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# 2015 Review of the Maryland White Perch Fishery Management Plan

July 2015

Maryland Department of Natural Resources
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July 2015

**Plan Review Team**

Fishery Management Plans Program Staff
Chesapeake Finfish Program Staff
Habitat and Ecosystem Program Staff
Fisheries Service Management Team
Sport Fisheries Advisory Commission
Tidal Fisheries Advisory Commission

**Approved by:**

Director, Fisheries Service

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**Acronyms**

| | |
|---|---|
| ASMFC | Atlantic States Marine Fisheries Commission |
| CPUE | Catch Per Unit Effort |
| CSA | Catch Survey Analysis |
| DNR | Department of Natural Resources |
| F | Fishing Mortality |
| FMP | Fisheries Management Plan |
| FS | Fisheries Service |
| MSP | Maximum Spawning Potential |
| PRT | Plan Review Team |
| PSE | Proportional Standard Error |

**Summary**

The 1990 White Perch Fishery Management Plan was reviewed in 2015. The Fisheries Service Plan Review Team concluded that the goal and objectives of the plan provide a framework for managing white perch in Maryland. They also concurred that the annual update to the implementation table is an appropriate way to track progress in meeting the plan objectives and to address problem areas. The 2014 white perch upper Bay stock assessment indicated that overfishing is not occurring. Estimated abundance in the upper Bay was 10.2 million fish. Data on white perch abundance indicates the population size is variable but above the proposed threshold. Restrictive measures on either the commercial or recreational fishery does not appear necessary at this time. The Plan Review Team recommends no changes to the current management of white perch in Maryland and supports continued monitoring and periodic stock assessments. Natural variation in recruitment is expected and the species is considered to be somewhat resilient. Water quality and habitat concerns are the primary issues for this species. The Plan Review Team recommends using impervious surface reference points to identify viable spawning locations and to preserve habitat in more pristine areas. They also recommend implementing land management decisions that protect aquatic resources.

**Introduction**

White perch (*Morone americana*) are one of the most abundant and widely distributed fish in the Chesapeake Bay and tributaries. They are one of the few commercial and recreational species that spend their entire lives in Bay waters. They consistently support important commercial and recreational fisheries in Maryland and are usually within the top five commercial finfish species by dollar value. White perch are highly sought by recreational fishermen for their excellent sport and food value.

**Status of the 1990 Fishery Management Plan (FMP)**

| | |
|---|---|
| Date of FMP Approval: | None |
| Amendments: | None |
| FMP Review Dates | 2005, 2015 |
| FMP Updates | 2007 – present (2015) |

Fishery management plans provide a framework for how a fishery resource will be managed based on a species life history, habitat, ecosystem considerations, fishery utilization and the goals and objectives for the fisheries and the stock. Over time, the status of a resource can change and new issues arise. Strategies and actions within a plan need to be periodically reviewed and evaluated to ensure the management framework is

still appropriate or amended/revised to address significant changes. For details on the process for reviewing plans and developing or amending plans, see Appendices 1 - 3.

In June, 2015, a Fisheries Service Plan Review Team (FS PRT) reviewed the 1990 White Perch FMP. The FS PRT was comprised of staff from the FS Policy and Planning Division FMP Program (Nancy Butowski, Rick Morin) and Habitat and Ecosystem Program (Marek Topolski), and Estuarine and Marine Fisheries Division Chesapeake Finfish Program (Paul Piavis and Butch Webb). Additional staff from Fisheries Service participated in the FMP review as well as members of the Sport Fisheries Advisory Commission (SFAC) and the Tidal Fisheries Advisory Commission (TFAC) (*Note: This draft does not yet incorporate input from SFAC or TFAC as their review is occurring now*.)

A FMP for white perch was prepared in 1990 but has not been formally adopted by reference into Maryland regulation. Despite this, Maryland has continued to manage the species under the framework of the FMP. The FMP includes a background section that describes the life history, fishery, landings, economic perspective, resource status, habitat issues, FMP status and management unit, laws and regulations, status of traditional fishery management approaches, and data and information needs. The white perch management section defines a goal and objectives, problem areas, strategies, and actions.

The goal of the 1990 white perch FMP is:

*Manage white perch stocks in the Maryland portion of the Chesapeake Bay in a manner which protects their ecological value and at the same time, generates the greatest long term economic and social benefits from using the resource.*

The objectives to achieve the goal are:

1. *Implement a directed white perch fishery which would result in a minimal bycatch of striped bass thus optimizing white perch commercial and recreational harvest.*

2. *Provide for fair allocation of allowable harvest, consistent with traditional uses, among the various components of the fishery.*

3. *Continue to establish reliable records of catch composition, catch and effort data.*

4. *Promote harvest practices which increase yield per recruit and avoid establishing populations with high abundance, low growth rates, and low mean size.*

5. *Promote studies that investigate the socioeconomic issues related to the white perch fishery.*

6. *Continue to pursue and enforce standards of environmental quality and habitat protection.*

**Status of the Stock**

The most recent stock assessment of white perch (Piavis and Webb, 2015b) utilized the same models as the 2011 stock assessment (Piavis and Webb, 2012) but included the latest three years of data (2012-2014). The model results were compared to the proposed biological reference points to determine stock status in the upper Bay and Choptank River (Piavis and Webb, 2006).

The catch survey analysis (CSA) model utilized for the upper Bay stock and the Choptank River is described by Piavis and Webb, 2015. The model includes indices of pre-recruit and post-recruit abundance, total removals from the population, assumed natural mortality (M) and a scalar relating pre-recruit selectivity to post-recruit selectivity for the years 2000-2014. This data was obtained from the upper Bay winter trawl survey and the Choptank River fyke net survey from 1989 -2014. The lower Bay (below the Bay Bridge to the Maryland state line) stock was assessed by compiling fishery dependent relative abundance indices and fishery independent surveys.

