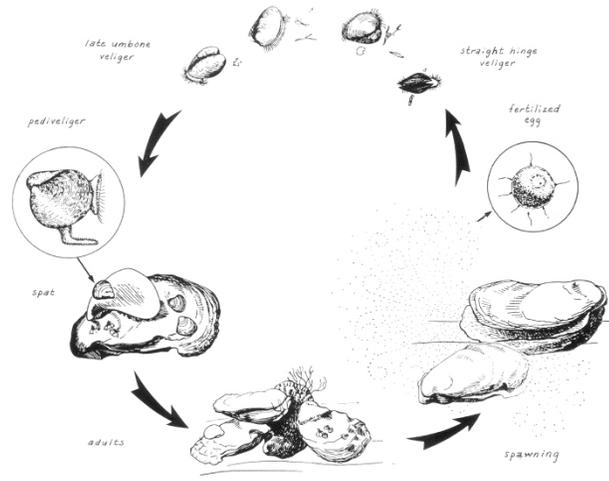
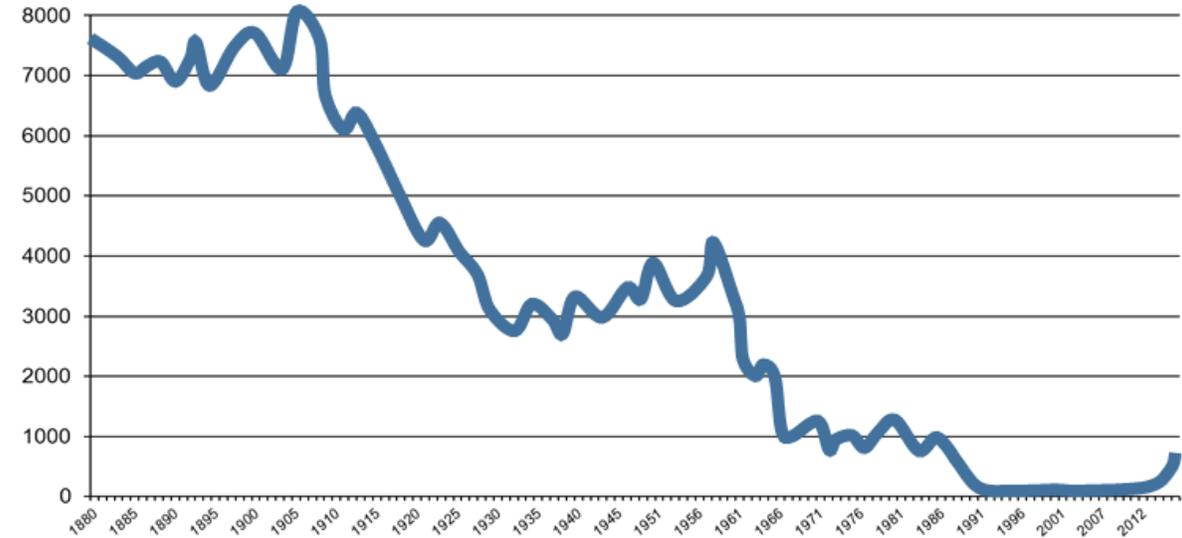


Virginia



By 1990s, things looked bad for oysters

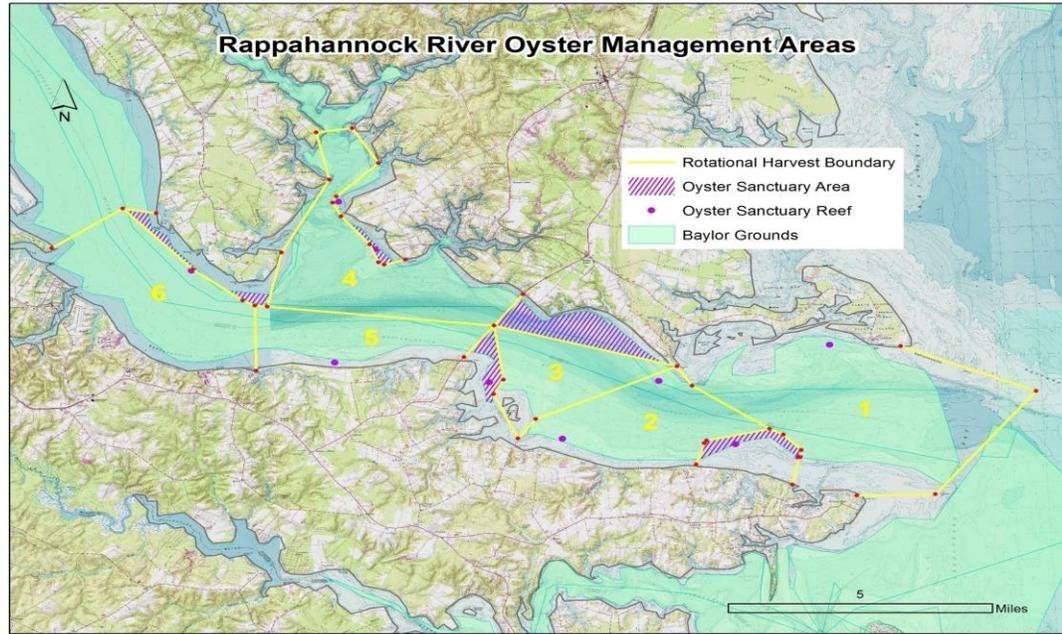


Public harvest (fishery)



