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A Plan for the Management of

Pennsylvania's Inland Walleye Fisheries

Pennsylvania Fish & Boat Commission
Division of Fisheries Management

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Executive Summary

The Pennsylvania Fish & Boat Commission (PFBC) intensively manages walleyes (*Sander vitreus*) in numerous rivers, lakes and reservoirs across the Commonwealth. Wherever possible, we attempt to manage walleye fisheries that are self-sustaining through natural reproduction. However, the majority of our walleye fisheries are dependent on hatchery stockings to maintain their recreational fisheries. The latest (2006) United States Fish and Wildlife Service (USFWS) National Survey of Fishing, Hunting and Wildlife Associated Recreation shows that angler interest in walleye fishing is growing in Pennsylvania. The PFBC spends a substantial amount of money to stock walleye, and we need to ensure that these stockings are providing recreation to Pennsylvania's anglers.

This document updates the *Walleye Plan for Pennsylvania* (Hoopes and Young 1988) to reflect a shift in the goal of our stocking program. Previously, the goals of our walleye program were to create diverse fishing opportunities and create directed walleye fisheries. These goals have narrowed to one goal; to create high-quality walleye fisheries. We have accomplished many of the goals of the *Walleye Plan for Pennsylvania*. We now need to refine our sampling procedures and stocking strategies to meet our new goal.

The plan reviews our sampling results since the adoption of the *Walleye Plan for Pennsylvania* (Hoopes and Young 1988). It proposes strategies necessary to make informed decisions about walleye abundance and updates our catch rate objectives in order to achieve our goal of creating high-quality walleye fisheries. It also prioritizes our sampling and establishes a decision framework to ensure that poor performing waters see a change in management.

PRIORITY 1: Determine the levels of walleye natural reproduction in our "Major River" sections that were formerly stocked with walleye. For those waters where natural reproduction is incapable of maintaining high-quality walleye fisheries we must determine if walleye stocking can produce high-quality walleye fisheries. "Major River" sections returned to the stocking program will be fully evaluated utilizing oxy-tetracycline (OTC) tagging and jonboat, night electrofishing.

PRIORITY 2: Assessing our "Last Chance" waters. All lakes and impoundments have been rated according to their historic survey catches of walleye. Those waters that have not yielded walleye catches that met the minimum standards of the *Walleye Plan for Pennsylvania* have been categorized as "Last Chance" waters. These waters are mandated to be surveyed before 2016 to make a final determination as to whether these waters may remain in the walleye stocking program.

PRIORITY 3: Update existing infrastructure and fish culture techniques to increase walleye fingerling production to exceed 2 million per year.

PRIORITY 4: Perform creel surveys and angler opinion surveys to determine how our definitions of high-quality walleye fisheries conform to anglers' experiences and opinions of our walleye fisheries.

Chapter 1: Introduction

The latest (2006) USFWS National Survey of Fishing, Hunting and Wildlife Associated Recreation estimates that walleyes (*Sander vitreus*) are the fifth most popular sportfish in Pennsylvania behind black bass, trout, panfish and "any fish." An estimated 143,000 Pennsylvania residents identified themselves as walleye anglers (approximately 18.9 percent of the 758,557 fishing licenses sold in 2006). They spent an estimated 3,061,000 angler days pursuing walleyes (and saugers). The estimated number of Pennsylvania resident walleye anglers went up between 2001 and 2006, even though the total number of anglers went down. The number of days spent walleye fishing in Pennsylvania has steadily increased since 1996 (USFWS 1996, 2001, 2006). This steady increase in angler effort targeting walleyes, in spite of decreasing overall angler numbers, suggests that walleye angling is becoming more popular and could suggest that the quality of Pennsylvania's walleye fishery is improving. Walleye stocking makes a substantial contribution to the quality of the walleye fisheries in most of our lakes and reservoirs that contain walleye populations.

The hatchery costs of the walleye stocking program (wild brood collection, spawning, pond rearing and stocking) ranked a distant third behind our trout and steelhead stocking programs. The average annual hatchery costs of the trout program were $8.2 million during the 2006-07 and 2007-08 stocking years (Wisner 2009). The 2010 total estimated hatchery costs of the steelhead stocking program in Lake Erie and its tributaries was $547,695 (Larry Hines, personal communication). The estimated total hatchery cost of the walleye program for 2005 was $396,248 (Larry Hines, personal communication). Creating better walleye populations and increasing angler use of walleyes increases the economic benefits to the Commonwealth and to the Commission, and it ensures the wisest use of angler dollars in creating fishing opportunities.

Plan Purpose

The purpose of this plan is to update the *Walleye Plan for Pennsylvania* (Hoopes and Young 1988) to reflect a change in the goal of our walleye stocking program.

Plan Goal

Historically, the goals of our walleye stocking program were to create diverse fishing opportunities and directed walleye fisheries. This has changed. The new goal of our walleye stocking program is to create high-quality walleye fisheries that receive directed angler effort (Lorantas 2010). The goal of most gamefish stocking programs is that some proportion of these stocked fish are caught (and harvested) by anglers. Stockings that do not result in fishable walleye populations or result in walleye populations that do not receive directed angler effort are not creating high-quality walleye fisheries.

Plan Objectives

The objectives that will measure our success in achieving the goal of the walleye stocking program are the catch rates from our sampling of walleye populations in our rivers and lakes and rate of contribution of stocked walleye to these populations as determined by the recovery of Oxy-Tetracycline (OTC) tagged walleye. We will identify waters with; self-sustaining, high-quality walleye populations, waters where stocking is successfully creating high-quality walleye populations and waters where stocking success is marginal or failing. This plan proposes a

stepped approach for identifying high-quality walleye fisheries, attempting to turn marginal fisheries into high-quality fisheries and removing poor performing waters from the stocking program. It should be recognized throughout the reading of this plan that the change in the walleye program's goal suggests higher standards of walleye relative abundance in our sampling.

Also in this plan, we propose strategies to determine angler demand for walleye fishing, statewide walleye angler effort and measure the return to anglers of walleye stocked by the PFBC.

This plan is not an in-depth discussion on walleye management nor does it include an extensive literature review. Additionally, we do not propose research into why walleye stocking succeeds or fails in any particular water. This plan focuses on identifying waters maintaining walleye fisheries through natural reproduction and developing a systematic approach to managing our walleye fisheries in an attempt to maximize angling quality and return to the creel of the walleyes the PFBC stocks.

Chapter 2: Management History

The Warmwater Rationale (1976)

The beginning of the modern era of warmwater/coolwater fisheries management in Pennsylvania might be pinpointed at the publishing of *The Warmwater Rationale* (Selcher and Cooper 1976). It was designed for use by the PFBC Fisheries Management Section (now PFBC Fisheries Management Division) and the stated purpose was to "bring about statewide consistency in management objectives, literature knowledge, techniques and in reporting warmwater survey data….and will be useful in helping new employees familiarize themselves with the techniques and theory of Pennsylvania warmwater fisheries management." *The Warmwater Rationale* contained three units (chapters). The first two units, "Warmwater Streams and Warmwater Lakes," standardized sampling techniques, sampling gears, data recording and data reporting techniques and included a small warmwater "troubleshooting" chart for solving problems in these two habitat types. The first two units would eventually be replaced by the *Stream Examination Manual* (Marcinko 1988) and the *Lake Examination Manual* (Hoopes 1989). The third unit provided a short life history and management recommendations for the warmwater sportfish species or species groups important in Pennsylvania. At the time, the walleye fisheries in Pennsylvania were considered "under-utilized" and less restrictive regulations were proposed to increase angler use and harvest of walleye.

Warmwater Fisheries Project (1977)

The first attempt to manage warmwater/coolwater fisheries under a resource category approach was the Warmwater Fisheries Project in 1977. There is no documentation of this project in the archives; however, the leader of the project described it in a later document (*The Strategic Plan for Pennsylvania's Warmwater/Coolwater Fisheries,* Hoopes 1984). He described the Warmwater Fisheries Project as follows, "The project objective was to achieve fisheries management by categories resulting from fisheries resource inventories and classification procedures. The five year project was designed to direct an operating plan for warmwater aspects of the Fisheries Management Section which would have baseline fisheries data collected. Fisheries inventories and classifications were to be emphasized during the first part of the project. The latter stages of the project were to shift to angler use and harvest analysis, program development, program promotions and technique evaluations (Hoopes 1984)." The Warmwater Fisheries Project was beset with problems and the results were unsatisfactory. In 1980, changes in leadership of the Fisheries Management Section and changes in funding sources placed a priority on trout management and forced a shift of Fisheries Management Section resources, culminating in 1983 with the implementation of the Trout Streams Program. No report was ever authored for the Warmwater Fisheries Project.

With the majority of coldwater fishery work completed by 1983, the Warmwater Unit produced a series of publications that would provide the basis for warmwater fisheries management by resource category for the next 35 plus years. The three that most influence the current walleye plan are *The Strategic Plan for Pennsylvania's Warmwater/Coolwater Fisheries* (also referred to as *Warmwater/Coolwater Review*; Hoopes and Cooper 1984), the *Lake Examination Manual* (Hoopes 1989) and the *Walleye Plan for Pennsylvania* (Hoopes and Young 1988). Periodic review of these documents by Fisheries Management Division staff should prove beneficial, especially to new hires, to retain the institutional knowledge of how we arrived

at this point in our fishery management philosophy and to avoid repeating previously unsuccessful strategies. .

***The Strategic Plan for Pennsylvania's Warmwater/Coolwater Fisheries* (1984)**

The Strategic Plan for Pennsylvania's Warmwater/Coolwater Fisheries (Hoopes and Cooper 1984) is a comprehensive volume that covered all areas of warmwater management in Pennsylvania. It provided the history of warmwater/coolwater management to date, the Pennsylvania Fish Commission programs and policies for warmwater/coolwater management, a fishery management history for the 20 species (or species groups) determined to fall under warmwater management in Pennsylvania and the format for reporting warmwater survey data. It continued the process of data computerization begun in the Warmwater Fisheries Management Project, listed all recent warmwater stockings and covered a myriad of other subjects.

***Lake Examination Manual* (1989)**

The *Lake Examination Manual* (Hoopes 1989) outlined how lake and reservoir physical, social, chemical and fishery data were to be collected and recorded. It also briefly described the minimum sampling guidelines and how to perform age and growth analysis using fish scales. With some modification, the protocols established in the *Lake Examination Manual* are still in use today.

***The Walleye Plan for Pennsylvania* (1988)**

The Walleye Plan for Pennsylvania (Hoopes and Young 1988) was a comprehensive document that summarized the history of walleye management in Pennsylvania and proposed the future direction of walleye management, by resource category, in all waters in the Commonwealth. It addressed statewide walleye management issues including; Habitat Protection, Walleye Stocking Frequencies and Rates, Walleye Stocking Techniques, Sampling and Evaluation Techniques, Statewide and Water Specific Angler Use and Harvest Needs, Regulations and Law Enforcement.

After addressing these statewide issues, *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) dealt with the individual management of each of the six resource categories established in previous Warmwater Unit efforts. Each resource category chapter summarized all previous survey data and all angler use and harvest data, provided sampling catch rate objectives, angler use and harvest objectives and provided management options. Each resource category chapter included tables that provided all sampling data and all angler use data collected in that category.

Many of the goals set in *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) have been successfully completed, but some have not. Adherence to the guidelines set forth in the plan has been variable.

Resource Categories

The Walleye Plan for Pennsylvania (Hoopes and Young 1988) managed our walleye fisheries according to six resource categories. Impounded waters were split into three resource categories: Ponds, Lakes and Reservoirs. Flowing waters were likewise divided into three resource categories: Warmwater Streams, Small Rivers and Major Rivers. Subsequently, the names Ponds, Lakes and Reservoirs were changed to Small Reservoirs, Medium Reservoirs and Large Reservoirs, respectively. Small Reservoirs (Ponds) are defined as natural lakes and reservoirs less

than 50 acres. Medium Reservoirs (Lakes) are defined as natural lakes and reservoirs larger than 50 acres but less than 500 acres. Large Reservoirs (Reservoirs) are defined as natural lakes and manmade reservoirs larger than 500 acres. Warmwater Streams have watersheds less than 250 square miles. Small Rivers have watersheds less than 1,500 square miles but larger than 250 square miles. Major Rivers have watersheds larger than 1,500 square miles.

The current plan will use these categories; however, more emphasis will be placed on the resource categories that receive the most walleye stocking and provide the bulk of the walleye fishing in Pennsylvania.

Saugeye

With the arrival of viral hemorrhagic septicemia (VHS) and the restrictions placed upon the movement of fish to and from the states that border the Great Lakes, our sources for saugeye (*Sander canadensis x vitreus*) to be stocked into Pennsylvania waters are no longer available. Thus, the saugeye program has ended in Pennsylvania and most waters that were maintenance stocked with saugeye are now stocked with walleye or are no longer stocked with *Sander* species.

Sauger

Saugers (*Sander canadensis*) are native to the Ohio River and Lake Erie drainages in Pennsylvania (as are walleyes). Saugers have mainly been collected in the lock and dam sections of the Ohio River drainage of western Pennsylvania and some of the smaller connected waters. Saugers maintain themselves through natural reproduction and appear to be doing well. They have maintained themselves within the current regulations, so changes do not appear necessary. Historically, the limiting factor for sauger was water quality in the Three Rivers (Allegheny, Monongahela and Ohio rivers). They are now distributed throughout the lock and dam portions of the Three Rivers.

The state record sauger was caught by an angler in the West Branch Susquehanna River near the city of Williamsport. The source of this fish is unknown. They have been captured in some of our smaller reservoirs and were likely stocked by the Pennsylvania Fish & Boat Commission or by anglers. The PFBC had a very limited stocking program for saugers using out-of-state sources. This program ended about the same time as the saugeye program with the appearance of VHS.

Chapter 3: Walleye Management in Flowing Waters

Stocking History

The Division of Fish Production has steadily increased the quantity of walleyes available for stocking. The primary life stages produced by the PFBC hatchery system were walleye fry (3-5 days old and approximately 10 mm in length), Phase I walleye fingerlings (approximately 35-50 days old and approximately 25-38 mm in length) and Phase II walleye fingerlings (approximately 120 days old and approximately 75-150 mm in length). Until 1981, it was also common practice that adult walleyes captured from Lake Erie and Pymatuning Reservoir as brood stock were stocked into other waters, once spawning was complete.

Through time, there were several shifts in stocking philosophy that accompanied the increases in production. Prior to 1977, the priority for walleye stocking appeared to be lakes and reservoirs. As more fry and Phase I fingerling walleyes became available, more were stocked into flowing waters. While both flowing waters and lakes received substantial amounts of fry and fingerlings, it appears that fry stockings focused on flowing waters and fingerling stockings focused on lakes and reservoirs.

Prior to *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988), most waters were stocked every other year. *The Walleye Plan for Pennsylvania* also provided alternate year stocking as a management tool but only for the evaluation of natural reproduction. The practice all but disappeared after the publication of *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988). Additionally, this plan set stocking rate guidelines for each resource category, categorized individual waters into specific management scenarios within each resource category and estimated hatchery production needed to obtain management objectives. Within each management objective, it outlined evaluation procedures to measure natural reproduction and/or the contribution of stocked walleyes to the fishery.

In addition to sampling catch rate objectives, *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) set angler use objectives and angler harvest objectives for each resource category. It was hoped that extensive creel survey work would measure success at attaining these goals.

In 1989, the Warmwater Unit revised the stocking request procedures to get base requests in line with production capabilities (Hoopes 1989). These new procedures limited walleye stocking in Major Rivers to fry only, except for the Delaware River and Juniata River, where small fingerling stockings were being evaluated (Hoopes 1989).

The Walleye Plan for Pennsylvania (Hoopes and Young 1988) called for extensive work using alternate year stocking and OTC tagging to determine the status of natural reproduction in our Major River sections that were stocked with walleye and also believed to maintain some level of natural reproduction.

From 1986 through 2007, the number of walleye stocked into flowing waters was fairly consistent. The largest shift in the stocking policy for flowing waters occurred in 2007. By order of the chief of the Division of Fisheries, all stocking of walleyes in streams and rivers was suspended following the 2007 stocking year. The only flowing water that remains in the stocking program and is under evaluation is Section 5 of the Clarion River.

Warmwater Streams

Very little data for the evaluation of walleye fisheries in Warmwater Streams are available because few Warmwater Streams maintain a high-quality walleye fishery; few were ever stocked on a regular basis and the proper equipment for evaluating them has only recently become operational.

Given the low number of Warmwater Streams with walleye fisheries and the higher priority of evaluating our Major River walleye populations, management activities on Warmwater Streams are at the Area Fisheries Manager's (AFM) discretion. Stocking Warmwater Streams may be initiated in an attempt to create a naturally reproducing walleye population if some obstruction prevents colonization by walleyes from larger downstream waters (i.e. a dam or a pollution block). There will be no long-term maintenance stocking of walleyes in Warmwater Streams. Stocking rates and evaluation procedures are presented in the next section of the plan.