Total upper Bay population abundance has been variable from 11 million fish in 2001 to 4.4 million in 2007 to 10.2 million in 2013 (Figure 1) (Piavis and Webb, 2015). The average pre-recruit abundance for the period 2000-2013 was 3.4 million fish. In 2013, a rough estimate, not fit by the model, was 7.8 million fish. The post-recruit population estimate for 2013 was the highest since 2002 and the pre-recruit population estimate for 2013 was the highest since 2001 (Piavis and Webb, 2015).

Biological reference points based on maximum spawning potential (MSP) were determined from spawning stock biomass per recruit analysis. F30% (target) and F20% (threshold or limit) appear to be appropriate considering the early age at maturity. Estimated F slightly exceeded the proposed target in 2007 but has otherwise been under the target in every year from 2000 to 2013 (Figure 2). The model indicated that there was only a 1.2% chance that F target was exceeded in 2013 for the upper Bay. This indicates that overfishing of the upper Bay stock did not occur. For the Choptank River, fishing mortality rates declined after 1997 when F exceeded the proposed limit reference point. Most recently, fishing mortality was slightly below the proposed limit reference point in 2011, exceeded it in 2012, and fell to 0.40 for 2013 (target F = 0.60).

A qualitative assessment, rather than the CSA model, was used to assess the lower Bay white perch stock. Three fishery dependent indices showed a decline from about 2004 to a low in 2007, followed by an increase through 2010. The population low in 2007 and apparent recovery through 2010 is consistent with the upper Bay CSA results. High relative abundance was observed from 2011 – 2013 for the fishery independent gill net survey. Since most years had higher than average CPUE, overfishing likely did not occur.

Young-of-year geometric mean index for white perch is highly variable (Figure 3). The most recent 2014 young-of-year geometric mean catch per haul was higher than the average geometric mean and the eight year moving average.

**Status of the Fishery**

White perch support significant commercial and recreational fisheries in Maryland. The commercial fishery is regulated with gear and area restrictions. An 8" minimum size limit applies when caught by net. White perch are largely harvested by fyke nets in Bay tributaries, but drift gill nets and pound nets accounted for 71.9% of the commercial white perch harvest in 2014. No minimum size limit applies to hook & line in either the commercial or recreational fisheries. There are no closed seasons. White perch are the third most valuable finfish species commercially harvested in Maryland (after striped bass and American eel) and were valued at $1.42 million in 2014 (C. Lewis pers comm.). White perch harvest has rebounded since the 1980's with the exception of a low year in 2004 (Figure 4).

White perch are among the most available recreational species to anglers and are common catches from shore, pier and boat. They are often caught by bottom fishing on hard bottom with bait, such as bloodworms or other annelids, grass shrimp or other small crustaceans, and minnows. Recreational anglers commonly keep their catch as the flesh is of high food quality. Most recently, the Marine Recreational Information Program (MRIP) estimates have shown low proportional standard errors (PSE) which indicates that the estimates are generally more precise. Recreational harvest trends follow the approximate trend of the commercial harvest (Figure 5). In 2014, 88 white perch over 13" in total length were submitted for MD citations. Twenty-two have been submitted as of June 22, 2015. The state record white perch of 2 lbs., 10 oz. was caught May 18, 1979 at Dundee Creek.

**Status of White Perch FMP Strategies and Actions**

FMPs include strategies that are used to implement actions to reach the FMP goals. The White Perch FMP lists four problem areas, strategies and actions.

1. Mixed Fishery: The FMP calls for a strategy to coordinate the white perch management with striped bass management measures due to the harvest of both species together in the gill net fishery. Changes to gill net regulations (mesh size and seasons) and increased utilization of fyke nets in the white perch fishery have reduced this problem and it is unlikely to be as great an issue today.

2. Optimum Harvest: Data on white perch abundance indicates the population size is variable but above the threshold. Restrictive measures on either the commercial or recreational fishery does not appear necessary at this time. Stunted growth was

identified as a density dependent issue for some areas. The Patuxent and Susquehanna Rivers were identified as areas where there was some evidence of stunting. Factors that can lead to stunted growth include intraspecific competition due to overcrowding, low food availability, and an increase in survival rate (such as the disappearance of a top predator). Usually, stunting indicates insufficient removals from the population. Stunting in the aforementioned open river systems is not presently observed, suggesting that harvest is sufficient to prevent overpopulation. Stunting is generally a more common problem in closed systems where removals from the population are low.

3. Stock Assessment: The FMP indicated that large numbers of white perch were taken as bycatch in the striped bass fishery. There was insufficient data available to characterize the age composition of harvests. Since 1990, the bycatch has been reduced. New surveys and stock assessment models show that white perch are not presently overfished (Piavis and Webb, 2015a; Piavis and Webb, 2015b). Stock assessments are conducted for three regions – Upper Bay, Choptank River, and Lower Bay (south of the Bay Bridge to the Maryland state line). The species is managed as a single stock throughout its range in Maryland's portion of the Chesapeake Bay and tributaries. The FMP points out that aggregating baywide juvenile indices for white perch may obscure regional differences and recommends that the juvenile index for white perch should reflect regions to better provide accurate assessments.

