Photo: Oyster Recovery Partnership

Expert Panel Report on Oyster BMP for Restoration & Harvest

Watershed Technical Workgroup

April 6, 2023

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Oyster Recovery Partnership

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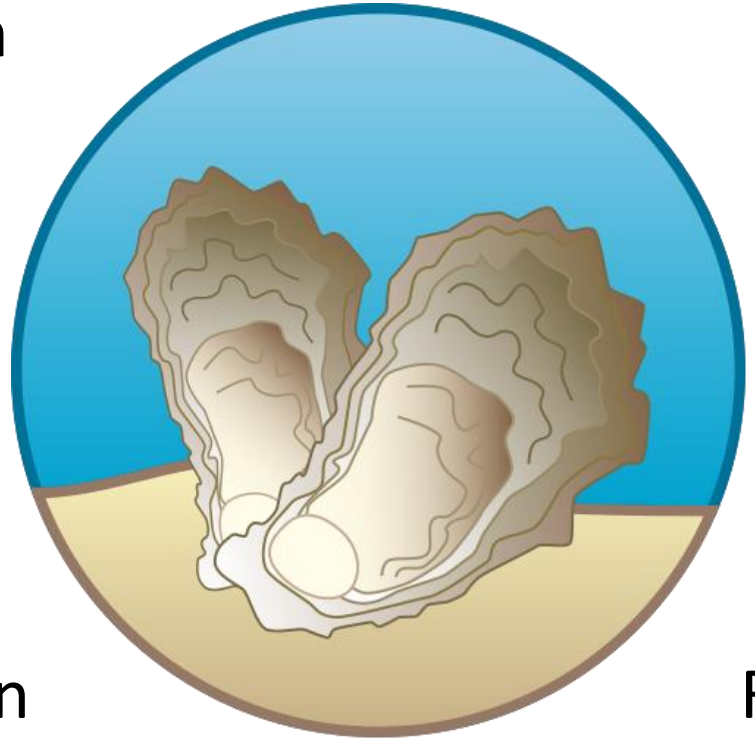
Chesapeake Bay Program
Science. Restoration. Partnership.

