Delaware Center for the Inland Bays
Scientific and Technical Advisory Committee Meeting

July 26, 2019 - 9:00 AM to 12:00 PM
DNREC Lewes Field Facility

Attendees:

STAC MEMBERS	CIB STAFF	OTHER
Scott Andres, Chairman	Marianne Walch	Aaron Givens
Susie Ball	Bob Collins	Mke Duffy
Ed Whereat	Michelle Schmidt	Mark Nardi
Sergio Huerta	Andrew McGowan	Nayani Vidyarathna
Jen Volk	Neil Keller	A. G. Robbins
Chris Main		George Dellapetra
Ellen Dickey		Ashley Tabibien
Ed Hale		Stacey Flood
Richard Watson, Secretary		Caitlynn Mitchell
		Karey Tiedeman
		Ben Anderson
		Glenn Christman
		Kate Fleming
		Andrew Wozniak
		Addie Best
		Nicole Minni
		Drexel Siot

The Meeting was called to order at 9:05 AM by Chairman Scott Andres

STAC Announcements – Dr. Scott Andres – Scott announced that he is stepping down as Chairman of STAC and that Jen Volk will be moving from Vice Chairman to Chairman starting with the next meeting. Anyone interested in the vacated Vice Chairman position should contact Marianne Walch.

CIB Announcements – Dr. Marianne Walch

Bunting Branch DE/MD: Fish Passage Restoration While Maintaining the Old Mill Pond – Roman Jesien, Maryland Coastal Bays Program

This presentation described the construction of an innovative 600-ft regenerative stream channel (RSC) at the head of tide in Bishopville, Maryland. At the insistence

of local residents, a major portion of the 4-acre pond was maintained upon modification of the 4-ft sheet metal dam. The dam was replaced with a series of four riffles and step pools that raised each water level by 1-ft over a distance of 30 ft. Completed in December 2014, monitoring over the past five years documents the consistent passage of alewife and white perch to over 7 miles of freshwater streams in the St. Martin's River System.

The goals of the project were to provide both fish passage for targeted fish species such as alewife and system resilience by improving connectivity to the floodplain, connectivity to the headwaters and a free flowing river to the ocean. The RSC was invented and patented by Keith Underwood and has been used at a number of locations. This is the first time that it has been applied to a dam.

The RSC is a parabolic shaped system of riffles designed to spread the water surface and decrease erosive forces. It was originally designed for stormwater conveyance, this was an innovative application at Bishopville.

A bank-full channel does not achieve the goals of reducing sediment and nutrient loads. The regenerative approach to stream restoration, where appropriate, creates a base-flow channel near the top of the bank that maximizes the stream's connection to the floodplain. Ecological benefits include:

1. Traps sediment;
2. Processes nutrients and pollutants;
3. Raises groundwater elevation and hydrates the floodplain;
4. Creates habitat for native floodplain vegetation including RTE targeted species;
5. Increases aquatic habitat;
6. Provides summer low flow refugia;
7. Attenuates Stormwater discharges; and
8. Mimics a natural beaver dam complex.

Roman stated that the design is similar to "Nature-like passage" but improved.

Roman then described the design for both the Bishopville Dam Project and the proposed Big Millpond Project. The Bishopville Dam design criteria is as follows:

1. 93 feet steel sheeting set in concrete apron,
2. There is 7 mi of freshwater upstream of the dam site,
3. The site drains 12 square miles of watershed,
4. Salinity is < 15 ppt below dam, ~ 0.2 ppt above dam,
5. Dam at that location since at least 1870,
6. Current dam built in 1959,
7. Dam height 4 feet, and

8. 4 acre pond.

The Big Mill Pond has the following design criteria:

1. 18 feet of steel sheeting and wood,
2. 5 miles of freshwater upstream,
3. 8 sq mi watershed,
4. Tidal freshwater below dam;
5. Dam at that location since late 1800's
6. Current dam built ~ 1930's,
7. Dam height 3 ft, and
8. 50 acres pond.

Roman noted that American eels occur upstream of the dams. No other anadromous species occur upstream. The target species for the study included:

1. Alewife Alosa pseudoharengus,
2. Blueback herring Alosa aestivalis,
3. White perch Morone Americana
4. Gizzard shad Dorosoma cepedianum
5. Hickory shad Alosa mediocris

Roman then reviewed several photographs and maps of the project area. He indicated that the plan was to combine the regenerative stream channel with a fish passage. At the Bishopville site, most of the construction was above the dam; at the Big Millpond site it will be primarily downstream of the dam. He also noted that there was a Bald Cypress grove downstream of the dam.