4. Habitat Issues: White perch use nearly every tributary of the Chesapeake Bay for spawning and/or nursery areas and are found in every portion of the Bay (Figure 6). The FMP notes that "tributary specific pollution and natural environmental fluctuations significantly influence stock size and recruitment". The strategy in 1990 was to promote the commitments of the 1987 Chesapeake Bay Agreement. Since then, the Chesapeake Bay Program has developed the Chesapeake 2000 Agreement and the Chesapeake Watershed Agreement (2014). Maryland DNR supports the water quality goal: "to reduce pollutants to achieve the water quality necessary to support the aquatic living resources of the Bay and its tributaries." Another aspect of the 2014 vision is "to restore, enhance and protect a network of land and water habitats to support fish and wildlife." including land management for impervious surfaces. The 2014 vision also includes a goal to "ensure that the Bay and its rivers are free of the effects of toxic contaminants on living resources."

**Habitat Considerations**

Impervious surface (IS) within a watershed and its impact on aquatic resources, particularly fish, has been shown to impact white perch. Uphoff et al. (2011) assessed the likelihood that age-0 and age-1+ white perch would be present in the shore zone and

bottom channel of several areas in the Chesapeake Bay: Bretton Bay, Corsica, Magothy, Miles, Rhode, Severn, South, St. Clements Bay, West, and Wicomico (western shore). The likelihood of age-0 white perch being present in the shore zone (odds ratio =1.07) was positively influenced by IS. Presence of white perch in bottom channel samples increased as IS decreased. Odds ratios indicated that the IS effect was for age-0 white perch (odds ratio = 0.73) rather than for age-1 + white perch (odds ratio = 0.94). The likelihood of age-0 and age-1+ white perch being present significantly increased as the distance from a nursery area increased.

Maryland DNR Fisheries Service currently promotes the use of IS reference points to inform the fisheries management decision-making process. Three IS reference points for fish habitat management have been identified: 5%, 10%, and 15%. The intermediate reference point of 10% IS identifies where other habitat parameters such as dissolved oxygen repeatedly reach critical thresholds in spawning and nursery areas for fish species (MDNR FS 2011). Habitat impairment, indexed by IS, can be used as an effective predictor of harvest management success. At 10% IS, the use of harvest controls becomes less effective as a management tool. The FS PRT recommends the following habitat considerations:

- Identify habitat parameters affected by IS, in addition to dissolved oxygen, that impairs spawning and nursery habitat suitability such as zooplankton availability, endocrine disruptors, and conductivity.
    - IS reference points should be developed for use by resource managers.
- Smart Growth development is intended to reduce the scope and impact of land development through implementation of "best management practices (BMPs)".
    - Historic white perch spawning rivers have been identified and mapped (Figure 6). Percent IS data and development projections should be used to identify currently viable spawning locations as potential habitat areas of particular concern (HAPC).
    - There should be an emphasis on preserving habitat especially in more pristine areas.
    - Citizens and county governments should be educated on the ecological and economic importance of aquatic health, identification of prime habitat and aquatic resources, and encourage/implement land management decisions for aquatic resource protection.

**Fisheries Allocation Policy**

The Department of Natural Resources Fisheries Allocation Policy went into effect on September 1, 2012. The policy requires FMPs to address the allocation among resource users and provides guidelines and procedures for review. As stated in the Allocation Policy, overarching factors are to be considered in allocation decisions. These factors are linked to FMP objectives and are addressed to the extent supported by available information. The overarching factors include:

- Conservation;
- Management goal for the species;
- Social and cultural importance of maintaining fisheries and dependent industries;
- Environmental impact;
- Economic value of dependent fisheries;
- Economic viability of activity supported by the fisheries;
- Management resources;
- Historical trends and values; and
- Potential for new fisheries to develop.

Among the Allocation Policy procedures are triggers for an allocation review. In accordance with policy, the pre-assessment of triggers is reviewed internally by FS PRT and shared with the SFAC and TFAC. Triggers listed in the policy with a summarized assessment are as follows:

- Initial development or revision of a FMP:

Pre-assessment: After conducting the white perch review, the FS PRT concluded that the 1990 FMP continues to be an acceptable framework for managing white perch. Annual updates to the FMP are considered to be sufficient for addressing management issues.

- Significant shift in fisheries harvest:

Pre-assessment: Years of higher recreational harvest generally correspond with higher commercial harvest with little evidence of a shift in trends between these fisheries. No specific allocation has been established. Typically, since the 1980's, reported commercial harvests have been about double to triple the estimated recreational harvest (Figs. 4, 5) White perch are most commonly used as food. The practice of using white perch for live lining as a hook and line fishing technique for striped bass has increased. Live spot are the preferred bait but small white perch are also used, especially when live spot cannot be obtained. Bait usage generally targets smaller white perch. The harvest of white perch for bait has not been estimated and it has not been possible to distinguish between harvesting white perch for bait or for food.

- Population shifts of target or non-target species:

Pre-assessment: There are no known population shifts for white perch. The impacts of invasive catfish species and snakeheads on white perch populations are unknown. Diet studies on blue catfish from the Potomac and Patuxent Rivers indicate that blue catfish consume white perch (M.Groves, per comm).

- Threatened and endangered species issues:

Pre-assessment: There are no known threatened and endangered species interactions with directed white perch fisheries in Maryland. It is possible that the same gear types that capture Atlantic croaker and spot in mixed species commercial fisheries might also occasionally catch threatened and endangered species, such as sturgeon, as bycatch.

- Changing social patterns & values:

White perch continue to support important commercial and recreational fisheries in the Maryland portion of the Chesapeake Bay. They are unique among fisheries in Maryland because white perch are present and available for harvest during all seasons of the year, are a desirable food species and spend their entire lives within the Maryland portion of the Chesapeake Bay. Their high value as a recreational species has not diminished and is unlikely to change. White perch have ranked among the top ten species harvested in the State since 1920 (Setzler-Hamilton 1991). White perch are widely available in the spring and early summer from commercial fishermen. The social patterns and values do not appear to have changed.

