Baseline Characterization of a Deteriorating Wetland Community in the Deal Island Impoundment, Lower Eastern Shore, Maryland

Chesapeake Bay National Estuarine Research Reserve Maryland

Maryland Department of Natural Resources

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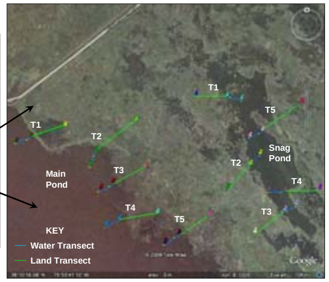
The Deal Island Impoundment is a 2,800 acre man-made "pond" built in the 1960's within the Deal Island Wildlife Management Area of the Lower Eastern Shore of Maryland. This impoundment consists of large expanses of tidal marsh, frequently broken by open water, forming ponds. These ponds are often colonized by submerged aquatic vegetation (SAV), which provides food to waterfowl. Over the past 20 years, changes have been observed in the impoundment including increased water levels and flooding, marsh vegetation decline, and decrease of SAV species diversity. In an effort to characterize and monitor changes on the impoundment's wetland community, transects and plots were established along the water-marsh interface of two ponds within the impoundment, Main and Snag Ponds. Baseline data on water quality, species diversity and abundance was collected during the fall of 2008 and will continue as a long-term monitoring effort. Preliminary results show *Ruppia maritima* as the dominant SAV species in both Main and Snag Ponds. Dominant marsh species in Main Pond included *Spartina alterniflora*, *S. patens*, *Distichlis spicata*, and *Pluchea purpurascens*. *S. patens*, *D. spicata*, *Hibiscus moscheutos*, and *P. purpurascens* were dominant in Snag Pond. Water quality and other parameters of the wetland community were analyzed in this characterization of the Deal Island Impoundment.

STUDY SITE:

Deal Island Impoundment, Maryland Eastern Shore



METHODS:

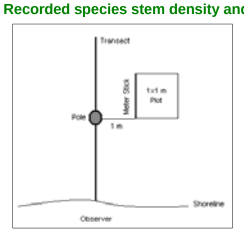
Sampled water quality, emergent vegetation, and submerged aquatic vegetation (SAV) within two ponds: Main Pond and Snag Pond

Water Quality:

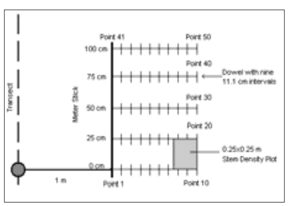
- Physical Parameters – measured at all water quality plots using a YSI Meter
  - Dissolved oxygen (mg/L)
  - Temperature (°C)
  - Conductivity (mS)
  - Specific conductance (mS)
  - Salinity (ppt)
  - pH
- Chemical Parameters – measured only at two of the water quality plots
  - TSS – TVS (mg/L)
  - Chlorophyll a
  - Total nitrogen (mg/L)
  - Total phosphorus (mg/L)
  - NH4, NO2, NO3 (mg/L)

Emergent Vegetation:

- Five transects per pond; 100 m in length; plots at 20 m increments
- Vegetation and substrate were characterized using the Point Intercept Method (Roman et al. 2001)
- Recorded species stem density and maximum heights



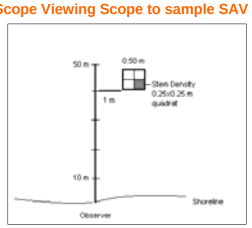
Emergent Vegetation Transect Diagram



Emergent Vegetation Plot Diagram, Point Intercept Method

SAV:

- Five transects per pond; 50 m in length; plots at 10 m increments
- Used a 0.25 m^2 PVC quadrant and Aqua Scope Viewing Scope to sample SAV
- Information gathered:
  - Species presence
  - Total percent cover (Paine 1981)
  - Individual species percent cover
  - Species stem density
  - Species maximum height
  - Presence of epiphytes and sediments on leaves



SAV Transect Diagram

RESULTS:

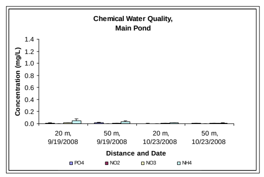
Water Quality:

	Main Pond		Snag Pond	
PARAMETER	9/19/2008	10/23/2008	10/3/2008	10/23/2008
Depth (m)	0.3 ± 0.0	0.4 ± 0.0	0.4 ± 0.0	0.4 ± 0.0
Salinity (ppt)	18.5 ± 0.1	20.6 ± 0.03	19.0 ± 0.05	24.2 ± 0.08
Temperature (°C)	21.5 ± 0.36	11.7 ± 0.4	18.7 ± 0.5	11.9 ± 0.3
Dissolved Oxygen (mg/L)	7.8 ± 0.4	8.8 ± 0.1	7.7 ± 0.2	8.8 ± 0.2
pH	8.2 ± 0.03	7.8 ± 0.03	7.4 ± 0.1	6.9 ± 0.1

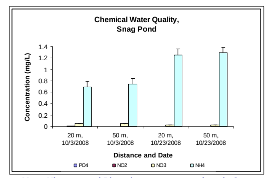
Mean Physical Water Quality Parameters, Deal Island Impoundment