Gear selection for sampling Warmwater Streams will be the new mini-boom shocker. Most Warmwater Streams are too small to be sampled with traditional jonboat electrofishing gear yet are too big to be effectively sampled with gear employed while wading such as backpack electrofishers or towed barges. Mini-boom shockers are smaller johnboat mounted electrofishers constructed for sampling these intermediate sized flowing waters. The Fisheries Management Division presently has three operational mini-boom shockers. Mini-boom shockers are not equipped for night operations and night operations on these waters are not safe. Therefore, Warmwater Streams will be evaluated with summer or fall daytime electrofishing.

Catch data for the mini-boom shocker is scarce and its effectiveness at capturing stream walleyes is unknown at this time. Establishing minimum catch rates for this gear will only be possible after several years of data have been collected from streams known to contain walleyes. If use of the mini-boom shocker proves that quality walleye fisheries can exist in Warmwater Streams and PFBC can effectively sample these waters, then we can define a high-quality walleye fishery and increase management activity in this resource category. Should the mini-boom shocker prove unsuccessful at sampling walleyes in Warmwater Streams, then an angler use and harvest survey should be used to measure program success.

In order to eventually create catch rate objectives specific to the mini-boom shocker, it must be added as a gear option in the Agency Resource Database, and historic sites that used this gear need to be updated.

Small Rivers

Based on data currently in the Agency Resource Database, there are 140 Small Rivers sections for which PFBC has management responsibility. Using the best available information, the current status of the walleye fishery in each section has been determined (*Table 1*). Some Small Rivers sections contain high-quality walleye fisheries. Several more sections are suspected of containing walleye fisheries that developed through stocking or immigration from larger downstream waters, but assessment data isn't available to determine the status of these fisheries.

Only 12 Small Rivers sections were stocked annually before the stocking moratorium took effect in 2008. With the exception of Section 5 of the Clarion River, which was a recent addition to the stocking list, all walleye stockings were ceased as part of the moratorium. This single stocking was permitted to continue to allow for the recommended minimum of five years of stocking prior to the determination of these stockings' success. Some of these formerly

stocked Small Rivers sections were not assessed for walleye abundance or for the contribution of hatchery fish to the population. Some of these sections are currently being sampled for walleye natural reproduction.

Walleye collection in this resource category has been sparse. Based on data currently available in the Agency Resource Database, there are only 90 established sites in Small Rivers where walleyes have been captured. With the exception of four sites, all are electrofishing sites. Many of these sites are from waters not known to contain walleye fisheries, and these fish are considered incidental catches. Most surveys (spring and fall, day and night electrofishing) of Small Rivers sections managed for walleye produced catches of zero walleyes.

Only a small fraction of Small Rivers are large enough to be sampled with traditional jonboat electrofishing gear and have the access points suitable for launching such a boat, which explains the paucity of walleye data. Those that have been sampled with traditional electrofishing boats may continue to be sampled in this manner. Until we have sufficient data to define what a high-quality walleye fishery is in a Small River, we will use the young-of-the-year (YOY) and adult minimum catch rates for electrofishing in Major Rivers presented below in determining the quality of the walleye fishery in Small Rivers. If any Small River sections are returned to the stocking list, all walleye stocked will be OTC tagged and evaluated following the guidelines in the Major Rivers section.

Most Small Rivers sections have not been sampled, because they are too small for a traditional jonboat and are awaiting sampling with the new mini-boom shockers. Daytime mini-boom shocker catch rates will be developed after walleye catch data is available to analyze. Again, priority is given to assessing walleyes in our Major Rivers. Sampling in Small Rivers is at the area fisheries manager's discretion. Sampling priority is given to those waters stocked until 2008 and those listed as existing walleye fisheries (see *Table 1*).

Table 1. **Status of Walleye Fisheries in Pennsylvania's Small Rivers Sections.**

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
2	Allegheny River	6	16	C	120.4	39.7	Walleye Fishery Present
3	Bald Eagle Creek	4	9	C	29.7	9.2	No Walleye Fishery
3	Bald Eagle Creek	5	9	C	21.0	4.2	Walleye Fishery Present
3	Bald Eagle Creek	6	9	C	136.3	20.0	Walleye Fishery Present
2	Brokenstraw Creek	4	16	B	8.9	4.8	No Walleye Fishery
2	Brokenstraw Creek	5	16	B	23.4	11.4	No Walleye Fishery
2	Brokenstraw Creek	6	16	B	19.4	6.1	No Walleye Fishery
8	Casselman River	1	19	F	14.9	9.4	No Walleye Fishery
8	Casselman River	2	19	F	24.2	8.5	No Walleye Fishery
8	Casselman River	3	19	F	34.5	11.6	No Walleye Fishery
8	Casselman River	4	19	F	99.8	21.2	No Walleye Fishery
8	Casselman River	5	19	F	141.1	25.9	No Walleye Fishery
8	Cheat River	1	19	G	-	5.6	Self Sustaining Walleye Fishery Present
4	Chemung River	1	4	B	5.7	3.5	Self-Sustaining Walleye Fishery Present
4	Chemung River	2	4	B	113.7	10.8	Self-Sustaining Walleye Fishery Present
2	Clarion River	1	17	A	43.6	13.7	No Walleye Fishery
2	Clarion River	2	17	A	62.0	13.8	No Walleye Fishery

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
2	Clarion River	3	17	A	85.9	17.9	No Walleye Fishery
2	Clarion River	4	17	B	202.8	39.0	No Walleye Fishery
2	Clarion River	5	17	B	123.4	19.9	Under Evaluation
2	Clarion River	6	17	B	24.2	4.4	Unknown
2	Clarion River	7	17	B	207.9	37.8	Unknown
8	Conemaugh River	2	18	C	83.0	12.2	Limited Self Sustaining Walleye Fishery Present
6	Conestoga River	1	7	J	70.1	58.9	No Walleye Fishery
6	Conestoga River	2	7	J	116.8	14.6	No Walleye Fishery
6	Conestoga River	3	7	J	54.2	11.3	No Known Fishery but Walleye Present
6	Conestoga River	4	7	J	137.1	27.7	Walleye Fishery Present, Mainly at Mouth
7	Conewago Creek	7	7	F	143.2	38.9	Unknown
7	Conewago Creek	8	7	F	-	44.8	Unknown
2	Conewango Creek	1	16	B	116.8	23.0	Walleye Fishery Present
1	Connoquenessing Creek	5	20	C	-	6.1	Unknown
1	Connoquenessing Creek	6	20	C	95.3	28.3	Unknown
1	Connoquenessing Creek	7	20	C	40.9	8.6	Unknown
7	Conococheague Creek	5	13	C	-	18.7	Unknown
7	Conococheague Creek	6	13	C	-	18.1	Unknown
7	Conococheague Creek	7	13	C	-	8.4	Unknown

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
4	Cowanesque River	1	4	A	1.2	11.9	No Walleye Fishery
4	Cowanesque River	2	4	A	24.6	19.2	No Walleye Fishery
4	Cowanesque River	3	4	A	38.6	20.5	No Walleye Fishery
4	Cowanesque River	4	4	A	4.8	2.2	Spring Walleye Fishery Only (Spawning Run)
2	Crooked Creek	5	17	E	54.5	11.6	Walleye Fishery Present
3	Driftwood Branch, Sinnemahoning Creek	4	8	A	40.2	11.2	No Walleye Fishery
3	Driftwood Branch, Sinnemahoning Creek	5	8	A	19.8	6.8	No Walleye Fishery
3	Driftwood Branch, Sinnemahoning Creek	6	8	A	62.6	16.1	No Walleye Fishery
4	Fishing Creek	7	5	C	12.0	6.0	No Walleye Fishery
4	Fishing Creek	8	5	C	-	2.9	No Walleye Fishery
4	Fishing Creek	9	5	C	20.5	8.3	No Walleye Fishery
4	Fishing Creek	10	5	C	12.9	5.6	No Walleye Fishery
4	Fishing Creek	11	5	C	28.6	6.2	No Walleye Fishery
2	French Creek	3	16	A	24.1	12.6	Under Evaluation
2	French Creek	4	16	A	221.2	45.6	Under Evaluation
2	French Creek	5	16	A	57.8	10.4	Under Evaluation
2	French Creek	6	16	A	299.4	49.9	Under Evaluation
8	Kiskiminetas River	1	18	B	468.7	43	Self Sustaining Walleye Fishery Present

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
4	Lackawanna River	7	5	A	12.6	4.2	No Walleye Fishery
5	Lackawaxen River	1	1	B	13.1	4.8	Unknown, None Ever Reported
5	Lackawaxen River	2	1	B	34.2	12	Unknown, None Ever Reported
5	Lackawaxen River	3	1	B	31.9	8.3	Unknown, None Ever Reported
5	Lackawaxen River	4	1	B	58.4	12.4	Unknown, None Ever Reported
5	Lackawaxen River	5	1	B	40.2	7.3	Unknown, None Ever Reported
5	Lehigh River	1	2	A	-	4.9	No Walleye Fishery
5	Lehigh River	2	2	A	5.6	6.6	No Walleye Fishery
5	Lehigh River	3	2	A	3.8	3.7	No Walleye Fishery
5	Lehigh River	4	2	A	20.7	11.8	No Walleye Fishery
5	Lehigh River	5	2	A	14.9	7.4	No Walleye Fishery
5	Lehigh River	6	2	A	60.1	15.7	No Walleye Fishery
5	Lehigh River	7	2	B	166.1	46.8	Under Evaluation, No Evidence So Far
5	Lehigh River	8	2	C	193.0	22.1	Under Evaluation, No Evidence So Far
5	Lehigh River	9	2	C	419.6	38.6	Under Evaluation, No Evidence So Far, Little Movement of Walleye through Fishways
1	Little Beaver Creek	1	20	B	-	0.9	No Walleye Fishery
1	Little Beaver Creek	2	20	B	8.3	1.2	No Walleye Fishery
7	Little Juniata River	4	11	A	11.6	5.2	No Walleye Fishery

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
7	Little Juniata River	6	11	A	15.3	5.8	No Walleye Fishery
7	Little Juniata River	7	11	A	14.8	5.1	No Walleye Fishery
3	Loyalsock Creek	4	10	B	81.8	22.4	No Walleye Fishery
3	Loyalsock Creek	5	10	B	10.1	2.4	No Walleye Fishery
3	Loyalsock Creek	6	10	B	81.0	19.3	No Walleye Fishery
3	Loyalsock Creek	7	10	B	15.4	3.6	No Walleye Fishery
3	Loyalsock Creek	8	10	B	61.5	12.7	Walleye Fishery Present
3	Lycoming Creek	6	10	A	54.7	14.5	No Walleye Fishery
2	Mahoning Creek	3	17	D	18.8	4.7	Walleye Fishery Present
2	Mahoning Creek	4	17	D	164.9	29.9	Walleye Fishery Present
1	Mahoning River	1	20	B	103.1	18.0	No Walleye Fishery
1	Neshannock Creek	2	20	A	18.3	8.7	No Walleye Fishery
1	Neshannock Creek	3	20	A	9.4	4.3	No Walleye Fishery
1	Neshannock Creek	4	20	A	52.5	18.8	No Walleye Fishery
2	Oil Creek	4	16	E	22.6	9.1	No Walleye Fishery
2	Oil Creek	6	16	E	44.7	13.7	No Walleye Fishery
2	Oil Creek	8	16	E	8.1	2.3	Unknown
2	Oil Creek	9	16	E	41.1	6.8	Walleye Fishery Present
3	Penns Creek	7	6	A	66.7	13.9	Walleye Fishery Present

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
3	Penns Creek	8	6	A	178.5	33.0	Walleye Fishery Present
3	Pine Creek	8	9	A	6.1	1.6	No Walleye Fishery
3	Pine Creek	9	9	A	58.0	11.9	No Walleye Fishery
3	Pine Creek	10	9	A	96.1	17.9	Walleye Fishery Present
3	Pine Creek	12	9	A	168.3	24.3	Walleye Fishery Present
3	Pine Creek	13	9	A	166.6	22.4	Walleye Fishery Present
5	Raymondskill Creek	3	1	D	1.4	1.51	No Walleye Fishery
7	Raystown Branch, Juniata River	6	11	C	16.2	5.3	Unknown
7	Raystown Branch, Juniata River	7	11	C	31.0	8.9	Unknown
7	Raystown Branch, Juniata River	8	11	D	166.8	41.7	Unknown
7	Raystown Branch, Juniata River	9	11	D	48.3	9.7	Unknown
7	Raystown Branch, Juniata River	10	11	D	36.4	6.3	Walleye Fishery Present
7	Raystown Branch, Juniata River	11	11	D	-	-	Walleye Fishery Present
7	Raystown Branch, Juniata River	12	11	D	-	7.2	Walleye
2	Redbank Creek	1	17	C	107.9	30.8	No Walleye Fishery
2	Redbank Creek	2	17	C	153.6	30.7	No Walleye Fishery
2	Redbank Creek	3	17	C	100.6	25.2	No Walleye Fishery
6	Schuylkill River	4	3	B	-	-	No Walleye Fishery
6	Schuylkill River	5	3	F	-	-	No Walleye Fishery

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
6	Schuylkill River	6	3	F	-	-	Very Limited Walleye Fishery Likely
6	Schuylkill River	7	3	C	-	-	Limited Walleye Fishery Present
6	Schuylkill River	8	3	F	-	-	No Walleye Fishery
6	Schuylkill River	9	3	F	-	-	No Walleye Fishery
6	Schuylkill River	10	3	D	-	-	No Walleye Fishery
6	Schuylkill River	11	3	F	-	-	No Walleye Fishery
1	Shenango River	2	20	A	32.1	13.8	Walleye Fishery Present
1	Shenango River	3	20	A	47.4	20.1	Walleye Fishery Present
1	Shenango River	4	20	A	10.1	2.4	Walleye Fishery Present
1	Shenango River	5	20	A	424.3	54.4	Walleye Fishery Present
3	Sinnemahoning Creek	1	8	A	204.4	25.4	No Walleye Fishery
1	Slippery Rock Creek	2	20	C	78.1	24.2	No Walleye Fishery
1	Slippery Rock Creek	3	20	C	23.0	9.3	No Walleye Fishery
1	Slippery Rock Creek	4	20	C	3.1	0.8	No Walleye Fishery
1	Slippery Rock Creek	5	20	C	20.3	5.6	No Walleye Fishery
7	Swatara Creek	5	7	D	119.6	25.2	Unknown
4	Tioga River	3	4	A	54.6	28.8	No Walleye Fishery
4	Tioga River	4	4	A	48.4	14.9	No Walleye Fishery
2	Tionesta Creek	1	16	F	98.1	25.6	No Walleye Fishery

AFM	Small Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
2	Tionesta Creek	2	16	F	32.0	7.2	No Walleye Fishery
2	Tionesta Creek	3	16	F	99.4	16.3	No Walleye Fishery
2	Tionesta Creek	4	16	F	10.5	1.4	Walleye Fishery Present
4	Towanda Creek	2	4	C	22.8	23.7	No Walleye Fishery
4	Towanda Creek	3	4	C	3.4	2.7	No Walleye Fishery
4	Towanda Creek	4	4	C	13.4	10.1	No Walleye Fishery
4	Towanda Creek	5	4	C	17.1	10.4	No Walleye Fishery
4	Tunkhannock Creek	3	4	F	15.9	10.3	No Walleye Fishery
4	Tunkhannock Creek	4	4	F	42.5	21.5	No Walleye Fishery
4	Tunkhannock Creek	5	4	F	25.7	10.5	No Walleye Fishery
5	West Branch Lackawaxen River	4	1	B	2.8	3.8	No Walleye Fishery
3	West Branch Susquehanna River	2	8	B	266.0	50.4	No Walleye Fishery, Could Develop as Water Quality Improves
3	West Branch Susquehanna River	3	8	B	28.0	4.3	No Walleye Fishery, Could Develop as Water Quality Improves
5	West Branch Delaware River	1	1	A	91.1	12.8	Walleye Fishery Present, Not Stocked

Major Rivers

The vast majority of our flowing water walleye fisheries occur in Major Rivers and management efforts will be prioritized in this category. The remainder of this chapter concentrates on the evaluation of these fisheries. The current status of the walleye fisheries in all 79 Major River sections has been reviewed (see *Table 3*).

Evaluation

PHASE ONE

The first phase in evaluating walleye management in our Major River sections is to evaluate the management decision implementing a five-year moratorium on stocking walleyes in flowing waters, which started in 2008. Concurrent with the order to cease walleye stocking in flowing waters was the order to assess all of these formerly stocked waters for walleye natural reproduction via fall night electrofishing. The presence and relative abundance of walleye YOY is the primary measure of successful reproduction.

By April 2011, the third year of sampling in the five-year assessment of walleye reproduction in the formerly stocked flowing waters will be complete. Fall sampling in 2012 will complete this assessment at most waters; however, some waters are slightly behind schedule. It will be the Area Fisheries Manager's decision whether the full five years of sampling is necessary to make a determination on the status of natural reproduction but a minimum of three years is recommended.

PHASE TWO

The second phase in evaluating walleye management in our Major River sections is to evaluate the management decisions made following the completion of the five-year stocking moratorium evaluation (Phase One). Any flowing waters subsequently returned or added to the stocking program will be fully evaluated and waters supported by natural reproduction will need regular monitoring.