- Ecosystem needs:

White perch are opportunistic predators. Juveniles typically consume aquatic insects and small crustaceans, while larger perch prey on crabs, shrimp and small fish (Murdy et. al 1997). White perch are consumed by larger fish predators such as striped bass and bluefish. Tagging and morphometric studies indicate that white perch found in rivers can be partially isolated (Setzler-Hamilton) so local populations may be vulnerable under intensive fishing pressure. Increased temperatures due to climate change may affect young life stages and their preferred prey. Sea level rise may affect habitat for early life stages and rising water temperatures could affect distribution and abundance of all life stages.

- Market dynamics:

White perch may be the most popular species sold from road-side trucks and at very reasonable prices. They are most commonly available through the spring and early summer months. The fish are usually available locally from harvesters and seafood dealers as whole fresh product.

- Management resources:

Management resources directed toward these species is commensurate to their recognized importance by management agencies. White perch data used for stock assessments are collected by fishery dependent and fishery independent surveys.

- New data

New data includes age and growth, CPUE, harvest, and recruitment. These data are useful to stock assessment and management recommendations but do not provide guidance that would suggest allocation changes. There were no public requests for a change in allocation.

**Conclusion**

The FS PRT concluded that the 1990 White Perch FMP is an appropriate framework to manage white perch in Maryland's portion of the Chesapeake Bay and tributaries. Continued monitoring and stock assessments are recommended. The FS PRT recommends using impervious surface reference points to identify viable spawning locations and to preserve habitat in more pristine areas. They also recommend implementing land management decisions that protect aquatic resources.

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Uphoff, James Jr., Margaret McGinty, Rudolph Lukacovic, James Mowrer & Bruce Pyle (2011). Impervious surface, summer dissolved oxygen, and fish distribution in Chesapeake Bay subestuaries: Linking watershed development, habitat conditions, and fisheries management, North American Journal of Fisheries Management, 31:3, 554-566

Figure 1. Total population estimate of upper Chesapeake Bay white perch from Catch Survey Analysis, 2000 – 2013

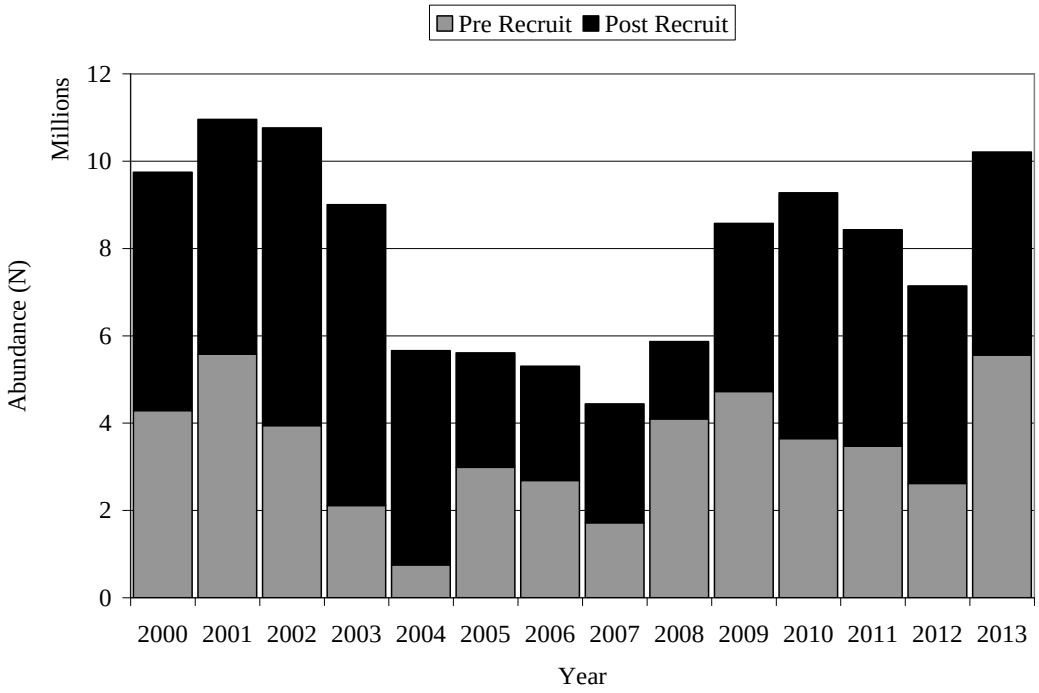



Figure 2. Instantaneous fishing mortality (F) of upper Chesapeake Bay white perch and proposed biological reference points for F, 2000—2013