The construction sequence of the Bishopville Dame RSC was as follows:

1. The break in the dam allowed for the slow release of the water;
2. Once the pond was dewatered, a pipe was installed to allow the passage of the base-flow;
3. The haul road was constructed which would allow construction of the berms and riffles;
4. The riffles were then installed;
5. The stream was confined to the old stream channel below the dam;
6. The first tidal weir was then constructed;
7. Sheetpiles were cut down; and
8. Material removed where needed.

The completed project can be summarized as follows:

1. The first four weirs were completed in December 2014 with the fifth weir completed in February 2016.
2. There was 246 feet of non-tidal stream channel length completed and 355 feet of tidal pools completed for an overall project length of 601 feet.
3. The existing pond was modified from 4 acres to 3.2 acres in size and a total of 0.5 acre of wetlands was created.
4. A total of 1,000 Atlantic white cedar trees and 200 Bald Cypress trees were planted.
5. No phragmites established at the project site.
6. The total cost of the project was $1,500,000.

Roman then discussed the results to date of the five year monitoring program that is being conducted. The following fish were collected:

Alewife	Alosa pseudoharengus	217
Gizzard Shad	Dorosoma cepedianum	315
White Perch	Morone americana	289
Black Crappie	Pomoxis nigromaculatus	131
Bluegill	Lepomis macrochirus	282
Brown Bullhead	Ameiurus nebulosus	175
Creek Chubsucker	Erimyzon oblongus	119
Golden Shiner	Notemigonus crysoleucas	43
Largemouth Bass	Micropterus salimoides	15
Pumpkinseed	Lepomis gibbosus	39
Striped Bass	Morone saxatilis	1
American Eel	Anguilla rostrata	1
Total		1627

Roman also provided information on the number of turtles collected by Fyke Net during the monitoring program:

1.	Painted Turtle	75
2.	Snapping Turtle	51
3.	Red Bellied Cooter	9
4.	Musk Turtle	6
	Total Turtles Collected	141

Roman concluded by stating that the site has become an area for anglers, birders, and nature lovers to enjoy and that it is regularly used for outreach and nature education programs.

Questions

1. **What was the total cost of the project and who paid for it?** The total project cost was $1,500,000 and it was paid for by the USFWS, USEPA and Maryland Coastal Bays Program.
2. **Were there system efficiency studies performed?** There were electroshock sampling and some fish were found in the weirs. However, since there was such a small number of fish passing at random times, it was considered too difficult to perform efficiency studies.
3. **What were the details of the monitoring program?** Roman commented that they are monitoring yearly and that he was not sure if a problem existed with the Gizzard Shad. They haven't seen any small fish as yet and suggested that the low water levels may have caused some of the problems.
4. **Will system work long term?** The system is self maintaining and was designed to seek its own level and not change its natural path. The overall design intent was that the system would conform with nature and have minimal slopes.
5. **What was the dam constructed of?** Steel sheeting with some areas exposed to air water interface (potential rusting).
6. **What were the technical and social challenges and what was done to get "buy-in"?** There were a number of meetings held with agencies and local homeowners during which the design benefits and low impact concept were emphasized.
7. **Could one homeowner have stopped the project?** One homeowner did in fact prevented the project from being raised an additional foot due top the potential volume impact.

8. **Any indication that downstream water quality has changed?** More algae have been observed but no way to connect to the project. No HAB have been observed coming downstream although there are still fish kills in lower river. The DO in the pond has increased.
9. **Was there reuse of the excavated soil materials during construction? Was there an increase in the phosphorus released downstream?** Some soils were reused during construction and phosphorus was not monitored.
10. **How long will monitoring continue?** Five years was required but may continue after that.

There was a general discussion about DCIB's efforts in the Inland Bays. Efforts are being made to get approval to construct similar designs for Millsboro Pond and Burton Pond. Unfortunately, we can't get state support due to the potential recreational fishing impact on gizzard shad. Efforts are continuing on securing funding and approvals for Burton's Pond.

Effects of climate change on physiology of HAB species in the Delaware Inland Bays and Its consequences on Trophic Transfer, Nayani Vidyarathna, University of Delaware

Shifts in global temperature as well as carbon dioxide are expected to have potentially profound effects on phytoplankton communities, with possible cascading consequences for marine food webs. Dr. Vidyaranthna discussed how the atmospheric CO2 level has been rising due to industrial atmospheric discharges and how projections indicate that the increased CO2 levels (as high as 1000 ppm by the year 2100) will lead to increased global warming (1.5 to 4.5 degrees C).