Sampling Options

Ultimately, the objective of field sampling is to accurately assess walleye relative abundance. While minimum catch rates are provided below for electrofishing and gillnetting, any gear that is effective in capturing walleyes in flowing water may be used. Justification will be provided in the management report covering the survey.

Young-of-the-Year

There is one option for sampling young-of-the-year (YOY) walleyes in Major Rivers: fall night electrofishing. Fall day electrofishing has been almost universally ineffective at capturing walleye YOY. The target catch rate of 20 YOY per hour is based upon the mean fall night electrofishing catch rates for YOY in Major Rivers maintaining high-quality walleye fisheries (*Table 2*). The YOY catch rate objective is a composite among the high range of the North Branch Susquehanna River and all other Major Rivers with high-quality walleye fisheries. A Major River section has the potential to support a high-quality walleye fishery when this YOY catch rate objective is achieved.

YOY walleyes have been captured during fall night electrofishing from September 1 through early November. Research suggests that walleye YOY surveys should be conducted

when water temperatures are between 20°C and 10°C (Burkholder 2001). The optimal timing within this window may be different for particular waters and experimentation with sample timing may be necessary. It is up to the Area Fisheries Managers to schedule surveys using local familiarity with their waters. Any night electrofishing survey that takes place after October 1 will collect all sizes of walleye, not just YOY.

The minimum sampling effort established for walleye YOY in reservoirs was set at four, 20-minute sampling runs (Lorantas 1993). However, this standard may not be achievable in our Major Rivers. Major Rivers sampling locations are usually dictated by access and total sampling effort at each site and is usually dictated by the amount of habitat accessible to jonboat electrofishing gear. It is suggested that fall YOY samples sites on our Major River sections use the summer adult smallmouth bass sites that are already established in most sections. If sufficient habitat is available to prevent repetitive sampling of any habitat, a total effort of 1.33 hours is recommended.

Table 2. **Major River Sections that Contain Quality Walleye Fisheries.**

Major River	Sections
Allegheny River	7 - 22
Juniata River	3 - 7
Monongahela River	1 - 6
North Branch Susquehanna River	1 - 10
Ohio River	1 - 4
Susquehanna River	2 - 8
West Branch Susquehanna River	6
Youghiogheny River	6

Adults

The options to assess adult walleye relative abundance in Major Rivers are electrofishing and gillnets. As stated earlier, other gear options may be employed. The goal is to effectively sample walleye.

Scales are to be collected according to standard procedures (10 fish per 25-mm-length group) and a subsample of these fish may be sacrificed for otoliths if the area fisheries manager deems increased accuracy of age estimation necessary. A minimum of five walleye per 25-mm-length group is recommended when otolith extraction is necessary. Accurate age estimation may allow us to develop a YOY/adult relationship similar to the smallmouth bass work done by the Warmwater Unit.

Electrofishing

Electrofishing was the only gear option for Major Rivers available in the original *Walleye Plan for Pennsylvania* (Hoopes and Young 1988). The objective catch rate was set at two legal-length walleye (≥ 15") per hour. There was no distinction among resource categories, spring, summer or fall electrofishing, or between day and night electrofishing.

Jonboat electrofishing has been the most effective and most used gear to assess adult walleye relative abundance in flowing waters. It will continue to be the primary assessment tool for walleye in Major Rivers. The new catch rate objective is based upon the mean fall night electrofishing catch rate of adults from waters maintaining high-quality walleye fisheries (see *Table 2*). For our new catch rate objective, all walleye Age 1+ were included in the computation and the new objective for Major Rivers is ten total walleye per electrofishing hour. The mean catch rate for legal-length walleye (≥ 375 mm) during these surveys was 2.84 per hour. Thus, a catch rate of two legal-length walleye (≥ 375 mm or 15 in.) per electrofishing hour will remain in place as a component of the total catch-rate objective.

While fall night electrofishing has been the best method for sampling adult walleye, some day electrofishing surveys and early spring and summer night electrofishing surveys have approached the target catch rate for a high-quality fishery. Therefore, a jonboat electrofishing survey may occur anytime, day or night, between March 15 and December 15 and a satisfactory walleye population declared if the target catch rate of ten Age 1+ walleye per electrofishing hour, of which two are ≥ 375 mm (15 in.) is documented.

Sampling locations in Major Rivers are usually dictated by access and total sampling effort at each site is usually dictated by the amount of habitat accessible to jonboat electrofishing gear. It is suggested that fall samples sites on our Major River sections use the summer adult smallmouth bass sites that are already established in most sections. A total effort of 1.33 hours (four 20-minute sites) is recommended if sufficient habitat is available to prevent repetitive sampling of any habitat (Lorantas 1993). Copeland's (1997) sampling recommendations for assessing Age 1 and older walleye in the 10 sections of the North Branch Susquehanna River were five sites and an effort of 120 minutes (or most of the pool) at each site should be night electrofished.

Gillnets

Gillnets have seen limited use in flowing water. Only seven of the 37 gillnet surveys in Major Rivers produced catch rates that exceeded 0.04/hr (or one walleye per 24-hour net set). These surveys occurred in the lock and dam sections of the Allegheny and Monongahela rivers and are the only sites with gillnet catch rates exceeding 0.01 legal-length walleye per hour in flowing waters. These seven gillnet surveys produced a mean catch of 0.21/hr for walleye ≥ 250 mm (Age 1+), which will be considered the new target catch rate until more gillnet surveys are completed. Ages of walleyes captured will have to be determined through scale analysis to compute Age 1+ catch rates. Gillnets may be used at the AFM's discretion when habitat, season and river morphology suggest they will be effective.

Reporting

Currently, all formerly stocked Major Rivers and Small Rivers sections are being sampled annually with jonboat night electrofishing for walleye YOY to evaluate the status of natural reproduction in these sections. Fall sampling in 2012 will complete this assessment of the formerly stocked flowing waters. By March 2013, all area fisheries managers are to complete a single, short status report detailing the results of this evaluation of all formerly stocked Major Rivers and Small Rivers sections in their area managed for walleye. The report should describe the status of the walleye populations, make management recommendations and

prioritize future sampling. For simplicity, this can be submitted to the Warmwater Unit Leader and Fisheries Management Division Chief in tabular form.

Post-2012 Management

It is assumed that not every formerly stocked river section will demonstrate sufficient walleye natural reproduction to maintain a high-quality fishery. The Area Fisheries Manager will decide if managing for walleye is appropriate for each river section based upon the historic presence and angler demand for a walleye fishery. If the walleye fishery is to be restored (assuming full or partial collapse, following the cessation of stocking), then the Area Fisheries Manager will begin stocking walleye at the rate of 2,000 fry and 20 Phase I fingerlings per surface acre. The two life stages will receive different OTC tags to facilitate the determination of their contribution to YOY and adult populations during subsequent evaluations as outlined in this plan. Once initiated, stocking should continue for at least five years.

Verifying the success or failure of stocking during this five-year period is critical and reduces required sampling after the initial five-year period. This high-intensity sampling is only for flowing waters returned to the stocking list. Area Fisheries Managers must provide evidence that stocked walleyes are making a contribution to the walleye population. On Major Rivers with multiple adjacent sections returned to the stocking list, the Area Fisheries Manager may establish index sites to represent the overall reach. Each individual section does not have to be sampled.

All walleye stocked into flowing waters will be OTC tagged. Stockings will be assessed with fall night electrofishing. A concurrent adult and YOY survey will occur in three of the first five years of stocking with the final survey occurring in the fifth year. The first 50 YOY captured during each fall night electrofishing survey will be sacrificed for OTC tag analysis. Analysis of otoliths for OTC tags must be arranged with Fish Production Services staff prior to collecting any otoliths. There may be a need to train Division of Fisheries Management staff in otolith preparation and analysis techniques to meet the needs of program timeliness.

The survey of adult walleye relative abundance performed (following the fifth year of stocking only) requires that five walleye per 25-mm-length group be sacrificed for OTC tag analysis. Only walleye up to Age 4+ have the potential to carry an OTC mark, so otoliths from older walleye should not be submitted for processing. Statewide average growth rates for walleye estimate a five-year-old walleye to be 513 mm (20.2 in.) in total length. Area fisheries managers may opt to take scales only on walleye larger than the 550-mm-length group.

As shown by annual surveys on the North Branch Susquehanna River and other waters with high-quality walleye fisheries, neither natural reproduction or stocking produces a large year class, every year. We observe in almost all naturally reproducing fisheries that occasional large-year classes can sustain a high-quality fishery. Therefore, at least one of the three YOY samples should meet or exceed the catch-rate objective of 20 YOY per hour.

Area Fisheries Managers will use fall YOY night electrofishing catch rates, adult catch rate(s) and percent contribution of hatchery fish to decide the next management action. Fall night electrofishing YOY catch rates and adult catch rates at or near zero suggest that walleye management is inappropriate and stocking should be terminated. If hatchery walleye are consistently contributing less than 33 percent to the YOY catch, stocking should be terminated. OTC tag analysis will determine relative contribution of fry and fingerlings, allowing the Area Fisheries Manager to choose the most effective life stage to stock. Fry stockings are preferred

because they are easier and less expensive to stock and this is the opportunity to determine their efficacy when stocked into flowing waters.

Should YOY fall electrofishing catch rates and adult catch rates meet or exceed the catch rate objectives (20 YOY and 10 Age 1+ walleye per hour, respectively) and OTC tag analysis reveals stocking accounts for 33 percent or more of the population (seven YOY per hour and five Age 1+ per hour), the Area Fisheries Manager may continue to stock walleyes. At this point the section is categorized as hatchery supported and future OTC tagging is not necessary unless the manager wants to re-evaluate natural reproduction.

If adult catch rates are greater than or equal to five per hour and less than 10 per hour (50 to 100 percent of the catch-rate objective) and YOY catch rates are greater than or equal to 10 per hour and less than 20 YOY per hour (50 to 100 percent of the catch rate objective) and hatchery walleye are contributing 33 percent or more of the total YOY catch, the manager may cease stocking or increase the stocking rate to 3,000 fry per acre or 30 fingerlings per acre in an attempt to reach the target catch rates (the decision on which life stage to stock should be answered by the end of five years). Adopting this change requires another five year assessment cycle; however, the required sampling effort is decreased. The new stocking rate must be evaluated with fall night electrofishing in two of the first five years with the final sample occurring after the fifth year of stocking at the new rate. Stocked walleye contribution will continue to be evaluated with OTC tagging. If the new stocking rate yields satisfactory catch rates, the section is categorized as hatchery supported and this stocking rate becomes the base rate for this section. If the increased stocking rate still fails to achieve catch rate objectives but stocking is maintaining a moderate density walleye population (determined through OTC tag analysis), the Area Fisheries Manager must provide justification to the Warmwater Unit Leader and the Fisheries Management Division Chief for the section to remain in the stocking program.

Once a section is declared as hatchery supported, sampling frequency for YOY and adults may be reduced to once every five years. If the results for both the YOY and adult samples fall below the catch rate objectives during this survey, a resurvey is required to verify stocking is still maintaining a fishery.

Walleye stocking in waters that don't meet the catch rate objectives may be considered for continued stocking; however, the rationale for the continuation of stocking must be clearly explained in the Fisheries Management Report and supported by both the Warmwater Unit Leader and Fisheries Management Division Chief.

Again, the high intensity sampling outlined above is only for flowing waters returned to the stocking list. Major River sections maintaining high quality walleye fisheries through natural reproduction can be monitored at the Area Fisheries Manager's discretion, possibly through the use of representative index sites. A five year rotation is recommended for both YOY and adults.

Post-2012 Reporting

Results of walleye sampling may be reported in a format chosen by the area fisheries manager depending upon the level of fisheries management activities that occurred in the river reach. These may include a Fisheries Management Report for the individual river section, an all encompassing Fisheries Management Report for multiple sections of the same river or a Management Brief to report individual surveys or update ongoing time series sampling.

Analysis

The stocking moratorium will allow us to determine the status of natural reproduction in our Major Rivers and provide solid baseline data to which we may compare the contributions made by future walleye stockings.

Here are some points to consider when analyzing post - 2012 YOY catch rates. There should be a substantial difference in the total YOY catch rate between years when stocking occurred and years when stocking did not occur (2008-2012). Stocking of walleye may be additive to the YOY catch rate or some compensatory mechanism might be substituting stocked fish for naturally reproduced fish. If stocking is additive to natural reproduction, it has the potential to turn a poor or modest fishery sustained entirely through natural reproduction into a high quality fishery when augmented by stocking. We should attempt to determine if abiotic river dynamics have as much of an effect on naturally reproduced and stocked walleye as they do on reproducing populations of smallmouth bass.

Ultimately for all Major River sections (and select Small River sections), we need to know if natural reproduction can support a high quality walleye fishery. If a high quality walleye fishery cannot be supported through natural reproduction and a walleye stocking program is initiated, a high quality walleye population must be developed because the expense to continue stocking to simply maintain a mediocre fishery is not consistent with our management goals.

Perhaps our most powerful (and simultaneously most underutilized) fisheries management tool in Pennsylvania that could be used to help characterize the fishery is an angler use and harvest survey. The high costs associated with these types of surveys have often precluded their use to assist in the evaluation of Pennsylvania's fisheries. The practice of angler use and harvest surveys should be given careful consideration for future evaluations of the success of a management program.

Prioritization of Waters for Evaluation

There are 79 Major River sections for which the PFBC has management responsibility. The current status of walleye in each Section has been determined (Table 3). The sampling priority will focus on Phase One, the completion of the 5-year evaluation of waters removed from the stocking list in 2008. Following completion of Phase I in fall of 2012, the focus will shift to evaluation of waters returned to the stocking list, regular monitoring of fisheries sustained through natural reproduction, determination of the status of walleye fisheries classified as unknown (Table 3) and looking for new sections suitable for stocking.

Stocking

The Division of Fish Production is capable of producing very large quantities of walleye fry and Area Fisheries Managers are encouraged to use them wherever effective. They are relatively inexpensive and hatchery production rarely falls short of requests. However, 23 years of evaluating fry stockings (since adoption of the Walleye Plan for Pennsylvania in 1988) has shown that they are ineffective in almost all of our lakes and reservoirs. The efficacy of fry stockings in Major Rivers and Small Rivers was not evaluated before the stocking moratorium was imposed, but fry stockings in rivers are suspected of being ineffective as well. The Iowa Department of Natural Resources' (DNR) analysis of their fry stocking program in rivers showed the program to be ineffective and much better results were achieved through walleye fingerling stockings (Gelwicks 2001).

The supply of Phase I fingerlings is limited. Over the last three years (2008 – 2010), the average annual request for fingerlings was 1,455,620 (Base – 1,083,037; Supplemental 372,583). Over those same three years, the average number of fingerlings produced was 1,277,672. So, Area Fisheries Managers should be aware that stocking fingerlings in flowing water sections means drawing them from the Supplemental fingerling stockings for lakes and reservoirs. This discrepancy between fingerlings requested and fingerlings produced heightens the need to verify that our hatchery stockings are actually contributing to high quality walleye populations in both rivers and lakes and may indicate the need to expand our walleye culture program.

Most Major River sections are large and will require a large increase in production to meet minimum stocking rates. Iowa DNR's analysis of their fingerling stocking program stated their optimal stocking rate as 425 walleye fingerlings per mile (Gelwicks 2001) and they found better results were obtained by stocking 'river strain' walleye fingerlings versus 'lake strain' walleye fingerlings. Changes proposed in the Reservoir chapter of this plan will likely reduce the availability of 'lake strain' walleye fingerlings for rivers in the short term. However, the untapped resource of Missouri River strain walleye fingerlings from North Dakota might be ideal for stocking our Major Rivers, especially in the Susquehanna and Delaware watersheds. They continue to offer approximately 200,000 of these fish in exchange for the tiger muskellunge we provide them (Hines, personal communication). Any concern over genetic mixing is a moot point as walleye are not native to these drainages.

Tailwater Fisheries

There are several instances across Pennsylvania where the stocking of walleyes in reservoirs creates (or at least contributes substantially to) a seasonal tailrace walleye fisheries. Examples include Woodcock Creek Lake, Shenango River Lake and Blue Marsh Lake. Following two years of stocking OTC tagged fingerlings in Woodcock Creek Lake, an electrofishing survey in 1995 of the dam tailwaters found that 100 percent of Age 1 and 2 walleyes were originally stocked in Woodcock Creek Lake (Lee and Woomer 1999). There are significant directed fisheries below some of these dams. Walleye instinctively move upstream in mid to late autumn to overwinter near their natal spawning grounds. In these cases, the walleye are blocked by the dam and congregate below it providing an opportunity for anglers to target them with success. Area Fisheries Managers are encouraged to document these fisheries in other locations and contemplate stocking the tailrace waters with fingerlings, especially if the quality of the walleye fishery in the lake is below standard and facing removal from the stocking program. If stocking the tailwaters is initiated, OTC tagged fish should be utilized to facilitate an evaluation of the contribution of hatchery reared fish to the population. If access is available, the most obvious method for evaluation is jonboat night electrofishing. Otherwise, mini-boom shocker or towed boat day electrofishing may be employed.