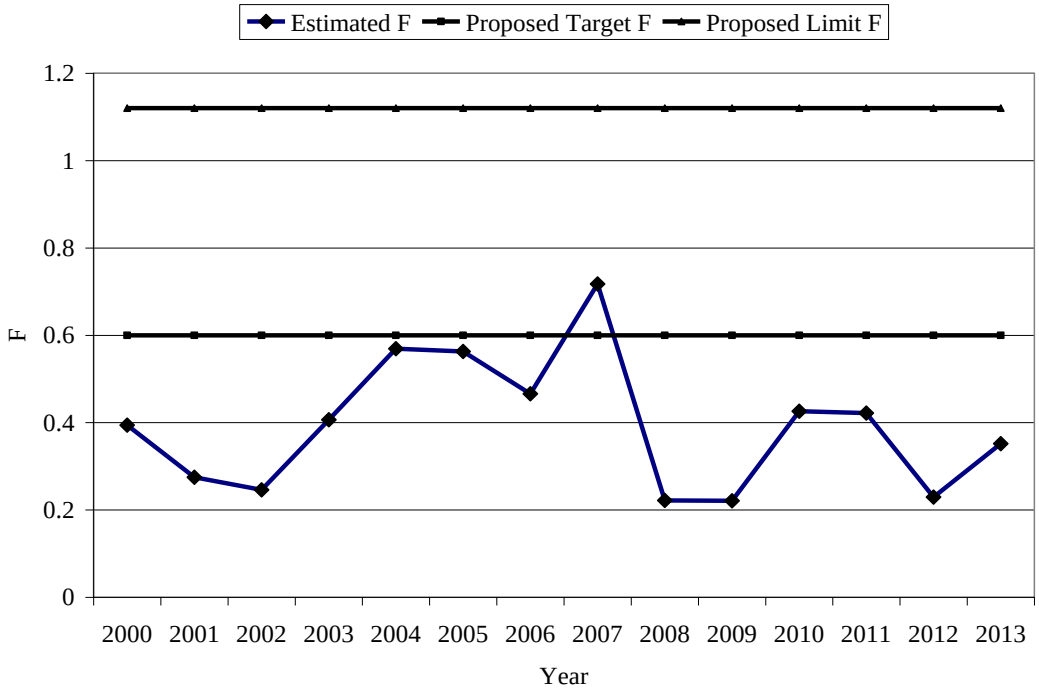


Figure 3. Young-of-year index for upper Chesapeake Bay, 1962-2014 (MDNR data).

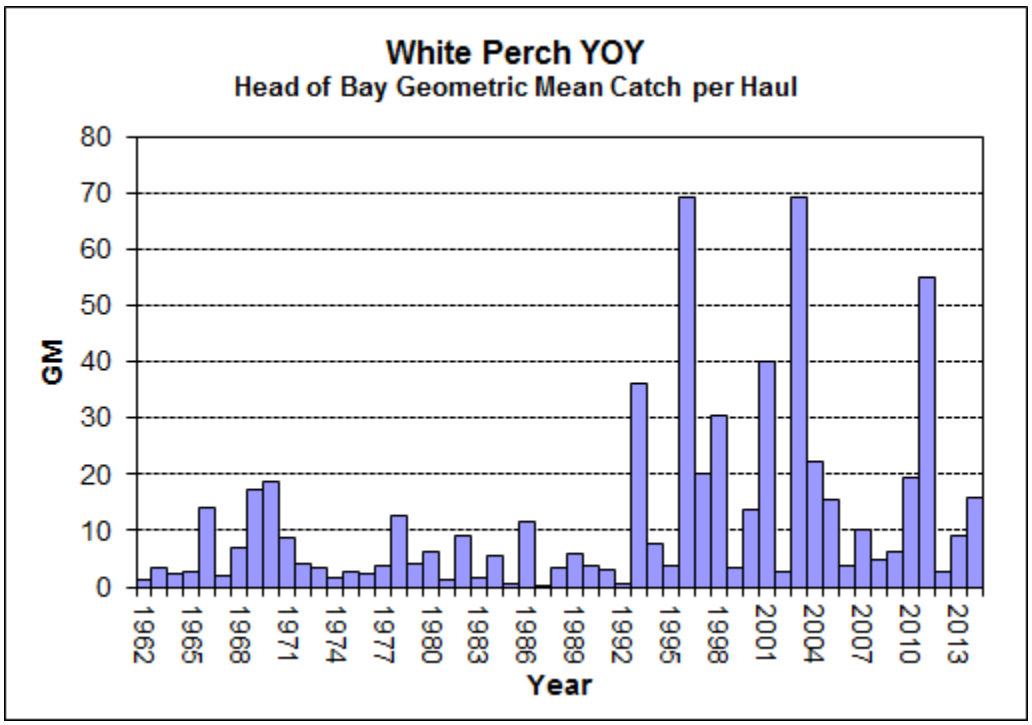



Figure 4. Commercial white perch landings in Maryland's portion of the Chesapeake Bay and tributaries, 1981-2013. (Personal Communication from the National Marine Fisheries Service, Fisheries Statistics Division, June 8, 2015.)

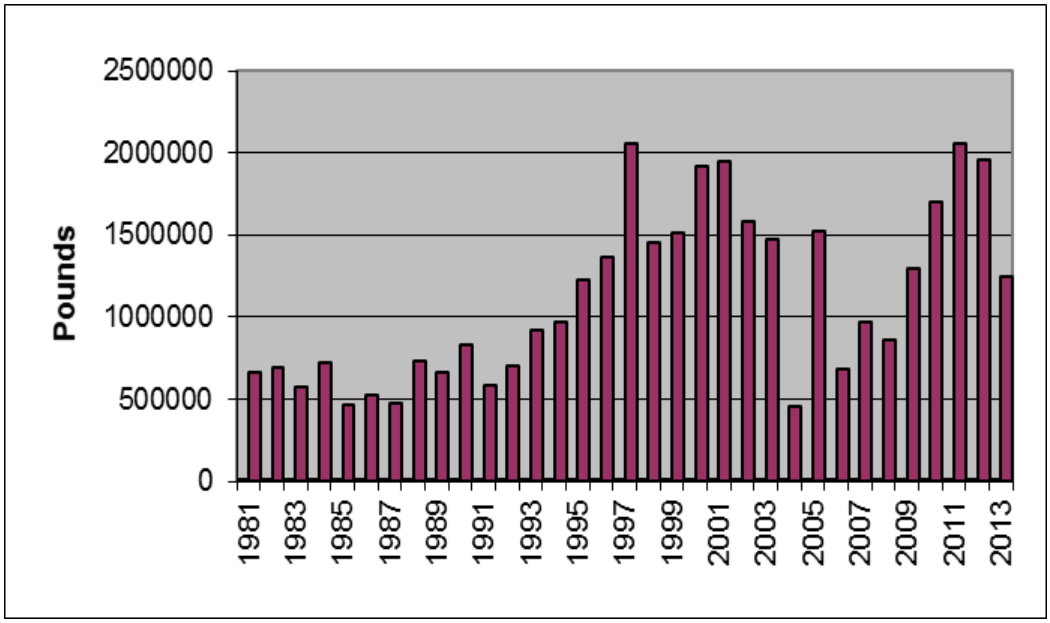


Figure 5. Recreational white perch harvest estimates in Maryland's portion of the Chesapeake Bay and tributaries, 1981-2014. (Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, June 8, 2015.)