	Main Pond		Snag Pond	
PARAMETER	9/19/2008	10/23/2008	10/3/2008	10/23/2008
PO_4 (mg/L)	0.0107 ± 0.0040	0.0041 ± 0.0007	0.0036 ± 0.0005	0.0027 ± 0.0001
NO_3 (mg/L)	0.0129 ± 0.0021	0.0067 ± 0.0016	0.0488 ± 0.0012	0.0257 ± 0.0007
NO_2 (mg/L)	0.0008 ± 0.0002	0.0004 ± 0.0001	0.0043 ± 0.0004	0.0028 ± 0.0002
NH_4 (mg/L)	0.0400 ± 0.0164	0.0117 ± 0.0013	0.7174 ± 0.0667	1.274 ± 0.0642
TP (mg/L)	0.1003 ± 0.0063	0.0974 ± 0.0041	0.0865 ± 0.0098	0.0311 ± 0.0076
TN (mg/L)	2.2 ± 0.09	1.8 ± 0.04	2.0 ± 0.05	1.7 ± 0.04
Chl a (µg/L)	21.4 ± 1.94	21.7 ± 1.78	94.2 ± 8.32	82.3 ± 9.55
TSS (mg/L)	765.8 ± 61.54	137.1 ± 31.12	345.3 ± 104.08	257.1 ± 31.87

Mean Chemical Water Quality Parameters, Deal Island Impoundment

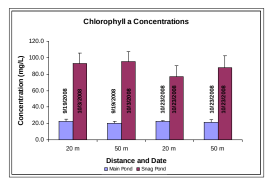


Mean Nitrogen and Phosphorus concentrations in Main Pond; samples collected in September and October



Mean Nitrogen and Phosphorus concentrations in Snag Pond; both collections occurred in October

Preparing chemical water quality samples, Snag Pond



Mean Chlorophyll a concentrations in Main Pond and Snag Pond; sample collection dates vary

- Salinity and temperature can change rapidly in short periods of time (result of shallow environment)
- Good dissolved oxygen conditions observed
- High Chlorophyll a concentrations could correlate with the high NH_4 concentrations in Snag pond

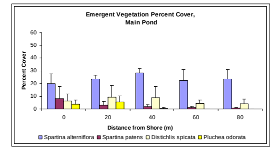
SAV:

Setting the SAV plots

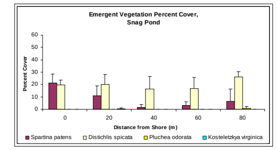
Estimating total SAV cover

- Dominance of *Ruppia maritima* (Widgeon Grass); 0-35 ppt salinity tolerance
- Current salinity values do not seem to be a limiting factor for SAV
- Need more data on SAV to better determine temporal and spatial species patterns

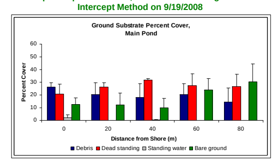
Emergent Vegetation:



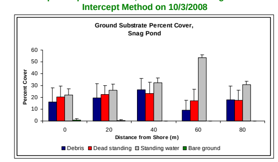
Species percent cover; data collected using Point Intercept Method on 9/19/2008



Species percent cover; data collected using Point Intercept Method on 10/3/2008

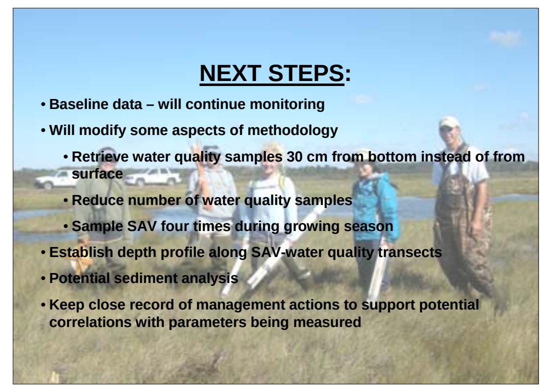


Ground substrate and dead standing vegetation percent cover; data collected using Point Intercept Method on 9/19/2008



Ground substrate and dead standing vegetation percent cover; data collected using Point Intercept Method on 10/3/2008

- *Spartina alterniflora* dominated in Main Pond; *S. alterniflora* not present in Snag Pond
- *Distichlis spicata* and *S. patens* dominated in Snag Pond
- Larger percentage of standing water in Snag Pond could be an indicator that the marsh is breaking up



NEXT STEPS:

- Baseline data – will continue monitoring
- Will modify some aspects of methodology
  - Retrieve water quality samples 30 cm from bottom instead of from surface
  - Reduce number of water quality samples
  - Sample SAV four times during growing season
- Establish depth profile along SAV-water quality transects
- Potential sediment analysis
- Keep close record of management actions to support potential correlations with parameters being measured

REFERENCES:

Paine, David P. (1981) *Aerial Photography and Image Interpretation for Resource Management.* John Wiley & Sons, Inc., New York City, NY. 571 pp.

Roman, C.T., M. James-Pirri, and J.F. Heltshe (2001) *Monitoring Salt Marsh Vegetation*. USGS Patuxent Wildlife Research Center.

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