming Per Unit Volume of Water	Hypoxia Index	Net number of oil platforms in the Gulf of Mexico
	AWP (Atlantic Warm Pool) Index, Measured by Calculating the Total Area of the Mid-Atlantic Basin with a Surface Temperature Greater Than 28.5° C	Changes in Oyster Areal Coverage and Filtration Capacity Over Time	Mercury and Cadmium Concentrations, measured from Coastal Sediments and Accumulation in Bivalve Tissue	Stock Assessment Models for All Major Commercially Assessed Species Based on Landing, Catch-Per-Unit-Effort, and Life History Data
	Average Offshore Sea Surface Temperature, Measured Per Month	Changes in Seagrass Cover, Measured from Aerial Survey Photography		Proportion of U.S. Stocks Considered to be Overfished/ Not Overfished Annually
	Northern Latitudinal Extent of the Loop Current	Monthly Median Chlorophyll *a* Levels Calculated from Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Satellite Imagery for 3 Coastal Regions and the Offshore Region (>200m Depth) in the Gulf of Mexico		Total Landings in Weight for U.S. Commercial Fisheries and Mexico Commercial Fisheries
	Weekly Geostrophic Heat Transport from Yucatan Channel and the Gulf of Mexico, Measured Using Sea Surface Difference from Both Sides of Each Current	Frequency of Red Tide HABs (Data from the Florida Fish and Wildlife Commission)		Total Recreational Landings by Weight Reported
	Hurricane Activity Using Meteorological Data	Abundance Index of Overall Zooplankton Biovolume Taken from Data Provided by SEAMAP		Annual Dockside Revenues for Each Commercial Species Group
	Sediment Load	Individual Larval Fish Surveys		Total Economic Impact

	Transported into the Gulf by the Mississippi River	for Selected Abundant Mesopelagic and Benthic Fish Species Taken from Inshore Surveys		Annually for Both Commercial Landings and Recreational Landings
	Percent Change of Emergent Wetland, Aquatic Beds, and Forested Wetland Cover in the Northern Gulf of Mexico	Annual Shrimp Abundance Based on Fisheries-Independent Data and Annual Trawl Survey		Commercial Fishing Effort Measured by Number of Fishing Trips and Number of Days at Sea from U.S. Logbook Data
	Marsh Flooding Index Measured by Average Mean Water Levels in Each Individual Marsh	Green Sea Turtle Growth Rates		Number of Boats Registered in Gulf of Mexico Coastal Marine States for Marine Fisheries
		Total Nest Counts for Kemp's Ridley Sea Turtles in Each Nesting Area		Percent Coastal Land Usage Based on CCAP Data
		Total Number of Reported Cetacean Strandings Annually		
		National Audubon Christmas Bird Count for Measuring Annual Abundance of Selected Bird Species		
Gulf of Maine (Gulf of Maine Regional Ocean Science Initiative)	Sea Level Rise, Measured by Water Surface Height in Marsh Areas	Current and Historical Plankton Concentrations Measured by Water Samples	Contaminant Levels within Fish Tissue, Measured by Tissue Analysis	Annual Fish Catch and Profit for All Commercial Species
	Water Quality Measurements	Annual Number of Harmful Algal Blooms and Locations	Contaminant Levels Measured within Local Sediment	Annual Profits from Aquaculture Activity
		Local Shellfish Population Estimates	Nutrient Input from Agricultural Runoff	Local Shoreline Activity, Measured in Acres
		Annual Lobster Population Estimates		
		Invasive Species Abundance		
		Local Marine Mammal Species Abundance		
Common Indicators	Water Temperature	Enterococcus Bacterial Load	Nutrient (N/P) Load from Outside Sources	Annual Fisheries Catch
	Sediment Load From Outside Sources	Abundance of Key Ecological/ Commercial Species	Toxic Chemical Concentrations	Use of Environmental Resources (Habitat/ Other)
	Local Weather Activity	Invasive Species Abundance	Pollutant Concentration Levels	
	Water Quality			
	Percent Restored Habitat Types			

Appendix II. List of Participants In NY Bight Indicators Workshop in Stony Brook, NY

First	Last	Organization
Debbie	Abercrombie	Independent
Mary Claire	Arnold	School of Marine and Atmospheric Sciences
David	Barnet	New York State Department of Environmental Conservation
Bryan	Berg	School of Marine and Atmospheric Sciences
Mary	Boatman	Bureau of Ocean Energy Management
Johnny	Bohorquez	School of Marine and Atmospheric Sciences
Lisa	Bonacci	New York State Department of Environmental Conservation
Marci	Bortman	The Nature Conservancy
Alison	Branco	Peconic Estuary Program
Merry	Camhi	Wildlife Conservation Society
Bob	Cerrato	School of Marine and Atmospheric Sciences
Alison	Chase	Natural Resources Defense Council
Noah	Chesnin	Wildlife Conservation Society
Karen	Chytalo	New York State Department of Environmental Conservation
Kirk	Cochran	School of Marine and Atmospheric Sciences
Frances	Dunwell	New York State Department of Environmental Conservation
Anthony	Dvarskas	School of Marine and Atmospheric Sciences
Charlie	Flagg	School of Marine and Atmospheric Sciences
Mike	Frisk	School of Marine and Atmospheric Sciences
Kevin	Hassell	New Jersey Department of Environmental Protection
Jeff	Herter	New York State Department of State
Mandy	Karnauskas	Southeast Fisheries Science Center
Hyemi	Kim	School of Marine and Atmospheric Sciences
Zachary	Lees	Clean Ocean Action
Anne	McElroy	School of Marine and Atmospheric Sciences
Kim	McKown	New York State Department of Environmental Conservation
Regan	Nelson	Natural Resources Defense Council
Mark	Nepf	School of Marine and Atmospheric Sciences
Janet	Nye	School of Marine and Atmospheric Sciences
Jay	Odell	The Nature Conservancy
Christine	Santora	Institute for Ocean Conservation Science
Liz	Smith	The Nature Conservancy
Lesley	Thorne	School of Marine and Atmospheric Sciences
Laura	Wehrman	School of Marine and Atmospheric Sciences
Judith	Weis	Rutgers University
Bill	Wise	New York Sea Grant

Appendix III: Meeting Minutes

Day 1

<u>Introductory Statements</u>

1. Opening statements were made by Anthony Dvarskas and Lesley Thorne of Stony Brook University. This meeting assembled an expert group that could develop and propose an indicator system for assessing the ecosystem health of the New York Bight.

    a. The indicators were broken into four categories: biological, chemical, physical, and socioeconomic indicators that would best assess the ecological integrity of the New York Bight.
        i. A good indicator is representative, sensitive to change, measurable, relevant and adaptable.

    b. Detail how current monitoring and data collecting activities could be used to support the indicator system, or how there may need to be additional monitoring efforts made in order to facilitate an effective monitoring system within the New York Bight.