Elements of the Oyster BMP Toolset

Aquaculture-Assimilation
Approved



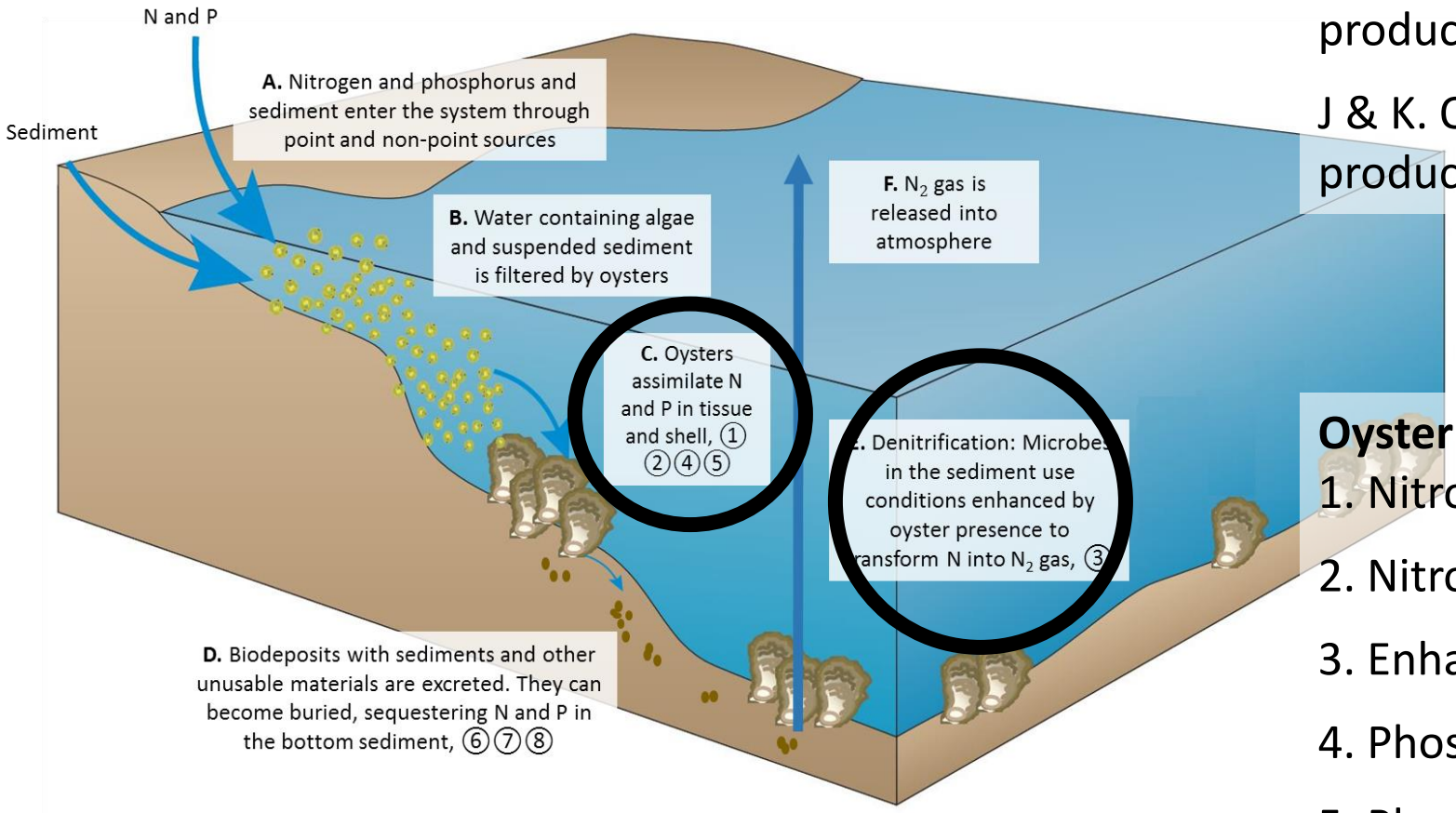
Harvest-Assimilation
Under Review

Restoration-Denitrification
Under Review

Restoration-Assimilation
Under Review

Graphic: UMCES Integrated Application Network

Recommended Practices & Protocols



Oyster Practices

F. Licensed oyster harvest using hatchery-produced oysters

J & K. Oyster reef restoration using (J) hatchery-produced oysters & (K) substrate addition

Oyster Protocols

1. Nitrogen Assimilation in Oyster Tissue
2. Nitrogen Assimilation in Oyster Shell
3. Enhanced Denitrification
4. Phosphorus Assimilation in Oyster Tissues
5. Phosphorus Assimilation in Oyster Shell

Harvest-Assimilation

Practice: Licensed oyster harvest using hatchery-produced oysters

- **Oyster tissue biomass** is used to estimate removal of N & P
- Total N & P removed depends on oyster harvest size
- Challenging to assess baseline biomass
- The Panel developed strict qualifying conditions outlining (1) how many and (2) when oysters can be harvested

Table K.1 (*Table 6.3 in report*)**.** Default nutrient reductions in pounds per one million harvested hatchery-produced oysters. Oyster size class based on shell height measurements.

