MD DNR Tidal Bass Program Policy for Supplemental Stocking of Largemouth Bass using Hatchery Reared Fish

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Introduction

Success of a sustainable fishery depends on the number of juveniles that reach sexual maturity. The number of juvenile largemouth bass that reach sexual maturity can depend on the proportion of successful nests[1], seasonal conditions that affect growth and survivorship[2,3], and infrequent stochastic events (e.g., hurricanes and colder than normal winters). Angling activity during the spawning season lowers the proportion of successful nests by reducing fitness of males that guard nests, which could negatively affect populations[2,4,5]. Population recovery from natural disasters, such as hurricanes, occurs naturally when habitats are suitable[6], but can yield poor fishing while the population recovers. One tool to mitigate environmental and angling stressors has been stocking.

Unfortunately, stocking for maintenance or increasing the size of a largemouth bass population is an unreliable tool[7]. The release of fry (~ 25 mm or 1”) may not contribute significantly to the spawning stock because of their vulnerability to predators and other environmental factors[8,9,11]. The release of larger juveniles (> 50 mm or 2”) may temporarily contribute a small proportion to the population[9,10]. In 2006 – 2009, the Virginia Department of Game and Inland Fisheries released over 100,000 juveniles that contributed to between 40 – 70% of the age 2 and age 3 cohorts. However, the level of contribution of juveniles to older age classes greatly depends on a release site’s quality, which is characterized by the availability of refugia, the availability of food, water quality, and the relative abundance of predators. Predation on juveniles generally limits the success of stocking programs[9,12].

Because of a stocking program’s potential to fail, policy should benefit from localized assessments and a thorough review of published literature. Differences in hatchery infrastructure and fishery managers’ objectives leave nationwide recommendations on cost-effective stocking strategies as impractical. Since 1982, Maryland DNR has documented the output of its stocking program by recording the number of largemouth bass juveniles released to various drainages of the Chesapeake Bay watershed (Table 1). In many cases, juveniles were marked and stocked in batches of different stages (fry and fingerlings/advanced fingerlings). The long-term release of different stages to two well-monitored drainages (Patuxent River and Choptank River) provides suitable datasets for evaluating: 1) the contribution of each size class to the spawning stock; 2) whether contribution increases with the number of released juveniles of each size class; and 3) the most cost effective stocking strategy for achieving fishery management objectives.

Methods

There were three stages of juveniles released by hatcheries to tidal rivers of Chesapeake Bay: fry (~ 25 mm); fingerlings (~ 50 mm); and advanced fingerlings (~ 100 – 200 mm). Because only 4 advanced fingerlings have been recaptured, fingerlings and advanced fingerlings were combined and considered as a single stage. Fry were released in large quantities without marks or with marks that were not discernable upon recapture (e.g., oxytetracycline, calcein). Some fingerlings released in June were marked with coded wire tags (CWT) and in late fall, some advanced fingerlings were marked using passive integrated transponder tags (PIT); both marks were detectable upon recapture. Once largemouth bass was collected during MD DNR tidal freshwater surveys during fall (September – October), it was scanned with CWT and PIT detectors. Total length of all marked and unmarked largemouth bass was used to determine age with a length-at-age key[13] developed from 347 largemouth bass that were aged using otoliths[14].

Contribution of Fry—Catch per hour (CPH) of all largemouth bass during fall was plotted by year and years were identified when fry were released. Much of the variation in CPH in Patuxent River and Choptank River population surveys can be attributed to variation in relative abundance of age 1+ fish because these ages constitute the greatest fraction of the sample (between 61% and 97%, 1999-2013). It was hypothesized that within 2 years of releasing large numbers of fry, CPH increased. Because CPH is a standard, easily understood index, it may be a convenient tool to assess hatchery contributions. However, CPH can be influenced by environmental conditions and a second method was used to assess the contribution of fry. This second method involved computing residuals from a catch-curve analysis using linear regression of the relative proportions of age groups within both the Patuxent River and Choptank River populations. The regression analysis was applied to all available data for each population. Once applied, residuals (r) were computed for each age class sampled each year (t). When $r \sim 0$, then the age class was not considered to vary from that expected by total mortality rates. When $r > 0.5$ for an age class at t, then it was considered a boom year, with a probability of recruitment ($p = 0, 0.25, 0.50, 0.75$, or 1.0) dependent on quartiles of r. The r was plotted by number of fry and fingerlings to determine if the number stocked influenced age class strength; year classes associated with fry stocking were also designated to determine those age classes were boom years.

Contribution of Fingerlings—The number of fingerlings and advanced fingerlings released per year was plotted by CPH initially and presented here for each age 1 – 5. It was hypothesized that CPH for each age would increase with number of fingerlings and advanced fingerlings released. The contribution of fingerlings and advanced fingerlings to age classes was measured as a proportion (p) of hatchery released fingerlings and advanced fingerlings in year to recaptured fish in year t. The p was considered a probability of recruitment. The p was plotted by the number of fingerlings and advanced fingerlings for each year t to determine whether p increased with the number of juveniles released.