Private harvest

Public



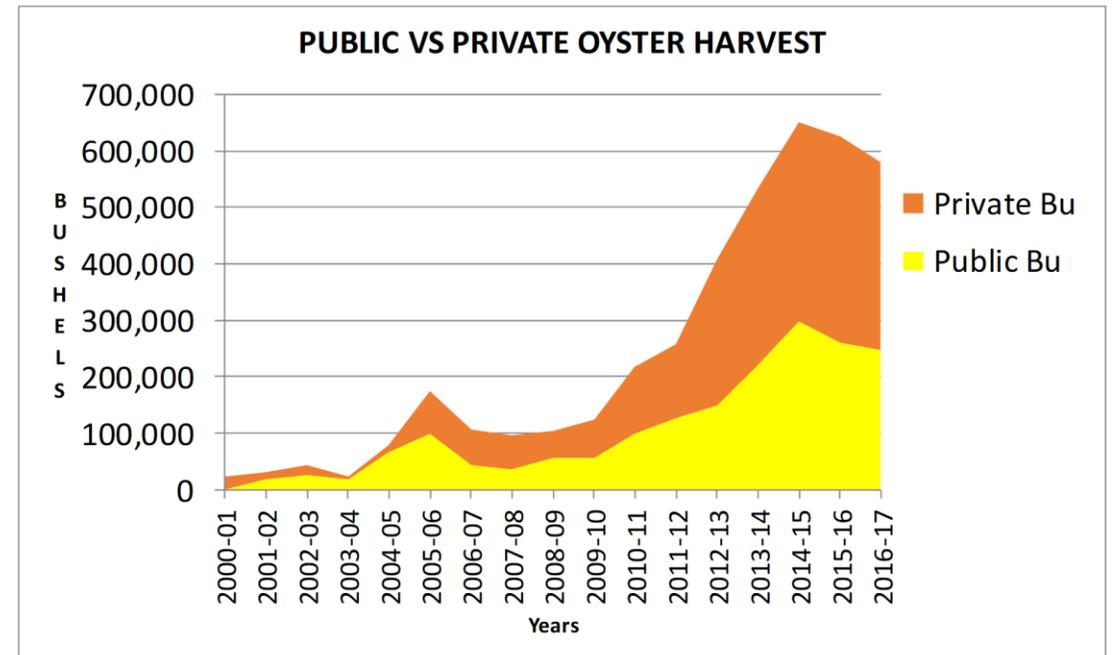
3D Reefs



Targeted shellplanting



More efficient gear





Private



Aging leasing system



Cage culture

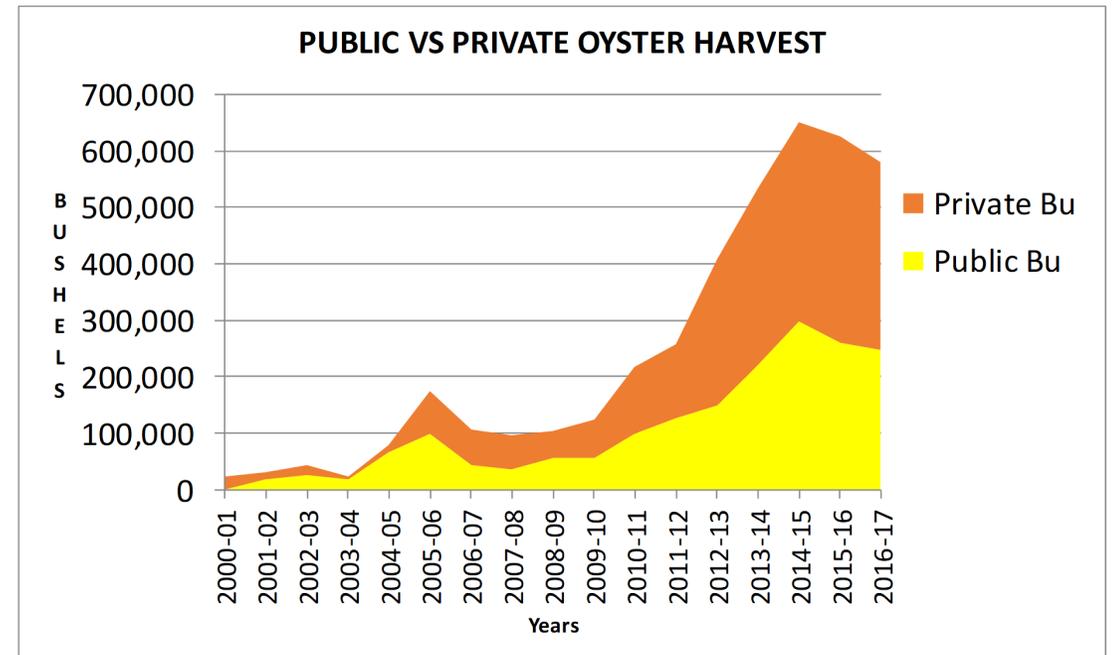


More efficient gear

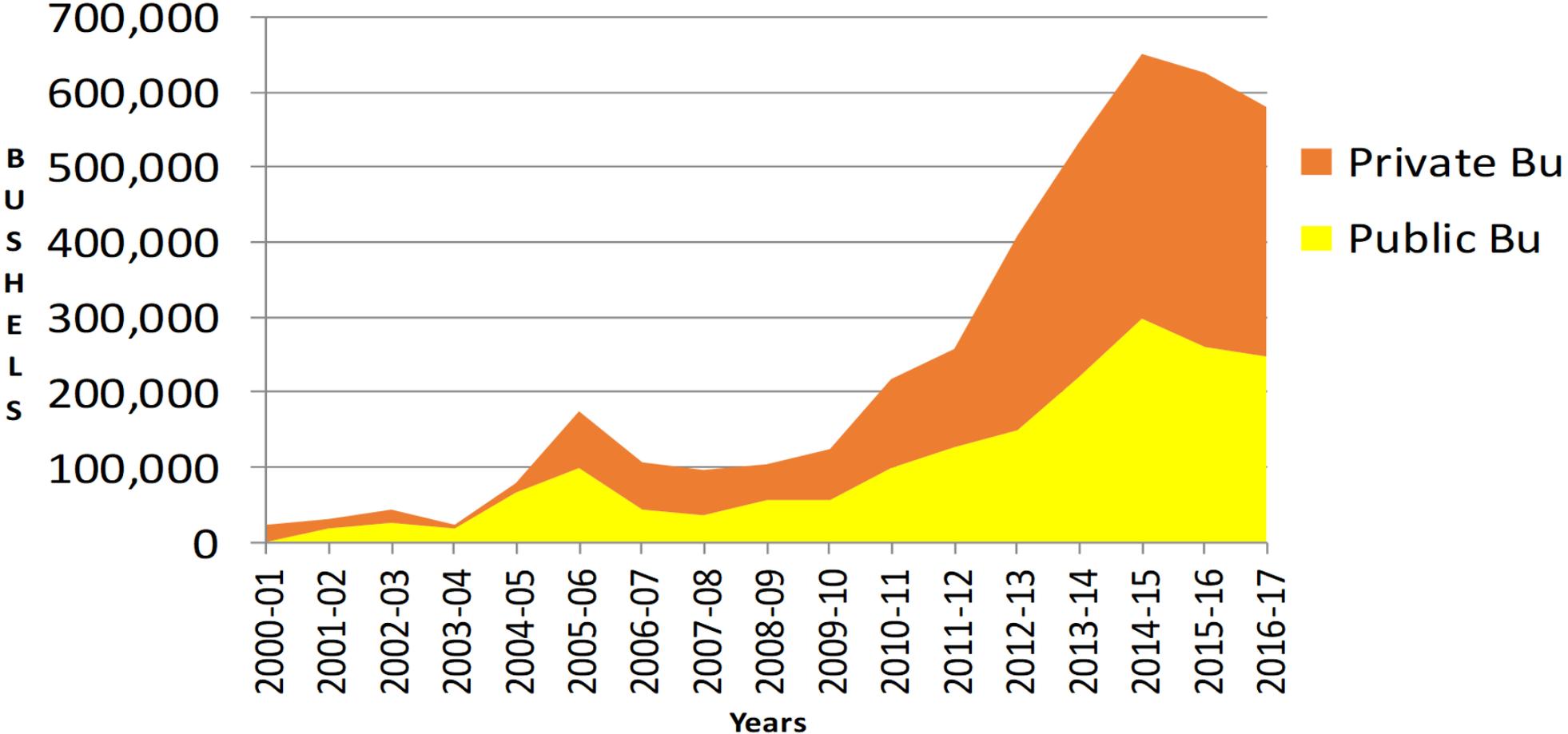