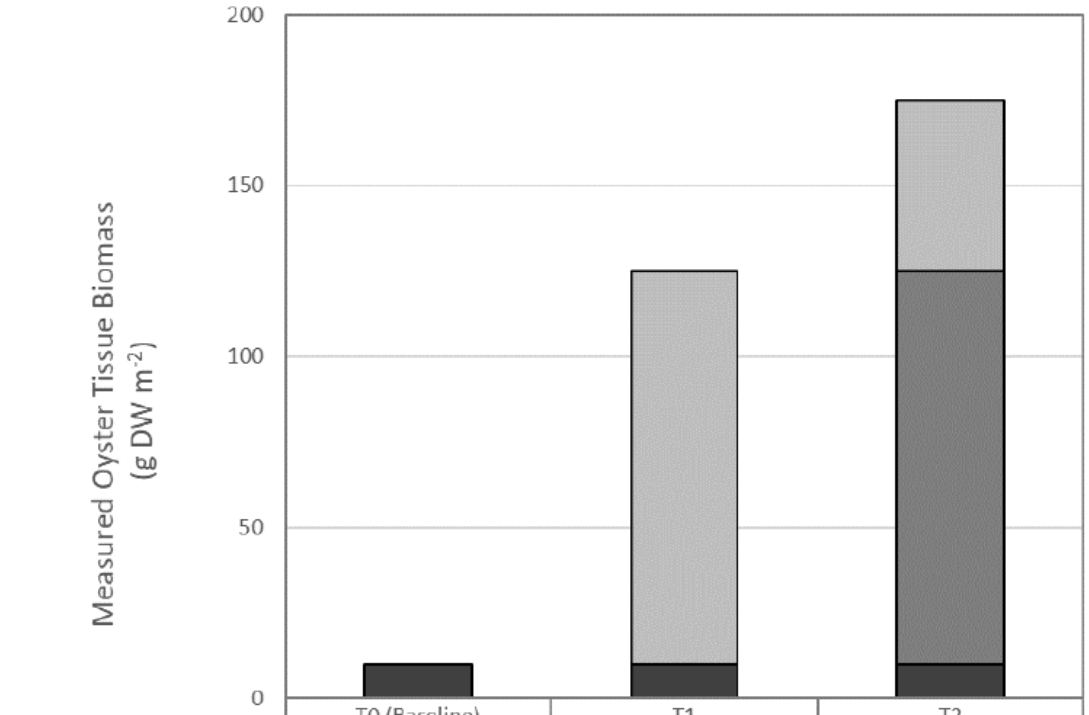
BMP Name	Oyster size class (in)	Nitrogen (lbs./million oysters)	Phosphorus (lbs./million oysters)
Diploid Licensed Oyster Harvest, Hatchery Produced 3.0 Inches	3.00-3.49*	198	22
Diploid Licensed Oyster Harvest, Hatchery Produced 4.0 Inches	3.50-4.49	331	44
Diploid Licensed Oyster Harvest, Hatchery Produced 5.0 Inches	4.50-5.49	485	44
Diploid Licensed Oyster Harvest, Hatchery Produced >5.0 Inches	≥ 5.50**	683	66
Diploid Licensed Oyster Harvest, Site-Specific Monitored	N/A	N/A	N/A

* Adjusted from 2.5-3.49. See text for details.
** Based on midpoint of 6.0 inches

Restoration-Assimilation

Practices: Oyster reef restoration using hatchery-produced oysters & substrate addition

- **Oyster tissue & shell biomass** are used to estimate removal of N & P
- Net removal at reef-scale occurs if oyster biomass is stable or increasing
- Only **appreciated biomass** is credited
- Credit can be received **incrementally** when biomass is assessed



	T0 (Baseline)	T1	T2
Eligible Appreciated		115	50
Non-eligible Appreciated		0	115
Baseline	10	10	10

Restoration-Enhanced Denitrification

Practices: Oyster reef restoration using hatchery-produced oysters & substrate addition

- **Oyster tissue biomass** is used to help estimate removal of N and N_2 under different conditions
- Default rates apply to subtidal reefs restored with small substrate
- Denitrification is an ongoing process, credit is continuous
- Post-restoration tissue biomass > baseline

