



Photo: Oyster Recovery Partnership

Expert Panel Report on Oyster BMP for Restoration & Harvest

Water Quality GIT
April 2023 Meeting
April 24, 2023

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Chesapeake Bay Program
Science. Restoration. Partnership.

Oyster BMP Approval Timeline

Jan 30 – Report posted

February – Roll-out Webinars

March 1 – Present at Fisheries GIT Meeting

March 2 – Present Technical Appendix to WTWG

March 10 – Feedback due

April 6 – present revised Technical Appendix to WTWG

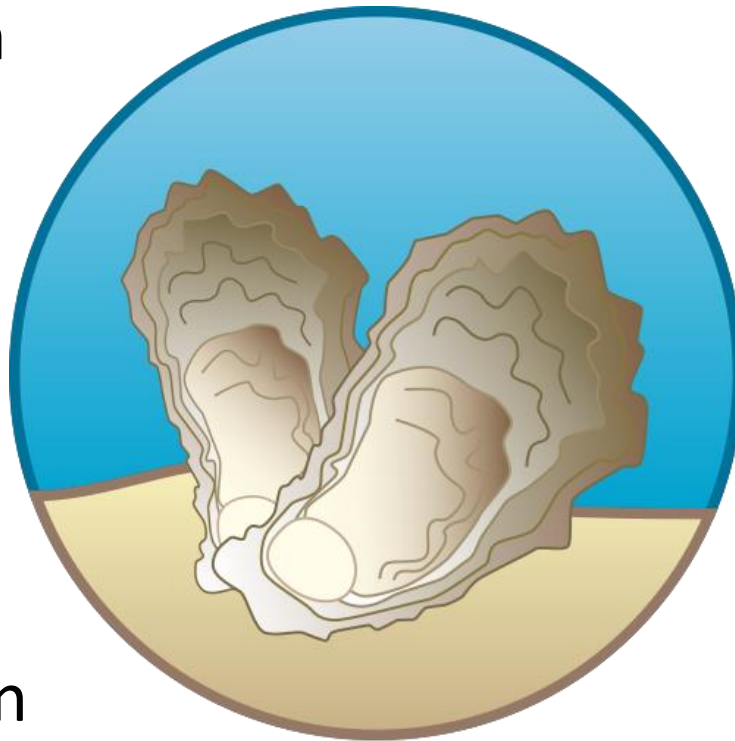
April 24 – present revised BMP to WQGIT

May 2 – Seek Technical Appendix approval from WTWG

May 22 – Seek BMP approval from WQGIT

Elements of the Oyster BMP Toolset

Aquaculture-Assimilation
Approved



Harvest-Assimilation
Under Review

Restoration-Denitrification
Under Review

Restoration-Assimilation
Under Review

Oyster BMP Approach



- Oyster biomass required to estimate reduction
 - Restoration: Biomass increases on reef
 - Harvest: Biomass harvested
- Qualifying conditions ensure that reduction occurs at BMP site
- Default estimates use data representative of Bay
- Guidelines provided for when and how to develop site-specific estimates
 - Restoration: Large substrates