Dr. Vidyaranthna reviewed her recent studies which were conducted on two years data. She discussed how the increased atmospheric CO2 concentration leads to ocean acidification (0.3-0.4 pH drop). This causes shell dissolution eliminating shell structure particularly for microorganisms. The food chain would therefore be impacted from the bottom up. On the other hand, global warming favors the growth of Harmful Algal Blooms (HAB) such as CyanoHABs. In addition, global warming increases the temporal window for bloom formation; she cited the example of Alexandrium catenella. She also noted that the ocean warming has expanded the niche of toxic algal blooms in the North Atlantic and North Pacific. She indicated that the ocean acidification actually increases the growth and cell toxicity of some HAB species.

With respect to temperature effects of species within Delaware Inland Bays, she posed the following questions:

1. Are the thermal niche and T_{opt} of the three species similar?
2. How does cell toxicity change with temperature and growth?

With respect to temperature, Dr. Vidyaranthna indicated that the three predominant HAB species in the Inland Bays had different T_{opt} and that C. subsalsa was the most resilient to warming temperatures. She then presented data on the species abundance in the Inland Bays based upon data by the University of Delaware Citizen Monitoring Program. She also presented data on the temperature effects on HAB toxicity.

Dr. Vidyaranthna then posed the question "what about high temperature and high CO_2 concentration"? Her research is addressing the following primary questions:

1. Could Climate Change potentially increase the magnitude of K. veneficum blooms?
2. How does Climate Change influence the physiology of K. veneficum and the copepod A. tons?
3. What are the consequences of shifts in algal physiology on trophic transfer?

Dr. Vidyaranthra briefly described the experimental procedures used and described their other findings:

1. Cell growth increased slightly and primary productivity increased under climate change conditions;
2. There were no significant changes in biochemical composition between ambient and long term Climate Change conditions;
3. The %SAFA decreased and the %MUFA increased under long term Climate Change conditions;
4. The % n3 FA including EPA and DHA increased under long term Climate Change conditions; and
5. K. veneficum toxicity increased such that significantly higher fish gill cell mortality increased under Climate Change conditions.

For acclimated copepods, the following was found:

1. Grazing rates declined under Climate Change conditions;
2. Egg production was reduced but hatching success remained unchanged under Climate Change conditions; and
3. Total Fecundity was reduced.

In summary, Dr. Vidyaranthna stated that to avoid Climate Change impacts, we must keep average temperature increases below 1.5 degree C and have a 45% decrease in net anthropogenic CO2 emissions by 2030.

Questions

1. **Did you consider increasing Temperature with extreme salinity gradient?** Not yet since it would be very difficult to do.

2. **Why do models not match thermal maximum?** The models were developed to determine the trends and do not always "see" the highest peaks.
3. **How well did model fit?** Dr. Vidyaranthna can provide the data after the meeting.
4. **Were there any results on bloom formation for non-HAB?** Some studies were conducted but none recently. The focus has been primarily on HAB.
5. **Has there been any data verification based upon sampling?** They are trying to get more data. Most data has been collected through Ed Whereat's Citizen Scientist program and is biased toward residential areas.
6. **In warmer years, do you see increased bloom window?** Not sure since there are a lot of caveats. If interested, she suggested that you contact Ed Whereat to look at the data collected.

A general discussion on data collection followed.

Update on Summer 2019 status of Inland Bays algal blooms, macro-algae, and bay-grasses

There was a general discussion on algal blooms in the Inland Bays.

1. They were unable to sonde at Wharton's Bluff.
2. The DO reached 4 mg/L but did not bottom out.
3. Another mahogany bloom occurred near the power plant but was not as bad as last year's bloom (rainfall was more normal this past year).
4. Algae density was not as high as previous years.
5. No reports of dead crabs so far this year (Ed Whereat).
6. Micro-algae levels were way down this year and the water was more turbid which may be the reason for the decrease in macro-algae.
7. There was a discussion about seagrass and SAV plantings.
8. There were resident complaints about the levels of sea foam and brown foam.

Update on Mountaire Groundwater Discharges Status

There is currently ongoing litigation between DNREC, Mountaire and private citizens. The primary issue is whether the private individuals have standing. DNREC and Mountaire are trying to reach agreement on a proposed consent order. The main concern is that the main lagoon iOS not functioning properly and may overflow.

Update on Abandoned Crab Traps

DCIB is currently seeking funding and partners to work on this projet. DCIB will be working with DNREC on locating abandoned traps.

Bay Modelling Efforts

A white paper is being developed for presentation to the Board of Directors in September. STAC Members should review this document when it is issued. It is the intent to make this document a "living document" which can be easily updated as new monitoring data is obtained.

State of the Bays Report

The next State of the Bays Report is due by Fall 2021 and therefore work needs to begin in preparing this document. A STAC subcommittee will be formed to assist the DCIB in preparation of this document.

DCIB Gala will be held September 27, 2019 at the Dewey Beach Hyatt.

Chairman Andres adjourned the meeting at 12:00PM

Upcoming 2019 STAC Meeting Dates November 1, 2019