Table 3. **Status of Walleye Fisheries in Pennsylvania's Major River Sections.**

AFM	Major Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
2	Allegheny River	7	16	B	114.6	14.1	Under Evaluation
2	Allegheny River	8	16	B	135.8	12.0	Under Evaluation
2	Allegheny River	9	16	F	761.8	47.2	Under Evaluation
2	Allegheny River	10	16	E	612.2	33.0	Under Evaluation
2	Allegheny River	11	16	E	267.6	12.0	Under Evaluation
2	Allegheny River	12	16	G	1024.3	53.5	Under Evaluation
2	Allegheny River	13	17	C	661.9	31.5	Under Evaluation
2	Allegheny River	14	17	C	294.8	11.7	Under Evaluation
2	Allegheny River	15	17	D	370.1	15.4	Under Evaluation
2	Allegheny River	16	17	E	390.5	11.0	Under Evaluation
2	Allegheny River	17	17	E	454.7	15.1	Under Evaluation
8	Allegheny River	18	18	A	241.0	9.4	Self-Sustaining Walleye Fishery Present
8	Allegheny River	19	18	A	284.4	10.1	Self-Sustaining Walleye Fishery Present
8	Allegheny River	20	18	A	445.7	15.6	Self-Sustaining Walleye Fishery Present
8	Allegheny River	21	18	A	379.3	12.5	Self-Sustaining Walleye Fishery Present
8	Allegheny River	22	18	A	296.3	10.7	Self-Sustaining Walleye Fishery Present
1	Beaver River	1	20	B	155.5	15.5	Unknown
1	Beaver River	2	20	B	203.6	20.3	Unknown

AFM	Major Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
6	Delaware Estuary	1	3	G	1532.3	28.9	Very Limited Self-Sustaining Walleye Fishery Present at Trenton Falls
6	Delaware Estuary	2	3	G	-	10.2	No Walleye Fishery
6	Delaware Estuary	3	3	G	-	22.8	No Walleye Fishery
6	Delaware Estuary	4	3	G	3888.0	21.6	No Walleye Fishery
5	Delaware River	1	1	A	331.7	30.6	Has always been managed as Self-Sustaining Walleye Fishery; will be addressed in Delaware River Mgmt. Plan
5	Delaware River	2	1	A	476.0	39.4	Has always been managed as Self-Sustaining Walleye Fishery; will be addressed in Delaware River Mgmt. Plan
5	Delaware River	3	1	B	231.4	19.3	Has always been managed as Self-Sustaining Walleye Fishery; will be addressed in Delaware River Mgmt. Plan
5	Delaware River	4	1	D	586.0	46.0	Under Evaluation
5	Delaware River	5	1	D	894.0	65.2	Under Evaluation, Walleye Fingerlings still stocked by NJ
5	Delaware River	6	1	F	570.3	41.6	Under Evaluation, Walleye Fingerlings still stocked by NJ
6	Delaware River	7	2	D	754.4	42.7	Very Limited Self-Sustaining Walleye Fishery Present
6	Delaware River	8	2	E	678.2	37.2	Limited Self-Sustaining Walleye Fishery Present
7	Juniata River	1	11	B	67.5	5.4	Unknown
7	Juniata River	2	11	B	84.8	11.7	Unknown
7	Juniata River	3	12	C	148.8	23.8	Unknown
7	Juniata River	4	12	A	750.4	48.1	Under Evaluation

AFM	Major Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
7	Juniata River	5	12	B	273.7	24.5	Under Evaluation
7	Juniata River	6	12	B	431.2	29.6	Under Evaluation
7	Juniata River	7	12	B	112.9	13.2	Under Evaluation
8	Monongahela River	1	19	G	282.5	14.9	Self-Sustaining Walleye Fishery Present
8	Monongahela River	2	19	C	673.0	33.5	Self-Sustaining Walleye Fishery Present
8	Monongahela River	3	19	C	624.2	31.5	Self-Sustaining Walleye Fishery Present
8	Monongahela River	4	19	C	631.3	28.5	Self-Sustaining Walleye Fishery Present
8	Monongahela River	5	19	C	458.7	20.3	Self-Sustaining Walleye Fishery Present
8	Monongahela River	6	19	A	459.2	18.0	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	1	4	E	84.2	7.9	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	2	4	E	224.9	17.2	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	3	4	B	529.8	26.7	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	4	4	C	140.7	7.1	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	5	4	D	1219.4	59.6	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	6	4	G	1280.4	58.2	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	7	5	A	88.9	3.4	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	8	5	B	1149.0	47.5	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	9	5	D	1026.4	31.0	Self-Sustaining Walleye Fishery Present
4	North Branch Susquehanna River	10	5	E	1296.6	35.3	Self-Sustaining Walleye Fishery Present
8	Ohio River	1	20	G	416.0	10.0	Self-Sustaining Walleye Fishery Present

AFM	Major Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
8	Ohio River	2	20	G	507.3	11.4	Self-Sustaining Walleye Fishery Present
8	Ohio River	3	20	G	1061.2	29.6	Self-Sustaining Walleye Fishery Present
8	Ohio River	4	20	D	428.8	13.4	Self-Sustaining Walleye Fishery Present
6	Schuylkill River	12	3	F	161.9	13.0	No Walleye Fishery
6	Schuylkill River	13	3	E	67.6	5.3	No Fishery
6	Schuylkill River	14	3	F	94.5	7.9	No Fishery, some Self-Sustaining Walleye Present
6	Schuylkill River	15	3	F	131.0	11.3	Self-Sustaining Walleye Fishery Present
6	Schuylkill River	16	3	F	142.0	13.4	Very Limited Self-Sustaining Walleye Fishery Present
7	Susquehanna River	1	6	B	151.2	2.1	Unknown
7	Susquehanna River	2	6	C	5798.7	58.9	Unknown
7	Susquehanna River	3	7	C	3849.8	39.6	Under Evaluation
7	Susquehanna River	4	7	D	289.3	6.1	Unknown
6	Susquehanna River	5	7	G	1667.5	23.0	Self-Sustaining Walleye Fishery Present
6	Susquehanna River	6	7	J	2888.2	16.9	Limited Self-Sustaining Walleye Fishery Present
6	Susquehanna River	7	7	J	1225.2	12.8	Self-Sustaining Walleye Fishery Present
6	Susquehanna River	8	7	J	1336.9	14.8	Self-Sustaining Walleye Fishery Present
3	West Branch Susquehanna River	4	9	B	1575.8	171.0	Unknown
3	West Branch Susquehanna River	5	10	C	1133.8	50.0	Self-Sustaining Walleye Fishery Present
3	West Branch Susquehanna River	6	10	D	1640.0	57.6	Self-Sustaining Walleye Fishery Present

AFM	Major Rivers	Sec Num	SB	SSB	Section Area (ha)	Section Length (km)	Walleye Fishery Status
8	Youghiogheny River	1	19	E	11.2	1.7	No Walleye Fishery, There was a Good One Prior to Hydro Plant Going Online in 1989
8	Youghiogheny River	2	19	E	16.4	1.8	No Walleye Fishery
8	Youghiogheny River	3	19	E	88.5	11.8	No Walleye Fishery
8	Youghiogheny River	4	19	E	142.1	20.9	No Walleye Fishery
8	Youghiogheny River	5	19	E	87.4	9.3	No Walleye Fishery
8	Youghiogheny River	6	19	E	771.9	74.4	Self-Sustaining Walleye Fishery Present

Chapter 4: Walleye Management in Lakes and Reservoirs

As stated earlier, the goal of the walleye stocking program has changed from creating diverse fishing opportunities and directed walleye fisheries to strictly creating high-quality walleye fisheries (Lorantas 2010). This chapter provides our approach to improve our walleye fisheries and the PFBC walleye stocking program in impoundments by verifying that PFBC stocked walleye are contributing to fishable walleye populations. Presuming that walleye catch rates from both biological and angler assessments are proportional to walleye abundance, gauging our success towards successful attainment of this objective consists of: 1). measuring walleye relative abundance through biological assessments and 2). verifying walleye angler effort, catch and harvest through angler use and harvest assessments on select waters.

Past biological assessments of impoundments stocked with walleyes by PFBC have documented a wide range of walleye densities, including some zero walleye populations. However, some waters with low survey catches, suggesting a low abundance of walleye, are anecdotally reported to receive significant angler effort directed at walleye through reports from Waterway Conservation Officers, anglers or news media. This type of subjective information is valuable but cannot be used solely in making management decisions.

In the absence of recent angler-use data on most reservoirs, and given the prohibitive cost and manpower limitations for conducting such surveys, we must largely rely on our survey catch rates from biological assessments to make management decisions. Our survey catch rates from past biological assessments suggest that PFBC walleye stockings are not producing walleye populations that are commensurate with our expenditures to stock these fish in some waters. There are waters with multiple consecutive survey catches below the minimum catch rate objectives of the original *Walleye Plan for Pennsylvania* and most of these waters have seen no change in management strategy. Since 1977, of all fish surveys (excluding surveys for YOY walleyes) conducted in lakes and reservoirs currently stocked with walleyes, only 28.2 percent (214/758) achieved the catch rate objectives established in *The Walleye Plan for Pennsylvania*, (a survey is defined as a one week sampling period). Since 1995, there have been 324 fish surveys (excluding surveys for YOY walleyes) conducted in the lakes and reservoirs currently stocked with walleyes. Only 114 (35.2 percent) of these assessments equaled or exceeded the catch rate objectives from the Walleye Plan for Pennsylvania.

Possible explanations for impoundments not attaining catch rate objectives include; walleyes were not the primary target species during sampling, the samples weren't representative of true walleye relative abundance or the minimum catch-rate objectives that define a high-quality walleye population were set too high. However, with the shift in stocked walleye management philosophy, we can no longer afford to stock underperforming waters. This plan requires a change in management activity on waters with low survey catch rates during focused biological assessments. These changes will result in either a change in management or a change in sampling technique in an effort to be effective and efficient in all future walleye management activities.

These results shouldn't give the impression that we were completely unwilling to remove waters from the stocking program or that walleye management has been static. Between 1995 and 2010, 12 waters that were maintenance stocked with Phase I fingerlings were removed from the stocking program due to poor survival. During the same period, 12 new waters were added

to the fingerling stocking program and several more waters were dropped from the stocking program only to be reinstated in subsequent years.

This plan provides a stepped approach to assess the success of PFBC walleye stockings in lakes and impoundments, determine the stocking rate necessary to maintain a high-quality walleye population and terminate walleye stocking in underperforming lakes and reservoirs. This chapter will also update our survey catch rate objectives, suggest changes in stocking policy and begin the process of measuring statewide angler demand for walleye fishing and statewide walleye angler effort.

Stocking History

The Division of Fish Production has steadily increased the quantity of walleyes available for stocking. Initially, fry stocking in the lakes and reservoirs of Pennsylvania were thought to be fairly successful. Policy in the late 1960s and 1970s dictated all initial walleye stockings in new and reclaimed reservoirs were to be walleye fry. However, fry stockings gradually became less successful in maintaining high-quality fisheries or in establishing naturally reproducing populations. By 1996, the majority of lakes and reservoirs stocked with walleye received exclusively Phase I fingerlings. As of 2010, only 10 reservoirs still receive walleye fry on a regular basis and seven of these fry stockings are considered supplements to Phase I fingerling stockings. Pymatuning Reservoir, Allegheny Reservoir and East Branch Clarion River Lake are the only reservoirs that receive fry only.

In the 1970s and 1980s, many waters were stocked experimentally. Apparently, excess fry production was stocked in reservoirs for one to three years with little or no assessment performed. This practice ended with the implementation of *The Walleye Plan for Pennsylvania*.

The production of Phase II walleye fingerlings was suspended after 1994 when a multi-year PFBC study (Lorantas 2001) revealed that Phase I fingerlings provided a better cost/benefit ratio. The production of Phase I fingerlings appears to have stabilized at roughly 1.3 million per year. Almost all waters on the stocking list have received their base rate for the last five years.

Research History

In the late 1980s and early 1990s, following adoption of *The Walleye Plan for Pennsylvania*, the Fisheries Management Division (and in particular the Warmwater Unit) undertook a series of investigations to refine walleye management in Pennsylvania. These projects included investigating the efficacy of OTC tagging (Hoopes 1990, Hoopes and Burman 1991, 1992), comparing the contribution of fry, Phase I and Phase II fingerlings to wild populations (Hoopes and Burman 1991, 1992), evaluating transport time and transport distance on short term survival of stocked walleye fry (Lorantas 1993), evaluating day stocking versus night stocking on survival of walleye fry (Lorantas 1993), determining the relative growth of forage fishes to help decide which life stage of walleye to stock and when they should be released (Lorantas 1993), collecting both YOY and yearling to measure over-winter survival and contribution to adult stock (Lorantas 1993),

The OTC tagging studies yielded several important results. These studies showed immersion in an OTC bath was an effective tagging method for all sizes of walleye stocked by the PFBC and revealed that our hatchery walleye were making substantial contributions to walleye populations in many lakes and reservoirs (Hoopes 1990, Hoopes and Burman 1991, 1992). It was also determined that Phase I fingerlings and fry produced larger YOY in the fall than Phase II fingerlings. When accounting for hatchery costs, mortality and contribution to wild

populations, Phase I walleye fingerlings were more cost effective than the larger Phase II fingerlings (Lorantas 1995).

Evaluations of our walleye fry transport and stocking techniques showed that the fry were arriving at their designated waters in good condition and mortality caused by long travel distances and travel times was low (Lorantas 1993).

The comparison of day versus night stocking of walleye fry was inconclusive because the number of walleye YOY captured in the fall was too few to yield meaningful results (Lorantas 1995).

The results of the other studies were never finalized due to budget cuts and changes in priorities (Lorantas 2001).

Small Reservoirs

Scott and Crossman (1973) found walleye are generally more abundant in larger waters and some of the Habitat Suitability Index models (McMahon et.al. 1984) use lake size greater than 100 hectares (~250 acres) as an indicator of excellent walleye habitat. Similar to Warmwater Streams, there are few, if any, Small Reservoirs that support high-quality walleye fisheries. No Small Reservoirs are suspected of supporting walleye natural reproduction and few Small Reservoirs have been stocked with walleye.

There are 197 Small Reservoirs listed in the Agency Resource Database. Of these reservoirs, 68 are equal to or greater than 20 acres. Slightly more than half of these (36) are stocked with adult catchable trout. The original *Walleye Plan for Pennsylvania* restricted walleye stocking in Small Reservoirs to those larger than 20 acres and not stocked with adult trout. It implied that the intense fishing pressure for stocked trout during the closed season for walleyes would result in high catch and release mortality for walleyes and possibly illegal harvest. One option to avoid this undesirable impact on the walleye population and provide increased angling opportunities for walleye would be to eliminate the closed season for walleyes on lakes and reservoirs whose walleye fisheries are created by stocking. This would provide increased opportunities to develop walleye populations in Small Reservoirs also stocked with adult trout. Large walleyes (> 20 inches) are a predator of stocked trout in smaller Pennsylvania reservoirs, therefore, trout stocking should occur as close as possible to opening day of trout (Kaufmann, personal communication). A second and more desirable option would be to manage these Small Reservoirs in the Approved Trout Waters, Open to Year-Round Fishing program. This would maximize angling opportunities for walleye, adult stocked trout and other popular sport fish. The Small Reservoirs, 20 acres and larger, in the Agency Resource Database are presented in *Table 4*.

Prior to the original *Walleye Plan for Pennsylvania* (1988), neither the stocking of walleyes in Small Reservoirs nor the evaluation of those stockings appeared to follow a systematic plan. Since 1988, only three Small Reservoirs have been actively managed for walleyes (i.e. stocked); White Deer Lake, Cloe Lake and Dunlap Creek Lake. Currently, only Cloe Lake (26 acres) and Dunlap Creek Lake (49.9 acres) are stocked with walleyes. Both are also stocked with adult catchable trout. White Deer Lake was removed from the stocking program due to poor survival of stocked walleyes.

The catch rate objective for Small Reservoirs in the original Walleye Plan was 0.1 legal walleye per trapnet hour. There is little walleye catch data from Small Reservoirs on which to base this definition of a quality fishery. Only one of the 24 surveys of Small Reservoirs compiled for *The Walleye Plan for Pennsylvania* achieved the catch rate objective set forth in

that plan. Those results are not surprising in light of the intermittency of the walleye stocking prior to those surveys.

The only current data on Small Reservoirs is from Dunlap Creek Lake. Dunlap Creek Lake was evaluated in 2006 with spring trapnets and yielded a catch rate of 0.06 legal walleyes per hour, just below the minimum catch rate of 0.1 legal walleyes per hour defined in the original walleye plan. However, the lake had been stocked in only three of the previous ten years. It appears that with more consistent walleye stocking, Dunlap Creek Lake could produce a high-quality walleye fishery as defined by the original walleye plan. Cloe Lake has been stocked since 2006 and has not been evaluated. Evaluation of these two waters is a lower priority than the Last Chance waters presented in the next section.

