Management Options for Conservation of Maryland's Black Bass Fisheries in Select Tidal Waters

Black Bass Advisory Subcommittee
July 6, 2016

The Department seeks advice from the Black Bass Advisory Subcommittee on two methods to implement Action 4.3.1 of the FMP. Each method has 2 or more options.

Methods

Method One: Extend Maximum Size Restriction

Regulatory Options to Implement Method One

Option 1. **Continue condition** to Maryland permitted tournaments, requiring either a limit of possession of large fish to 1 that is equal to or greater than 15-inches, per angler, unless the permitted tournament adheres to special conditions for organizing the tournament (Supplemental Material S3). The stipulation applies to tournaments held between June 16 and October 31 of any year.

Option 2. **Institute statewide regulation** to restrict possession of large fish (≥ 15-inches) to one per angler in tidal waters from June 16 through end of February. Tournament anglers could be issued a waiver that requires adherence to special conditions of possession.

Science to Support Options

Options 1 and 2 implement Action 4.3.1 by limiting the number of large fish that are possessed. Reducing the number of large fish (≥ 381 mm or 15-inches) that can be possessed could lower mortality rates for older individuals in the population. The largest fish in the population are weighed during tournaments, caught and immediately released, or harvested. Fisheries Service cited failure to maintain oxygen levels in live wells as a problem for keeping adults alive as early as 1990. Live wells can experience significant drops in oxygen when not properly maintained[1] and larger bass require more oxygen[2,3]. Bass greater than 15 inches are also more likely to be photographed, with prolonged exposure to air and held by the jaw without supporting the back. These factors may contribute to the observation that larger bass tend to die more frequently during tournaments[4]. In an analysis of length data collected during Potomac River bass tournaments (1990, 2003, 2008), an average 31% of the total catch included fish that were 15-inches or larger during the 12-inch season. During a tournament, 70% of the fish that die are 15-inches (381 mm) or larger (Figure 1). Thus, while only 1/3rd of the catch is expected to be 15-inches or larger during Potomac River tournaments, the vast majority of mortalities are suffered

[1] Hartley, R.A. and J.R. Moring. 1993. Observations of black bass (Centrarchidae) confined during angling tournaments: a cautionary note concerning dissolved oxygen. Aquaculture Research 24:575-579.
[2] Beamish, F.W.H. 1970. Oxygen consumption of largemouth bass, Micropterus salmoides, in relation to swimming speed and temperature. Can J Zool 48:1221-1228.
[3] Burleson, M.L, D.R. Wilhelm, and N.J. Smatresk. 2001. The influence of fish size on the avoidance of hypoxia and oxygen selection by largemouth bass. J Fish Biol 59:1336-1349.
[4] Wilde, G. 1998. Tournament-associated mortality in black bass. Fisheries 23:12-22.

by fish that are 15-inches or greater. Additionally, there are proportionately more large fish in Patuxent River and upper Chesapeake Bay than Potomac River, which has a longer history of intense fishing (Figure 2).

Option 1 applies only to a subset of tournaments staged in Maryland. Option 2 applies to anyone possessing bass in Maryland water and is similar in style to the management of bass fisheries in Florida by the Florida Fish and Wildlife Conservation Commission. The regulations in Florida allow possession of 5 black bass, only one of which may be 14 or 22 inches or longer, depending on the area. However some tournaments are exempt from that regulation if they obtain a permit with special conditions from the State of Florida. Tournament organizations have long-recognized the importance of minimizing mortality risks of bass. To lower mortality risks on large fish during tournaments, recommendations by B.A.S.S. have included chilling live wells, with continuous recirculation and water exchanges, especially during summer months with water temperatures > 80° F. Both options 1 and 2 allow tournament directors to receive a waiver that will allow anglers to possess more than one fish that is 15-inches or greater if the participants agree to follow practices identified by nationwide studies that will lower mortality risks. These practices may improve post-release survival of larger bass.