D. Meritt
University of Maryland
Center for Environmental Science
Horn Point Oyster Hatchery

Hatchery Production



PUBLIC VS PRIVATE OYSTER HARVEST



Expanding Virginia's oyster industry while minimizing user conflict

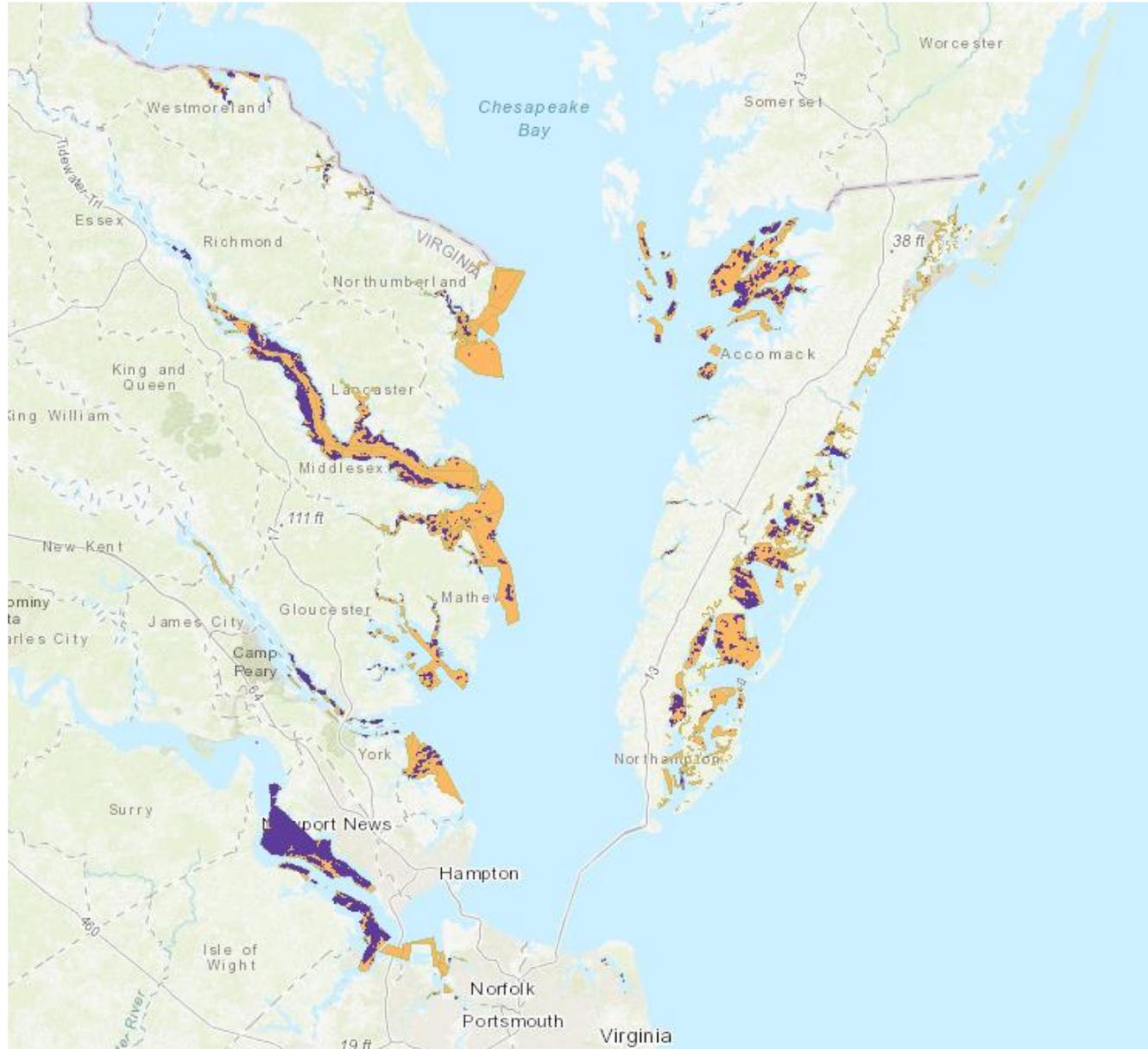