2. The NYS DEC drafted the first Ocean Action Plan in 2015 and it had **four main goals**:
    a. Ensure the ecological integrity of the ocean ecosystem.
    b. Promote economic growth, coastal development and human use of the ocean in a manner that is sustainable and consistent with maintaining ecosystem integrity.
    c. Increase resilience of ocean resources to impacts associated with climate change.
    d. Empower the public to actively participate in decision-making and ocean stewardship

3. Karen Chytalo of the New York State Department of Environmental Conservation provided a review of the New York Ocean Action Plan, and clearly established our goals for the meeting.

    a. NYS used the NY Ocean and Great Lakes Ecosystem Conservation Act and the Hudson River Estuary Program as examples to help draft the OAP, whose purpose would be to address ecological stressors including impaired waterways, destruction of marine habitats, loss of marine biodiversity, and man-made threats.

b. Outlined in her presentation were some main issues for the New York Bight:

   i. Fisheries threats –gears and bycatch
   ii. Shipping and Transportation - Largest port on the East coast, and expecting an increase in cargo ship flux because of the widening of the Panama Canal, greater risk of invasive species and nuisances
   iii. Offshore Energy Development
   iv. Pathogens and Toxic Contaminants
   v. Habitat Loss and Destruction – Marsh loss, sea level rise, sediment loss, seagrass loss.
   vi. Water Quality Issues – Long Island Nitrogen Action Plan (Eutrophication, HABs)
   vii. Aquatic Invasive Species
   viii. Climate Change

c. Chytalo included some of the challenges the OAP faces including jurisdictional boundaries and State v. Federal v. NGO conflicts. But the vision remains to restore, strengthen, and maintain the ecological integrity of the State's ocean ecosystem.

d. Recommendations for future monitoring activities were outlined: Whale Monitoring Pilot Program (2016), Fisheries Observer Coverage (2015), Breach Monitoring Workshop (Ongoing), Sea Turtle Monitoring Workshop. Long term datasets are a necessity, given gaps in currently available information.

e. Chytalo concluded with a discussion of Governor Cuomo's initiatives and the need to understand that we cannot stop change, but we can become more resilient.

<u>Expert Presentations</u>

4. Presentations on important background information on monitoring activities and related activities in the New York Bight were given by Anthony Dvarskas and Lesley Thorne, Mandy Karnauskas, Janet Nye, Mike Frisk, Bob Cerrato, Merry Camhi, Zachary Lees, Lisa Bonacci, Regan Nelson and Alison Chase.

   a. Mandy Karnauskas from NOAA SWFSC – Developing Ecosystem Indicators for the Gulf of Mexico. The objective of this talk was to use what they learned in the Gulf of Mexico as an example for the New York Bight. Mandy explained the framework and the methodology they used to choose, prioritize, and evaluate indicators. She then went through some of the challenges they faced, such as a non-existent universal data source. Some of the challenges they have in the Gulf of

Mexico, many of which are similar to those faced by the New York Bight were also shared, including:

i. Major ports
ii. Important commercial and recreational fishing
iii. Hypoxia
iv. HABs
v. Wetland deterioration
vi. Hurricanes.

b. Lesley Thorne and Anthony Dvarskas gave brief overviews on the Puget Sound, Gulf of Maine, and California Current Indicator systems. In all three systems long term monitoring was the goal, as it is the key to understanding and detecting change within the area.

   i. The Puget Sound established indicators that they could monitor to track the progress they made toward their goals for ecosystem recovery in 2020.

   ii. The Gulf of Maine team chose seven areas of focus (aquaculture, aquatic habitats, climate change, coastal development, contaminants, eutrophication, and fisheries) then selected indicators within each of those areas.

   iii. The California Current system selected three focal areas (Ecological components, Human activities, Climate and ocean drivers). Within these areas, 174 indicators were chosen.

c. Janet Nye from SoMAS spoke about relevant atmospheric and oceanographic indicators. There is an urgent need to understand climate pressures, as climate variability plays a large role in fisheries. The temperature change in the New York Bight is very dynamic, and fish are adapting to change. Even slight changes can greatly change the availability of species.

   i. Potential indicators included:
      1. Atmospheric – wind speed, direction, jet stream, NAO, Icelandic low, Azore high, AO or NAM, PDO
      2. Oceanic – AMO, position of north wall of gulf stream, AMOC, Volume of Labrador Slope Water.

d. Mike Frisk from SoMAS engaged a conversation about monitoring the endangered Atlantic Sturgeon in the Mid-Atlantic Bight. When choosing indicators, it is essential to choose those that will help protect endangered species like the Atlantic Sturgeon. Objectives for Atlantic sturgeon management in the mid-Atlantic region include bycatch reduction while minimizing economic impact on other fisheries. Acoustic telemetry has been used to monitor sturgeon in the

Bight. A future goal is real-time adaptive management using remote sensing to implement seasonal closures.

e. Bob Cerrato from SoMAS spoke about community/system level indices. One example was the use of Ecopath in the Great South Bay and in the Peconic Trawl Survey. This modeling approach constructs mass balanced, trophically linked biomass pools from available biomass, P/B, Q/B, other mortality, diet, and catch data. The Ecopath modeling allowed researchers to see changes in top predators, declines in migratory, upper trophic, and filter feeder species.

f. Noah Chesnin and Merry Camhi from the Wildlife Conservation Society, talked about Raising Our Voice and public outreach and education. Some data they have archived thus far include: Bronx River eel populations, sand tiger shark numbers in the Great South Bay, and mako and blue sharks off the coast. They have just begun whale monitoring, by using aerial surveys, acoustic buoy data, and SAT tags. The main goal at the NY Aquarium is to connect the public to wildlife.

   They also discussed work in assessing ocean civic vitality and ocean literacy and civic engagement. The Aquarium has a large outreach platform with an average of 4.3 million visitors annually.

g. Zachary Lees from Clean Ocean Action discussed actions they have taken in the New York Bight, including collaborative work with Bloomberg. A main focus for this NGO is water quality, pollution, and marine debris. They are working with the EPA's Trash- Free Waters Program and archiving data on marine debris that could be edited and accessed globally.

h. Lesley Thorne from SoMAS discussed short-finned pilot whales in the Mid-Atlantic Bight and approaches for defining their range and habitat. Studies now show that they rely on shelf break and the Gulf Stream for habitat use. A major threat to these whales' habitats are pelagic long-line fisheries, so the goal is to predict pilot whale "hotspots" for fishermen to avoid thus reducing the odds of interactions.

   Thorne also recommended seabirds as important indicators, because their diet reflects the changes in the pelagic food-web, they are easy to study, and react to change quickly and predictably.

i. Lisa Bonacci from the NYS DEC spoke next on the Baseline Monitoring of Large Whales in the New York Bight. This work is important because there are large gaps in our data and understanding of whales and their locations. Now that there are greater numbers of whales,

management is more important, as they face numerous threats including ship strikes, offshore alternative energy development, and entanglement. The focus is on large, endangered species, including blue, fin, humpback, North Atlantic right, sei, and some turtles. Data are recorded through passive acoustics and through aerial surveys, with a focus on shipping lanes. She mentioned the goal of including shipboard surveys and tagging data in the future.

j. Regan Nelson and Alison Chase from NRDC provided a list of currently monitored datasets associated with their stated goals for a healthy ocean ecosystem (promote ocean ecosystem health, functionality, and integrity through conservation, protection, enhancement, and restoration). Through their work, they developed 55 indicators, and 37 focal components when solely using federal data.