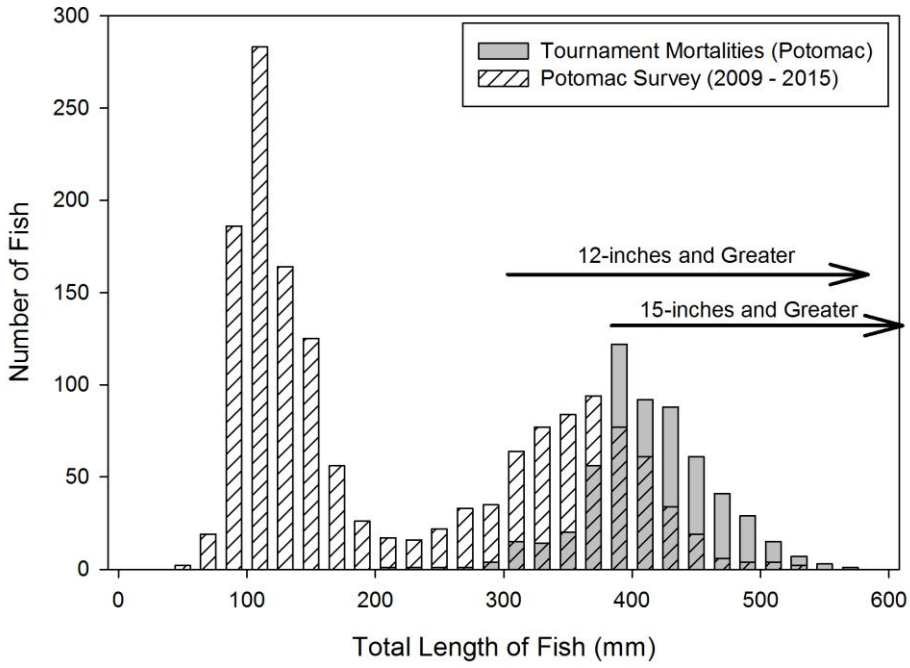

Figure 1. Length-frequency histogram of number of largemouth bass caught during fall boat electrofishing surveys in the Potomac River (hashed bars) compared with a length-histogram for a number of tournament mortalities collected following tournaments (gray bars).

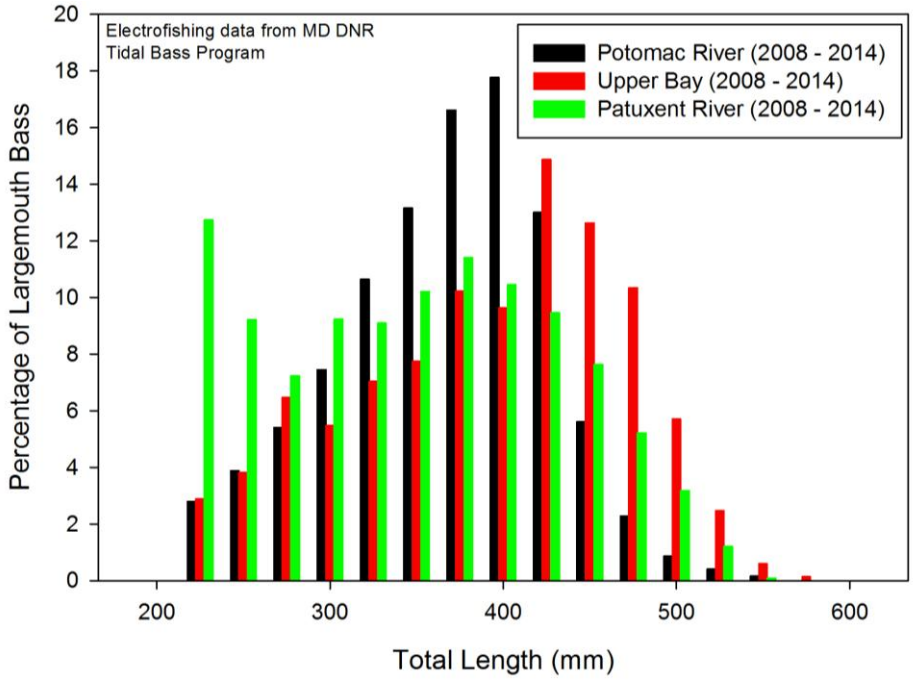

Figure 2. Length-frequency histogram for three populations in the Chesapeake Bay: Potomac River (intensively fished), Patuxent River (not highly fished), and upper Chesapeake Bay (increasingly fished). For reference, a 305 mm fish is 12-inches and a 381 mm fish is 15-inches. Data collected using boat electrofishing by MD DNR and Tidal Bass Program.

Method 2: Implement Closed and/or Catch-and-Return Areas

Regulatory Options to Implement Method 2

Option 1. **Institute year-round no target** of black bass for ONE location in Potomac River and ONE location in upper Chesapeake Bay

Possible high quality locations identified by stakeholders and the Department include: all or upper Chicamuxen Creek; all or portions of Furnace Bay.