Cost Effectiveness—A cost-effective strategy for stocking largemouth bass was developed using decision tree analysis[1]. A decision tree analysis was used to discern among 4 choices: 1) stocking fry (~ 25 mm), 2) stocking fingerlings (~ 50 mm) and advanced fingerlings (~ 100 – 200 mm), 3) stocking subadults (~ 250 – 300 mm), or 4) stocking nothing. The decision among the 4 choices was mitigated by both costs and revenue. The costs included: cost per fish stage (unpubl. data, B. Richardson, Program Manager for Hatcheries) and the optimum number of fish stocked by stage in a reservoir[15,16]. Cost was mitigated by probability of recruitment of the fish stage per fish (see Contribution above). Revenue included that expected to be generated by

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[1] http://vserver1.cscs.lsa.umich.edu/~spage/ONLINECOURSE/R4Decision.pdf

fishing the drainage if the stocking is successful. For each choice scenario, the revenue generated by fishing the drainage was determined as the product of the amount spent per angling trip[17] (unpublished data, MD DNR Volunteer Angler Survey: Freshwater Multispecies Survey) and the expected number of angling trips per angler for a fixed number of anglers per year (1000). Because the expected number of angling trips increases with catch rate16 and because catch rate depends on the stage of stocked largemouth bass[15,16], revenue for each choice scenario can be predicted as a function of the stage stocked for largemouth bass. The expected value (EV) for each choice of stage stocking was determined as: (net profit * probability of success) + (net profit * probability of failure). The EV was compared among ranked choices: preferred (1), good (2), least preferred (3), and worst (4).

Results

- Since 1982, over 2 million largemouth bass have been stocked to the Choptank River and Patuxent River (Table 1).
    - Of those stocked, 25.9% (N = 620,968) were marked and over 400,000 were fingerlings or advanced fingerlings.
- Stocking fry did not contribute to an increase in average CPH within 2 years (Fig. 1) or strong year classes (Fig. 2) of Largemouth Bass in Patuxent River or Choptank River.
    - 80% of age classes associated with fry stocking were bust year classes.
    - Only one of 10 age classes associated with fry stocking may be considered a boom year class (r = 0.68) with p = 1.0 and an overall p of 0.10 was assumed (1.0/10 age classes).
- Stocking fingerlings and advanced fingerlings led to greater CPH for at least ages 1 – 3 (Fig. 3).
    - Number of stocked fish is weakly related to CPH, similar to other studies10
    - Stocking numbers of fingerlings and advanced fingerlings beyond optimal numbers appears counterproductive.
    - Stocking at least 10,000 fingerlings (19 fish/ha) may increase CPH for ages 0 to 3.
- Stocking fingerlings and advanced fingerlings led to stronger year classes (average p = 0.10 – 0.25, among ages) and 21% recruitment to age 1 (Fig. 4); other studies indicate similar levels of recruitment to age 1: 9-13% to age 118; 17-18% to age 110.
    - Contribution to ages 1 – 3 was greatest when 30,000 (57 fish/ha) – 60,000 (114 fish/ha) fingerlings/advanced fingerlings were stocked to Patuxent River (Fig. 5).
    - Contribution by hatchery released fish to the population was highly variable among stocking events (CV = 89%, ages 0 – 2), which suggests that habitat conditions in the year of stocking strongly influences survivorship.
- Stocking fingerlings and advanced fingerlings has a ranked EV that is greater than that for stocking fry (Table 2).
    - Stocking fingerlings or advanced fingerlings had a 3-fold greater EV than not stocking and a 2-fold advantage to stocking fry.
    - Stocking subadults had a 1.5-fold greater EV than stocking fingerlings and advanced fingerlings.
    - Stocking subadults had a 5-fold greater EV than not stocking and a 3-fold advantage to stocking fry.

Additional Considerations

Stocking largemouth bass may bolster fisheries[19] and benefit the local economy. However, adults may emigrate from the stocked area and ultimately have little effect on the fishery[20], unless stocked annually[16]. Contribution of hatchery releases heavily depends on environmental conditions. When stocking, biologists should assess these conditions (e.g., predator types, climate, water quality) prior to stocking.

Stocking densities of fingerlings and advanced fingerlings have widely varied for Patuxent River (1 – 275 fish/ha), though precise locations of released fish were not often noted. For 50 – 100 mm fish, successful stocking densities have been: 10 – 41 fish/ha[14], 18 – 25 fish/ha[18], 62 fish/ha10, and 26 – 60 fish/ha[9]. The optimum stocking density in impounded waters (24 – 32 fish/ha) occurred because of density-dependent survival of stocked juveniles[15].

Stocking either fingerlings or advanced fingerlings appears to be equally effective[10], with stocking 50 mm fingerlings possibly more cost effective[9]. To date, it is not possible for MD DNR to determine differences in benefit between stocking fingerlings or advanced fingerlings. There have been only 4 recaptured advanced fingerlings with PIT tags (2 in Patuxent River, 2012; 2 in Choptank River, 2013). In Choptank River, there was an age 2 and an age 3 fish collected, whereas both fish in Patuxent River were age 0.

Policy Recommendations

1. Most populations of the tidal Chesapeake Bay watershed do not need stocking.
    a. Regional Managers should work with stakeholders to identify populations that need periodic support of recruitment or to identify waterways where there is interest in developing a larger fishery
    b. Regional managers should identify and achieve attainable reference points to learn whether stocking is supporting recruitment or generating a larger fishery; reference points may include: a) increase in 1 fish caught per angler-day; b) 5% increase in number of adults per hectare of suitable habitat; c) 10% increase in the catch per hour of juveniles during fall; d) reduce coefficient of variation by 20% in annual index for relative abundance of juveniles
2. If a sustainable population needs periodic support of recruitment in a fishery that receives notable fishing pressure already, then stocking fingerlings or advanced fingerlings is the cost-effective solution when recruitment is considered poor because of temporarily bad environmental conditions (e.g., Potomac River).
    a. Assess habitat for prey and predator densities and habitat conditions; release in habitats with prey, low predator density, and refugia (e.g., thick grasses)
    b. Stock at a density of at least 20 fish/ha, but preferably at 60 fish/ha
3. For populations that do not receive considerable fishing pressure and where there is interest in generating a bigger fishery, stocking subadults every 2 – 3 years is recommended (e.g., Middle River, Choptank River) for immediate benefits.
    a. It is possible to grow 4800 juveniles in June with forage (900 minnows per day for 3 days a week) and yield 1381 fish in October, with a mass of 9 fish/lb.
    b. At a stocking density of 25 fish/ha, subadults should contribute to the fishery
    c. Effort should be made to release fish in nearly freshwater, lentic-like habitats
4. It is recommended that offspring be purchased from a state approved vendor when it is not possible to obtain enough brood stock to meet stocking demands for a population. Brood stock and their offspring will be returned to the river of brood stock origin.