   Some examples include: Sea Turtles- Sea Turtle Stranding and Salvage Network, Cetaceans (Annual Stock Assessment Reports), Seabirds SEANET (Citizen science mortality surveys), Shorebirds (US FWS Endangered Species Monitoring, Benthic Invertebrates, Aquatic Invasive Species, Primary Productivity, Small Pelagic fishes, elasmobranchs and groundfish, Fish Tissue Contamination, Sediment Contamination, Oil/ Chemical Spills, Marine Debris, Beach Closures, Public Access, Water Quality, Carbon Storage and Sequestration, Ocean Acidification, Offshore Sand Dredging, Ocean Dumping Sites, Ship Strikes and Gear Entanglement of Large Whales, and Underwater Ambient Noise.

End of Day 1/Day 2

<u>Breakout Groups</u>

5. The next step in our workshop was to split into four groups that would provide a conceptual framework and come up with indicators within each group. The four areas were Physical/Chemical, Biological, Policy, and Socioeconomic.
   a. The *Physical and Chemical* group talked about the existence of long term datasets that already exist and must be continued.
      i. Indicators discussed:
         1. PRIORITY -- Temperature (SST, Bottom, Nearshore/ estuarine), Salinity (proxy for water mass exchange), Nutrients (Nitrogen, Phosphorus, Silica), Chlorophyll, Meteorological Data (Surface Wind Velocity, etc.), Contaminant Chemical Tissue/ Sediment Levels (Mussel), Total Ekman Transport, Storm Tracks, Gulf Stream North Wall Index, Eddy Activity (# of warm core rings/ year), Gulf Stream Transport Index, AMOC,

Contaminant Levels (PAH, PCBs), EPA's Sediment Metals- Mercury, Cadmium, Contaminants of Emerging Concern (CEC) PFOS, PFOA (should be added to CEC),

2. LOWER RANK – Pharmaceuticals, Mussel Watch-Nearshore Particulate Levels, pH, pCO2, DIC, alkalinity-carbonate chemistry, Dissolved Oxygen, Water Clarity (sediment loading, light attenuation), Sea Level, NAO, AO, AMO, PDO, microplastic Levels (Litter and Pollution)

ii. All must be analyzed together for importance and all data should be accessible through a central data portal.

iii. Potential First Step: develop an Ecosystem Status Report using available data.

iv. Offshore model: NE Ecosystem Status Report & inshore model: LIS Environmental Indicators Report.

v. <u>Outcomes and Actions</u>

1. The chemical group would like to review some other indicator systems and analyze status reports, in hopes of helping guide the indicator prioritization process.
2. They suggest meteorological data, and climate be of immense importance when developing the indicator system.
3. The chemical group pushed for developing a central data portal that is easily accessible and can be updated universally. This was one of the strong suggestions from the experts on the Gulf of Mexico's Indicator System.

b. The *Policy* breakout group created four important categories and associated indicators. There were important objectives that would have to go with each category, including the ability to measure effectiveness, ability to engage the public, the ability to acquire adequate funding, and the ability of the policy to adapt.

i. Climate

1. Indicators include: Acceptance by public to accept alternative structures, and confirm that the law is adopting well, number of people taking classes, and being aware of the risks that are presented by living near the shoreline, towns implementing the CRRA guidance into their laws, housing permits considering sea level rise, and use of living shorelines, number of vulnerability indices performed for marine species and their habitat, number of towns that have resilience plans in place, number of municipalities that have

participated in efforts to communicate and share, percent of infrastructure that has become resilient to climate change.

ii. Water Quality
   1. Reduce loadings of nutrients and pathogens in the New York Bight, decrease algal blooms and the potential risk in the New York Bight. (reduce frequency, aerial extent, severity of toxicity, seasonality), identify causal factor of massive blooms, linkage between land-use and water quality and loadings, track and measure change in wastewater management action and wastewater policy (ensure existing TMDL are met), Measure public support for adequate financing (How are we engaging the public as a civic indicator)

iii. Environmental Protection (Habitat/Species Protection)
   1. Biodiversity maintenance as well as species abundance within community, less marine species being listed or candidates (endangered, threatened), less species suffering from strandings or gear entanglements.

iv. Marine Spatial Planning
   1. Is the plan adopted into the coastal management program? Number of permits that are submitted reference the plan as part of their application, important offshore areas are considered in decision-making processes, measuring user conflicts within the important offshore areas, ocean economies are sustained or growing in an environmentally sustainable manner, species and diversity are thriving within the planning area.

v. <u>Outcomes and Actions</u>
   1. The Policy group would like to see a strong role of civil ocean engagement with every step within the proposed indicator system. The education and awareness of the public is essential in order to develop a successful indicator system.
   2. They believe splitting it into important categories would be beneficial to the development of the system.

c. The *Biological* indicators group also split their indicators into categories: Resilience, System productivity, Biodiversity, Fishery production, Species of concern, Habitat quality, Ecosystem health.

i. Resilience - Measure: Species diversity, abundance, productivity, demographic parameters of benthic organisms
ii. System productivity – **Primary productivity measures**: Chla, phytoplankton assemblages, timing of the bloom
Middle/upper measures: Abundance, biomass, phenology, relative abundance of gelatinous, cold vs. warm water species.
iii. Biodiversity - Measure: Density or biomass, age and size, structure, species diversity, distribution
iv. Fisheries production – Measure: landings, closures, biomass of resident vs. migratory species, stock status, sustainability as defined under stock assessment
v. Habitat quality - Measure: spatial extent of habit forming organisms, species diversity, species density (e.g., from telemetry studies), essential fish habitat, disturbance (e.g., benthic community structure), residence time
vi. Species of concern - Measures: bycatch, abundance estimates, age, structure, presence and trends in the number of ESA listed species/ species of greatest conservation concern
vii. Ecosystem Health - Ratio of total primary production to total biomass, fin cycling index, predatory cycling index, residence time of energy, path length

viii. <u>Outcomes and Actions</u>
1. The Biological group must decide on the certain species that they believe should be prioritized and also would make good indicators. These species should align with the DEC's outlined tasks.

d. The *Socioeconomic* group also separated their indicators into categories: Recreational, Commercial, Community Well-being, Coastal development, Ocean engagement, Infrastructure and Transportation.

i. Recreational – Number of fishing trips, saltwater fishing licenses, revenues to water-dependent businesses, number of boating trips, boat launch fees, boat registrations, number of beach trips, beach closures.
ii. Commercial - Value of landings, density of vessels within grid cell with gear type, average distance of vessel from port, hot spot map
iii. Community Well-being - Income levels, percent poverty in coastal areas, affordability in coastal zip codes, average age in fishing-related industries
iv. Coastal Development – Population density along the coast, percent Impervious surface, number of new construction permits.

v. Ocean Engagement – Percent of people with awareness of ocean and ocean issues
vi. Infrastructure
vii. Transportation - Number of vessels transiting New York Bight, Composition of shipping, Spending on treatment technologies for water

viii. <u>Outcomes and Actions</u>
1. The socioeconomic group would like to see fisheries data heavily involved in the indicator system, both recreational and commercial.