Roger Mann, James Wesson, Marcia Berman, Melissa Southworth and Tamia Rudnicki

Virginia Institute of Marine Science

November 15, 2018

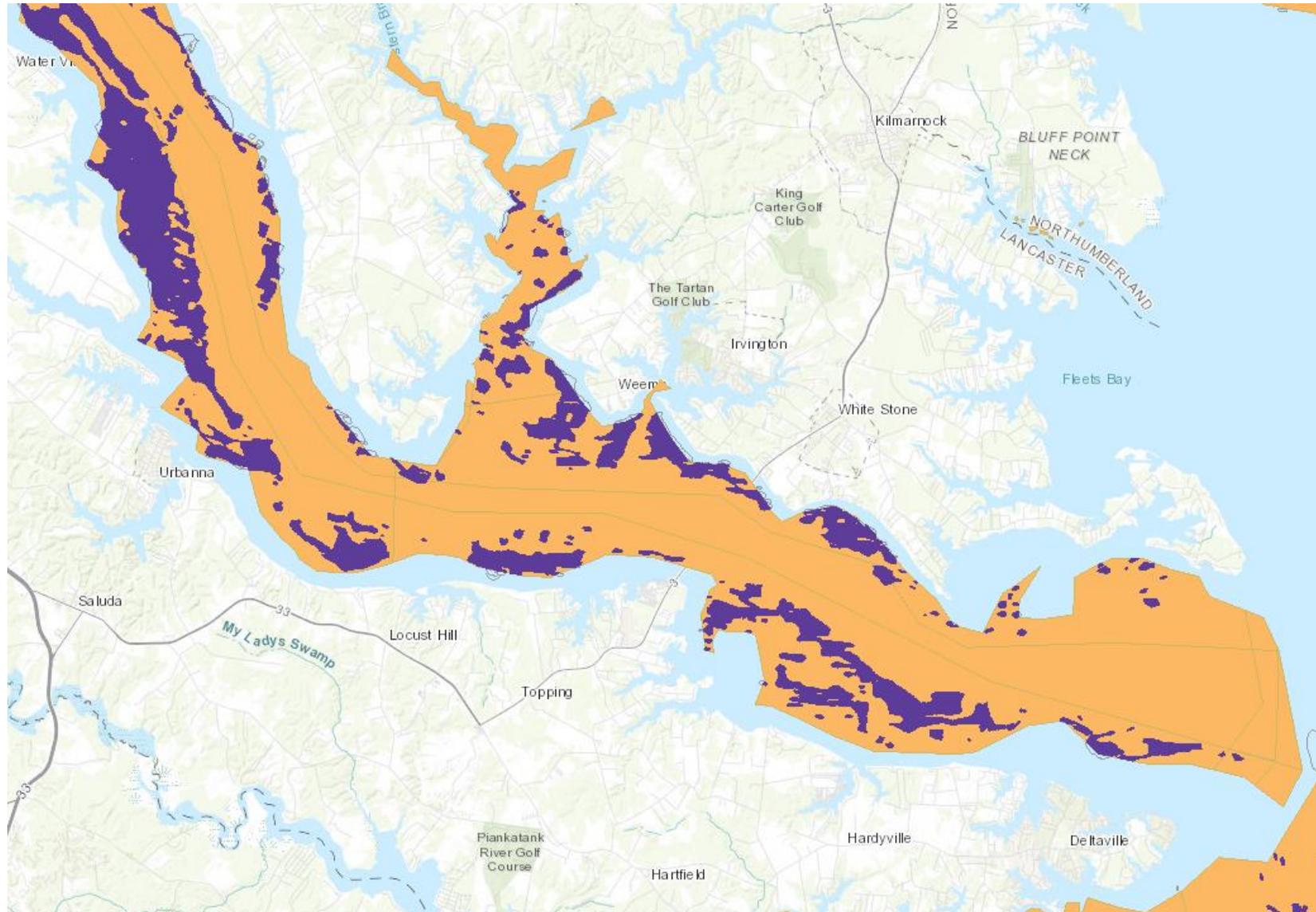
Year 1 Products; Review of current status of the oyster industry, current industry practices, and current regulatory and statutory framework