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Table 1. Dates (or years) of hatchery releases of largemouth bass (*Micropterus salmoides*) to either Choptank River or Patuxent River and at various stages (FRY = 25 mm; FIN = 50 mm; 100 mm < ADV FIN < 250 mm; UNK = unknown). Prior to release, the fish may have been marked with coded wire tags (CWT), passive integrated tags (PIT), oxytetracycline (OTC), or calcein. Immediate retention of tags was determined to be greater than 95%.

YEAR	RIVER	NUMBER	STAGE	MARK
1988	CHOPTANK	35088	FRY	
1988	CHOPTANK	10000	UNK	
1988	CHOPTANK	29912	UNK	
1989	CHOPTANK	7880	FRY	
1989	CHOPTANK	6685	UNK	
1989	CHOPTANK	22013	UNK	
1989	CHOPTANK	1656	UNK	
1990	CHOPTANK	10240	FRY	
1990	CHOPTANK	6898	UNK	
1990	CHOPTANK	16640	UNK	
1991	CHOPTANK	24900	FIN	
1994	CHOPTANK	3752	FIN	
1995	CHOPTANK	69700	FIN	
1996	CHOPTANK	80788	FIN	
2005	CHOPTANK	25473	ADV FIN	CWT
2005	CHOPTANK	30000	FIN	OTC
2006	CHOPTANK	96,932	FRY	OTC
2006	CHOPTANK	18,327	FIN	CWT
2007	CHOPTANK	21,791	UNK	
5/21/2009	CHOPTANK	20625	FRY	OTC
5/29/2009	CHOPTANK	40942	FRY	OTC
5/29/2009	CHOPTANK	37425	FRY	OTC
6/4/2009	CHOPTANK	7,627	FIN	CWT
5/13/2010	CHOPTANK	61	FIN	
5/19/2011	CHOPTANK	36000	FRY	NONE
5/29/2011	CHOPTANK	20000	FRY	NONE
5/31/2011	CHOPTANK	150000	FRY	NONE
6/21/2011	CHOPTANK	13092	FIN	CWT
6/22/2011	CHOPTANK	10657	FIN	CWT
10/19/2011	CHOPTANK	308	ADV FIN	PIT
5/21/2013	CHOPTANK	37,370	FRY	NONE
5/22/2013	CHOPTANK	25107	FRY	NONE
5/23/2013	CHOPTANK	25,200	FRY	NONE
5/25/2013	CHOPTANK	90,000	FRY	NONE
5/30/2013	CHOPTANK	25,000	FRY	NONE
7/9/2013	CHOPTANK	7259	FIN	CWT
7/16/2013	CHOPTANK	3006	FIN	CWT
10/9/2013	CHOPTANK	125	ADV FIN	PIT
10/9/2013	CHOPTANK	300	FIN	PIT (83)
1982	PATUXENT	49336	FIN	
1983	PATUXENT	100022	FIN	
1984	PATUXENT	50968	FIN	
1985	PATUXENT	106300	FIN	
1986	PATUXENT	24000	FIN	

1987	PATUXENT	28000	FIN	
1987	PATUXENT	32643	FIN	
1987	PATUXENT	21392	FIN	
1987	PATUXENT	7900	FIN	
1987	PATUXENT	8700	FIN	
1988	PATUXENT	30913	FIN	CWT
1989	PATUXENT	9823	FIN	CWT
1989	PATUXENT	2123	FIN	CWT
1989	PATUXENT	9817	FIN	CWT
1989	PATUXENT	20869	FIN	CWT
1992	PATUXENT	1040	FIN	
1993	PATUXENT	8608	FIN	
1994	PATUXENT	52259	FIN	
1995	PATUXENT	50199	FIN	
1996	PATUXENT	83709	FIN	
1997	PATUXENT	41000	FIN	
1997	PATUXENT	1303	FIN	
1998	PATUXENT	18473	FIN	
1999	PATUXENT	41921	FIN	
2000	PATUXENT	30395	FIN	
6/21/2000	PATUXENT	10595	FIN	CWT
6/22/2000	PATUXENT	12956	FIN	CWT
7/6/2000	PATUXENT	6844	FIN	CWT
6/13/2001	PATUXENT	12,606	FIN	CWT
6/14/2001	PATUXENT	12,670	FIN	CWT
6/22/2001	PATUXENT	16,194	FIN	CWT
6/26/2001	PATUXENT	13,113	FIN	CWT
6/5/2002	PATUXENT	4,419	FIN	CWT
6/6/2002	PATUXENT	4,141	FIN	CWT
6/17/2003	PATUXENT	16,451	FIN	
6/27/2003	PATUXENT	8,991	FIN	
5/7/2004	PATUXENT	60,000	FRY	
5/13/2004	PATUXENT	78,000	FRY	
6/22/2004	PATUXENT	6,940	FIN	
5/18/2005	PATUXENT	50,000	FRY	OTC
6/23/2005	PATUXENT	9,393	FIN	CWT
8/17/2005	PATUXENT	1,678	FIN	CWT
6/28/2006	PATUXENT	5,931	FIN	CALCEIN
7/20/2006	PATUXENT	8,807	FIN	CALCEIN
7/6/2007	PATUXENT	4,072	FIN	CALCEIN
7/6/2007	PATUXENT	6,000	FIN	CALCEIN
7/7/2009	PATUXENT	7163	FIN	CWT
7/6/2010	PATUXENT	46,610	FIN	CWT
7/12/2010	PATUXENT	4500	FIN	
7/26/2010	PATUXENT	5500	FIN	
10/26/2010	PATUXENT	1,511	ADV FIN	PIT (757)
5/31/2011	PATUXENT	75000	FRY	NONE
9/5/2012	PATUXENT	230	ADV FIN	PIT (227)
11/2/2012	PATUXENT	2346	ADV FIN	PIT (786)
11/14/2013	PATUXENT	580	ADV FIN	PIT

Table 2. Decision Tree Analysis of data collected for the largemouth bass (*Micropterus salmoides*) fishery.