6. The workshop ended with a discussion of any last questions, additional ideas, and recommendations for next steps.

a. Future meetings are necessary. Preliminary indicators discussed at the workshop should be fleshed out in further discussions by relevant experts. There is a need to list and then prioritize a set of indicators for the New York Bight.

b. An outcome paper of the meeting proceedings, with a projected timetable for future efforts will be released to those who were present at the meeting.

c. There needs to be an analysis of data that have already been collected, and compare it to what needs to be collected, and that it must be made accessible universally whether online or through an app.

d. Match indicators against objectives and put together a framework to make the different indicators more consistent across groups
i. Make sure we capture the richness without overlap OR gaps

e. Prepare a combination of all the groups suggested indicators into a table, similar to the one presented by Anthony Dvarskas from the socioeconomic group.

f. Compile a comparison of the workshop outcomes and the NYOAP list of objectives and goals.

g. Approach the monitoring in a specific way: evaluate existing data before spending for monitoring. Long-term thinking is required—what will we really want for ten years of New York Bight monitoring?

h. Come up with a way to prioritize indicators and communicate agreement between groups. Online surveys may be a way to collect this information.

Appendix IV: Survey Template and Individual Responses to Participant Survey (anonymous)

Developing Indicators in the New York Bight

Ecosystem Components

Thank you all for attending the NY Bight Ocean Indicators workshop in Stony Brook and for helping make it such a success! We are soliciting your feedback to try to prioritize ecosystem components and to summarize a the list of indicators for each component.
If possible we ask that we receive all feedback on or before August 24th, Thank you!

1. Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

	High	Medium	Low
Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	○	○	○
Invasive Species	○	○	○
Habitat Quality (e.g., Species density, Disturbance, Residence time)	○	○	○
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	○	○	○
Biodiversity (e.g., Species diversity, distribution, density or biomass)	○	○	○
Ecosystem Maturity (e.g., Community energetics, Community structure)	○	○	○
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	○	○	○
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	○	○	○

	High	Medium	Low
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	○	○	○
Climate Indicators (e.g., NAO, AMO, PDO)	○	○	○
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	○	○	○
Nutrients (e.g.,Levels of N, P, silica in open ocean)	○	○	○
Contaminants and Pollutants	○	○	○
Public Access (e.g., Annual number of public access sites created)	○	○	○
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	○	○	○
Coastal Communities (e.g., Shoreline population and income)	○	○	○
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	○	○	○

Please provide any comments about the listed components or provide suggestions regarding additional components that should be considered.

Developing Indicators in the New York Bight

Biological Components

This page describes *biological* components and preliminary indicators suggested for each component. For each question, the component is in bold and the proposed indicators are in a bulleted list. If there is an indicator you feel is relevant to a component that is not listed, please describe it in the comment box below the indicator list.

2. The following were discussed in the meeting as indicators of**Species of Concern**:

- Presence
- Abundance estimates
- Age structure
- Population trends
- Bycatch
- Strandings (marine mammals, sea turtles)
- Ship strikes (marine mammals)
- Presence and trends in the number of ESA listed species/ species of greatest conservation concern

3. The following were discussed in the meeting as indicators of**Invasive Species**:

- Presence
- Abundance
- Taxonomy
- Trends and source of introductions through time

4. The following were discussed in the meeting as indicators of**Habitat Quality**:

- Shoreline composition
- Acreage of usable habitat
- Abundance
- Species density
- Species distribution
- Residence time of transient species

5. The following were discussed in the meeting as indicators of **Biodiversity**:

- Species diversity
- Resident vs. Migratory species
- Stock status
- Sustainability (defined by stock assessment)
- Landings
- Fisheries closures
- Relative abundance of gelatinous species

6. The following were discussed in the meeting as indicators of **Habitats of Concern** (Canyons, Migratory Corridors, and Spawning Areas):

- Species diversity
- Essential fish habitat
- Disturbance
- Residence time
- Spatial extent of corals
- Contact with human activities

7. The following were discussed in the meeting as indicators of **Ecosystem Maturity**:

- Ratios of different trophic levels within the ecosystem
- Number of interactions and complexity of trophic food web

8. The following were discussed in the meeting as indicators of**Ecosystem Resilience**:

- Relative abundance of cold water vs. warm water species
- Species abundance
- Species diversity
- Productivity
- Age and size structure
- Distribution

Developing Indicators in the New York Bight

Physical and Chemical Components

This page describes *physical/chemical* components and preliminary indicators suggested for each component. For each question, the component is in bold and the proposed indicators are in a bulleted list. If there is an indicator you feel is relevant to a component that is not listed, please describe it in the comment box below the indicator list.

9. The following were discussed in the meeting as indicators of**Ecosystem Productivity**:

- Chlorophyll a
- Annual number of algal blooms
- Phytoplankton assemblages
- Timing of the bloom

10. The following were discussed in the meeting as indicators of**Oceanographic and Atmospheric Trends**:

- Current speed
- Tidal height
- Nearshore/ Offshore temperature
- Temperature change (year to year, month to month)
- Dissolved oxygen

11. The following were discussed in the meeting as**Climate Indicators**:

- Gulf Stream North Wall
- Nearshore/ Offshore temperature

12. The following were discussed in the meeting as indicators of**Terrestrial Inputs**:

- Total river flow
- Time of peak river flow
- Marsh elevation
- Hudson River plume
- Levels of N, P, Silica
- Levels of river flow
- Notable locations and concentrations of runoff

13. The following were discussed in the meeting as indicators of**Nutrients**:

- Levels of N, P, Silica, other nutrients of concern in open ocean

14. The following were discussed in the meeting as indicators of**Contaminants and Pollutants**:

- Levels of contaminants of concern within sediment (nearshore, offshore, deep water)
- Contaminants of emerging concern (PFOS, PFOA)
- EPA's sediment metals- Mercury, Cadmium, PAH, PCBs
- Levels of chemicals of concern within fish tissue

Developing Indicators in the New York Bight

Socioeconomic Components

This page describes *socioeconomic* components and preliminary indicators suggested for each component. For each question, the component is in bold and the proposed indicators are in a bulleted list. If there is an indicator you feel is relevant to a component that is not listed, please describe it in the comment box below the indicator list.

15. The following were discussed in the meeting as indicators of**Public Access**:

- Annual number of public access sites created
- Annual number of public access sites enhanced
- Annual number of new shoreline construction permits

16. The following were discussed in the meeting as indicators of**Resource-Based Industries and Communities**:

- Gross total income of local fisheries by species
- Total annual catch of fisheries by species
- Total income of offshore development
- Total area used by offshore development
- Number of fishing trips
- Number of saltwater fishing licences
- Shoreline community income levels
- Number of vessels transiting in NYB
- Ecosystem health within fished areas/ types of gear used within fished areas
- Number and type of oil/chemical spill incidents
- Abundance of marine debris by type and trends in abundance by type

17. The following were discussed in the meeting as indicators of**Coastal Communities**:

- Shoreline population and income
- Number of towns implementing CRRA Guidance into their laws
- Housing permits considering sea level rise

18. The following were discussed in the meeting as indicators of**Ocean Awareness and Engagement**:

- Acceptance by public of alternative structures and laws
- Number of people taking Ocean Health Management classes
- Awareness of risks to ocean well-being
- Important offshore areas considered in decision-making processes
- Number of volunteers for beach cleanup programs
- Number of volunteers for ocean education and outreach programs
- Volunteers for marine animal rescue and rehabilitation

19. Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.