GIS/Database analysis of shell resources and active harvesting



- Suitable for restoration
- Not suitable for restoration

GIS/Database analysis of shell resources and active harvesting



- Suitable for restoration
- Not suitable for restoration

GIS/Database analysis of shell resources and active harvesting

Location	Suitable for Restoration (acres)	Additional Suitable bottom set aside by VMRC (acres)	Not Suitable for restoration (acres)	Total Acres	% Suitable of Total
Chesapeake Bay Lower West and Poquoson	785	0	8,124	8,909	8.8
Chesapeake Bay Upper West and Fleets Bay	721	11	35,608	36,341	2.0
Great Wicomico River	455	1	2,238	2,694	16.9
James River and Tributaries	17,977	110	12,960	31,047	57.9
Lynnhaven Bay	0	48	19	67	0.0
Piankatank River and Milford Haven	915	12	7,450	8,377	10.9
Pocomoke/Tangier Sounds and Chesapeake Bay Upper East	5,862	6	26,779	32,647	18.0
Potomac River Tributaries	704	1	2,563	3,268	21.5
Rappahannock River and Tributaries	9,953	0	33,467	43,420	22.9
York River and Mobjack Bay (with tributaries)	1,745	0	10,400	12,145	14.4
Chesapeake Bay Total	39,117	189	139,608	178,915	21.97

GIS/Database analysis of shell resources and active harvesting

- Shell from natural mortality is the literal base of natural reefs.
- We have maps of regions that are self-sustaining with respect to shell. These are a very small proportion of the total Baylor bottom.
- We can maintain through shell repletion (**~22%** with infinite money and infinite shell), but shell resources are limited and will continue to be so.
- In practical terms, the area that can be maintained by shell repletion for production and harvested by the fishery will gradually decrease.
- We use long-term stock assessment* to strategically guide shell repletion to both maintain reef structures and maximize productivity.
- BUT, the vast majority of Baylor ground (**~78%**) cannot be maintained with available shell resources and should be considered for alternate strategies.