	FRY	FIN/ADV FIN	SUBADULT	None/Failure
COST				
cost/fish	$0.53	$1.14	$8.25	$0
# fish/acre	25	9.8-12.5	9.9-10.2	0
# fish	39,000	15,600	13,260	0
Total Cost	$20,670	$17,784	$109,395	$0
Probability of success	0.10	0.21	0.40	0
REVENUE				
per angling-trip	$35	$35	$35	$35
# trips expected	13	13	18	1
# anglers	1000	1000	1000	1000
Total Revenue	$455,000	$455,000	$630,000	$35,000
NET PROFIT	$434,330	$437,216	$520,605	$35,000
EXPECTED VALUE	$56,330	$105,416	$163,605	$35,000
RANK	3	2	1	4
CONTEXT	least effective	periodic stocking to support recruitment for major fisheries	consistent stocking, support fishery in rivers with small carrying capacity	no action, warranted for majority of populations without major fisheries
CONSEQUENCES	some public support; expectations set but not realized unless habitat changes to benefit the fishery	no immediate impact to fishery; public support; prey diversity is initially more limiting and mortality rates are high; may buffer poor recruitment years, but will not expand fishery	immediate impact; public support; the prey that may be consumed is highly diverse; greater negative impact on ecosystem, likely; will expand fishery but may detrimentally affect existing population of Largemouth Bass as well as other species	essentially no benefits; trips to go fishing depend on factors other than increasing catch rate of Largemouth Bass.

Figure 1. Catch per boat electrofishing hour of largemouth bass (*Micropterus salmoides*) for Choptank River and Patuxent River. Circled data points are years when fry (Total Length = 25 mm) were stocked.

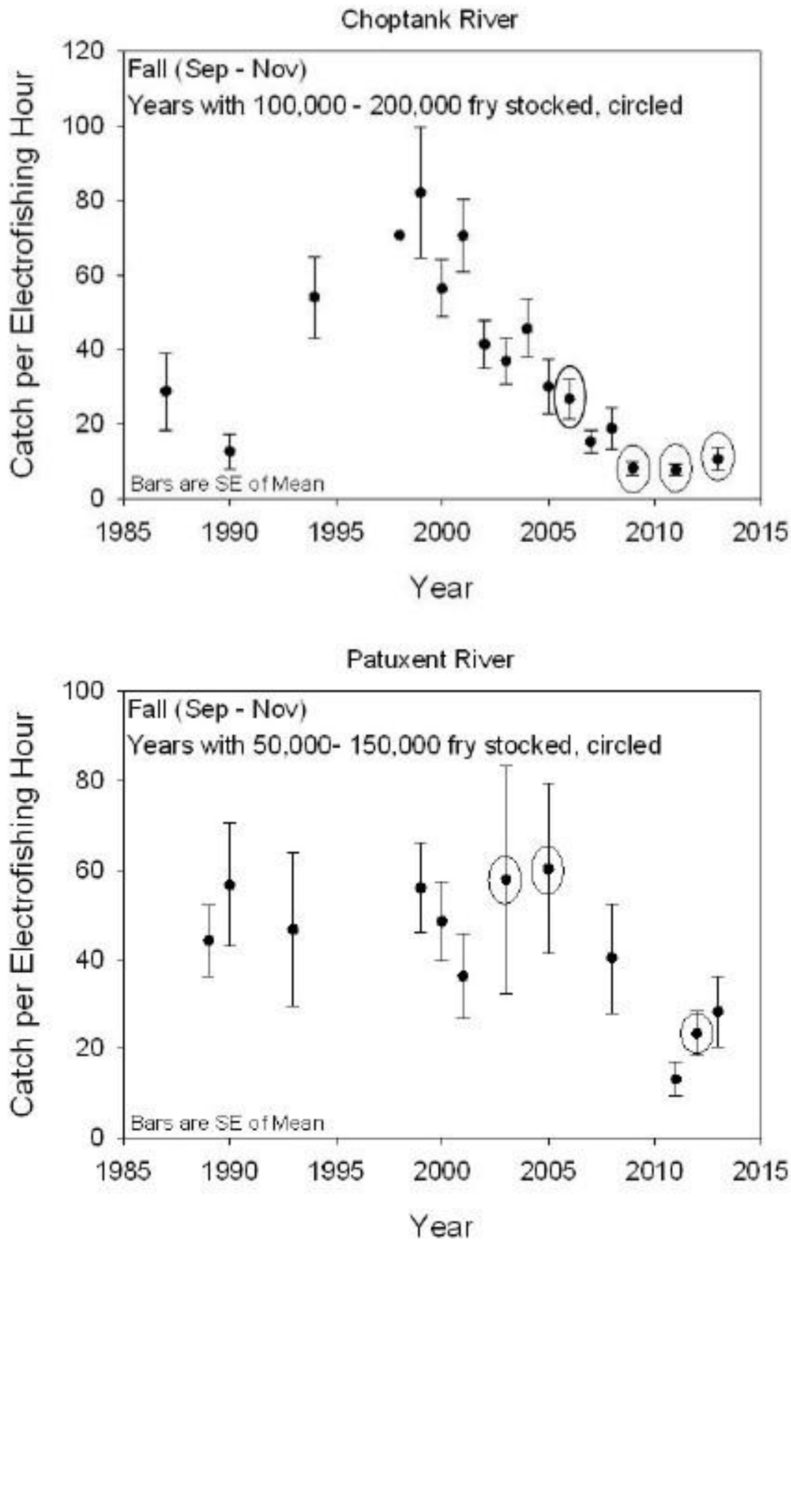
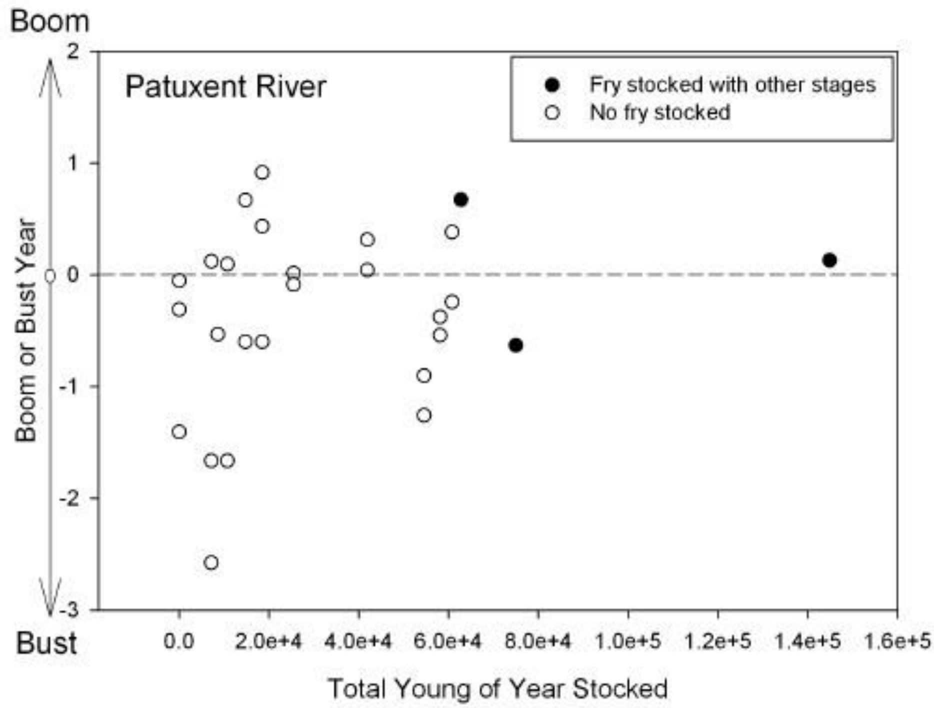