#1

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, August 12, 2016 11:36:57 AM
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PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	High
Habitat Quality (e.g., Species density, Disturbance, Residence time)	Medium
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	High
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	High
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*

Q7: **The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web**

It seems like these could be wrapped into the Biodiversity component.

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	It's helpful that you pulled out Objectives from the plan, and showed which components might inform those objectives. However, it still seems as though the objectives and components are not as tightly coupled as they should be to provide meaningful information to decision makers and the public. For instance, one objective is concerned with "protecting and restoring sensitive habitats." The components listed alongside this objective are the right ones, but the indicators should be more oriented toward reporting on how things are (or are not changing). For example, they should be able to report on things like # of acres restored, # of acres in designated protected area, etc. I think its important to differentiate between what we need to evaluate for an ecosystem assessment, versus what we need to report on via indicators to understand if our management actions are making difference. I think the Puget Sound Partnership does a great job of selecting a handful of indicators that best tell the public story about the state of their Sound. Would be great if New York could have a similarly precise handful of public-friendly indicators.

#2

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, August 12, 2016 1:12:49 PM
Last Modified: Friday, August 12, 2016 1:26:20 PM
Time Spent: 00:13:30

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Low
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Medium
Contaminants and Pollutants	Medium
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Low
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

impacts on native species

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

cycling of dissolved oxygen

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#3

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, August 12, 2016 12:51:13 PM
Last Modified: Friday, August 12, 2016 1:41:06 PM
Time Spent: 00:49:53

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Low
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Low
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Medium
Contaminants and Pollutants	Medium
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

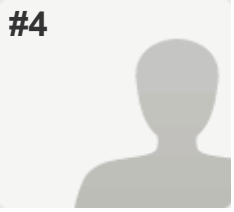
Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, August 15, 2016 3:22:13 PM
Last Modified: Monday, August 15, 2016 3:38:11 PM
Time Spent: 00:15:58

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Medium
Ecosystem Maturity (e.g., Community energetics, Community structure)	Low
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Low
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Low
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Low
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

Please provide any comments about the listed components or provide suggestions regarding additional components that should be considered.
Public Use (e.g. visitation at beaches, recreational fsihing trips, ecostourism activity)

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*

Q8: **The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution**

Habitat types evaluated by some factor of condition/status

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*

Q10: **The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen**

ph or other acidification measure

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

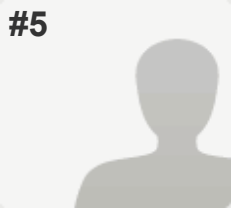
Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

Rather than measure new public access, measure overall public use over time.

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type

Measure of wildlife viewing including whales

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*
Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, August 15, 2016 11:14:11 PM
Last Modified: Monday, August 15, 2016 11:25:26 PM
Time Spent: 00:11:15

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Medium
Ecosystem Maturity (e.g., Community energetics, Community structure)	High
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Low
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Low
Contaminants and Pollutants	Low
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low
Please provide any comments about the listed components or provide suggestions regarding additional components that should be considered. I did this for OCEAN not estuaries or freshwater	

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

Respondent skipped this question

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

Respondent skipped this question

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species

I think you should think of temperature, salinity and other physiochemical properties as habitat or an ecological resource especially for pelagic organisms.

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species

genetic diversity, alpha, beta and gamma diversity

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities

Essential fish habitat is essentially everything.

Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web

Respondent skipped this question

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution

Respondent skipped this question

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

Productivity is a rate. Chlorophyll a is a proxy for biomass of phytoplankton but primary productivity would be a measure of phytoplankton productivity. I don't think of any of these things as indicators of ecosystem productivity, but rather characterizing the base of the food web that ultimately affects upper trophic levels.

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

Oceanic indicators-AMO, GS index, volume of labrador slope water, SST and BT at various spatial scales

Atmospheric indicators-NAO, AO, ENSO, PDO, Icelandic low, azores high, Jet Stream

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Indicators of climate variability-AMO, NAO, AO ENSO, PDO

So many other indicators like wind direction speed, wind and storm events, precipitation, storm tracks

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*
Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#6

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, August 19, 2016 5:22:52 PM
Last Modified: Friday, August 19, 2016 5:45:01 PM
Time Spent: 00:22:09

PAGE 1: Ecosystem Components

Q1: **Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.**

Please provide any comments about the listed components
or provide suggestions regarding additional components
that should be considered.
I feel I do not have enough familiarity with the system and its management goals to effectively rank these.

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*

Q5: **The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species**

I'm not sure how stock status, sustainability, or fisheries closures are indicators of biodiversity.

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution

Respondent skipped this question

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

Also zooplankton assemblages

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

"current speed" is too broad -- exactly which currents are being measured? For example, strength of the Gulf Stream? Or are indicators of vertical current speed important; e.g. for describing upwelling? Similarly the other indicators need to be defined spatially and temporally.

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Also, more broad-scale indicators such as NAO or AMO may be useful

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff

Respondent skipped this question

Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean

Respondent skipped this question

Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue

Respondent skipped this question

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

Respondent skipped this question

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type

Total economic impact of fishing activities, e.g. number of jobs including processors, vendors
How is "ecosystem health" defined or measured? That has an extremely broad range of definitions.

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*
Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	Some of the indicator categories are vague, which makes it difficult to suggest measures that could be representative. For example, "public access" is clear -- it can be increased or reduced, and we can measure that in meaningful ways. But what is meant by "indicators of coastal communities?" A "coastal community" is not something measurable in that it cannot increase or decrease. Specifcally what is meant here... community population growth or coherence? resilience to climate change? aestheic or tourist value? Clarification on what processes we are trying to track would help in identifying indicators to measure these processes.

#7

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, August 22, 2016 12:49:25 PM
Last Modified: Monday, August 22, 2016 1:11:24 PM
Time Spent: 00:21:59

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	Medium
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Medium
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Low
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	High
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	High
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species

species density should include absence of historical species

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: **The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits**

measure of people access (not all sites will have a count but some may)

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#8

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, August 22, 2016 4:03:59 PM
Last Modified: Monday, August 22, 2016 4:21:59 PM
Time Spent: 00:17:59

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	Medium
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	High
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

competition with native species?

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species

relative abundance of invasive species

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

number of harmful algal blooms

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#9

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Tuesday, August 23, 2016 4:05:35 PM
Last Modified: Tuesday, August 23, 2016 4:07:37 PM
Time Spent: 00:02:02

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Medium
Ecosystem Maturity (e.g., Community energetics, Community structure)	High
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	High
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Medium
Contaminants and Pollutants	Medium
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Low
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#10

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Wednesday, August 24, 2016 10:24:40 AM
Last Modified: Wednesday, August 24, 2016 10:35:43 AM
Time Spent: 00:11:03

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	Medium
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Medium
Ecosystem Maturity (e.g., Community energetics, Community structure)	Low
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Low
Climate Indicators (e.g., NAO, AMO, PDO)	Low
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Low
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

Number of native species negatively affected

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

I think there may be several indicators missing here..