Option 2. **Institute year-round catch-and-return** for ONE location in Potomac River and ONE location in upper Chesapeake Bay

Possible high quality locations identified by stakeholders and the Department include: all or upper Chicamuxen Creek; all or portion of Furnace Bay (Mill Creek).

Option 3. **Institute year-round catch-and-return** in TWO areas in Potomac River and TWO areas in upper Bay;

Possible high quality locations identified by stakeholders and the Department include: Piscataway Creek and upper Mattawoman Creek; all or portion of Furnace Bay (Mill Creek) and Swan Creek.

Option 4. **Institute spring catch-and-return areas** (March 1 - June 15) in TWO areas in Potomac River and TWO areas in upper Bay;

Possible high quality locations identified by stakeholders and the Department include: Piscataway Creek and upper Mattawoman Creek; all or portion of Furnace Bay (Mill Creek) and Swan Creek.

Option 5. **Institute a mix (no target and catch-and-return) of spring possession restrictions (March 1 - June 15)** in TWO areas in Potomac and TWO areas in upper Bay;

Possible high quality locations identified by stakeholders and the Department, with restriction option, include: Piscataway Creek (no target) and upper Mattawoman Creek (catch-and-return only); all or portion of Furnace Bay (Mill Creek) (no target) and Swan Creek (catch-and-return only).

Option 6. **Statewide, spring catch-and-return regulation, similar to non-tidal waters.**

Science to Support Options

Options 1 through 6 implement Action 4.3.1 by reducing creel limit to 0 for specific tidal waters and specific times. Benefits and complications of each option are summarized in Table 1. In 2014, the Department surveyed anglers regarding catch-and-return areas and presented the data to the Sport Fisheries Advisory Commission (Supplemental Material S4). There was general public support for catch-and-return areas, especially during spring; there were also suggestions for no target areas. The options presented above were developed based on strategies used by the Department and management agencies in other states, discussed internally, and modified based on all public comments received over the past 2 years. In all cases, the options presented will minimize mortality risks (as explained below) to adults that may have reproduction and survival negatively impacted because of angling[5,6,7,8,9].

No Target Areas (Closed Areas)

No target areas for black bass fishing prevent targeting of black bass. This could protect fish from factors that increase risk of catch-and-release mortality[10]. This action is more likely successful in an area with high catch rates and well-known for fishing[11]. When targeting is prevented in highly popular areas, no target areas may justifiably lower the number of fish that die. Catch-and-release mortality was estimated at 11% in a small-scale study in 2015[12], which is supported by some studies that indicate up to 1 in 5 largemouth bass may die from catch-and-release mortality depending on type of hook, water temperature[13], and hooking location[14]. Catch-

[5]Goodgame, L.S. and L.E. Miranda. 1993. Early growth and survival of age-0 largemouth bass in relation to parental size and swim-up time. TAFS 122:131-138.
[6] Sutter, D.A.H., C.D. Suski, D.P. Philipp, T.Klefoth, D.H. Wahl, P.Kersten, S.J. Cooke, and R. Arlinghaus. 2012. Recreational fishing selectively captures individuals with the highest fitness potential. PNAS 109:20960-20965.
[7] Suski, C.D. and D.P. Philipp. 2004. Factors affecting the vulnerability to angling of nesting male largemouth and smallmouth bass. TAFS 133:1100-1106.
[8] Miranda, L.E. and R.J. Muncy. 1987. Recruitment of young-of-year largemouth bass in relation to size structure of parental stock. NAJFM 7:131-137.
[9] Ostrand, K.G., S.J. Cooke, and D.H. Wahl. 2004. Effects of stress on largemouth bass reproduction. NAJFM 24:1038-1045.
[10] Bartholomew, A. and Bohnsack, J.A. 2005. A review of catch-and-release angling mortality with implications for no-take reserves. Reviews in Fish Biology and Fisheries 15:129-154.
[11] Matthias, B.G., M.S. Allen, R.N.M. Ahrens, T.D. Beard, Jr. and J.A. Kerns. 2014. Hide and seek: Interplay of fish and anglers influences spatial fisheries management. Fisheries 39:261-269.
[12] Love, J.W., J.J. Newhard, and M. Groves. 2015. Risk of population decline for largemouth bass in a Potomac River fishery (USA): Effects from invasive northern snakehead. American Fisheries Society Symposium 82:207-221.
[13] Bartholomew, A. and Bohnsack, J.A. 2005. A review of catch-and-release angling mortality with implications for no-take reserves. Reviews in Fish Biology and Fisheries 15:129-154.

and-release angling during the spawning season could also lead to production of less aggressive males that are less attentive to nests and more vulnerable to angling[15,16].