Figure 2. Age class strength for various age classes of largemouth bass (*Micropterus salmoides*) and survey years (1999 – 2013) does not increase with increases in the number of stocked juveniles (years when fry were stocked represented by dark circles). Boom years are represented by age classes with residual variance (x-axis) that is greater than 0, a reference point.



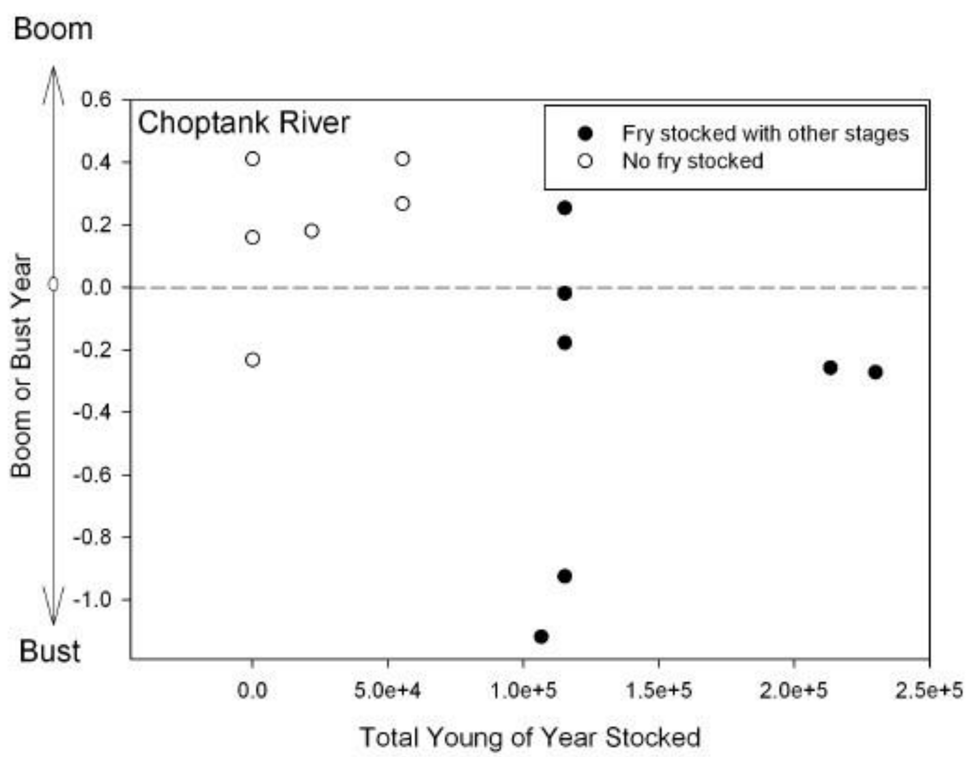


Figure 3. Catch per hour of largemouth bass (*Micropterus salmoides*) for ages 1 – 5 from Patuxent River versus number of fingerlings (~ 50 mm) stocked. While parameters were usually not significant, quadratic models fit the data better than linear models.

