Inland Bays Environmental Monitoring Plan

Marianne Walch
Science & Restoration Coordinator

DELAWARE CENTER FOR THE
INLAND BAYS
Research. Educate. Restore.

July 28, 2017

Purpose:

- Track status/trends of key indicators of eutrophication, habitat modification
- Evaluate effectiveness of CCMP actions
- Guide research, monitoring, and assessment
- Increase integration of work, consolidation of resources

Plan should identify:

- Monitoring needed to track progress toward goals
- Data collected / who's responsible
- Timetable for collecting and reporting monitoring data
- How data are shared and used
- Data gaps
- Additional funding needed

Overview of Plan:

- Introduction
  - Objectives, process, future updates
- Assessment & reporting
  - State of the Bays reports, TMDL, model
- Inventory of existing monitoring programs
- Data management, QA/QC
- Data collection timeline
- Recommendations
- References and appendices

Process:

- Facilitated workshop to discuss ambient WQ programs, needs, coordination
- Questionnaires to key stakeholders
- STAC input
- First draft w/ help from RK&K
- CIB completion of second draft w/ stakeholder help
- Internal CIB review
- Final STAC review and approval ←
- EPA approval

Current Programs

- Surface Water
  - State Ambient WQ Program
  - Citizen Monitoring Program
  - Fecal coliform monitoring
  - DGS/USGS stream & tide gaging
  - State biological assessment of streams
  - National Aquatic Resource Surveys
  - Toxics monitoring
- Living Resources
  - Statewide vegetation/land cover mapping
  - Seaweed monitoring
  - Coastal finfish survey
  - CIB inshore fish/blue crab survey
  - Recreational fishing surveys
  - Hard clam survey
  - HSC survey
  - Breeding bird atlas
  - Mid-winter waterfowl
  - Bals eagle/osprey nesting