Most research regarding spring closures has not demonstrated an improvement in the fishery as a result of the closure. Work in New York and Virginia provided no evidence that spring fishing for black bass resulted in negative population level impacts[17,18]. Most angling impacts were overshadowed by those from the environment, which has been supported by other studies[19,20,21]. Disease reportedly caused poor recruitment in smallmouth bass in Susquehanna River and a spring-time (May 1 - June 17), no-target regulation adopted in 2011 has not demonstrated improved recruitment or catch of adult smallmouth bass compared to the 1990's or late 2000's[22]. One reason closures may not work is that closed areas are illegally fished[23]. Spring-time closures in Maryland and year-round closures in Virginia (e.g., near mouth of Quantico Creek) have not yet been shown to have a greater number of adults than other areas, but those restricted areas are illegally fished, relatively small, or not considered prime habitats for bass.

Catch-and-Return Areas

Preventing possession of black bass could lead to a significant, proportional increase in adults for fisheries undergoing high levels of harvest (harvest rate = 0.20 or 18%)[24]. Indeed, the general adoption of catch-and-release angling and reduction in harvest has led to an increase in the number of large bass in populations[25]. The proportion of bass that are harvested in Maryland's Potomac River is under 5% of caught bass[26]. Of 228 anglers surveyed in 2009 by U.S. Fish and Wildlife Service on Potomac River, 13 (~ 6%) harvested largemouth bass at a rate of about 3 bass/ang-day[27]. In addition to harvest some bass are relocated during bass tournaments and only 14% may return to their home streams[28]. Retention of bass during tournaments could permanently remove adults from quality habitats and further increase their mortality risk. Additional mortality risks associated with retention, but not catch-and-release, include live well

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[14] Wilde, G.R. and K.L. Pope. 2008. A simple model for predicting survival of angler-caught and released largemouth bass. TAFS 137:834-840.
[15] Sutter, D.A.H., C.D. Suski, D.P. Philipp, T. Klefoth, D.H. Wahl, P. Dersten, S.J. Coke, and R. ARlinghaus. 2012. Recreational fishing selectively captures individuals with the highest fitness potential. Proceedings of the National Academy of Sciences 109:20960-20965.
[16]Philipp, D.A., J.E. Claussen, J.B. Koppelman, J.A. Stein, S.J. Cooke, C.D. Suski, D.H. Wahl, D.A. Sutter, and R.A. Arlinghaus. 2015. Fisheries-induced evolution in largemouth bass: Linking vulnerability to angling, parental care, and fitness. In: Tringali, M.D., Long, J.M., Birdsong T.W., Allen, M.S. (Eds.), Black Bass Diversity: Multidisciplinary Science for Conservation. American Fisheries Society Symposium 82, Bethesda, Maryland, pp. 223-234.
[17] Jackson, J.R., D.W. Einhouse, A.J. VanDeValk, and T.E. Brooking. 2015. Year-class production of black bass before and after opening of a spring catch-and-release season in New York: Case studies from three lakes. American Fisheries Society Symposium 82:181-191.
[18] Ray, B. 2008. Factors affecting largemouth bass recruitment in a trophy bass reservoir of Virginia, Briery Creek Lake. Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.
[19] Miranda, L.E. and W.D. Hubbard. 1994. Winter survival of age-0 largemouth bass relative to size, predators, and shelter. NAJFM 14:790-796.
[20] Ludsin, S. and D. R. DeVries. 1997. First-year recruitment of largemouth bass: The interdependency of early life stages. Ecol App 7:1024-1038.
[21] Ray, B. 2008. Factors affecting largemouth bass recruitment in a trophy bass reservoir of Virginia, Briery Creek Lake. Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.
[22] Pennsylvania Fish and Boat Commission. 2013 and 2015 reports: http://fishandboat.com/images/reports/2013bio/susq2013smb.pdf and http://fishandboat.com/images/reports/2015bio/susq2015yoybass.pdf.
[23] Kubacki, M.F., F.J.S. Phelan, J.E. Claussen, and D.P. Philipp. 2002. How well does a closed season protect spawning bass in Ontario. American Fisheries Society Symposium 31:379-386.
[24] Gwinn, D.C. and M.S. Allen. 2010. Exploring population-level effects of fishery closures during spawning: An example using largemouth bass. TAFS 139:626-634.
[25] Allen MS, Walters CJ, Myers R. 2008. Temporal trends in Largemouth Bass mortality, with fishery implications. North American Journal of Fisheries Management 28:418-427.
[26] MDDNR (unpublished data). 2015 Volunteer Creel Angler Survey. Also, 2015 Virginia Department of Game and Inland Fisheries (pers. comm., J. Odenkirk). Also, USFWS 2009 intercept creel survey of Potomac River (pers. comm., J. Newhard).
[27] Newhard, J.J., Maryland Fish and Wildlife Conservation Office, U.S. Fish and Wildlife Service. Personal Communication.
[28] Wilde GR. 2008. Dispersal of tournament-caught black bass. Fisheries 28:10-17.