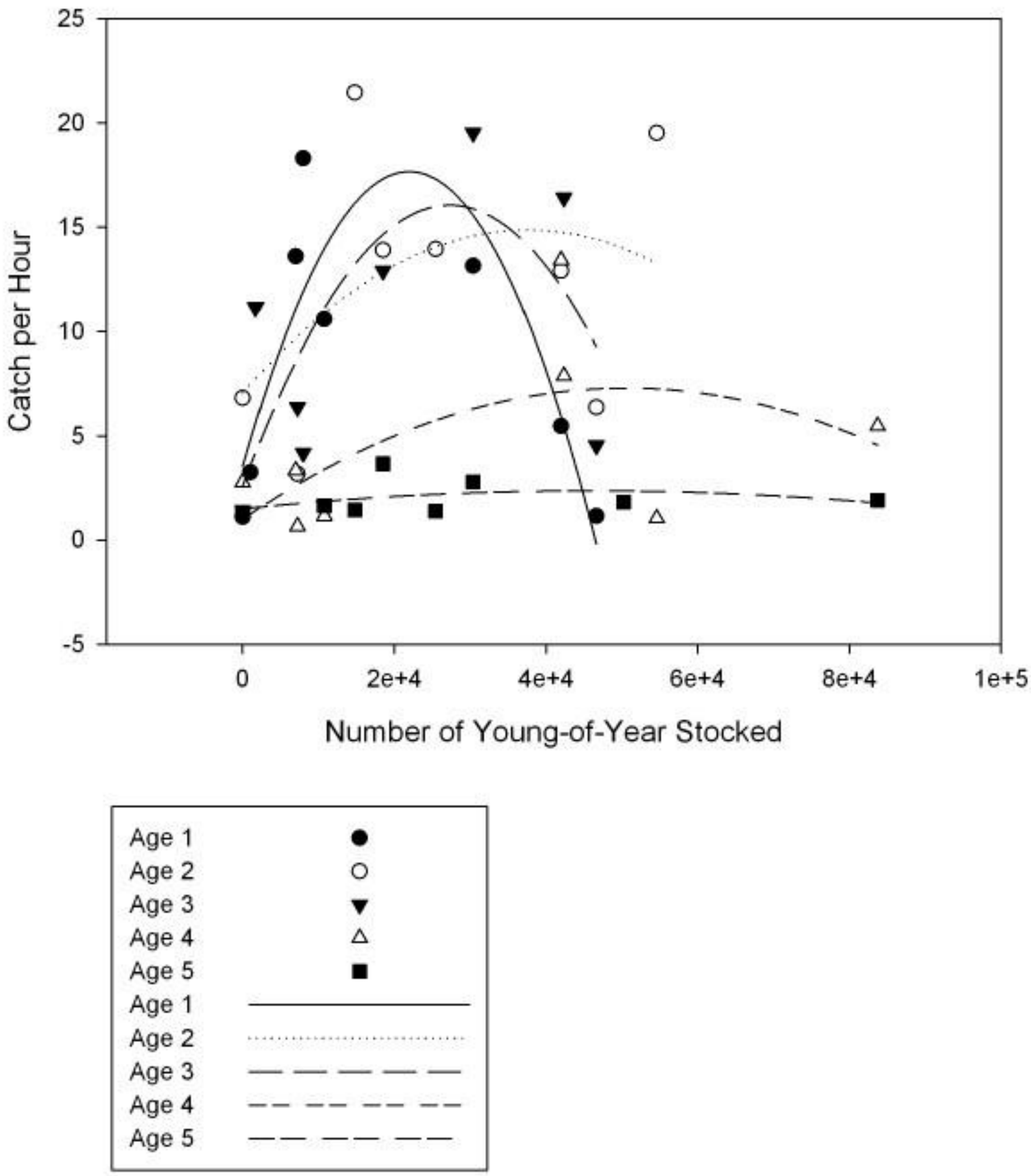


Figure 4. Proportion of hatchery recaptures for each age class of largemouth bass (*Micropterus salmoides*) collected during fall surveys of Patuxent River and Choptank River populations.