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#11

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Thursday, August 25, 2016 10:28:28 AM
Last Modified: Thursday, August 25, 2016 10:50:52 AM
Time Spent: 00:22:24

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Low
Climate Indicators (e.g., NAO, AMO, PDO)	High
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	Medium
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Low
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: **The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern**

Health parameters? (bioaccumulation of toxins in necropsies?

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

pH? Or, since data might not be available, describe ideal distribution of monitoring?

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*

Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue

contaminants in protected species (from necropsy)?

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#12

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Wednesday, August 24, 2016 1:22:09 PM
Last Modified: Thursday, August 25, 2016 1:20:46 PM
Time Spent: 23:58:37

PAGE 1: Ecosystem Components

Q1: **Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.**

Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	High
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	High
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

life history and susceptibility to impacts from inshore/nearshore activities

also, susceptibility to climate impacts

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

climate impacts/ exacerbation?

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

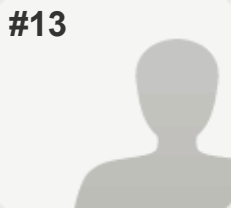
Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, August 26, 2016 1:40:14 PM
Last Modified: Friday, August 26, 2016 1:45:13 PM
Time Spent: 00:04:59

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	Medium
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Medium
Contaminants and Pollutants	Medium
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	High
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

Please provide any comments about the listed components or provide suggestions regarding additional components that should be considered.
I'm not sure this question format really gives much information. This needs further in depth thought and discussion not just a ranking of relative importance which is probably pretty subjective and possibly biased towards what each participant is most interested in/has the most knowledge about.

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

These are all good, but need further discussion. Same with all the others below.

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

same as answer as for biological indicators

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*
Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

same answer as for biological indicators

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*
Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*

Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.

Respondent skipped this question

#14

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, August 29, 2016 10:06:11 AM
Last Modified: Monday, August 29, 2016 11:36:52 AM
Time Spent: 01:30:40

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Low
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	Medium
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	High

Please provide any comments about the listed components or provide suggestions regarding additional components that should be considered.
Some of these, e.g. oceanographic and atmospheric trends, climate indicators and terrestrial inputs are more system drivers than emergent properties (system health indicators), hence their lower ratings by me.

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

Absence in otherwise suitable habitats

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

Ecological niche and potential impact on native species

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species

Functional services provided to the larger ecosystem

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species

Respondent skipped this question

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities

Functional services provided to the larger ecosystem

Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web

Respondent skipped this question

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution

Existence and status of keystone species

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

Respondent skipped this question

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

Ocean acidification indicators (e.g. pH, pCO2, dissolved inorganic carbon, total alkalinity)

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Gulf of Maine "cool pool" water supply on the mid-Atlantic shelf

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff

Respondent skipped this question

Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean

Respondent skipped this question

Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue

Microplastics
Endocrine disrupters
Levels of chemicals of concern in high trophic level protected marine mammals (e.g. dolphins, seals)

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

Respondent skipped this question

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type

Number and areal extent of resource exploitation restrictions based on conservation efforts and non-fisheries human uses

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise

Respondent skipped this question

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation

Respondent skipped this question

Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.

Respondent skipped this question

#15

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, September 02, 2016 2:04:53 PM
Last Modified: Friday, September 02, 2016 2:16:12 PM
Time Spent: 00:11:19

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	Medium
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	Medium
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Medium
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	High
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

What makes it invasive vs. exotic? How is it harming the environment? So, monitor the amount of harm, i.e. area covered by Kudzu....habitat lost for example

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

Salinity

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Salinity - from changes in precipitation, freshwater input

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#16

INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, September 02, 2016 2:20:15 PM
Last Modified: Friday, September 02, 2016 2:33:29 PM
Time Spent: 00:13:14

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	Medium
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	Medium
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	High
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Medium
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Low
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Low
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#17

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, September 02, 2016 3:49:12 PM
Last Modified: Friday, September 02, 2016 3:56:24 PM
Time Spent: 00:07:12

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	High
Climate Indicators (e.g., NAO, AMO, PDO)	High
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Low
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	High
Coastal Communities (e.g., Shoreline population and income)	High
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	High

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern	*Respondent skipped this question*
Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time	*Respondent skipped this question*
Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species	*Respondent skipped this question*
Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species	*Respondent skipped this question*
Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities	*Respondent skipped this question*
Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web	*Respondent skipped this question*
Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution	*Respondent skipped this question*

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom	*Respondent skipped this question*
Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen	*Respondent skipped this question*

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature	*Respondent skipped this question*
Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff	*Respondent skipped this question*
Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean	*Respondent skipped this question*
Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue	*Respondent skipped this question*

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits	*Respondent skipped this question*
Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type	*Respondent skipped this question*
Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	*Respondent skipped this question*

#18

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, September 02, 2016 5:13:46 PM
Last Modified: Friday, September 02, 2016 5:26:53 PM
Time Spent: 00:13:07

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	Medium
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	Medium
Biodiversity (e.g., Species diversity, distribution, density or biomass)	Low
Ecosystem Maturity (e.g., Community energetics, Community structure)	Low
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	Low
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	Medium
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	Low
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	High
Coastal Communities (e.g., Shoreline population and income)	High
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Low

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

Abundance

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

Presence

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species

Acreage

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species

Species diversity

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities

EFH.

Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web

Difficult to measure.

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution

Difficult to measure

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

Ecosystem productivity is more than primary productivity. Need to know how energy passes through system.

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

Temperature salinity DIC nutrients.

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Measured by others GNWI, AMO, NAO

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff

Hydrographs of river flow with temperature and nutrients and contaminants.

Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean

N, P, Si, DIC

Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue

Yes

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

Not my area of expertise. Check NOAA Fisheries Social Indicator Website.

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type

Not my area of expertise. Check NOAA Fisheries Social Indicator Website.

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise

Not my area of expertise. Check NOAA Fisheries Social Indicator Website.

Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation

Not my area of expertise. Check NOAA Fisheries Social Indicator Website.

Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.

Should define purpose and objectives and attach metrics to these.

#19

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Wednesday, September 07, 2016 11:17:38 AM
Last Modified: Wednesday, September 07, 2016 1:52:30 PM
Time Spent: 02:34:51

PAGE 1: Ecosystem Components

Q1: Rank the following components based on their relative importance (high/ medium/ low) for assessing ecosystem health within New York Bight.