conditions, weigh-in procedures, release strategies, and post-release habitat conditions[29]. Studies of post-release mortality indicate that these additional mortality risks can result in death and lead to death of between 3 and 34% of catch, with greater risks if water temperature exceeds 80°F[30]. An annual average of 10,000 bass were reportedly caught and released during tournaments between 2011 and 2015 in Potomac River. This average is between 7% and 20% of population sizes estimated within the past 3 decades for largemouth bass from Potomac River.

Spring-Only Possession Restrictions

The prevention of targeting or possession of bass in proposed areas during spring could minimize mortality risks during one of the most popular fishing seasons and increase the proportion of large bass (> 400 mm). During spring, adults spawn and males protect nests. This nesting behavior causes males to be highly vulnerable to capture[31]. Spring time catch and immediate release of 12-inch to 15-inch bass began in 1989 by the Department for black bass and appears to have affected size structure positively (Figure 3) because fewer 12-inch (305 mm) to 15-inch (381 mm) fish were removed. Restricting harvest and mortality of a size class during spring helped to improve the relative abundance of those size classes in the population. Applying such restrictions on all sizes of fish within selected areas could likewise increase catch of large fish in Potomac River. However, there was no significant difference in size distribution of largemouth bass between Potomac River and Deep Creek Lake, a popular bass fishery with a spring-only catch-and-return season (unpublished analysis, JWL; Figure 4). Because Potomac River and Deep Creek Lake differ in habitat conditions that could affect growth and length frequencies, additional investigation into the expectations of spring management restrictions on the fishery appear warranted. Reproduction may also benefit from spring-only restrictions if such restrictions limit physiologic stress on caught fish[32] or reduce nest abandonment. In areas lacking complex refugia, prolonged retention (2 hours) and displacement of adults up to 1 km could lead to significant nest abandonments by males[33].

[29] Siepker, M.J., K.G. Ostrand, S.J. Cooke, and D.P. Philipp, and D.H. Wahl. 2007. A review of the effects of catch-and-release angling on black bass, *Micropterus* spp.: implications for conservation and management of populations. Fisheries Management and Ecology 14:91-101.
[30] Gilliland, E.R. 2002. Livewell operating procedures to reduce mortality of black bass during summer touranments. American Fisheries Society Symposium 31:477-487.
[31] Philipp, D.A., J.E. Claussen, J.B. Koppelman, J.A. Stein, S.J. Cooke, C.D. Suski, D.H. Wahl, D.A. Sutter, and R.A. Arlinghaus. 2015. Fisheries-induced evolution in largemouth bass: Linking vulnerability to angling, parental care, and fitness. In: Tringali, M.D., Long, J.M., Birdsong T.W., Allen, M.S. (Eds.), Black Bass Diversity: Multidisciplinary Science for Conservation. American Fisheries Society Symposium 82, Bethesda, Maryland, pp. 223-234.
[32] Ostrand, K.G., S.J. Cooke, and D.H. Wahl. 2004. Effects of stress on largemouth bass reproduction. NAJFM 24:1038-1045.
[33] Siepker, M.J. S.J. Cooke, D.H. Wahl, and D.P. Philipp. 2009. Individual reproductive success of largemouth bass and smallmouth bass subjected to different components of competitive angling events. Transactions of the American Fisheries Society 138:818-825.