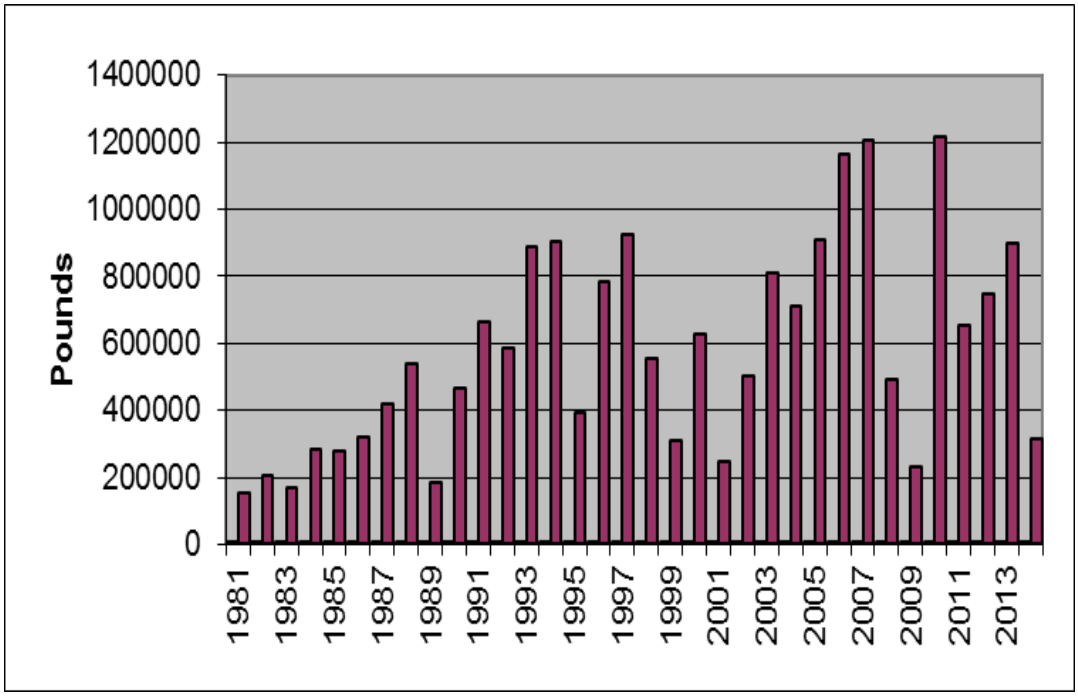
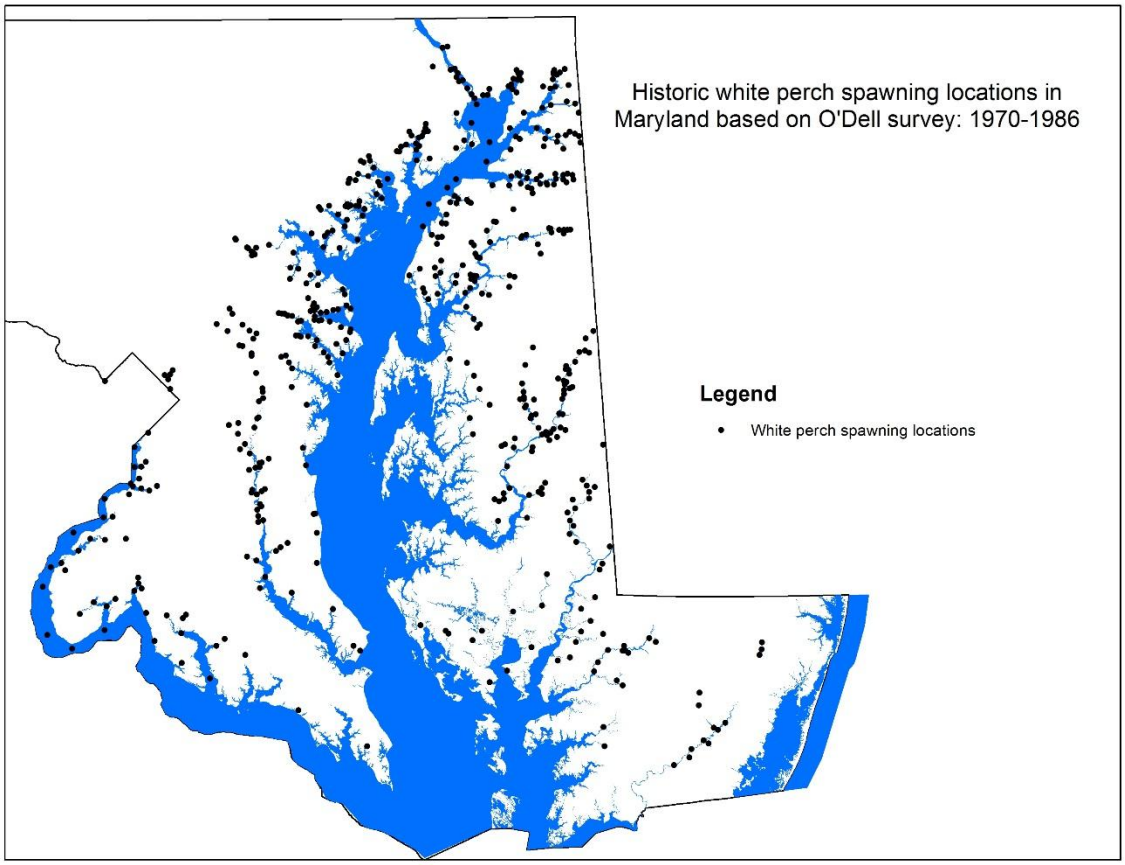


Figure 6.