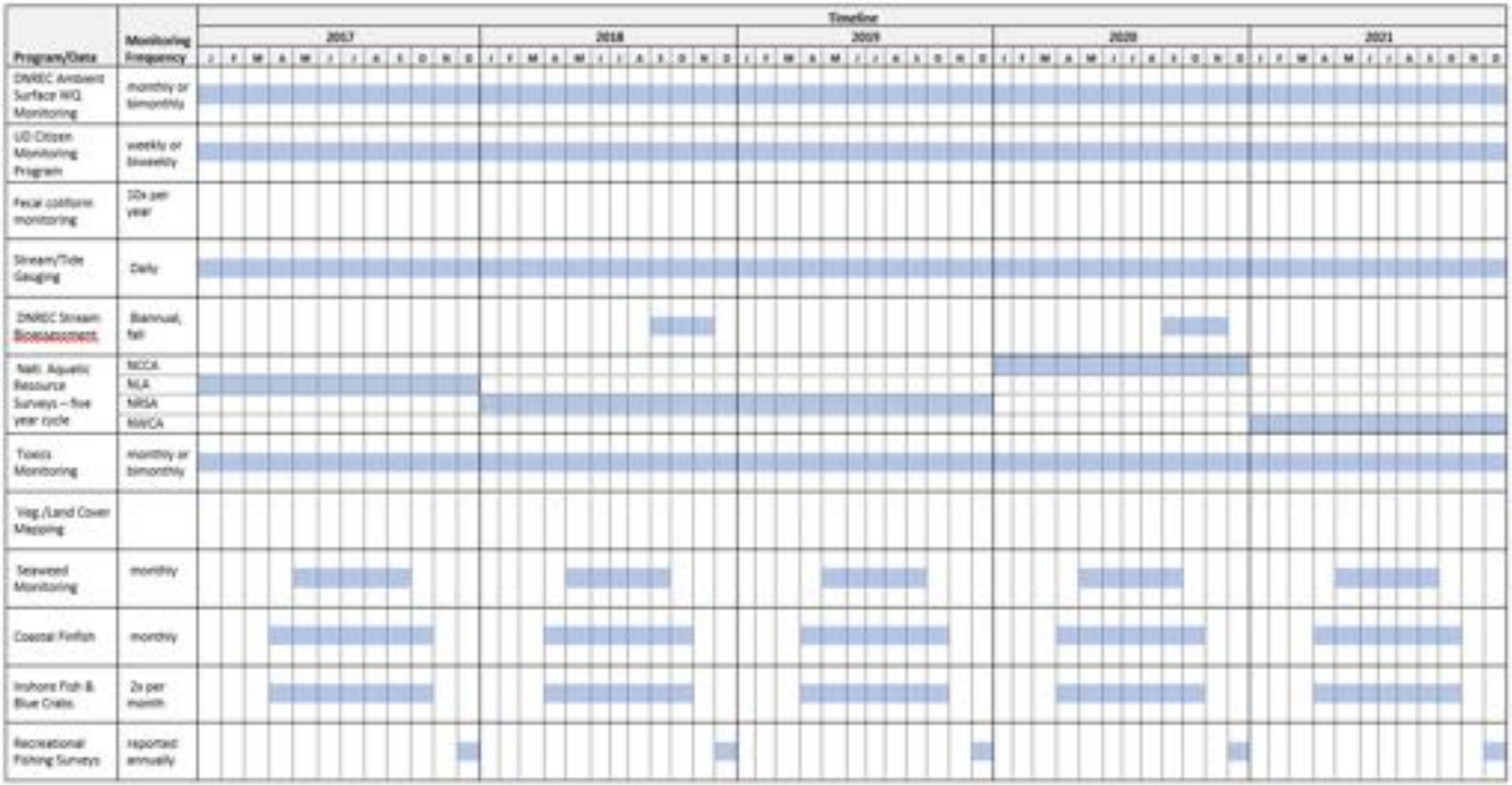
Current Programs

- **Nutrient Loads**
  - Point source discharges
  - Land application of wastewater
  - Nonpoint source discharges
  - Atmospheric deposition
- **Groundwater**
  - DE groundwater monitoring network
  - DE Agricultural shallow groundwater network
- **Wetlands**
  - State wetlands assessment & monitoring program
  - CIB long-term saltmarsh monitoring

Environ. Indicators Table

Indicator	CCMP Objectives Addressed	Data Source	Coverage	Responsible Organization	Contact	Period of Record	Frequency	Notes
WATERSHED CONDITION								
Human Population Growth		Delaware Population Consortium http://stateplanning.delaware.gov/information/dpc_projections.shtml	Sussex County and Inland Bays watershed using Traffic Analysis Zone Population Projections	State of Delaware Office of State Planning Coordination	Constance Holland, AICP, State Planning Director 302-739-3090	2010 - 2040	Every 10 years with a mid point survey	Data are estimates made in 10 year increments. Data for watershed is derived from county data using an ArcGIS analysis
Land Use Change		Delaware First Map Land Use Land Cover Layer	All of Delaware	State of Delaware, Office of Management and Budget, Delaware Geographic Data Committee	N/A	1992 - 2012	Every 5 years	
Impervious Surface Cover		NOAA's C-CAP land use data	Inland Bays watershed	NOAA Coastal Services Center	Andrew Homsey, University of Delaware 302-831-4932	1992 - 2010	Every 4 to 5 years	Andrew Homsey did analysis on the NOAA data. Some data collected 6 years apart, others collected 5 years apart
Average Width of Buffers on Croplands	Managing Living Resources and Their Habitat: Objective 2, Action E	Delaware First Map Land Use Land Cover Layer, National Elevation Dataset, National Hydrography Dataset, Delaware Inland Bays watershed boundary	Inland Bays watershed	CIB	Andrew McGowan, Environmental Scientist 302-226-8105	1992 - 2012	Every 5 years	This data was derived from a tool built for the CIB and the data is generated using the new land use land cover dataset
Salt Marsh Acreage and Condition		Aerial photography, State of Delaware Wetland Maps, and Landsat Thematic Mapper satellite imagery	Inland Bays watershed	Center for Remote Sensing College of Marine and Earth Studies University of Delaware	Y. H. Jo, Center for Remote Sensing, College of Marine and Earth Studies University of Delaware	1938 - 2007	Special Report	This indicator was prepared using a special report written by the Center for Remote Sensing College of Marine and Earth Studies University of Delaware
Natural Habitat Protection and Restoration	Managing Living Resources and Their Habitat Objective 2 Action D.	EPA's National Estuary Program Online Reporting Tool (NEPORT) database http://ofmdev1-epa-ow.attaincloud.com/ple/apex_oeedev/f?p=1321	Inland Bays watershed	EPA NEPORT (data reported from a variety of organizations)		2003-present	Every year	Reliant on partner input
Indian River Inlet Flushing		Coastal Planning Section, Army Corps of Engineers	Indian River Inlet	US Army Corps of Engineers	Jeff Gebert Coastal Planning Section, Army Corps of Engineers, Jeffrey.A.Gebert@usace.army.mil	1939 - 2004	No longer tracked	No future plans for data collection
MANAGING NUTRIENT POLLUTION								
Point Source Pollution		By FOIA request to DNREC Surface Water Discharges Section	Inland Bays watershed	DNREC Surface Water Discharges Section	Glenn Davis, Glenn.Davis@state.de.us 302-739-9946	1990 - present	Daily	
Atmospheric Deposition	Water Quality Management Objective 6 Action B.	National Atmospheric Deposition Program, http://nadp.sws.uiuc.edu/data/sites/siteDetails.aspx?net=AIRMoN&id=DE02	Lewes, DE	National Atmospheric Deposition Program	Bill Ullman, University of Delaware ullman@udel.edu 302-645-4302	1990 - 2015	Yearly	Bill Ullman performed original analysis to determine atmospheric deposition