Enhanced Nitrogen Removal (lbs acre^{-1} yr^{-1})		*Post-restoration Oyster Biomass Range (g DW m^{-2})*												
		15 - 24.9	*25 - 34.9*	*35 - 44.9*	*45 - 54.9*	*55 - 64.9*	*65 - 74.9*	*75 - 84.9*	*85 - 94.9*	*95 - 104.9*	*105 - 114.9*	*115 - 124.9*	*125 - 134.9*	*135 - 144.9*
Baseline Oyster Biomass Range (g DW m^{-2})	*0 - 14.9*	29	51	74	97	120	143	165	169	172	176	179	183	186
	15 - 24.9		23	46	68	91	114	137	140	144	147	151	154	158
	25 - 34.9			23	46	68	91	114	118	121	124	128	131	135
	35 - 44.9				23	46	68	91	95	98	102	105	109	112
	45 - 54.9					23	46	68	72	75	79	82	86	89
	55 - 64.9						23	46	49	53	56	59	63	66
	65 - 74.9							23	26	30	33	37	40	44
	75 - 84.9								3	7	10	14	17	21
	85 - 94.9									3	7	10	14	17
	95 - 104.9										3	7	10	14
	105 - 114.9											3	7	10
	115 - 124.9												3	7
	125 - 134.9													3

Comments on Tech Appendix – All Practices

- Specify whether measurements are Optional vs. Required
- Specify whether measurements are Parent vs. Child
- Concerns about report accuracy if need multiple pieces of information
- Define measurement names

- Related question from general report review – Uncertainty in reduction estimates
  - Are they included in model? Required? How handled?

Comments on Tech Appendix – Licensed Harvest

- Specify units – millions of oysters or oysters?
- Specify whether diploid or triploid in BMP names

Comments on Tech Appendix – Restoration

- Specify units for “site area” – acres
- Need to clarify what needs to be collected and reported during the year of post-restoration biomass assessment
- Need to clarify if the year or years are needed

Revised Reporting Structure

Licensed Harvest

- BMP Name: Select from list in Table K.1
- Measurements
  - Required (Parent) – Oysters harvested OR Millions of oysters harvested, Unit = count
  - If site-specific
    - Required (Child) – lbs TN, Unit = lbs
    - Required (Child) – lbs TP, Unit = lbs
- NEIEN geographic site, hydrologic code, state
- Year eligible oysters are harvested

Table K.1 (*Table 6.3 in report*)**.** Default nutrient reductions in pounds pe
produced oysters. Oyster size class based on shell height measurement

BMP Name	Oyster size class (in)	Nit (lbs./mill
Diploid Licensed Oyster Harvest, Hatchery Produced 3.0 Inches	3.00-3.49*	
Diploid Licensed Oyster Harvest, Hatchery Produced 4.0 Inches	3.50-4.49	
Diploid Licensed Oyster Harvest, Hatchery Produced 5.0 Inches	4.50-5.49	
Diploid Licensed Oyster Harvest, Hatchery Produced >5.0 Inches	≥ 5.50**	
Diploid Licensed Oyster Harvest, Site-Specific Monitored	N/A	

* Adjusted from 2.5-3.49. See text for details.
** Based on midpoint of 6.0 inches

Revised Reporting Structure

Restoration-Assimilation

- BMP type/name: Oyster reef restoration – assimilation
- Measurements
  - Required (Parent) – site area, Unit = acres
  - Required (Child) – lbs TN, Unit = lbs
  - Required (Child) – lbs TP, Unit = lbs
  - Optional (Child) – appreciated oyster tissue and shell biomass, Unit = lbs
  - Optional (Child) – no. of structures, Unit = count
- NEIEN geographic site, hydrologic code, state
- Year of post-restoration biomass assessment in which oyster tissue and shell biomass appreciated

Restoration-Denitrification

- BMP type/name: Oyster reef restoration – enhanced denitrification
- Measurements
  - Required (Parent) – site area, Unit = acres
  - Required (Child) – lbs TN, Unit = lbs
  - Optional (Child) – annual reduction from enhanced DNF, unit = lbs
- NEIEN geographic site, hydrologic code, state
- Year annual enhanced DNF occurred

Oyster BMP Approval Timeline

April 6 – Present revised Tech Appendix draft

April 24 – Present revised BMP to WQGIT

May 4 – Seek Tech Appendix approval from WTWG

May 22 – Seek BMP approval from WQGIT

Feedback & questions to oysterBMPresponse@oysterrecovery.org