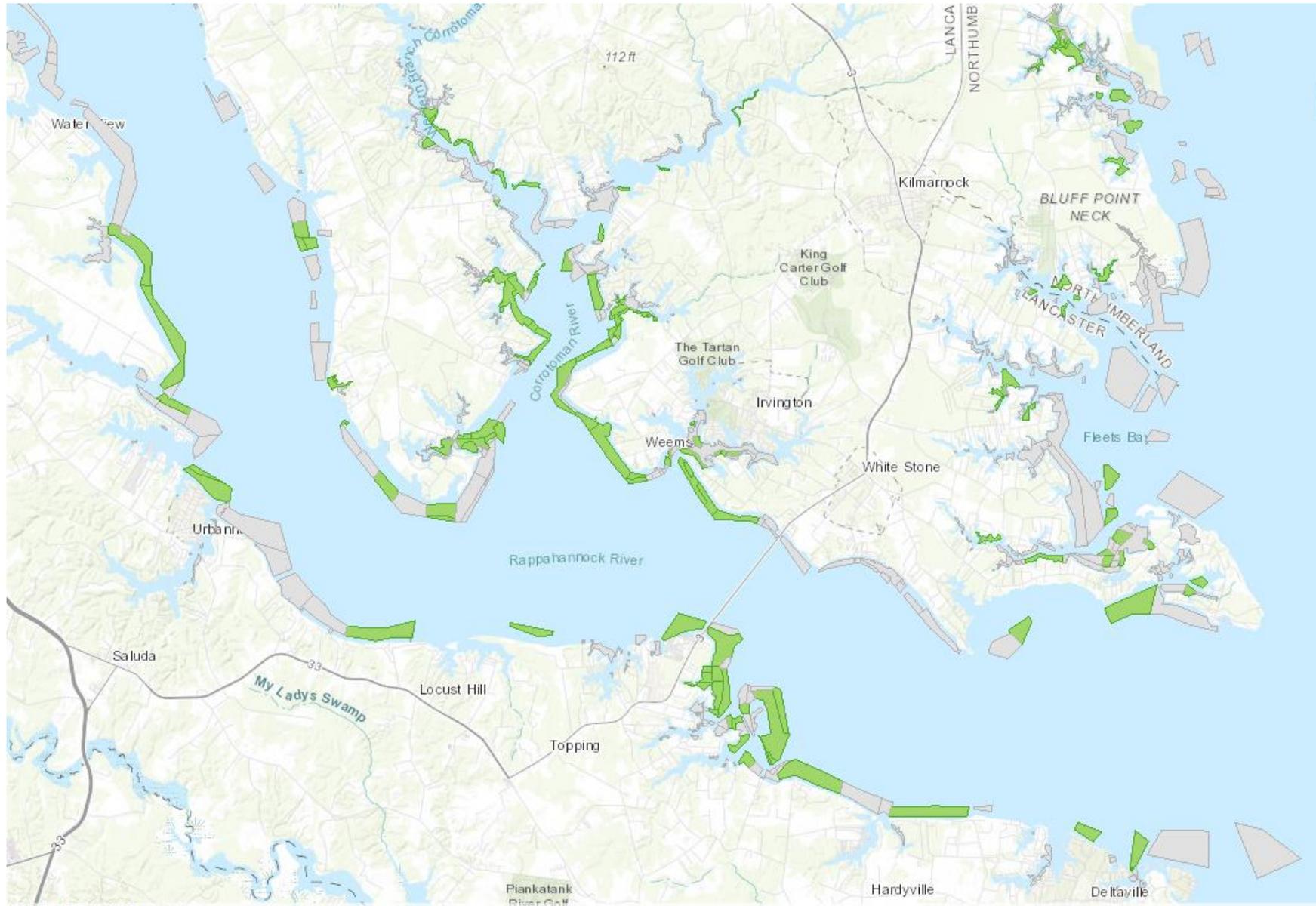
* <http://cmap2.vims.edu/VOSARA/viewer/VOSARA.html>

GIS Analysis of active harvesting on private leases



- Reported any harvest from 2013 to 2017
- No reported harvest from 2013 to 2017

GIS Analysis of active harvesting on private leases



- Reported any harvest from 2013 to 2017
- No reported harvest from 2013 to 2017

Assessment of current aquaculture metrics

River Area Name	Number of Leases	Acres of Private Leases	Water Area Acres	% of Water Area that is Leased	Active (reporting) Private Lease Acres	Inactive Private Lease Acres	Intensive Aquaculture Acres	Extensive Aquaculture Acres	Number of Leases Reporting Intensive Harvest
Chesapeake Bay Lower East	162	2797.03	103409.24	2.70	1323.41	1473.62	1196.32	730.72	48
Chesapeake Bay Lower West	68	3495.52	228474.56	1.53	375.02	3120.51	57.12	323.27	6
Chesapeake Bay Upper East	335	5339.07	183874.03	2.90	2172.81	3166.27	1883.03	990.06	100
Chesapeake Bay Upper West	142	2283.02	253747.78	0.90	419.96	1863.06	121.81	371.73	6
Fleets Bay	114	1899.94	5780.79	32.87	275.71	1624.24	20.50	255.20	2
Great Wicomico River	250	2003.67	7987.41	25.09	837.88	1165.80	202.79	694.14	15
James River	542	30353.23	129103.13	23.51	8771.14	21582.14	27.40	8743.74	1
Lynnhaven Bay	167	2378.61	5015.98	47.42	491.37	1887.24	321.39	291.99	20
Piankatank River	235	3394.35	16302.48	20.82	1276.49	2117.87	285.95	1126.52	18
Poquoson/Back Rivers	228	4599.71	10626.37	43.29	1680.89	2918.83	402.77	1510.73	16
Potomac Tributaries	514	9678.36	30027.75	32.23	3707.20	5971.17	1414.21	2972.99	87
Rappahannock River	448	10689.02	90299.94	11.84	4379.54	6309.50	1348.73	3315.19	26
Tangier/Pocomoke Sound	70	3254.65	149851.85	2.17	2479.59	775.07	210.65	2341.02	8
York River/Mobjack Bay	702	28176.97	84354.09	33.40	9204.87	18972.15	1168.95	8202.62	28
Chesapeake Bay Total	3,977	110,343	1,298,855		37,396	72,947	8,662	31,870	381
Percent					33.89	66.11	7.85		9.58

Assessment of current aquaculture metrics

Oysters and clams combined	100 ft Buffer	200 ft Buffer	300 ft Buffer	500 ft Buffer	Chesapeake Bay Totals
Total Leases	2,545	2,835	2,997	3,215	3,977
Percent Leases	63.99	71.28	75.36	80.84	100.00
Total Intensive Harvest	286	321	333	355	381
Percent Intensive Harvest (of total)	7.19	8.07	8.37	8.93	9.58
Percent Intensive Harvest	75.07	84.25	87.40	93.18	100.00

GIS Analysis of active harvesting on private leases and assessment of current aquaculture metrics

- Only **34%** of the private lease acreage reported harvest at some point between 2013 and 2017.
- Approximately **15%** of those leases reporting harvest between 2013 and 2017, reported <10 bushels of shellfish.
- Approximately **10%** (381/3,977) of those reporting harvest between 2013 and 2017, reported using intensive aquaculture practices.
- Approximately **75%** (286/381) of leases reporting intensive aquaculture harvest are on leases that begin within 100 ft of the shoreline.
- Approximately **93%** (355/381) of leases reporting intensive aquaculture harvest are on leases that begin 500 ft of the shoreline.