Historic white perch spawning locations in Maryland based on O'Dell survey: 1970-1986
Legend
White perch spawning locations

**1990 White Perch Fishery Management Plan Implementation Table** (updated 6/15)
Bolded text in the comment section indicates new information added since last update of the implementation table.

| Problem Area | Action | Date | Comments |
|---|---|---|---|
| Mixed Fishery<br>1.1. Coordinate management with striped bass actions. | 1.1. The white perch fishery will abide by striped bass restrictions. Striped bass bycatch will be minimized. | 1990<br>Continue | Commercial gear restrictions and area restrictions and closures apply. White perch are primarily caught with gill nets and fyke nets, both of which have mesh size and location restrictions that, in some cases, vary seasonally. |
| Optimum Harvest<br>2.1. White perch populations exhibit growth differences. | 2.1. Consider eliminating minimum size limits. | 1990<br>Continue | Minimum size limit for commercial and non-H&L recreational is 8"; no size limit for recreational H&L. |
| Stock Assessment<br>3.1. Basic stock information is lacking, including commercial and recreational harvest size and age-composition. | 3.1. Stock assessments will be performed periodically. | Periodic | White perch stock assessments are performed every three to four years. A stock assessment survey was conducted in 20**14 using data collected from 2012 to 2014** and employed a catch survey analysis **(CSA) for the upper Bay and Choptank River (Piavis and Webb, 2015)**. This type of analysis has been better than surplus production models for assessing stock size. **A qualitative stock assessment was utilized for the lower Bay. Fishery independent and dependent indices produced similar results and helped to validate the conclusions reached by the CSA. The most recent 2014 young-of-year index was above both the average geometric mean catch per haul and the eight year moving average (Fig.3). Fishing mortality remains under both target and limit F.** |

**1990 White Perch Fishery Management Plan Implementation Table** (updated 6/15)
Bolded text in the comment section indicates new information added since last update of the implementation table.

| Problem Area | Action | Date | Comments |
|---|---|---|---|
| | | | Fishing mortality rates have decreased since 1997. **Since 2000, fishing mortality rates have been under F=0.60 in every year except 2007 when it slightly exceeded the proposed target** (Fig.2)**. The upper Bay population has increased since the last assessment while the Choptank River population has decreased. The 2014 upper Bay assessment indicated an increase to about 10 million white perch in 2013 from a recent low of 4 million in 2007 (Fig. 1).**<br><br>White perch stocks are not overfished and overfishing is not occurring, based on the suggested $F_{limit}$ = 0.60. Formal BRPs have not been adopted **but these BRPs appear to be appropriate.** |
| Habitat Issues<br>4.1. Water quality impacts distribution and abundance of finfish species in Chesapeake Bay. | 4.1. MD will develop objectives for finfish water quality standards under the latest Bay agreements, including, nutrient and toxics reduction strategies on a watershed approach. | Ongoing | Watershed indicators for aquatic systems include water quality as well as components of aquatic systems, biological diversity, hydrologic, and terrestrial system.<br>http://www.dnr.state.md.us/watersheds/surf/indic/md/md_indic.html<br>The Maryland Integrated Watershed Data and Information System is a cooperative effort between the DNR and Dept. of Environment and provides a comprehensive database of natural resources and biological information for watershed indicators, profiles, bibliography, planning & strategies, and organizations. |

**1990 White Perch Fishery Management Plan Implementation Table** (updated 6/15)
Bolded text in the comment section indicates new information added since last update of the implementation table.

| Problem Area | Action | Date | Comments |
|---|---|---|---|
| | | | The Chesapeake Bay Program tools to track water quality improvement can be found at: http://www.chesapeakebay.net/track/tools **A new Chesapeake Watershed Agreement was adopted by the Bay jurisdictions (June 2014). It includes goals and outcomes that address sustainable fisheries, vital habitats, water quality, toxic contaminants, healthy watersheds, stewardship, land conservation, public access, environmental literacy and climate resiliency. The Bay jurisdictions have developed management strategies for each outcome. Biennial work plans are under development and scheduled for completion in March 2016.** |

**Acronyms:**

BRPs = Biological Reference Points
CPUE = Catch per Unit Effort
CSA = Catch Survey Analysis
DNR = Department of Natural Resources
F = Fishing Mortality
H & L = Hook and Line