Species of Concern (e.g., ESA or MMPA listed species, Species of greatest conservation concern)	High
Invasive Species	Medium
Habitat Quality (e.g., Species density, Disturbance, Residence time)	High
Habitats of Concern (Ecologically rich areas, Canyons, Corals, Migratory corridors, Spawning areas)	High
Biodiversity (e.g., Species diversity, distribution, density or biomass)	High
Ecosystem Maturity (e.g., Community energetics, Community structure)	Medium
Ecosystem Resilience (e.g., Changes in productivity, Dominant species, Demographic parameters)	High
Ecosystem Productivity (e.g., Primary productivity, Indicators of mid-trophic level species, Landings)	High
Oceanographic and Atmospheric Trends (e.g., Temperature, Dissolved oxygen, Sea winds, Tidal height)	Medium
Climate Indicators (e.g., NAO, AMO, PDO)	High
Terrestrial Inputs (e.g., Total river flow, Time of peak river flow)	Medium
Nutrients (e.g.,Levels of N, P, silica in open ocean)	High
Contaminants and Pollutants	High
Public Access (e.g., Annual number of public access sites created)	Medium
Resource-Based Industries (e.g., Gross total income of local fisheries by species)	Medium
Coastal Communities (e.g., Shoreline population and income)	Medium
Ocean Awareness and Engagement (e.g., Number of volunteers for cleanup programs)	Medium

PAGE 2: Biological Components

Q2: The following were discussed in the meeting as indicators of Species of Concern: Presence Abundance estimates Age structure Population trends Bycatch Strandings (marine mammals, sea turtles) Ship strikes (marine mammals) Presence and trends in the number of ESA listed species/ species of greatest conservation concern

Possibly genetic diversity within and between populations, though this may be a lower priority frontier.

Q3: The following were discussed in the meeting as indicators of Invasive Species: Presence Abundance Taxonomy Trends and source of introductions through time

Respondent skipped this question

Q4: The following were discussed in the meeting as indicators of Habitat Quality: Shoreline composition Acreage of usable habitat Abundance Species density Species distribution Residence time of transient species

Need to consider 3 dimensional pelagic habitat envelopes -- think about total volume for key species/ species groups sharing same thermal niches...

Q5: The following were discussed in the meeting as indicators of Biodiversity: Species diversity Resident vs. Migratory species Stock status Sustainability (defined by stock assessment) Landings Fisheries closures Relative abundance of gelatinous species

Most of these don't seem like biod indicators to me. Or if so they are very indirect. Perhaps consider diversity more broadly -- diversity within trophic groupings or feeding guilds, benthic, epibenthic, pelagic.

Q6: The following were discussed in the meeting as indicators of Habitats of Concern (Canyons, Migratory Corridors, and Spawning Areas): Species diversity Essential fish habitat Disturbance Residence time Spatial extent of corals Contact with human activities

Structure -- complex vs. simple. Complex of greater concern.
Natural disturbance regime -- e.g. bottom current energy, surficial sediment stability. Lower natural disturbance, higher concern.

Q7: The following were discussed in the meeting as indicators of Ecosystem Maturity: Ratios of different trophic levels within the ecosystem Number of interactions and complexity of trophic food web

Seems difficult to define and difficult to measure. What are assumptions -- that there are late successional stages and these are desirable? Maybe consider beta-diversity/habitat diversity instead.

Q8: The following were discussed in the meeting as indicators of Ecosystem Resilience: Relative abundance of cold water vs. warm water species Species abundance Species diversity Productivity Age and size structure Distribution

Diversity may be best direct indicator. Also consider functional diversity/redundancy

PAGE 3: Physical and Chemical Components

Q9: The following were discussed in the meeting as indicators of Ecosystem Productivity: Chlorophyll a Annual number of algal blooms Phytoplankton assemblages Timing of the bloom

What about secondary productivity. What about areas where primary productivity is masked/hard to measure because of intense grazing by zooplankton?

Q10: The following were discussed in the meeting as indicators of Oceanographic and Atmospheric Trends: Current speed Tidal height Nearshore/ Offshore temperature Temperature change (year to year, month to month) Dissolved oxygen

pH. Use distribution and size of anomalous areas -- e.g. areas that are recently and persistently different than long term/historical averages.

Might be interesting to look at some measure of winds -- number/intensity of very windy days.

Q11: The following were discussed in the meeting as Climate Indicators: Gulf Stream North Wall Nearshore/ Offshore temperature

Julian dates of "ocean fall" and "ocean spring", etc..they are changing.

Size, shape and temporal dynamics of the cold pool - -the dominant feature in the Mid-Atlantic bight -- the world's most highly stratified ocean region.

Q12: The following were discussed in the meeting as indicators of Terrestrial Inputs: Total river flow Time of peak river flow Marsh elevation Hudson River plume Levels of N, P, Silica Levels of river flow Notable locations and concentrations of runoff

Respondent skipped this question

Q13: The following were discussed in the meeting as indicators of Nutrients: Levels of N, P, Silica, other nutrients of concern in open ocean

Could stratify sampling based on distances from ocean outfalls

Q14: The following were discussed in the meeting as indicators of Contaminants and Pollutants: Levels of contaminants of concern within sediment (nearshore, offshore, deep water) Contaminants of emerging concern (PFOS, PFOA) EPA's sediment metals- Mercury, Cadmium, PAH, PCBs Levels of chemicals of concern within fish tissue

Respondent skipped this question

PAGE 4: Socioeconomic Components

Q15: The following were discussed in the meeting as indicators of Public Access: Annual number of public access sites created Annual number of public access sites enhanced Annual number of new shoreline construction permits

Something about beach tourism -- number of visits/people etc

Q16: The following were discussed in the meeting as indicators of Resource-Based Industries and Communities: Gross total income of local fisheries by species Total annual catch of fisheries by species Total income of offshore development Total area used by offshore development Number of fishing trips Number of saltwater fishing licences Shoreline community income levels Number of vessels transiting in NYB Ecosystem health within fished areas/ types of gear used within fished areas Number and type of oil/chemical spill incidents Abundance of marine debris by type and trends in abundance by type

Respondent skipped this question

Q17: The following were discussed in the meeting as indicators of Coastal Communities: Shoreline population and income Number of towns implementing CRRA Guidance into their laws Housing permits considering sea level rise	*Respondent skipped this question*
Q18: The following were discussed in the meeting as indicators of Ocean Awareness and Engagement: Acceptance by public of alternative structures and laws Number of people taking Ocean Health Management classes Awareness of risks to ocean well-being Important offshore areas considered in decision-making processes Number of volunteers for beach cleanup programs Number of volunteers for ocean education and outreach programs Volunteers for marine animal rescue and rehabilitation	*Respondent skipped this question*
Q19: Please provide any additional comments and suggestions on the workshop, development of the indicators, and suggested next steps below.	Nice work. Suggest focus on identifying and organizing data that's already being collected/readily available. Suggest do not underestimate capacity needs to actually monitor a suite of selected indicators, and publish/use in a meaningful way.