The development of criteria to define a quality walleye fishery in Small Reservoirs was precluded by the lack of available data. As such, we will defer to the original *Walleye Plan for Pennsylvania* until a more complete dataset for Small Reservoirs is developed. Therefore, the trapnet catch rate objective for Small Reservoirs remains 0.1 legal-length walleyes per trapnet hour. A trapnet survey may occur during any season, but an Area Fisheries Manager has a much higher likelihood of achieving the catch rate objective during the early spring period (March 15 – April 20). For Small Reservoirs stocked with adult trout, it is also recommended that the survey occur prior to the pre-season stocking if possible.

Night electrofishing wasn't an option for evaluating walleyes in Small Reservoirs in the original walleye plan. It is included to provide an efficient and effective means of evaluation. These night electrofishing catch-rate criteria were based on an evaluation of the early spring night electrofishing catch rate for Medium Reservoirs. The target night spring night electrofishing catch rate for a Small Reservoir to continue to receive stocking of hatchery reared walleye is 18 legal-length walleyes per hour. For most Small Reservoirs, most of the lake's shoreline can be electrofished in one night. The manager will pick a random starting point and may electrofish the entire shoreline in 20- 30 minute runs. No shoreline should be sampled more than once. If the entire shoreline is not electrofished, a minimum of 1.33 hours (four 20-minute runs) is recommended (Lorantas 1993). Sampling should take place during the early spring period between March 15 and April 20. For waters stocked with catchable trout, the night electrofishing survey should occur before the trout are stocked.

Small Reservoirs may also be evaluated with concurrent YOY and adult night electrofishing during the fall period when walleye movements to shallow water make them vulnerable to capture (water temperatures 10^{o}- 20^{o}C). The catch rate objective for fall night electrofishing will be 30 total walleyes per hour with 15 YOY per hour a component within the total. If the entire shoreline is not electrofished, a minimum of four 20-minute runs is recommended (Lorantas 1993).

Because of their small size, increasing the stocking rate on Small Reservoirs will not have a significant impact on the statewide pool of hatchery fingerlings. The maximum fingerling stocking rate on Small Reservoirs is 50 per acre. If the Area Fisheries Manager believes the lake has a forage base sufficient to support this higher density of walleye, he may select the higher stocking rate. Because of the current backlog of walleye stocked waters needing evaluation, as Area Fisheries Manager must provide a clear evaluation plan concurrently with adding a Small Reservoir to the walleye stocking program.

Table 4. **Potential for Walleye Management in Pennsylvania's Small Reservoirs (20- 50 acres) listed in the PFBC's Agency Resource Database.**

AFM	Small Reservoirs	Acres	ATW?	Walleye Potential
8	Acme Dam	24	No	Low Potential due to Summer Water Temperatures and Largemouth Bass
1	Barmore Lake	21	No	Unknown
3	Bearwallow Pond	25	No	Low Potential
2	Beaver Meadows Lake	27	No	No Potential
3	Beaver Run Shallow Water Impoundment	25	No	No Potential
8	Beaverdale Reservoir (Lloydell Reservoir)	42	No	Low Potential Due to Acid Precipitation
1	Bessemer Lake	28	Yes	Low Potential, Limited Historic Stockings Yielded Poor Survival, Stocked Trout Fishery
2	Bradford City Number Three Reservoir	20	Yes	No Potential
1	Brady's Run Lake	26	Yes	Low Potential Due to Largemouth Bass and Stocked Trout Fisheries
4	Briar Creek Lake	50	Yes	No Potential, Past Walleye Stocking Failed
5	Bruce Lake	48	No	No Potential
7	Carbaugh Reservoir	20	No	No Potential
2	Cloe Lake*	26	Yes	Under Evaluation
4	Cooks Pond	32	No	Walleye Management not Desired
7	Cowans Gap Lake	42	Yes	Low Potential
6	Deep Creek Dam	25	Yes	Low potential due to shallow nature and Largemouth Bass and Stocked Trout Fisheries.
8	Duman Lake	21	Yes	Low Potential due to Largemouth Bass and Stocked Trout fisheries

AFM	Small Reservoirs	Acres	ATW?	Walleye Potential
8	Dunlap Creek Lake*	49.9	Yes	Walleye Fishery Present, Hatchery Dependent; Combined Walleye and Saugeye TN Catch at 0.13 Fish Hour
4	Dunmore Reservoir No. 1	23	No	No Potential, Toxic Water Quality
5	Fogelsville Quarry North	35	No	No Potential, Closed to Public
3	Hamilton Lake	42	Yes	Low Potential Due to Largemouth Bass and Stocked Trout Fisheries
1	Harbar Acres Lake	20	Yes	Low Potential Due to Largemouth Bass and Stocked Trout Fisheries
4	Harris Pond	30	No	Low Potential, Very Shallow
4	Heart Lake	31	No	No Potential, Closed to Public
5	Hidden Lake	40	Yes	No Potential, Shallow, Stocked Trout Fishery
8	Indian Creek Reservoir (Mill Run Reservoir)	26	No	Low Potential Due to Mine Drainage and Low Productivity
6	Kaercher Creek Dam	32	Yes	Low Potential Due to Largemouth Bass, Could be Tried, Forage OK, Depth OK, Access OK, Recent D.O.?
4	Klines Reservoir	32	No	No Potential, Very Acidic
4	Lake Irena	20	Yes	No Potential, Very Acidic
5	Lake Jamie	45	No	No Potential, Private
4	Lake Lorain	48	No	No Potential, Closed to Public
5	Lake Minisink	34	Yes	No Potential, Shallow, Stocked Trout Fishery
4	Lake Montrose	50	No	No Potential, Closed to Public
4	Lake Took A While	24	Yes	Low Potential, Very Shallow
6	Lake Towhee	37	No	Low Potential, Very Shallow
7	Laurel Lake	25	Yes	Low Potential

AFM	Small Reservoirs	Acres	ATW?	Walleye Potential
6	Levittown Lake	20	Yes	Low Potential, Intensive Stocked Trout Fishery
5	Lily Pond	23	Yes	No Potential, Shallow, Stocked Trout Fishery
5	Little Mud Pond	26	Yes	No Potential, Shallow, Stocked Trout Fishery
3	Lopez Pond	20	No	Low Potential
3	Lyman Lake	40	Yes	Low Potential
6	Magnolia Lake	26	No	Low Potential, Targeting Walleye Unlikely as with Lakes Galena and Luxembourg
8	Mammoth Lake	27	Yes	Low Potential Due to Summer Water Temperatures, Largemouth Bass and Stocked Trout Fisheries
4	Merli-Sarnoski Park Lake	30	Yes	Possible in Future
4	Moon Lake	47	Yes	Walleye Management not Desired
4	Mountain Lake	34	Yes	Walleye Management not Desired
4	Mountain Springs Lake	40	No	No Potential, Very Acidic
3	Parker Lake	21	Yes	Very Low Potential
6	Pine Run Reservoir	39	No	Low Potential, Shallow, Poor Access
3	Poe Lake	24	Yes	Low Potential
8	Reservoir Number Two (Peters Lake Reservoir No. 2)	36	No	Low Potential Due to Summer Water Temperatures and Largemouth Bass
6	Scotts Run Lake	22	Yes	Low Potential, Intensive Stocked Trout Fishery, Possibly Limited Forage
3	Shaggers Inn Pond	34	No	Low Potential
7	Sheppard Myers Reservoir	47	Yes	Low Potential
3	Shumans Lake	37	No	Low Potential
7	Stovers Lake	26	Yes	Low Potential

AFM	Small Reservoirs	Acres	ATW?	Walleye Potential
1	Strawberry Lake	28	No	Unknown
4	Sunfish Pond	35	Yes	Walleye Management Not Desired
4	Tingley Lake	42	No	No Potential, Closed to Public
6	Trout Run Reservoir	42	No	Low Potential, No Boating, Free Permit Required for Shore Angling, Good Largemouth Bass Population and Good Water Quality
8	Twin Lakes Number One Reservoir (Lower Twin Lake)	30	Yes	Low Potential Due to Summer Water Temperatures, Largemouth Bass and Stocked Trout Fisheries
8	Twin Lakes Number Two Reservoir (Upper Twin Lake)	20	Yes	Low Potential Due to Summer Water Temperatures, Largemouth Bass and Stocked Trout Fisheries
2	Union City Reservoir	25	No	Low Potential
4	Upper Ice Pond	40	No	Under Evaluation
8	Virgin Run Lake (Virgin Run Dam)	33	Yes	Low Potential Due to Summer Water Temperatures, Largemouth Bass and Stocked Trout Fisheries
7	Waynesboro Reservoir	23	Yes	Low Potential
7	Whipple Lake	22	Yes	No Potential
5	White Deer Lake	48	No	Poor to Fair Potential, Tannic Water, Low Productivity

*- Reservoir is currently stocked with walleye.

The vast majority of our walleye fisheries and historical and current PFBC walleye stockings exist in Medium Reservoirs and Large Reservoirs and management efforts in these impoundments will be the top priority. The remainder of this chapter concentrates on the management of these fisheries.

Medium Reservoirs (50-500 acres)

The Agency Resource Database lists 140 lakes and reservoirs in the Medium Reservoir resource category. Of these, 45 are stocked with walleye fingerlings and three (Howard Eaton Reservoir, Long Arm Dam and Lake Chillisquaque) maintain fishable populations through natural reproduction. The current status of the walleye fisheries in these 140 Medium Reservoirs is presented in *Table 5*.

Table 5. **Status of Walleye Fisheries in Pennsylvania's Medium Reservoirs.**

AFM	Medium Reservoirs	Acres	Status
8	Beaverdam Run Reservoir	360	No Walleye Fishery
4	Beechwood Lake	67	Walleye Fishery Present, Hatchery Dependent
5	Belmont Lake	172	Walleye Fishery Present, Hatchery Dependent
3	Black Moshannon Lake	250	No Walleye Fishery
5	Bradys Lake	229	Under Restoration Stocking
8	Bridgeport Reservoir	70	No Walleye Fishery
4	Brownell Reservoir	126	No Walleye Fishery, Closed to Public
2	Buzzard Swamp No. 6	66	No Walleye Fishery
7	Canoe Creek Lake	155	Marginal Walleye Fishery Present, Hatchery Dependent, Trophy Fishery
8	Canonsburg Lake	76	No Walleye Fishery
6	Chambers Lake	89	No Walleye Fishery
2	Chapman Dam Reservoir	68	No Walleye Fishery
4	Chapman Lake	98	No Walleye Fishery, Closed to Public
8	City Reservoir (Howells Run Dam)	82	No Walleye Fishery
2	Clear Lake	117	No Walleye Fishery
8	Colver Reservoir	73	Walleye Fishery Present, Hatchery Dependent
3	Colyer Lake	77	No Walleye Fishery
4	Comfort Lake	62	No Walleye Fishery
8	Cranberry Glade Lake	72	No Walleye Fishery
2	Crooked Creek Lake	350	Fingerling Stocked, Under Evaluation in 2011

AFM	Medium Reservoirs	Acres	Status
8	Cross Creek Lake	244	Walleye Fishery Present, Hatchery Dependent
4	Curtis Reservoir	75	No Walleye Fishery, Closed to Public, May Reopen in 2011
8	Donegal Lake	90	No Walleye Fishery, Stocking Terminated 2009
5	Duck Harbor Pond	228	Walleye Fishery Present, Hatchery Dependent
8	Dutch Fork Lake	91	No Walleye Fishery, Lake is Drained. Scheduled to be Rebuilt in 2011
5	East Bangor Lake	78	No Walleye Fishery
2	Edinboro Lake	240	Walleye Fishery Present, Hatchery Dependent
5	Egypt Meadow Lake	60	No Walleye Fishery
4	Elmhurst Reservoir	180	No Walleye Fishery, Closed to Public, May Reopen in 2011
2	Erie NWR Pool No. Nine	56	No Walleye Fishery, not managed by PFBC Due to Objections from USFWS
5	Fairview Lake	169	Limited Walleye Fishery Present, Hatchery Dependent
6	Falls Township Park Lake	67	Walleye Fishery Present, Hatchery Dependent
3	Faylor Lake	130	No Walleye Fishery
4	Fords Lake	73	No Walleye Fishery
4	Frances Slocum Lake	166	Walleye Fishery Present, Hatchery Dependent
5	Francis E Walter Reservoir	100	No Walleye Fishery
3	George B Stevenson Reservoir	142	No Walleye Fishery
1	Glade Dam Lake	200	No Walleye Fishery
1	Glade Run Lake	52	No Walleye Fishery, Stocked Trout Fishery Present
7	Gordon Lake	146	No Walleye Fishery (1999), Walleye Stocked, Needs Evaluation

AFM	Medium Reservoirs	Acres	Status
5	Gouldsboro Lake	250	Under Restoration Stocking
8	Green Lick Reservoir	100	Walleye Fishery Present, Hatchery Dependent.
4	Griffin Reservoir	110	No Walleye Fishery, Closed to Public, May Open in 2011
8	High Point Lake	338	Walleye Fishery Present, Hatchery Dependent.
4	Hills Creek Lake	136	Walleye Fishery Present, Hatchery Dependent
8	Hinckston Run Reservoir	104	Walleye Fishery Present, Hatchery Dependent
6	Hopewell Lake	68	No Walleye Fishery
2	Howard Eaton Reservoir	246	Walleye Fishery Present, Sustained via Natural Reproduction
3	Hunters Lake	117	No Walleye Fishery
2	Kahle Lake	251	Walleye Fishery Present, Hatchery Dependent
3	Kettle Creek Lake	160	No Walleye Fishery
8	Keystone Lake	78	No Walleye Fishery
5	Kizer Little Lake	85	No Walleye Fishery, Closed to Public
7	Koon Lake	233	Limited Walleye Fishery Present, Hatchery Dependent
2	Kyle Lake	165	Walleye Fishery Present, Hatchery Dependent
4	Lackawanna Lake	198	No Walleye Fishery
2	Lake Canadohta	170	Walleye Fishery Present, Hatchery Dependent
4	Lake Carey	262	Fishery Present but May Terminate Stocking in 2011 Due to Access Issues, Pending Field Review in 2011
3	Lake Chillisquaque	165	Walleye Fishery Present, Self Sustained
6	Lake Galena	365	No Walleye Fishery, Low Angler Interest in Hatchery Dependent Population, Stocking Terminated

AFM	Medium Reservoirs	Acres	Status
5	Lake Giles	117	No Walleye Fishery, Closed to Public
5	Lake Greeley	58	No Walleye Fishery
4	Lake Jean	245	No Walleye Fishery
1	Lake Latonka	260	No Walleye Fishery, Closed to Public
6	Lake Luxembourg	166	No Walleye Fishery, low angler interest in Hatchery Dependent Population, Stocking Terminated
3	Lake Nessmuk	60	No Walleye Fishery
1	Lake Oneida	94	No Walleye Fishery, Shore Fishing Only
7	Lake Perez	72	No Walleye Fishery, Lake is Drawn Down
2	Lake Pleasant	60	No Walleye Fishery, Stocked Trout Fishery Present
6	Lake Redman	290	No Walleye Fishery, Low Angler Interest in Hatchery Dependent Population, Stocking Terminated
4	Lake Silkworth	75	No Walleye Fishery, Closed to Public
8	Lake Somerset	253	Walleye Fishery Present, Hatchery Dependent
6	Lake Williams	220	Very Minor Walleye Fishery Present, Small Population, Termination of Lake Redman Stocking will end Lake Williams Fishery
4	Lake Winola	198	No Walleye Fishery
7	Laurel Creek Reservoir	67	Unknown
2	Laurel Run Reservoir	92	No Walleye Fishery, Stocked Trout Fishery Present
6	Leaser Lake	117	No Walleye Fishery
2	Leboeuf Lake	70	Walleye Fishery Present, Hatchery Dependent
7	Letterkenny Reservoir	54	Unknown, Stocked Trout Fishery Present

AFM	Medium Reservoirs	Acres	Status
4	Lily Lake	161	No Walleye Fishery
7	Little Buffalo Lake	88	No Walleye Fishery
3	Little Pine Lake	90	No Walleye Fishery
6	Locust Lake	52	No Walleye Fishery
7	Long Arm Dam	225	Walleye Fishery Present, Self Sustained via Natural Reproduction, Under Evaluation
7	Long Pine Run Reservoir	150	Unknown
5	Long Pond	81	Walleye Fishery Present, Hatchery Dependent
5	Lower Lake	173	No Walleye Fishery
5	Lower Woods Pond	91	Walleye Fishery Present, Hatchery Dependent
8	Loyalhanna Lake	479	No Walleye Fishery
2	Mahoning Creek Lake	279	Fingerling Stocked, Under Evaluation in 2011
4	Maple Lake	100	No Walleye Fishery, Closed to Public, May Reopen in 2011
5	Mauch Chunk Lake	330	Limited Walleye Fishery Present, Hatchery Dependent
4	McWilliams Reservoir	183	No Walleye Fishery
7	Meadow Grounds Lake	204	Walleye Fishery Present, Hatchery Dependent
7	Memorial Lake	84	No Walleye Fishery
6	Middle Creek Reservoir	361	No Walleye Fishery
4	Mill Creek Reservoir	100	No Walleye Fishery, Closed to Public
5	Miller Pond	61	No Walleye Fishery