## Appendix 1

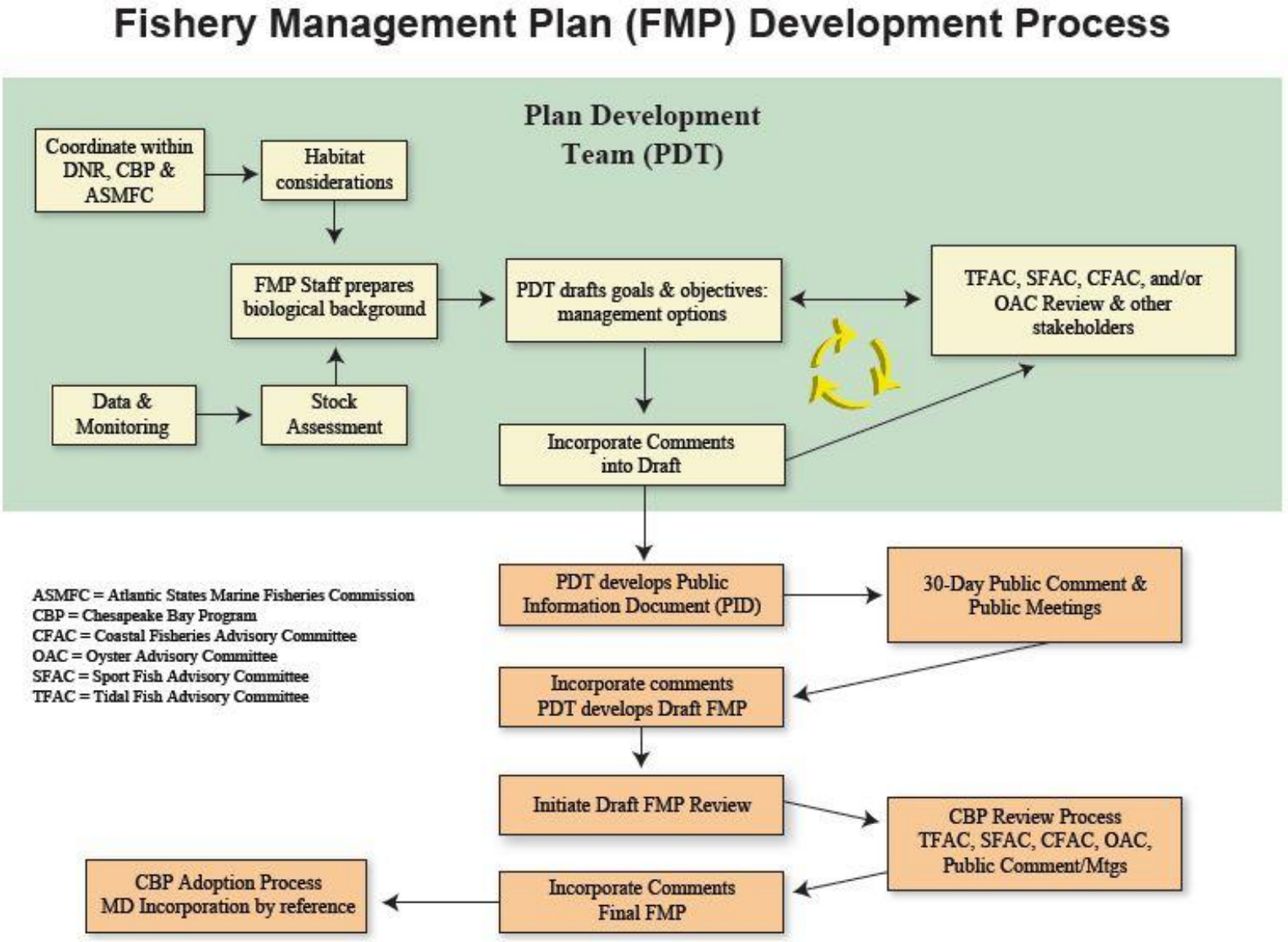
Fishery management plans (FMPs) provide a framework for how a fishery resource will be managed based on a species life history, habitat, and fishery utilization over time. Maryland law (Natural Resources Article §4-215) contains a statutory mandate for the development of FMPs for a given list of species. Legislation enacted in 2010 expanded MD Department of Natural Resources' (MDNR) authority to prepare FMPs for additional fish species. MDNR no longer needs to go to the General Assembly to justify adding new species to the list. FMPs can be prepared for species based on specific concerns about the status of a species and after consultation with the Tidal Fisheries Advisory Commission (TFAC) and the Sport Fisheries Advisory Commission (SFAC).

A Maryland Task Force on Fishery Management (Task Force) was convened in 2008 to review the current fishery management planning process and recommend improvements to the process that would increase stakeholder input and transparency during all stages of the FMP development and review process (Appendices 4 and 5 for flowcharts of the FMP Development Process and the FMP Review Process). The FMP staff developed a time line to review FMPs for 26 species. It is used to delineate an annual work plan.

FMP review begins with the designation of a Plan Review Team (PRT) by the Fisheries Service (FS) Director. The FS PRT evaluates the FMP goal, objectives, management strategies, and actions for their implementation status and applicability to current management needs. Depending on the particular species, the FMP review could also include the Chesapeake Bay Program and/or coordination with the Atlantic States Marine Fisheries Commission (ASMFC). After reviewing the components of the FMP and providing comments on the status of the management actions, the FS PRT recommends one of three pathways: 1) continue implementing the plan; 2) develop an amendment to significantly change or add to the FMP; or 3) revision of the FMP. The FS PRT drafts a FMP review report for review by the Fisheries Service Senior Management Team. The draft is also sent to the TFAC and SFAC for their review and input. The final, revised FMP review report is submitted to the Fisheries Service Director who makes the final decision regarding which of the three options to pursue: status quo, amendment, or revision.

In 2008, the Task Force emphasized the need for ecosystem-based management for all state managed fish species, including ASMFC managed species such as striped bass. The Task Force recommended MDNR continue research on the influence of habitat on fish populations, factors that impair fish habitat, participation in the environmental revue process, updating regulations, transparent management framework, and outreach to County, local, and public entities. Chesapeake Bay jurisdictions are developing quantitative ecosystem-based management tools that will supplement traditional management tools currently in use. Ecosystem-based tools will address habitat, food web, stock assessment, and socioeconomic issues.

**Appendix 2.** Schematic of the fishery management plan development process in Maryland.



**Appendix 3.** Schematic of the fishery management plan review process in Maryland.