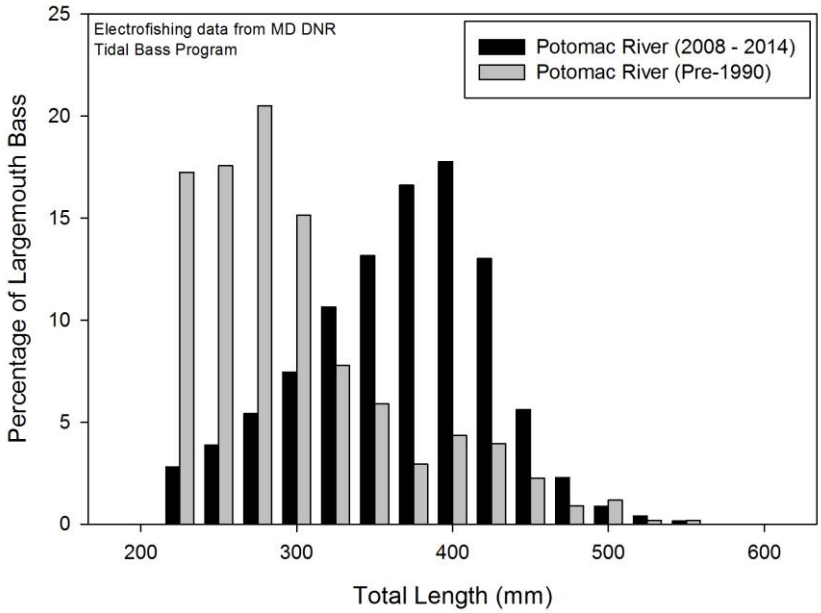

Figure 3. Largemouth bass length frequency figures for two time periods in Potomac River (pre-15" minimum or "pre-1990" and afterwards). For reference, a 305 mm fish is 12-inches and a 381 mm fish is 15-inches. Data collected using boat electrofishing by MD DNR and Tidal Bass Program.

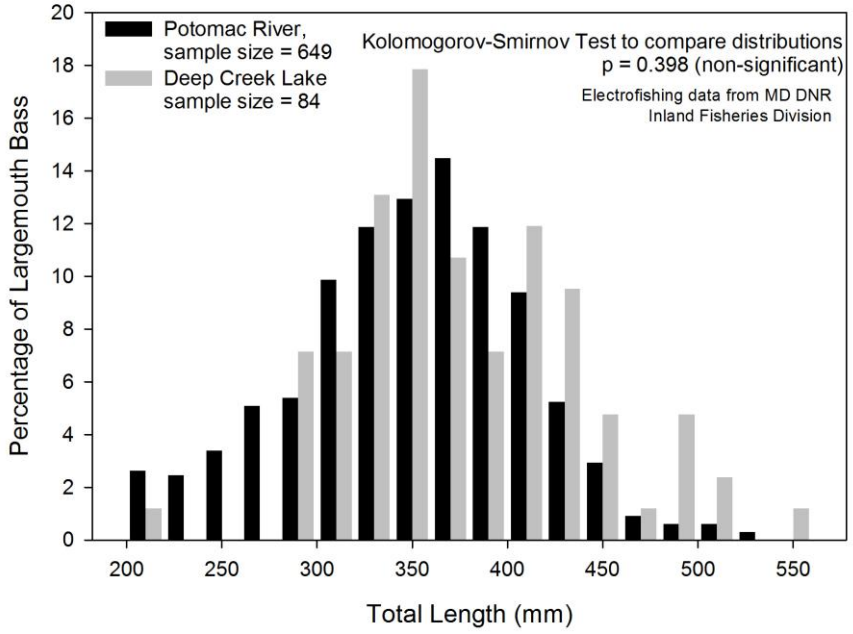

Figure 4. Largemouth bass length frequency for fish collected in Potomac River and compared to that for fish collected from Deep Creek Lake, for which possession of largemouth bass is disallowed between March 1 and June 15. For reference, a 305 mm fish is 12-inches and a 381 mm fish is 15-inches.

Table 1. Summary table of management options that may be chosen to implement Action 4.3.1. For each option, expectations (or pros) and complications (or cons) are provided.