AFM	Medium Reservoirs	Acres	Status
5	Minsi Lake	122	No Walleye Fishery, Limited Survival of Stocked Fingerlings, Stocking Terminated
6	Muddy Run Recreation lake	98	No Walleye Fishery
4	Nesbitt Reservoir	116	No Walleye Fishery, Closed to Public, May Reopen in 2011.
4	Newton Lake	112	No Walleye Fishery, Closed to Public
8	North Fork Reservoir	94	No Walleye Fishery, Closed to Public
8	North Park Lake	75	No Walleye Fishery
7	Opossum Lake	59	No Walleye Fishery, Lake is Drained, Under Construction
6	Owl Ck Reservoir	67	No Walleye Fishery
4	Oxbow Lake	60	No Walleye Fishery
5	Pecks Pond	300	No Walleye Fishery
5	Pickerel Lake	155	No Walleye Fishery, Closed to Public
4	Pikes Creek Reservoir	400	Low Level Walleye Fishery Present, Self Sustained
7	Pinchot Lake	340	Walleye Fishery Present, Hatchery Dependent, Needs Evaluation
5	Promised Land Lake	422	No Walleye Fishery
5	Prompton Lake	280	Walleye Fishery Present, Hatchery Dependent
4	Quaker Lake	127	No Walleye Fishery
8	Raccoon Lake	101	Walleye Fishery Present, Hatchery Dependent
2	Ridgway Reservoir	75	No Walleye Fishery, Stocked Trout Fishery Present
3	Rose Valley Lake	389	Walleye Fishery Present, Hatchery Dependent
8	Ryerson Station Reservoir	62	No Walleye Fishery, Lake is Drained

AFM	Medium Reservoirs	Acres	Status
7	Shawnee Lake	451	Limited Walleye Fishery Present, Hatchery Dependent
6	Speedwell Forge Lake	106	No Fishery Present, Stocking Terminated
6	Springton Reservoir	391	No Walleye Fishery
4	Stephen Foster Lake	78	No Walleye Fishery
4	Stevens Lake	62	No Walleye Fishery
4	Stillwater Lake	83	No Walleye Fishery
2	Straight Run Lake	60	Walleye Fishery Present, Hatchery Dependent
6	Struble Lake	146	Walleye Fishery Present, Hatchery Dependent and Limited Reproduction
2	Sugar Lake	90	No Walleye Fishery
7	Sweet Arrow Lake	100	No Walleye Fishery
4	Sylvan Lake	82	Walleye Fishery Present, Hatchery Dependent
6	The Giving Pond	62	No Walleye Fishery
4	Tioga Reservoir	470	No Walleye Fishery
5	Tobyhanna Lake	170	No Walleye Fishery
6	Tuscarora Lake	96	Walleye Fishery Present, Hatchery Dependent
2	Two Mile Run Reservoir	144	Walleye Fishery Present, Hatchery Dependent
5	Upper Woods Pond	80	No Walleye Fishery
3	Walker Lake	239	Walleye Fishery Present, Hatchery Dependent
4	Watres Reservoir	164	No Walleye Fishery, Closed to Public
5	White Oak Pond	175	Unknown
8	Wilmore Dam	195	No Walleye Fishery
2	Woodcock Creek Lake	325	Walleye Fishery Present, Hatchery Dependent

Large Reservoirs (> 500 acres)

The Agency Resource Database lists 34 lakes and reservoirs in the Large Reservoir resource category. Of these, 24 are stocked with walleyes by the PFBC. Two maintain high-quality walleye populations through natural reproduction but are also stocked with walleyes; Youghiogheny River Lake and Allegheny Reservoir. Three Large Reservoirs; Allegheny Reservoir, East Branch Clarion River Lake and the Pymatuning Reservoir are stocked with walleye fry only. The current status of the walleye fisheries in all 34 waters is presented in *Table 6*.

Pymatuning Reservoir is stocked annually with fry and is the nursery water that supplies all of the brood stock for Linesville State Fish Hatchery (SFH). Lake Wallenpaupack is stocked annually with fry and Phase 1 fingerling and is the nursery water that supplies all of the brood stock for Pleasant Mount SFH. Management of these waters is well established and is not subject to the changes outlined in this plan.

Table 6. **Status of Walleye Fisheries in Pennsylvania's Large Reservoirs.**

AFM	Waters	Acres	Resource Category	Status
2	Allegheny Reservoir	12,086	Large Reservoir	Walleye Fishery Present, Hatchery Supported and Natural Reproduction Contribute to the Population
5	Beltzville Lake	947	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
6	Blue Marsh Lake	1,150	Large Reservoir	Walleye Fishery Present, Minor in Lake, Major in Tailrace.
6	Chester Octoraro Reservoir	669	Large Reservoir	Walleye Fishery Present for Privately Stocked Walleye, especially in Tailrace
8	Conemaugh River Lake	640	Large Reservoir	No Walleye Fishery
2	Conneaut Lake	929	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
4	Cowanesque Lake	1,090	Large Reservoir	Walleye Stocking Begins in 2011
3	Curwensville Lake	791	Large Reservoir	Walleye Stocking Began in 2010
2	East Branch Clarion River Lake	1,161	Large Reservoir	Walleye Fishery Present, Hatchery Supported, Reproduction Unknown but Suspected
3	Foster Joseph Sayers Lake	1,730	Large Reservoir	No Fishery Present, Under Future Consideration
3	Glendale Lake	1,601	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
6	Green Lane Reservoir	814	Large Reservoir	No Walleye Fishery
4	Hammond Lake	640	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
4	Harveys Lake	658	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
2	Keystone Lake	950	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
1	Lake Arthur	3,225	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
6	Lake Marburg	1,275	Large Reservoir	Walleye Fishery Present, Hatchery Supported, Some Natural Reproduction Suspected
5	Lake Wallenpaupack	5,700	Large Reservoir	Walleye Fishery Present, Hatchery Dependent

AFM	Waters	Acres	Resource Category	Status
2	Lake Wilhelm	1,740	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
6	Marsh Creek Lake	535	Large Reservoir	No Fishery Present, Small Population, Supported by Reproduction
6	Nockamixon Lake	1,450	Large Reservoir	Walleye Fishery Present, Hatchery Supported, Some Natural Reproduction Suspected
6	Ontelaunee Lake	1,082	Large Reservoir	No Fishery Present, Stocking Terminated
2	Piney Reservoir	690	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
1	Pymatuning Reservoir	13,926	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
1	Pymatuning Sanctuary	2,499	Large Reservoir	Walleye Fishery Present, Hatchery Dependent, Nursery Water
8	Quemahoning Reservoir	899	Large Reservoir	Walleye Fishery Present, Hatchery Supported, Some Natural Reproduction Suspected, Under Evaluation in 2011
7	Raystown Lake	8,300	Large Reservoir	Walleye Fishery Present
1	Shenango River Lake	3,561	Large Reservoir	Walleye Fishery Present, Hatchery Supported, Reproduction Unknown
5	Shohola Marsh Reservoir	1,135	Large Reservoir	No Walleye Fishery
2	Tamarack Lake	562	Large Reservoir	Walleye Fishery Present, Hatchery Dependent
2	Tionesta Lake	570	Large Reservoir	No Walleye Fishery, Stocking Terminated
8	Yellow Creek Lake	720	Large Reservoir	Limited Walleye Fishery Present, Hatchery Dependent
8	Youghiogheny River Lake	2,841	Large Reservoir	Walleye Fishery Present, Sustained via Natural Reproduction and also stocked

Prioritization of Sampling

Medium Reservoirs and Large Reservoirs stocked by PFBC with walleyes are separated into three categories to prioritize future biological surveys for adult and YOY walleye and for angler use and harvest surveys. The three categories are Stable, Priority and Last Chance waters. Waters were assigned to these categories by examining historic walleye sampling catch rates.

Stable Waters are known producers of walleye and stocking is known to maintain a high-quality fishery though examination of walleye catch rates that have met or exceeded *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) objectives for the majority of surveys. Angler use and harvest surveys have shown high angler effort directed at walleye or strong evidence exists to confirm high angler use.

Priority Waters have approached or achieved the catch-rate objectives of the original *Walleye Plan for Pennsylvania* (Hoopes and Young 1988) in the past, but the most recent surveys fell short of the objectives. Most are known or suspected of supporting targeted angler use for walleye.

Last Chance Waters are those that have never achieved the target catch-rate objectives since the adoption of *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988). Last Chance waters are given the highest priority for sampling of adult and YOY walleye (*Table 7*). This is the last opportunity for these waters to achieve program catch-rate objectives. Failure to achieve any of the catch-rate objectives in this plan during the next survey year will result in the water being removed from the stocking program. The next survey in these Last Chance waters should target adult walleye and should occur between March 15 and April 20. Sampling should be completed prior to 2016. Some areas with a high number of Last Chance waters may need assistance from other division personnel to complete all required sampling. If all efforts to schedule area management surveys or coordinate with other division personnel are unsuccessful prior to 2016, permission must be obtained from the Warmwater Unit Leader and the Chief of the Fisheries Management Division to continue PFBC walleye stockings in these lakes and impoundments.

Priority waters are the second priority and should be surveyed on the normal area rotation through their waters (*Table 8*). These waters should achieve this plan's catch-rate objectives during the next survey. Barring mitigating circumstances, failure to meet or exceed plan catch-rate objectives requires a change in management, a follow-up sample or a change in sampling strategy. Justification for the water to remain on the stocking list must be provided to the Warmwater Unit and the Fisheries Management Division Chief in the Lake Management Report.

Stable waters will receive the lowest priority for assessments as these impoundments contain established and documented walleye fisheries through stocking, natural reproduction or both. Biological surveys can be scheduled on the normal area rotation through their waters (*Table 9*). These waters should continue to achieve this plan's catch-rate objectives during the next survey. Failure to meet these catch-rate objectives will require a follow-up sample or a change in sampling strategy. Explanation of potential mechanisms resulting in failure to achieve the catch-rate objectives must be provided to the Warmwater Unit and the Fisheries Management Division Chief in the Lake Management Report.

Exceptions for any Medium Reservoir or Large Reservoir that consistently fails to meet this plan's catch-rate objectives can be made only with adequate justification and approval from the Fisheries Management Division Chief. Justification for remaining in the walleye stocking program must be made in the Lake Management Report to the Warmwater Unit Leader, the Fisheries Management Division Chief and the Fisheries Bureau Director.

Table 7. **Last Chance Walleye Waters and the most recent sampling method to achieve the catch rate objectives of the Walleye Plan for Pennsylvania.** (NEF=Spring Night Electrofishing, TN=Pennsylvania style Trapnets, GN=Gillnets, YOY=Fall Night Electrofishing).

Waters	Resource Category	AFM	Last Survey that met Walleye Plan guidelines
Belmont Lake	Medium Reservoir	5	Never
Canoe Creek Lake	Medium Reservoir	7	Never
Conneaut Lake	Large Reservoir	2	NEF - 1980
Crooked Creek Lake	Medium Reservoir	2	Never
Fairview Lake	Medium Reservoir	5	Never
Gordon Lake	Medium Reservoir	7	Never
Gouldsboro Lake	Medium Reservoir	5	Never
Hills Creek Lake	Medium Reservoir	4	Never
LeBoeuf Lake	Medium Reservoir	2	Never
Long Pond	Medium Reservoir	5	Never
Lower Woods Pond	Medium Reservoir	5	Never
Mahoning Creek Lake	Medium Reservoir	2	Never
Mauch Chunk Lake	Medium Reservoir	5	Never
Piney Reservoir	Large Reservoir	2	Never
Prompton Lake	Medium Reservoir	5	Never
Shawnee Lake	Medium Reservoir	7	TN - 1987
Straight Run Lake (Hemlock Lake)	Medium Reservoir	2	Never
Tamarack Lake	Large Reservoir	2	Never
Twomile Run Reservoir (Justus Lake)	Medium Reservoir	2	Never
White Oak Pond	Medium Reservoir	5	Never
Yellow Creek Lake	Large Reservoir	8	Never

Table 8. **Priority Walleye Waters and the most recent sampling method to achieve the catch rate objectives of the Walleye Plan for Pennsylvania.** (NEF=Spring Night Electrofishing, TN=Pennsylvania style Trapnets, GN=Gillnets, YOY=Fall Night Electrofishing).

Waters	Resource Category	AFM	Last Survey that met Walleye Plan guidelines
Beechwood Lake	Medium Reservoir	4	NEF - 1999
Beltzville Lake	Large Reservoir	5	TN - 1996
Blue Marsh Lake	Large Reservoir	6	NEF - 1991
Cross Creek Lake	Medium Reservoir	8	Stocking Began 2009
Curwensville Lake	Large Reservoir	3	Stocking Began 2010
Duck Harbor Pond	Medium Reservoir	5	TN - 1993
East Branch Clarion River Lake	Large Reservoir	2	Never
Falls Township Park Lake	Medium Reservoir	6	Stocking Began 2000
Hammond Lake	Large Reservoir	4	Stocking Began 2005
High Point Lake	Medium Reservoir	8	TN - 1998
Hinckston Run Reservoir	Medium Reservoir	8	Stocking Began 2000
Kahle Lake	Medium Reservoir	2	NEF - 2003
Kyle Lake	Medium Reservoir	2	NEF - 1998
Lake Arthur	Large Reservoir	1	TN - 1993
Lake Redman	Medium Reservoir	6	TN - 1991
Meadow Grounds Lake	Medium Reservoir	7	TN - 1990
Nockamixon Lake	Large Reservoir	6	NEF - 1997
Pinchot Lake	Medium Reservoir	7	GN - 1996
Quemahoning Reservoir	Large Reservoir	8	Stocking Began 2000
Shenango River Lake	Large Reservoir	1	YOY - 2009
Sylvan Lake	Medium Reservoir	4	TN - 1996
Tuscarora Lake	Medium Reservoir	6	NEF - 1999
Walker Lake	Medium Reservoir	3	NEF - 1996

Table 9. **Stable Walleye Waters and the most recent sampling method to achieve the catch rate objectives of the Walleye Plan for Pennsylvania.** (NEF=Spring Night Electrofishing, TN=Pennsylvania style Trapnets, GN=Gillnets, YOY=Fall Night Electrofishing).

Waters	Resource Category	AFM	Last Survey that met Walleye Plan guidelines
Allegheny Reservoir	Large Reservoir	2	YOY - 2008
Colver Reservoir	Medium Reservoir	8	TN - 2008
Edinboro Lake	Medium Reservoir	2	TN - 1998
Frances Slocum Lake	Medium Reservoir	4	TN - 2001
Glendale Lake	Large Reservoir	3	NEF - 2001
Green Lick Reservoir	Medium Reservoir	8	TN - 2008
Harveys Lake	Large Reservoir	4	GN - 1995
Keystone Lake	Large Reservoir	2	GN - 2008
Lake Canadohta	Medium Reservoir	2	TN - 1998
Lake Carey	Medium Reservoir	4	NEF – 1998
Lake Galena	Medium Reservoir	6	TN - 2003
Lake Marburg	Large Reservoir	6	NEF - 1998
Lake Somerset	Medium Reservoir	8	TN - 2005
Lake Wallenpaupack	Large Reservoir	5	TN - 1998
Lake Wilhelm	Large Reservoir	2	TN - 2004
Pymatuning Reservoir	Large Reservoir	1	TN - 2010
Pymatuning Sanctuary	Large Reservoir	1	TN - 2010
Raccoon Lake	Medium Reservoir	8	TN – 2008
Raystown Lake	Large Reservoir	7	GN - 1999
Rose Valley Lake	Medium Reservoir	3	TN - 2003
Struble Lake	Medium Reservoir	6	TN – 2004
Woodcock Creek Lake	Medium Reservoir	2	TN - 2003
Youghiogheny River Lake	Large Reservoir	8	TN - 2007

Sampling Options

During discussions at the December 2009 Fisheries Management Division meeting in Erie, Pennsylvania, it was made clear that opportunities generally do not exist for individual management areas to perform early spring trapnet or gillnet surveys targeting spawning walleye in every lake and reservoir where walleye are stocked. Most waters will not be surveyed in early spring unless there is a concentrated effort among the entire division and walleye management becomes a higher priority as directed by the Bureau Director or Division Chief.

The walleye spawn extends approximately one to three weeks and timing of the walleye spawn is driven by a combination of ice out, water temperature and photoperiod. This can cause significant shifts in the timing of walleye spawning activity from year to year, which makes scheduling a survey targeting spawning walleye using only a calendar problematic. Statewide, there are significant differences in timing of the walleye spawning run related to each lake's latitude, morphometry and altitude.

Furthermore, sampling efficiency often dictates that our surveys must target multiple species and the ideal time to capture each species is different. Area Fisheries Managers must make management decisions for panfish, walleyes, muskellunge and channel catfish (for example) based upon one or two sample periods (weeks), which may or may not have occurred at the optimal time to capture each species.

For walleyes, we will try to address these problems using four strategies. 1). Coordinate lake sampling targeting walleye (outlined above); 2). Where appropriate, provide different catch rate objectives for different sample periods; 3). Encourage more fall sampling; 4). Utilize walleye YOY catch rates to inform management decisions.