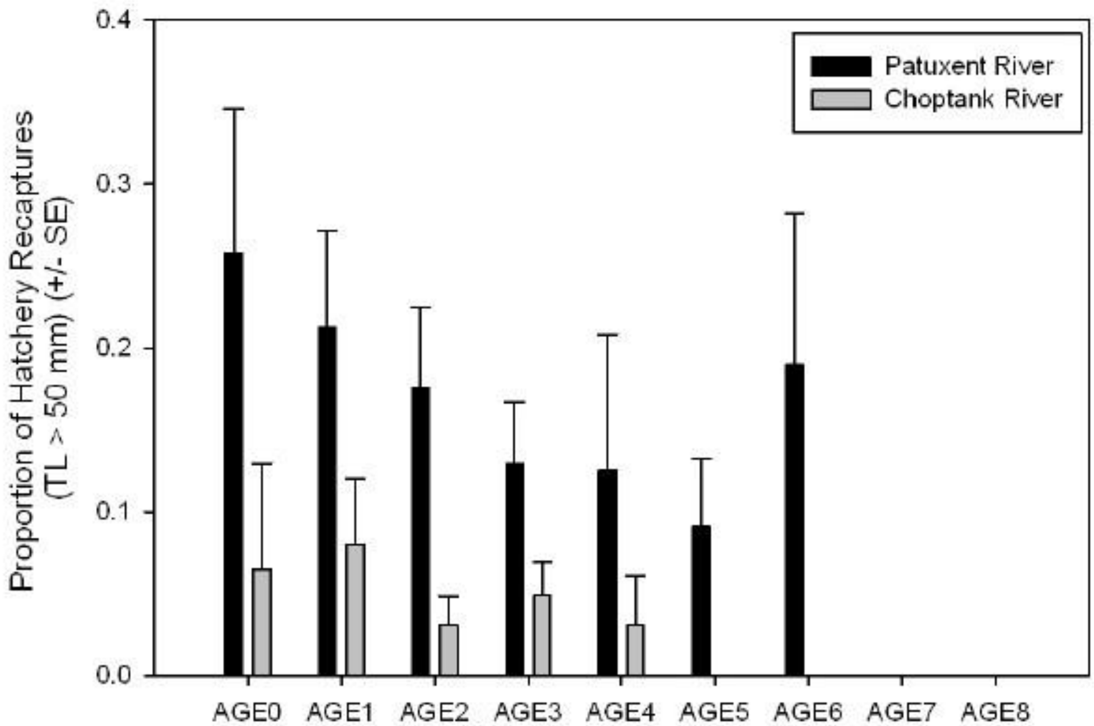
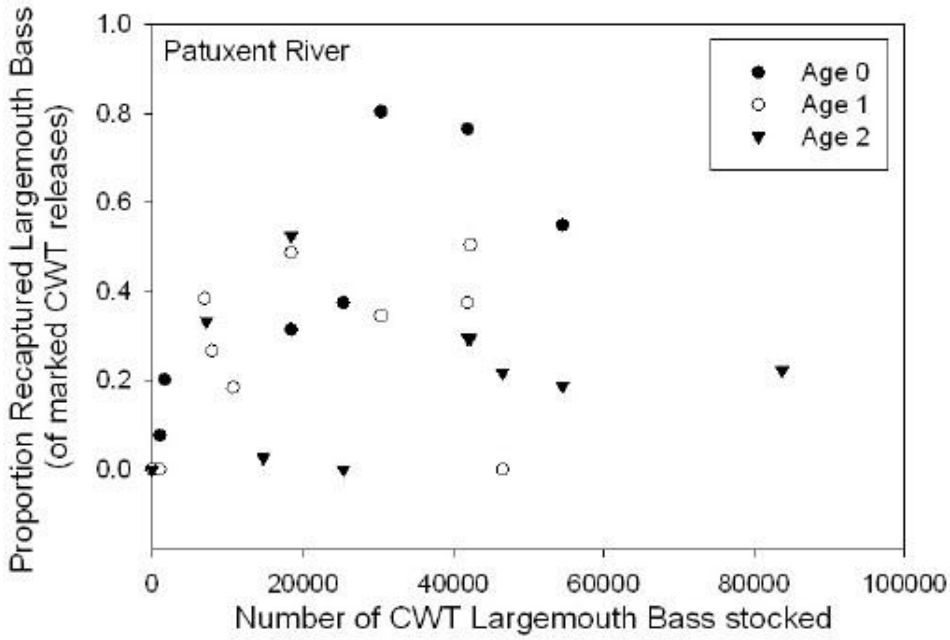
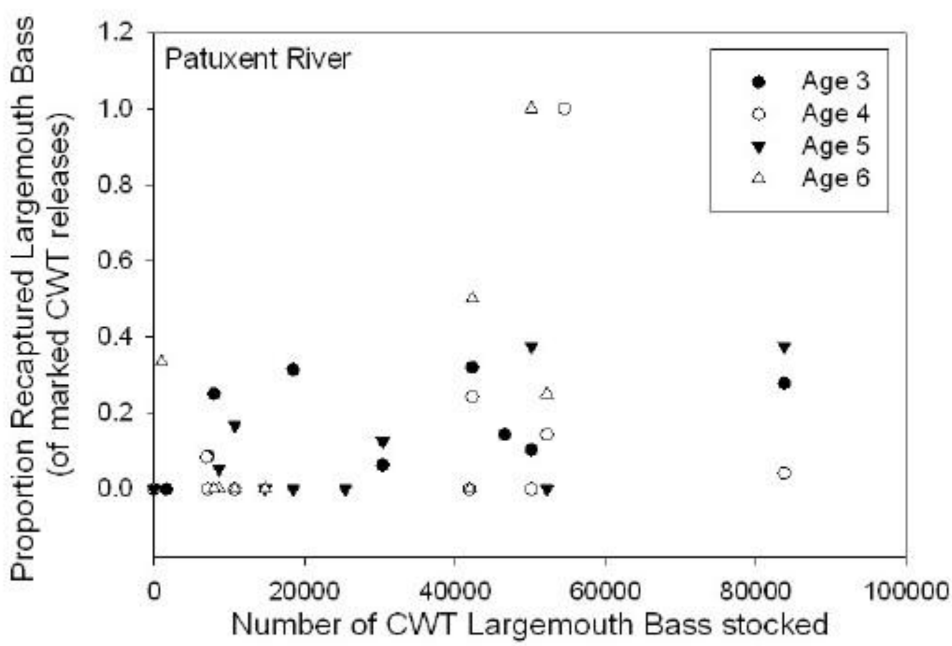


Figure 5. The proportion of hatchery released fish recaptured during fall surveys of Patuxent River and Choptank River Largemouth Bass (*Micropterus salmoides*) populations varies with the number of marked fingerling (~50 mm) fish stocked.