Appendix V. Additional Figures of Survey Results

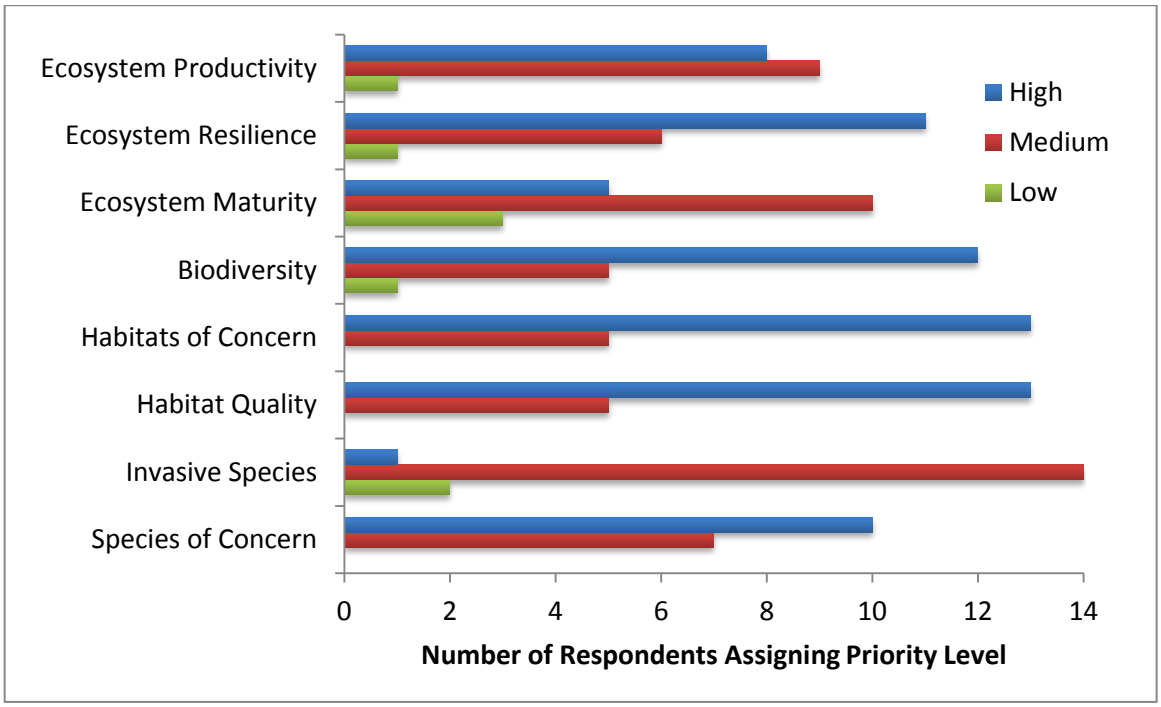


Figure A1. Respondent priority ranking of biological ecosystem components (Note: ecosystem productivity is included as a biological component here although it was grouped as a Physical/Chemical component on the survey).

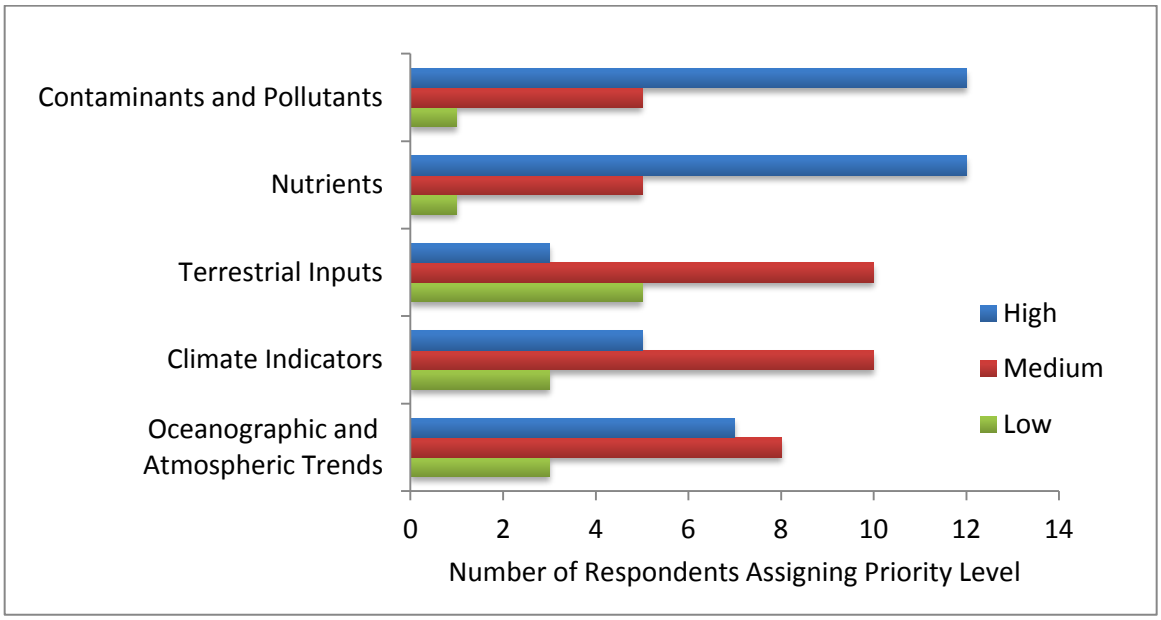


Figure A2. Respondent priority ranking of physical and chemical ecosystem components.

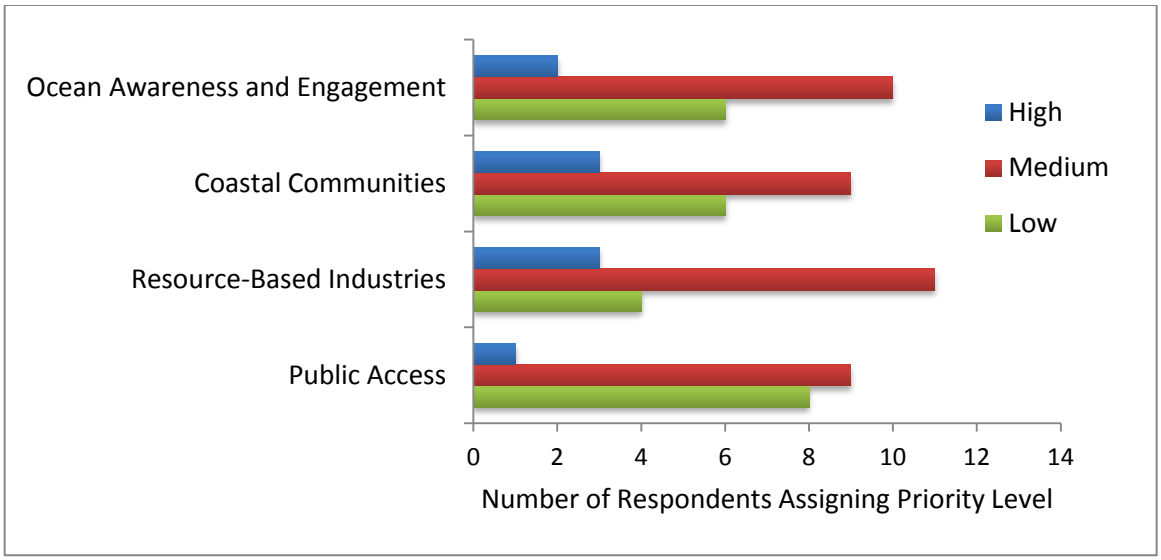


Figure A3. Respondent priority ranking of socioeconomic ecosystem components.