Methods for assessing relative abundance of adult and YOY walleyes will consist of the sampling gears currently in use, Pennsylvania style trapnets, Experimental gillnets and johnboat night electrofishing. Deployment of sampling gear should be consistent throughout the entirety of the evaluation. Future evaluations should employ the sampling protocols currently under development by the Division of Fisheries Management. Experimenting with new sampling gears or using old gears in new ways is encouraged. Obviously, no sampling gear is effective in all situations. This plan includes sampling guidelines; however, the choice of sampling gears and sample timing should be adapted to provide the highest possible efficiency and accuracy. Justification for non-traditional sampling must be approved by the Warmwater Unit prior to the survey and should be provided in the *Lake Management Report* covering the survey.

Accurate estimation of the age of the adult walleyes in our sample catch is an important part of managing successfully for walleyes. Growth rates, year class strength and mortality rates are valuable pieces of information to the manager when assessing stocking rates and harvest regulations. It can be difficult to estimate the age of walleyes using lateral body scales. When in doubt, the manager is encouraged to extract otoliths for age estimation and for comparison to ages estimated from scales. The standard method in Pennsylvania is to collect scales from 10 fish per 25-mm-length group. If managers decide to collect otoliths, they should be removed from a subsample of walleye from which scales were taken. A minimum of five walleye per 25-mm-length group is recommended for an otolith sample.

Catch Rates

The catch-rate objectives for legal-length walleyes in *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) were set for each gear based upon all surveys prior to 1987 in a resource category using that gear. No distinction was made for when surveys occurred (early spring, spring, summer or fall). All were included in the analysis. The catch-rate objectives were

set significantly higher than the mean catch rate for all surveys that captured walleye in that gear/resource category combination because part of the purpose of *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) was to improve walleye fishing and optimize current PFBC walleye stocking programs during that era. For example, the mean catch rate of all gillnet surveys that captured walleyes in Medium Reservoirs was 0.074 legal-length walleyes per gillnet hour. The catch-rate objective for gillnets in Medium Reservoirs was set at 0.3 legal-length walleyes per hour. All catch-rate objectives for Medium Reservoirs and Large Reservoirs follow the same pattern. The new catch-rate objectives will take these historic objectives into consideration in addition to updated catch rates from our surveys of Stable Waters and Priority Waters from 1978-2010.

The new purpose of our walleye stocking program is to create high-quality walleye fisheries that receive directed angler effort in waters where natural reproduction of walleyes does not exist or is insufficient to maintain a high-quality fishery. This change in the walleye stocking program's purpose suggests higher standards of walleye relative abundance in our sampling. For some categories there is limited data on which to base a definition of a quality walleye population.

Our catch-rate objectives that define a high-quality walleye population will be periodically re-examined and updated in the future as needed, especially for some season and gear combinations for which there is currently little data.

Adults

Any survey of adult walleye in a Medium Reservoir or Large Reservoir that meets or exceeds the catch-rate objectives of this plan is sufficient evidence of successful walleye management and makes YOY sampling unnecessary unless natural reproduction of walleyes is suspected and the extent of the contribution of PFBC-stocked walleyes needs to be determined. The current gear options for sampling adult walleye are jonboat night electrofishing, Pennsylvania-style trapnets and experimental monofilament gillnets.

Early Spring, Night Electrofishing

Early spring, night electrofishing is targeted sampling for spawning walleyes; therefore, site selection should target areas where walleyes congregate to spawn such as larger inflowing streams, windswept points with clean gravel substrate and sites that have historically produced high early spring catches of walleyes. Sites located on the leeward side of the prevailing winds and riprap armored dams and causeways have a much higher potential than windward shoreline areas. In southeast Pennsylvania, shorelines and points on the south, southeast and eastern sides of reservoirs have proven to be the best areas to collect early spring walleyes (Kaufmann, personal communication). Avoid coves, unless they are fed by a large tributary.

Analysis of previous early spring night electrofishing surveys show that the catches of legal-length walleyes are highest from March 15 to April 20. The March 15 to April 20 window should be used as a guideline when scheduling sampling targeting adult walleye. The few early spring, night electrofishing surveys that have occurred after April 20 have all yielded low catch rates of legal-length walleyes. Early spring, night electrofishing had the highest rate of success in documenting catch rates that achieved the original *Walleye Plan for Pennsylvania* objectives (Hoopes and Young 1988).

Early spring, night electrofishing provides flexibility to sampling not available with trapnets or gillnets. Sampling properly targeted at spawning walleyes will catch ripe males and a mixture of green and gravid females. Area Fisheries Managers can judge their sample timing by

the gender composition and spawning ripeness of the walleyes they catch. Since night electrofishing for most waters is a one or two night sampling event, an early sample or first night that produces a low catch rate of males and green females allows the AFM to reschedule another sample at a later date with the expectation that catch rates will improve.

A minimum total effort of 60-90 minutes is recommended for Medium Reservoirs and 80-120 minutes on Large Reservoirs (Lorantas 1993). Sampling should consist of at least three individual sites to facilitate the calculation of a mean catch rate and a measure of variance. The mean efforts expended in previous early spring, night electrofishing surveys were 2.26 hours for Medium Reservoirs and 2.77 hours for Large Reservoirs, suggesting that two hours of effort and multiple sites or survey nights should be considered.

Early spring, night electrofishing specifically targets concentrations of spawning walleyes. Following the spawn, walleyes gradually redistribute themselves throughout the suitable habitat in the reservoir. Therefore, any night electrofishing survey during the field season that yields a walleye catch rate that exceeds the early spring catch rate is excellent evidence of a high-quality fishery.

Early Spring, Night Electrofishing: Medium Reservoirs

Twenty five of the 45 Medium Reservoirs currently stocked with walleye fingerlings have been sampled for adult walleye with early spring, night electrofishing. There have been a total of 64 early spring, night electrofishing surveys in those 25 Medium Reservoirs. Twenty-nine of those surveys (45 percent) yielded catch rates that met the catch-rate objective of *The Walleye Plan for Pennsylvania* (five legal-length walleyes per electrofishing hour). Thirteen surveys (20 percent) captured no walleyes.

The new catch-rate objectives are based upon mean catch rates for early spring, night electrofishing surveys in Stable Waters and Priority Waters occurring between March 15 and April 20. Only surveys that captured walleyes were included. The early spring, night electrofishing catch-rate objective for Medium Reservoirs is 18 legal-length walleyes per hour. An alternative objective for slower growing populations or waters with large year classes under legal size is 24 total walleyes per hour. Achieving one of these catch rates indicates a quality walleye population.

Early Spring, Night Electrofishing: Large Reservoirs

Fifteen of the 24 Large Reservoirs currently stocked with walleyes have been sampled for adult walleyes with early spring, night electrofishing. There have been a total of 51 early spring, night electrofishing surveys in those 15 Large Reservoirs. Thirty-three of those surveys (65%) yielded catch rates that met the catch-rate objective of *The Walleye Plan for Pennsylvania* (seven legal-length walleyes per electrofishing hour). Only three surveys (6 percent) failed to capture any walleyes. All but three early spring, night electrofishing surveys of Large Reservoirs occurred between March 14 and April 20.

Based upon the median walleye catch rate from Stable Waters and Priority Waters during early spring, night electrofishing surveys in Large Reservoirs, the new target catch rate for early spring, night electrofishing was determined to be 17 legal-length walleyes per hour and 23 total walleyes per hour. We used the median values because of the extreme range in sample catch rates (1 to 285 walleyes per hour). However, since the Large Reservoir and Medium Reservoir catch-rate objectives are nearly identical, we chose to use a single catch-rate value for both Medium Reservoirs and Large Reservoirs to avoid confusion. Therefore, the catch-rate

objectives for Large Reservoirs are also 18 legal-length walleyes per hour and 24 total walleyes per hour. Achieving one of these catch rates indicates a high-quality walleye population.

Trapnets

Trapnet sample effort is based upon the amount of work that can be accomplished by an area office field crew of two or three workers in one week, with little or no overtime. Therefore, a sample size of 4-6 trapnets set for one week (16-24 overnight sets) will be the target sample size for Pennsylvania style trapnets in both Medium Reservoirs and Large Reservoirs.

As would be expected, there are significant differences in the walleye catch rates between the early spring period (spawn) and other sample periods (post-spawn) for both Medium Reservoirs ($t=3.36$, $p < 0.05$) and for Large Reservoirs ($t=3.44$, $p < 0.05$). Therefore, there will be different catch-rate objectives for the spawn and post-spawn sample periods. The early spring period (spawn) is defined as March 15 through April 20. The post-spawn period covers all other samples. The new spawn and post-spawn catch-rate objectives are based upon historic surveys that captured walleyes in waters judged to be examples of successful walleye management (Stable Waters and Priority Waters). Sampling properly targeted at spawning walleye in the early spring will catch ripe males and a mixture of green, gravid and spent females. Area Fisheries Managers will judge their sample timing by the gender composition and spawning ripeness of the walleyes they catch and should report such when comparing survey catch rates to the catch rate objectives.

Trapnets will be set in the traditional manner. Sampling locations for Pennsylvania-style trapnets are restricted by their design. They are effective in a specific habitat type, shallow gently sloping littoral zones. The occurrence of this habitat type can be limited, especially in oligotrophic and mesotrophic lakes and reservoirs. If random site selection is to be employed, then the pool of available trapnet sites should be restricted to those sites suitable for effective trapnet usage. In many Medium Reservoirs, the number of available trapnet sites is less than the total number of overnight sets, therefore, random site selection isn't necessary as long as each site receives at least one set. During the spawn period, trapnet sites should be chosen specifically to intercept spawning adult walleyes. Area Fisheries Managers should choose sites with a history of high walleye catch. In southeast Pennsylvania, sites on the leeward side of a reservoir (S, SE & E) have been the best locations for capturing adult walleyes with trapnets (Kaufmann, personal communication).

Spring Trapnets: Medium Reservoirs

Thirty-nine of the 45 Medium Reservoirs currently stocked with walleye fingerlings have been sampled for adult walleyes with spring trapnets. There have been a total of 231 spring trapnet surveys in those 39 Medium Reservoirs. Only 47 surveys (20 percent) yielded catch rates that met the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.10 legal-length walleyes per trapnet hour). Twenty-seven surveys (12 percent) captured no walleyes.

In Priority Waters and Stable Waters, 38.5 percent of early spring, trapnet surveys (spawn) achieved the catch-rate objectives of the original walleye plan and 22.5 percent of post-spawn trapnet surveys achieved the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.10 legal-length walleyes per trapnet hour).

The new early spring, trapnet catch-rate objective, based upon surveys of Priority Waters and Stable Waters, for Medium Reservoirs is 0.20 legal-length walleyes per trapnet hour. As an alternative, the early spring, trapnet catch rate for Medium Reservoirs is 0.25 total walleyes per trapnet hour. Post-spawn trapnet surveys have a new catch-rate objective of 0.075 legal-length

walleyes per trapnet hour. As an alternative, the post-spawn trapnet catch rate objective for Medium Reservoirs is 0.10 total walleyes per trapnet hour.

Spring Trapnets: Large Reservoirs

Nineteen of the 23 Large Reservoirs currently stocked with walleyes have been sampled for adult walleyes with spring trapnets. There have been a total of 224 spring trapnet surveys in those 19 Large Reservoirs. Sixty-seven surveys are from Pymatuning Reservoir. Of the remaining 157 trapnet surveys, 24 or 15.2 percent yielded catch rates that met the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.15 legal-length walleyes per trapnet hour). Fifteen surveys or 9 percent captured no walleyes.

For Priority Waters and Stable Waters, 31.4 percent of early spring trapnet surveys that captured walleyes (16 out of 51) achieved the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.15 legal-length walleyes per trapnet hour). Only 10.5 percent of post spawn trapnet surveys (8 out of 76) achieved the catch-rate objectives of *The Walleye Plan for Pennsylvania*.

The early spring, trapnet catch-rate objective, based upon surveys of Priority Waters and Stable Waters, for Large Reservoirs remains 0.15 legal-length walleyes per trapnet hour. Post-spawn trapnet surveys have a new catch-rate objective of 0.075 legal-length walleyes per trapnet hour. As an alternative, the post-spawn trapnet catch-rate objective for Large Reservoirs is 0.10 total walleyes per trapnet hour.

Fall Sampling

Fall sampling is under utilized in Pennsylvania; however, it provides an opportunity to capture walleyes when they return to shallow water to forage as water temperatures fall back into the walleye's preferred range.

Fall Trapnets: Medium Reservoirs

Only two fall trapnet surveys have been performed in Medium Reservoirs currently stocked with walleyes, both in Struble Lake. One of them achieved the catch-rate objective from *The Walleye Plan for Pennsylvania* (0.10 legal-length walleyes per trapnet hour). The catch-rate objectives for fall trapnetting will be the same as the post-spawn trapnetting catch-rate objectives for Medium Reservoirs. When more fall trapnet surveys have been performed, these catch-rate objectives will likely be revised.

Fall Trapnets: Large Reservoirs

The Agency Resource Database contains a total of 13 fall trapnet surveys in Large Reservoirs with 11 of them occurring in Pymatuning Reservoir. All 13 surveys captured walleyes but only three exceeded the catch-rate objective of *The Walleye Plan for Pennsylvania* (0.15 legal walleyes per trapnet hour). The catch-rate objectives for fall trapnetting will be the same as the post-spawn trapnetting catch rate objectives for Large Reservoirs. When more fall trapnet surveys have been performed, these catch-rate objectives may be revised.

Gillnets

Gillnets can be an effective sampling gear in virtually all habitats. When set overnight, gillnets may cause higher fish mortality than trapnets. This may have reduced their use in Pennsylvania.

An alternate deployment method for gillnets could make their use more palatable to managers. Other states and some Pennsylvania managers have employed partial day sets to effectively sample walleyes and improve catch rates. Instead of overnight sets, gillnets are set in the morning upon arriving at the lake and then pulled. Fish are processed before returning to the office at the end of the sample day. This method appears to be effective in spring and fall and can be employed concurrently with a trapnet survey. Also, fish mortality is significantly reduced with a shorter soak time. Another alternative is used by the Ohio Division of Wildlife with success. Their protocol is to set gillnets two hours before sunset and pull them two hours after sunset (Matt Wolfe, personal communication).

There was no significant difference in mean catch rates for legal-length walleyes between spawn and post-spawn gillnets in Medium Reservoirs ($t = -0.17$, $p > 0.05$) or Large Reservoirs ($t = -1.64$, $p > 0.05$).

Standard sampling protocols are currently in development. Monofilament gillnets are available in many dimensions and can be custom made to almost any dimension. Experimental gillnets (consecutive panels of gradually increasing mesh size) appears to be the standard in many other Midwestern states. Current PFBC inventory is mostly 46 meter (150 feet) long experimental gillnets consisting of six 7.6 meter (25 feet) panels of 13, 25, 38, 51, 64 and 76 mm (0.5, 1, 1.5, 2, 2.5 and 3 inch) bar mesh. These nets should be used as the standard until new standard gillnet dimensions are established in the sampling protocols.

Spring Gillnets: Medium Reservoirs

Twenty-three of the 45 Medium Reservoirs currently stocked with walleye fingerlings have been sampled for adult walleyes with spring gillnets. There have been a total of 55 spring gillnet surveys in those 23 Medium Reservoirs. Only two surveys (4 percent) yielded catch rates that met the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.30 legal-length walleyes per gillnet hour). Twelve surveys (22 percent) captured no walleyes. There were ten gillnet surveys in Medium Reservoirs classified as Stable Waters. Four surveys captured no walleyes and only one achieved the catch rate objective from *The Walleye Plan for Pennsylvania*. It appears that the plan's catch-rate objective for gillnets was set too high for Medium Reservoirs, or that spring gillnets are not the best choice for sampling walleyes in Medium Reservoirs. However, it remains each area fisheries manager's decision which gear is best to sample walleyes in each water.

The new catch-rate objective is based upon all gillnet surveys in Stable Waters and Priority Waters that captured walleyes and applies to all sampling seasons. The mean catch rate for walleyes from gillnet surveys in Medium Reservoirs stocked with walleyes is 0.10 legal-length walleyes per hour or 0.12 total walleyes per hour. As a compromise between *The Walleye Plan for Pennsylvania* and the catch data from Medium Reservoirs (recalling the idea of a higher standard associated with the change in purpose of the walleye stocking program), we will set the gillnet catch rate objective for Medium Reservoirs at 0.10 legal-length walleyes per gillnet hour and 0.15 total walleyes per gillnet hour for all seasons.

Spring Gillnets: Large Reservoirs

Nineteen of the 24 Large Reservoirs currently stocked with walleyes have been sampled for adult walleyes with spring gillnets. There have been a total of 91 spring gillnet surveys in those 19 Large Reservoirs. Fifteen surveys (16.5 percent) yielded catch rates that met the catch-rate objectives of *The Walleye Plan for Pennsylvania* (0.50 legal-length walleyes per gillnet

hour). Nine surveys (10 percent) captured no walleyes. It appears that the catch-rate objective for gillnets in the plan was set too high.

The new catch-rate objective is based upon all gillnet surveys in Stable Waters and Priority Waters that captured walleyes. The new catch-rate objective for gillnets in Large Reservoirs is 0.30 total walleyes per gillnet hour and applies to all seasons.