OPTION(S)	Expectation	Complications
1: Year-round, No Target	Prevents catch-and-release mortality and translocation in prime areas year-round; prevents nest failure in spring; demonstrates a regulatory action	Evidence to support its effectiveness is demonstrated when harvest and fishing mortality rates are high and angling effects overshadow habitat effects; additional enforcement requires identification of angler in the area, targeting bass; will create a new regulation for an off-limits area for bass anglers but allow other anglers to fish the area.
2: Year-round, Catch and Return	Prevents mortality from harvest and translocation in prime areas, year-round; prevents nest failure in spring, if related to translocation or harvest in prime areas; demonstrates a regulatory action.	Some empirical evidence to support its effectiveness, but only when harvest or fishing mortality rates are high in the area; additional enforcement requires identification of an angler in the area possessing bass; will create a new regulation for an area that prohibits *some* forms of bass tournament fishing, but allows other bass anglers to target bass.
3: Year-round, No Target/Catch and Return mix	See Above	See Above
4 - 6: Springtime, a) Catch and Return (limited areas); b) No Target (limited areas); and c) Catch and Return statewide	All options could prevent nest failure in spring, if nest failure is mainly related to targeting, translocation or harvest in prime areas; No target areas additionally prevent catch-and-release mortality during a period (spring) when bass are more easily targeted in prime areas; demonstrates a regulatory action.	May be effective when harvest or fishing mortality rates are high and angling effects overshadow habitat effects; enforcement requires identification of angler in the area, targeting bass or possessing bass, depending on the area; will create multiple areas with specialized restrictions (unless statewide) that prohibits some forms of bass tournament fishing, and could prevent bass anglers from targeting bass, but allows other forms of fishing in that area during spring.

Outcome Assessment

The Department will gather data on the effectiveness of any implemented action(s). Any implemented action(s) may be *temporary*. If successful at improving catch and proportion of stock size fish that are 15-inches or greater (see below), then an action may be considered for more widespread use in tidal freshwater.

Success of any option for implementing Action 4.3.1 depends on current harvest, current catch-and-release mortality, current removal of fish from the proposed areas, enforcement, and environmental factors. Therefore, any management action implemented should also include a Departmental plan to: 1) conduct a recreational creel survey to quantify harvest and fishing effort in the proposed areas; 2) measure catch-and-release mortality; 3) assure adequate enforcement with clear outreach to anglers and Natural Resources Police; and 4) document environmental factors that could contribute to additional mortality risks on bass.

The FMP indices that may be used to examine whether expectations are met include: 1) catch of adults (age 1+); and 2) length frequencies and the proportion of stock size bass that are 15-inches or greater in the proposed area. Reference points are established in the FMP for targeted river populations. For example, in general, the proportion of stock size bass (≥ 8-inches) that are 15-inches or greater should be between 0.2 and 0.4 (Figure 5). Additional indices that address the broad application of the action should include: 1) a preference survey of anglers for the tool and its effectiveness; and 2) a tally of the number of citations issued by Natural Resources Police or sighted violators of the regulatory option by the general public reported to Catch a Poacher (1-800-635-6124)

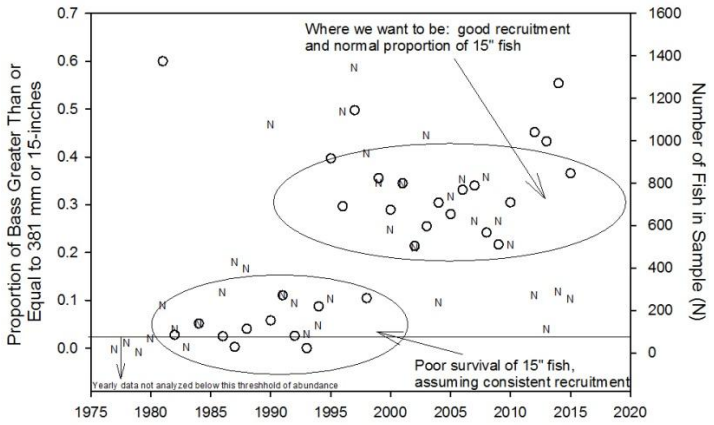

Figure 5. Data collected for the tidal freshwater population of largemouth bass in Maryland's Potomac River, with reference to the proportion of stock size bass that are 15-inches or larger (clear circles) and to the number of fish in the sample (N) for years spanning over three decades. When Proportional Size Distribution (PSD) is too low (< 0.20), it can indicate high harvest or mortality of large fish. When PSD is too high (> 0.40), this can indicate poor recruitment. Data were collected using boat electrofishing.