Appendix - A Stocking Formula to prioritize stocking locations
MD DNR Tidal Bass Program for Supplemental Stocking of Largemouth Bass
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A stocking formula to guide strategy for stocking largemouth bass was developed following review of work by Albert Powell, Howard Stinefelt, and Susan Rivers. The formula included 10 variables reflecting differences in habitat, fishery exploitation, and fishing opportunities (Table 1). Variables were either ranked based on 25th (low) and 75th (high) percentiles of the variable or on presence of the variable. Ranks were then categorized as: 5, in favor of stocking; 1, in opposition of stocking; or 3, intermediate (Table 1).

The formula used to combine ranks (x) of 10 variables (n) was a geometric mean (θ) that could range from 0.0 (don't stock) to 5.0 (stock). The stocking formula was : $\theta = \sqrt[i]{\prod_{\mathrm{i}}^{\mathrm{n}} \mathrm{xi}}$, or more specifically:
$\theta = \sqrt[10]{(L * A * U) * (G * H * I * W) * e * S * R}$, where L, A or U = 0 when unknown and where G, H, I or W = 1 when unknown. There was a high penalty when L, A, or U were unknown because it would be inappropriate to stock bass in areas where there is no knowledge on the number of fishing opportunities or fishers in an area.

Standard deviation in θ among ranks for a possible stocking location was calculated as:
$\sigma = \exp(\sqrt{(\sum_{i=1}^{n} \left(\frac{\ln(ni+1)}{\theta}\right) \hat{}2)}\ /n)$, where n = the number of metrics (*i*) or 10, and θ = geometric mean for the location. High values of σ may indicate less certainty in stocking a specific location.

The θ was calculated for and plotted by each subwatershed in Maryland following the HUC-8 designation in Maryland. The θ ranged between 0.0 to 4.1 and variance was bi-modally distributed. Subwatersheds with a geometric mean score of 2.2 or greater were prioritized. Highest priority was assigned to scores of 2.8 or greater. A GIS layer illustrating the distribution of scores is provided at: common drive/Inland Fisheries/Tidal Bass/GIS Data/Stocking Formula.lyr.

Table 1. Variables used in the stocking formula, along with the source of the data and how the data were summarized (i.e., percentiles or presence-absence). Possible ranks that the data were assigned are also given.

Variable (Abbreviation)	Source	Possible Ranks
Body Growth Rates of Bass: (*G*)	MD DNR, percentiles	5 (high *G*), 3, 1
Fishery Exploitation (*e*)	A Guess, percentiles	5 (high *e*), 3, 1
Habitat Suitability of spawning coves (*H*)	MD DNR, percentiles	5 (high *H*), 3, 1
Number of Black Bass Licensed Anglers (*L*)	MD DNR, percentiles	5 (high *L*), 3, 1
Number of Public Fishing Access Sites (*A*)	MD DNR, percentiles	5 (high *A*), 3, 1
Occurrence of Fishery Independent Survey (*S*)	MD DNR, presence-absence	5 (*S* present), 1
Proportion of Urbanized Land (*U*)	MD DNR, percentiles	5 (high *U*), 3, 1
Rare, Threatened or Endangered Species (*R*)	MD DNR, presence-absence	5 (*R* absent), 1
Waste Water Treatment Plants (*W*)	MD DNR, percentiles	5 (low *W*), 1
Habitat Impairment (*I*)	Chesapeake Bay Program, Grade C+ or C, C- or D, or D-	5 (low *I* or high grade), 3, 1

Table 2. Targeted subwatersheds assigned a priority for stocking largemouth bass every 2 or 3 years, or as necessary. Priorities were not assigned for subwatersheds with a geometric mean score that was less than 2.2. Based on the distribution of variance in geometric mean score, a break point of 2.2 was identified for prioritizing subwatersheds. Priorities were further categorized as high or low. When scores exceeded 2.8, which was another natural break point in the variance, then they were given a higher priority.

Subwatershed	Geometric Mean Score	Standard Deviation	Priority (NR)[1]
Potomac River (upper, tidal)	4.07	1.61	HIGH
Patuxent River	3.68	1.64	HIGH
Nanjemoy Creek	3.47	1.69	HIGH
Gunpowder River	3.30	1.59	HIGH
Sassafras River	3.27	1.63	HIGH
Lower Elk River	3.11	1.52	HIGH
Northeast River	3.11	1.75	HIGH
Lower Wicomico River	2.95	1.77	HIGH
Piscataway Creek	2.81	1.79	HIGH
Upper Choptank River	2.81	1.79	HIGH
Furnace Bay	2.78	1.82	LOW
Middle River	2.65	1.73	LOW
Nanticoke River	2.65	1.61	LOW
Potomac River (middle, tidal)	2.65	1.83	LOW
Upper Chester River	2.65	1.73	LOW
Upper Elk River	2.65	1.73	LOW
Lower Gunpowder Falls	2.63	1.76	LOW
Mattawoman Creek	2.51	1.85	LOW
St. Mary's River	2.51	1.63	LOW
Tuckahoe Creek	2.51	1.74	LOW
Wicomico River	2.51	1.63	LOW
Little Gunpowder Falls	2.49	1.77	LOW, NR
Eastern Bay	2.37	1.68	LOW, NR
Lower Susquehanna River	2.37	1.89	LOW
Lower Pocomoke River	2.37	1.89	LOW, NR
Marshyhope Creek	2.37	1.89	LOW
Oxon Creek	2.37	1.79	LOW
Potomac River (Montgomery County)	2.37	1.68	LOW
Wye River	2.37	1.68	LOW, NR
Back Creek	2.25	1.70	LOW, NR
Middle Chester River	2.25	1.80	LOW
St. Clements Bay	2.25	1.70	LOW, NR
Zekiah Swamp	2.25	1.70	LOW

[1] Score for the subwatershed may have indicated a priority ranking, but when additionally noted as "NR" then it is not recommended by the Tidal Bass Program to be stocked because of habitat restrictions unaccounted for in the current stocking formula.