Data Collection Timeline



Future plan updates:

- Appointment of standing STAC subcommittee
- Biannual review/update of programs, plan, and progress
- Correspond with 305(b)/303(d) reporting

  - Spring 2019
  - Spring 2021

Recommendation 1

High Priority

Development of new hydrodynamic/watershed model

- Brady (2014) - GEMSS is not effective at simulating diel-cycling hypoxia in Inland Bays
- Critical need for a coupled watershed, hydrodynamic, and WQ model for the Bays that uses current and high-frequency data.
- Specific recommendations made in that assessment.

Recommendation 2

High Priority

Upgrade CMP database and serve data to public online through STORET & state Water Quality Portal.

- EPA supplemental grant awarded.
- DEMAC to develop updated, supportable db structure, data ingestion software, and QA/QC reviewer access procedure.
- Automated submission from db to STORET; then ingestion in WQ Portal.
- Eventual conversion of legacy data.

Recommendation 3

High Priority

Continuous monitoring networks for DO/chl deployed in Inland Bays, with focus on tributaries.

- Discrete sampling useful for LT status/trend analyses, but insufficient resolution to detect rapidly changing or cycling conditions, or episodic events.
- Effort should build upon ongoing work, and consider emerging, innovative technologies.
- STAC help guide selection of sites and station configuration.

Recommendation 4

High Priority

Monitor/map of submerged aquatic vegetation in the Inland Bays.

- Data needed to protect any existing SAV beds, and focus restoration to areas where SAV known to survive.
- Technological advances → new options for monitoring and mapping SAV.
- Sparseness is a challenge.

Recommendation 5

High Priority

Monitoring of local indicators of sea level rise, including a flood monitoring network.

- Critical need for monitoring to address how SLR affects and is perceived by the public.
- CFMS expansion to Bays planned, but model doesn't work well here. Development of this tool should be continued and prioritized.
- Water level/flood monitoring network should be permanently installed throughout the Bays.
- Data are needed not only for flood alert tools, but also for development of a new hydrodynamic model for the Inland Bays.

Recommendation 6

Medium Priority

Continue monitoring tidal flushing at the Indian River Inlet.

- LT increase in salinity of the Bays, greater flushing of nutrients from system, ecological impacts.
- Tidal prism calcs ↝ vol. thru inlet, residence time in Bays
- Need for dedicated funding to regularly assess the inlet flushing.

Recommendation 7

Medium Priority

Regular, long-term surveys of oyster populations and recruitment in all three Bays.

- Major goal to restore sustainable population of native oysters in the Inland Bays.
- Oyster restoration/enhancement projects, oyster aquaculture.
- Monitoring of oyster population, distribution, recruitment necessary to evaluate effectiveness of restoration efforts.

Recommendation 8

Medium Priority

Shoreline condition and modification monitoring.

- Living Shoreline Initiative
- VIMS shoreline inventory done for IRB (2006) & RB (2012). No funding to complete or update.
- Shoreline condition database will evaluate success in reducing hardened shorelines and increasing the extent of natural/living shorelines in the Bays.
- Could include citizen science component.

Recommendation 9

Lower Priority

Continue analyses of tidal marsh acreage and condition using GIS methodology established in 2104 RARE study.

- Study documented the areal extent of the marshes 1937 and 2007 using geospatial analyses of aerial imagery and LC data.
- Historic trends in extent of vegetated marsh, fractured pooling, ditching, wetland/upland boundary hardening ☞ indicators of tidal marsh system health.
- Methodology for continued status/trend analysis.

Recommendation 10

Lower Priority

Monitoring of estuary acidification.

- Drivers, patterns, and ecological impacts of acidification in estuaries not well understood.
- Upwelling/overturn, tides, eutrophication, w.s. alteration expected to interact with increasing CO_2 and warming waters in complex ways.
- Other NEPs monitoring LT coastal acidification trends.
- Monitoring needed to understand proton fluxes/balances in Inland Bays.

Recommendation 11

Lower Priority

Monitoring of recreational blue crab and hard clam harvests.

- High priority of DFW for fisheries research in Inland Bays.
- Currently no info on quantity of shellfish landed recreationally.
- Needed to assess the health and status of populations & better account for recreational harvest in management.

Next steps:

- Corrections, missing information needed immediately.
- STAC approval, send to EPA.
- Goal is to implement plan.
- Establish subcommittee/procedures for oversight and review.