Assessment of regulatory impediments and conflict analysis (SAV presence 2012-2016)

	100 ft Buffer			200 ft Buffer			300 ft Buffer			500 ft Buffer			Chesapeake Bay Totals		
Total Leases	2545			2835			2997			3215			3977		
Percent Leases	63.99			71.28			75.36			80.84			100.00		
	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases
Non-Riparian Leases with SAV	654	16.44	68.99	761	19.14	80.27	821	20.64	86.60	887	22.30	93.57	948	23.84	100.00
Non-Riparian Leases with No SAV	1891	47.55		2074	52.15		2176	54.71		2328	58.54		3029	76.16	
Intensive Harvest - Oysters & Clams	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases
Intensive Harvest with SAV	106	2.67	27.82	122	3.07	32.02	125	3.14	32.81	140	3.52	36.75	154	3.87	40.42
Intensive Harvest with No SAV	180	4.53	47.24	199	5.00	52.23	208	5.23	54.59	215	5.41	56.43	227	5.71	59.58
Total Intensive Harvest	286	7.19	75.07	321	8.07	84.25	333	8.37	87.40	355	8.93	93.18	381	9.58	100.00

Assessment of regulatory impediments and conflict analysis (SAV presence 2012-2016)

- Approximately 4% (154/3,977) of all the leases in the Chesapeake Bay have both SAV and report harvest using intensive aquaculture.
- Approximately 40% (154/381) of all the leases that are reporting intensive aquaculture have SAV present.
- In recent years, SAV has been increasing in many areas of the Bay.
- In recent years, aquaculture has also been increasing in the Bay.
- This suggests that aquaculture can co-exist with SAV without significant impact.
- However, current regulatory practices do not take this ability to co-exist into consideration.

Assessment of regulatory impediments and conflict analysis (SAV presence 2013-2017)

	100 ft Buffer			200 ft Buffer			300 ft Buffer			500 ft Buffer			Chesapeake Bay Totals		
Total Leases	2545			2835			2997			3215			3977		
Percent Leases	63.99			71.28			75.36			80.84			100.00		
	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases	Number of Leases	Percent of Total	Percent of SAV Leases
Non-Riparian Leases with SAV	715	17.98	69.35	831	20.90	80.60	893	22.45	86.61	965	24.26	93.60	1031	25.92	100.00
Non-Riparian Leases with No SAV	1830	46.01		2004	50.39		2104	52.90		2250	56.58		2946	74.08	
Intensive Harvest - Oysters & Clams	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases	Number of Leases	Percent of Total	Percent of Intensive Leases
Intensive Harvest with SAV	110	2.77	28.87	126	3.17	33.07	129	3.24	33.86	144	3.62	37.80	158	3.97	41.47
Intensive Harvest with No SAV	176	4.43	46.19	195	4.90	51.18	204	5.13	53.54	211	5.31	55.38	223	5.61	58.53
Total Intensive Harvest	286	7.19	75.07	321	8.07	84.25	333	8.37	87.40	355	8.93	93.18	381	9.58	100.00

Assessment of regulatory impediments and conflict analysis (SAV presence 2013-2017)

- There were 84 additional leases with SAV on them in the 2013-2017 period compared to the 2012-2016 period. This is an increase of 2% of the 5 year running average.
- Approximately 41.5% (158/381) of all the leases that are reporting intensive aquaculture have SAV present.
- Forward prediction of SAV presence/absence is difficult, thus compromising business planning.
- Current regulation does not distinguish between ephemeral (i.e. Rupia) and more permanent species (i.e. Zostera).