Restoration-Enhanced Denitrification

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

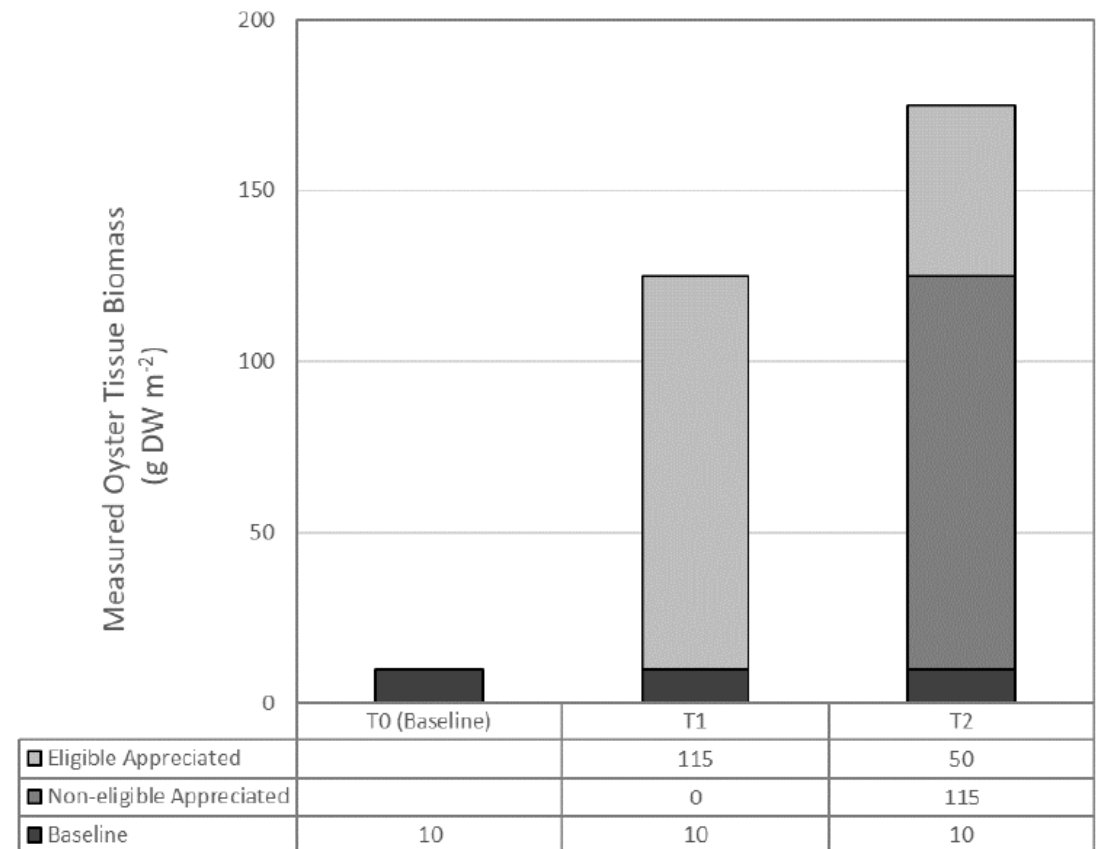
- **Oyster tissue biomass** is used to help estimate removal of N and N₂ under different conditions
- Default rates apply to subtidal reefs restored with small substrate
- Denitrification is an ongoing process, credit is continuous
- Post-restoration tissue biomass > baseline

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	

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



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 6.4. Recommended default nitrogen and phosphorus content of diploid oyster tissue. Oyster size class based on shell height measurements.

Oyster size class (in)	Midpoint (in)	Midpoint (mm)	Tissue dry weight (g oyster ⁻¹)	Content in oyster tissue (g oyster ⁻¹)	
				Nitrogen	Phosphorus
3.00-3.49	3	76	1.06	0.09	0.01
3.50-4.49	4	102	1.81	0.15	0.02
4.50-5.49	5	127	2.70	0.22	0.02
≥ 5.50	6	152	3.74	0.31	0.03

Table 6.5. Default nutrient reductions

Oyster size class (in)	Nitrogen (lbs./million oysters)	Phosphorus (lbs./million oysters)
3.00-3.49*	198	22
3.50-4.49	331	44
4.50-5.49	485	44
≥ 5.50**	683	66

Oyster BMP Feedback Summary

12 responses on BMP report
1 response on Technical Appendix



Oyster BMP Feedback Summary

12 responses on BMP report **1 response on Technical Appendix**

- Eligible Practices
- Definitions
- Clarification & Grammar
- Approach & Data
- Biomass Assessment
- Future Research
- Regulations
- Implementation



Oyster BMP Feedback Summary

- **Eligible Practices – Pending Panel input**
- Definitions – Adjusted (minor)
- Clarification & Grammar – Addressed (minor)
- **Approach & Data – No changes, adding some justification**
- **Biomass Assessment – No changes**
- **Future Research – Added**
- Regulations – Beyond scope
- Implementation – Beyond scope

Oyster BMP Feedback: Eligible Practices

- General agreement with Panel on Restoration practices
 - Question about whether in situ setting of oyster larvae could be eligible – **needs Panel discussion**
- Concern that verification and accounting associated with Harvest practice too difficult
 - Do not believe should move forward for approval unless alterations to oyster fishery management made.

Oyster BMP Feedback: Approach & Data

- Geographic scope could be larger for developing Bay-wide default regression equations (Restoration-Assimilation BMP - oyster shell)
- Concerns about extrapolating survival data from planting to harvest from large-scale restoration area to harvest areas (Harvest BMP - default spat survival rate)
- Suggestions about how to improve statistical power of regressions and sensitivity tests
- Concerns and confusion about why the Panel not providing default DNF rates for reefs restored using “large structures”

Oyster BMP Feedback: Biomass Assessment

- Direct measurement of parameters (e.g., biomass) may be difficult depending on scale of restoration program. Suggest using proxies
- Concerns about destructive sampling methods

Oyster BMP Feedback: Future Research Suggestions

Harvest BMP

- Collect at least 5 years of data on spat survival data in harvest areas
- Determine potential negative consequences of increased biodeposition and phosphorus dynamics on harvested reefs

Restoration BMPs

- Investigate advantages/disadvantages of additional alternate substrates in restoration

Oyster BMP Praise



- Support for Panel's endorsement of crediting oyster restoration
- Satisfaction that sufficient science was used to generate estimates and recommendations
- Several general, positive comments

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Thoughts? Questions?

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