SAV Coverage



July



May

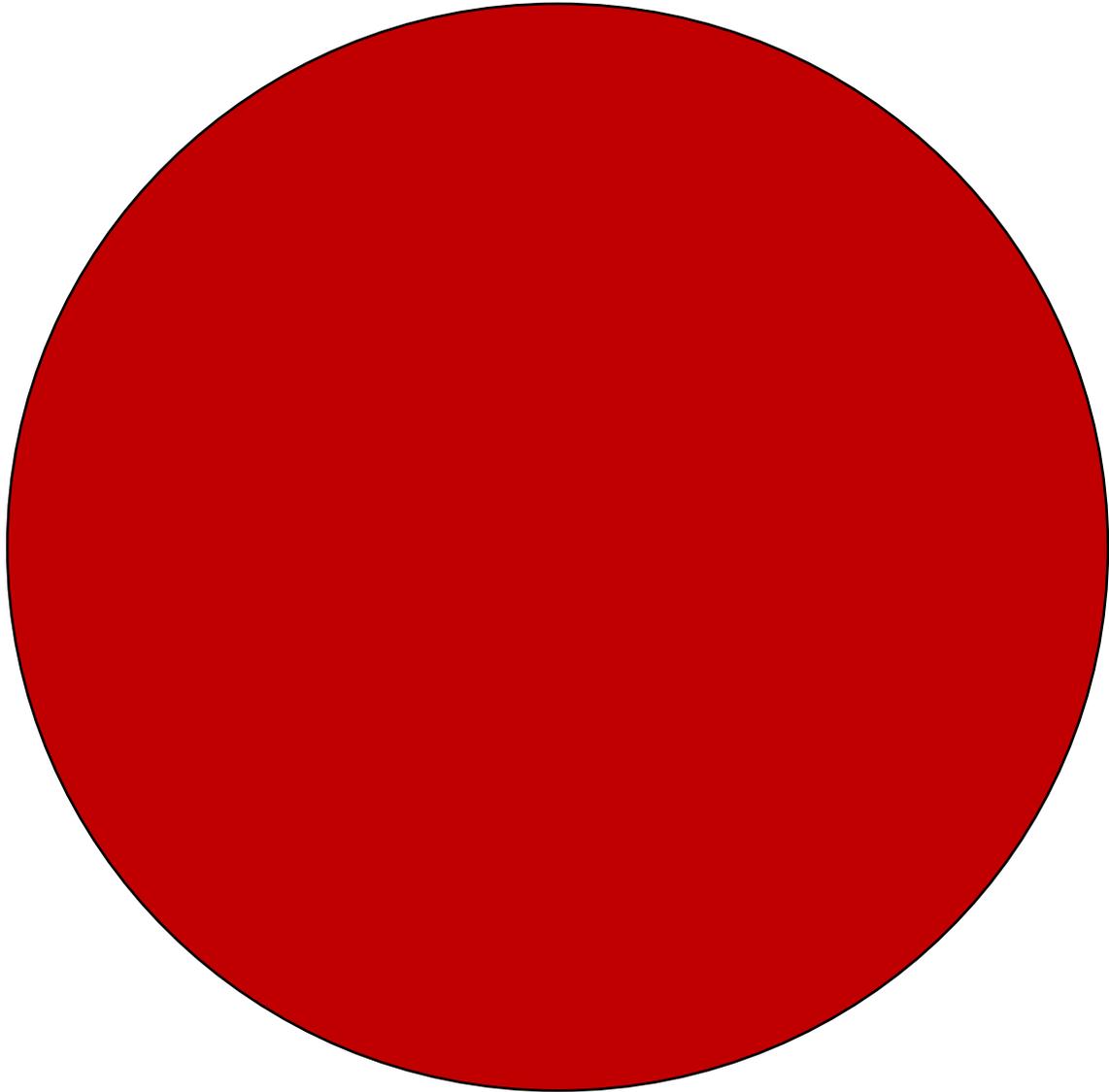


September

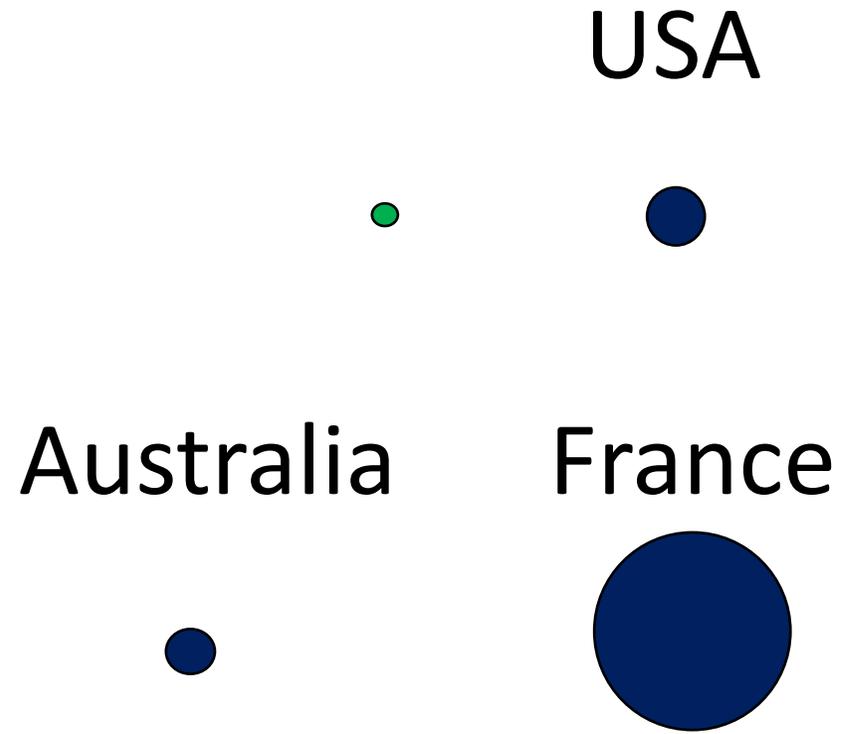
Assessment of regulatory impediments and conflict analysis

- Current low annual lease cost and low application fee encourages leases to be taken with no thought of ever using them
- Ten year lease period, large leases (250 acres) are common, and no use plan required of leases
- Because of exceptions in the Code there are no enforceable requirements to use leases, therefore leaseholders hold leases from potential shellfish growers
- 12 inch rule allowing cages on leases with no permit and no plan
- Conflicts with SAV

World



Virginia



USA



Australia



France