Fall Gillnets: Medium Reservoirs

Only two fall gillnet surveys have been performed in Medium Reservoirs currently stocked with walleyes. Two additional summer gillnets surveys are included for a total of four surveys in this category. Three of the surveys captured walleyes, although none of them achieved the catch-rate objective established in *The Walleye Plan for Pennsylvania*.

In several other midwestern states, fall gillnetting is the standard sampling method for walleye. This is an underutilized sampling regimen in Pennsylvania. Because of the limited amount of data, the spring catch rate will apply to all seasons, including the fall. If appropriate, the fall catch-rate objective will be updated after more fall gillnet surveys are performed.

Fall Gillnets: Large Reservoirs

Only three Large Reservoirs stocked with walleyes have been sampled with fall gillnets by the PFBC. A total of 23 fall gillnet surveys were performed in these three waters with 16 of them occurring in Harveys Lake. Only one of the 17 surveys exceeded the catch-rate objective of 0.5 legal-length walleyes per hour.

Because of the limited amount of data, the spring catch rate will apply to all seasons, including the fall. If appropriate, the fall catch-rate objective will be updated after more fall gillnet surveys are performed.

Fall Night Electrofishing

The primary target of fall night electrofishing is walleye YOY. However, in most cases, all sizes of walleyes may be collected without jeopardizing the YOY catch rate. This provides managers an opportunity to meet catch-rate objectives for both YOY and/or adults in a single survey, thus allowing subsequent trapnet and gillnet surveys to target other species, because successful walleye management has been demonstrated.

It appears from the limited data that sublegal Age 1+ and Age 2+ walleyes (250 mm ≤ walleye < 375 mm) are more vulnerable to fall night electrofishing than legal-length walleyes (≥ 375 mm). Therefore, the catch-rate objectives presented below are for all walleyes Age 1+ and older.

Fall Night Electrofishing for Adult Walleye: Medium Reservoirs

Twenty-four of the 48 fall night electrofishing surveys of Medium Reservoirs appear to have targeted or captured Age 1+ and older walleyes. Four of those 24 surveys achieved the catch-rate objective for electrofishing in *The Walleye Plan for Pennsylvania* (5.0 legal-length walleyes per electrofishing hour). The fall night electrofishing catch-rate objective is based upon the mean catch of Age 1+ and older walleyes from Stable Waters and Priority Waters. The catch-rate objective is 20 Age 1+ and older walleyes per electrofishing hour.

Fall Night Electrofishing for Adult Walleye: Large Reservoirs

Seventeen of the 24 Large Reservoirs currently stocked with walleyes have been sampled for walleyes with fall night electrofishing. There have been a total of 80 fall night electrofishing

surveys in those 17 Large Reservoirs. None of them achieved the catch-rate objective for electrofishing in Large Reservoirs (7.0 legal-length walleyes per electrofishing hour). Sixteen surveys failed to capture any walleyes (20 percent). Thirty-three of these surveys collected Age 1+ and older walleyes (defined as ≥ 250 mm) and catch rates were almost universally poor, except for Allegheny Reservoir. The mean catch rate for Age 1+ and older walleyes in these surveys was 4 per electrofishing hour. This data suggests that indexing adult walleyes in Large Reservoirs with fall night electrofishing isn't effective. If practical, area fisheries managers are encouraged to collect all walleyes during fall night electrofishing in an effort to establish a catch-rate objective in the future.

Young-of-the-Year

Any survey of adult walleyes that meets or exceeds the catch-rate objectives of this plan is sufficient evidence of successful walleye management and makes YOY sampling unnecessary. There was no YOY component in *The Walleye Plan for Pennsylvania*. We would prefer to make management decisions based upon adult abundance data because it provides better evidence of long-term stocking success (i.e. multiple year classes). However, YOY sampling is provided as an alternate method of assessing walleye management. Although rare, there is an example of recruitment failure for stocked walleyes occurring between the YOY and adult life stages at Speedwell Forge Lake, Lancaster County, Pennsylvania (Area Fisheries Manager Mike Kaufmann, personal communication). This possibility makes management decisions based solely upon YOY sampling tenuous; however, considering current commitments and staff levels, it may be the only data available on which to base management decisions.

Young-of-the-year sampling is always available as an assessment tool should a manager want to use it. YOY sampling provides us a good opportunity to assess walleye stocking success. It is effective in almost all waters and appears to be a reliable method for estimating year class strength. It provides us a good opportunity to evaluate stocking rates and should allow us to determine if there is a relationship between stocking rates and YOY relative density for individual waters. This will allow us to steer excess production to waters where it will do the most good. Second, when incorporating OTC tagging, it will allow us to determine the status of natural reproduction and the contribution of hatchery fish. Third, where time series data is available, it may allow us to determine if there is a relationship between YOY catch rates and subsequent catch rates for the same year class (i.e. the Warmwater Unit's work on riverine smallmouth bass).

Currently, there is one option for sampling walleye YOY in lakes and reservoirs, fall night electrofishing. Fall night electrofishing is the best tool for assessing YOY relative abundance and, combined with OTC tagging, is the best tool for assessing natural reproduction and the contribution of our hatchery stocked fry and fingerlings. Sampling should take place when water temperatures are between 10^{o}C and 20^{o}C (Burkholder 2001). We recommend following the procedures established by Lorantas (1993), Serns (1982, 1983) and Hansen (2004). We recommend a minimum of 1.33 hours of effort (four 20 minute sites) on all reservoirs as established by Lorantas (1993). Researchers in Oklahoma's Department of Wildlife Conservation (DOWC) found that two hours of night electrofishing were sufficient to give a representative sample (Anonymous 1987). Pymatuning (Pennsylvania's largest reservoir) is divided into five basins with two hours of YOY sampling performed in each basin (Hoopes 1990). Sites should be selected based upon habitat and should consist primarily of cobble, gravel and sand substrates on gently sloping shorelines in the 0.5 to 2 meter depth zone, if such habitat is available. Oklahoma DOWC suggested targeting rocky points, shallow coves and shoreline

areas with some vegetation (Anonymous 1987). Once established, these sites will become index sites to be repeated during subsequent YOY surveys.

If management decisions are to be based upon YOY catch rates only, slightly higher sampling effort will be required since it samples only one year class at a time. Once the decision has been made to manage a water using only walleye YOY catch rate data, sampling will occur according to the following schedule.

An area fisheries manager has a maximum of three years to verify walleye stocking is contributing to a walleye fishery. If the catch-rate objectives set below are not met during the first sample, a follow-up YOY survey is required the next year. If catch-rate objectives are not achieved in the second survey, a third is required. Three consecutive YOY surveys below the catch-rate objectives forces the removal of the water from the stocking program. If the initial survey achieves the catch rate objectives, we recommend YOY should be sampled on a once every five years schedule.

Because of the high number of walleye stocked waters in some management areas, YOY sampling should be concentrated on Last Chance Waters and waters with below standard adult catch rates that the manager believes maintain quality walleye populations. Again, the achievement of catch-rate objectives during any survey of adults eliminates the need for YOY sampling, but on certain waters it is the best method available for sampling walleyes.

After 30+ years of sampling, the status of natural reproduction in most Medium Reservoirs and Large Reservoirs is known (*Table 5 and Table 6*). Although potentially important in reducing associated costs and expenditures with raising and stocking walleyes, assessing the percent contribution of naturally reproduced fish to a fishery is a lower priority than first determining the presence or absence of a high quality walleye population at this time. Many waters experience a low level of natural reproduction that is unable to sustain a quality directed fishery. On Medium and Large Reservoirs in which the status of walleye natural reproduction is unknown, managers should request OTC tagged walleye for the years scheduled for YOY surveys. The first 50 walleye YOY collected will be sacrificed for OTC analysis.

There are some waters that maintain high quality walleye populations in which fall night electrofishing failed to yield a representative sample of YOY walleye despite repeated attempts. These waters must have their walleye management based upon adult catch rate data.

Fall gillnets have been used to effectively sample walleye YOY and yearlings (Willis 1987). Although this is more labor intensive, this option is available to managers. Gillnets with the appropriate size mesh would have to be purchased (see Willis 1987).

YOY were defined as walleyes < 250 mm for data analysis. This may not be appropriate for some waters with relatively fast growth rates. Scales may need to be taken to determine walleye age if the length frequency distribution does not sharply define the border between year classes.

YOY: Medium Reservoirs

Twenty one of the 45 Medium Reservoirs currently stocked with walleye fingerlings have been sampled for walleye YOY. There have been 48 fall night electrofishing surveys of those 21 Medium Reservoirs. Seventeen surveys (35 percent) failed to capture any YOY walleyes.

The new catch rate objective of 16 YOY per hour is based upon the mean fall night electrofishing catch rates from historic surveys with non-zero catch rates in Stable Waters and Priority Waters. Our statewide data set suggests that this YOY catch rate indicates stocking has the potential to produce a high-quality walleye population.

YOY: Large Reservoirs

Seventeen of the 23 Large Reservoirs currently stocked with walleyes have been sampled for walleye YOY. There have been 80 fall night electrofishing surveys of those 17 Large Reservoirs. Sixteen surveys (20 percent) failed to capture any walleyes.

The new catch rate objective of 16 YOY per hour is based upon the mean fall night electrofishing catch rates from historic surveys with non-zero catch rates in Stable Waters and Priority Waters.

Reporting

The catch rates provided in this plan are for use in evaluating survey catches and making management decisions that are reported in standard Lake Management Reports.

Management Options

Management options are basically unchanged. Following a survey, an area fisheries manager may maintain current management, terminate walleye stocking, increase walleye stocking rates or suggest changes in seasons, size limits or creel limits. If minimum catch rates are not met, management changes may be delayed for one year if the manager still believes walleye management is desirable. To justify this delay, a follow up survey may be performed that should include a change in sampling technique or timing required the following year. Justification will be provided in the Lake Management Report for acceptance or denial by the Warmwater Unit Leader and the Fisheries Management Division Chief.

Stocking Rates for Medium Reservoirs

Current policy states that all Medium Reservoirs may receive a base stocking rate of 20 fingerlings per acre. Waters that exceed the catch rate objectives from *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988) are eligible for an increased stocking rate up to 40 fingerlings per acre.

Currently, 45 Medium Reservoirs are stocked with walleye fingerlings, totaling 8,543 acres. Thirty (30) of these Medium Reservoirs are stocked at the base rate of 20 fingerlings per acre or less. Of the 30 waters stocked at 20 fingerlings per acre, 16 (53%) are classified as Last Chance Waters and have never achieved the catch-rate objectives of *The Walleye Plan for Pennsylvania* (Hoopes and Young 1988). This suggests that 20 fingerlings per acre may be too low of a fingerling stocking rate to establish a quality walleye population in some Medium Reservoirs or that biotic and abiotic factors make the establishment of a walleye fishery impractical. With implementation of this plan, managers have **the option** to immediately increase the base walleye fingerling stocking rate for all Medium Reservoirs in their Area to 40 per acre. Stocking all Medium Reservoirs currently on the stocking list at 40 fingerlings per acre requires an annual commitment of 341,720 fingerlings or approximately 27 percent of Pennsylvania's annual walleye fingerling production.

Stocking Rates for Large Reservoirs

Current policy is Large Reservoirs may receive a base stocking rate of 20 fingerlings per acre. Waters that exceed the catch rate objectives from the Walleye Plan for Pennsylvania are eligible for an increased stocking rate of up to 40 fingerlings per acre.

The desire is to give managers the same option to increase the base fingerling stocking rate for Large Reservoirs to 40 per acre. At this point, production cannot produce enough fingerlings to implement this practice.

The average annual production of walleye fingerlings by the Division of Fish Production for the last three years is 1,277,672 fingerlings. Stocking all reservoirs currently on the stocking list at 40 fingerlings per acre would require 2,446,954 fingerlings, a deficit of 1,169,282 fingerlings. Because the Ohio Division of Wildlife and the PFBC both stock Pymatuning Reservoir at 20 fingerlings per acre (293,000 walleye fingerlings each), we can exempt Pymatuning from the rate increase. This reduces the demand at 40 fingerlings per acre for all waters statewide to 2,153,954. If we remove Youghiogheny Reservoir from the stocking list because repeated surveys have shown that natural reproduction can sustain the fishery, we reduce the total demand to 2,040,354 walleye fingerlings. If we exclude from the rate increase all waters that currently maintain a quality walleye fishery at 20 fingerlings per acre (or less), we will find additional savings. Last Chance Waters were stocked with a total of 101,700 walleye fingerlings in 2010. Should they fail to meet catch-rate objectives, their removal from the stocking list will allow those fingerlings to be stocked in more productive waters.

Achieving Production Goals

If some engineering and budgetary assistance was provided to rehabilitate several ponds not currently used for fish production, Division of Fish Production personnel believe they have the ability to produce as many as 2 million or more Phase I fingerlings per year. These large ponds lack the concrete basins necessary to concentrate fingerlings when the ponds are drawn down for harvest (Larry Hines, personal communication).

The opportunity to get 200,000 plus fingerlings from the state of North Dakota still exists; however, there may be reservations regarding introducing walleye of a different genetic strain.

Between now and that future point when the 2 million fingerling production goal is attained, managers are given the option to rotate waters in their Area between 20 and 40 fingerlings per acre. Walleyes are known cannibals and research has shown that a large year class can suppress the next year class through cannibalism (Chevalier 1973), so stocking 20 and 40 fingerlings per acre on an alternating basis could direct hatchery production towards waters where the chance of survival is higher.

Neither the Fisheries Management Division Central Office nor the individual Area Fisheries Management offices are equipped to analyze otoliths for OTC tags. Managers should arrange for otolith processing by Fish Production Services before collecting any fish. Preferably, arrangements should be made when the request for tagged fish is made.

Table 10. Survey catch rate objectives for the management of walleye fisheries in Pennsylvania's Small Rivers and Major Rivers.

Resource Category	Fall NEF catch rate objective for YOY walleyes	NEF catch rate objective for all walleyes	NEF catch rate objective for legal walleyes
Small and Major Rivers	20/Hour	10/Hour	2/Hour

Table 11. Survey catch rate objectives for the management of walleye fisheries in Pennsylvania's Small Reservoirs (< 50 acres).

Resource Category	Early Spring Trapnet catch rate objective for legal walleyes	Post Spawn Trapnet catch rate objective for legal walleyes	Early Spring NEF catch rate objective for legal walleyes	Fall NEF catch rate objective for YOY walleyes	Fall NEF catch rate objective for all walleyes
Small Reservoirs	0.10/ Hour	0.10/Hour	18/Hour	15/Hour	30/Hour

Table 12. Survey catch rate objectives for the management of walleye fisheries in Pennsylvania's Medium Reservoirs (50 – 500 acres).

Resource Category	Early Spring TN catch rate objectives for legal walleyes (total walleyes)	Post Spawn TN catch rate objectives for legal walleyes (total walleyes)	GN catch rate objectives for legal walleyes (total walleyes)	Early Spring NEF catch rate objectives for legal walleyes (total walleyes)	Fall NEF catch rate objective for YOY walleyes	Fall NEF catch rate objective for Age 1+ walleyes
Medium Reservoirs	0.20/Hour (0.25/Hour)	0.075/Hour (0.10/Hour)	0.10/Hour (0.15/Hour)	18/Hour (24/Hour)	16/Hour	20/Hour

Table 13. Survey catch rate objectives for the management of walleye fisheries in Pennsylvania's Large Reservoirs (> 500 acres).

Resource Category	Early Spring (Spawn) Trapnet catch rate objectives for walleyes (all walleyes)	Post Spawn Trapnet catch rate objectives of legal walleyes (all walleyes)	Gillnet catch rate objectives for all walleyes	Early Spring NEF catch rate objectives for legal walleyes (all walleyes)	Fall NEF catch rate objective for YOY walleyes	Fall NEF catch rate objective for Age 1+ walleyes
Large Reservoirs	0.15/Hour	0.075/Hour (0.10/Hour)	0.30/Hour	18/Hour (24/Hour)	16/Hour	N/A

Angler Demand and Satisfaction

We need to determine Pennsylvania anglers' demand for walleye fishing and determine their satisfaction with the current management. We should perform a statistically valid survey via mail or telephone using the PFBC's Point of Sale database. These interviews may allow us to assess angler demand for walleye angling, angler satisfaction with current programs and estimate statewide angler effort directed at walleyes. It will also help identify waters where our walleye management is working and where it isn't. It will help prioritize our walleye sampling efforts. A statewide survey of angler effort will help us determine the accuracy of our definitions of high-quality walleye fisheries and how our survey catch rates relate to anglers' opinions of angling quality. Or, we can continue to rely solely on the USFWS National Survey of Fishing, Hunting and Wildlife Associated Recreation performed every five years.

Angler Use

As stated in the introduction, the goal of our walleye stocking program has changed. We now endeavor to create quality walleye populations that receive directed angler use. Previous sections have dealt with biological assessments but program success can also be determined by measuring angler use, harvest and opinions of walleye anglers.

Future angler use and harvest surveys performed by the Division of Fisheries Management should include the periods of highest walleye angler use and highest angler catch of walleye during the open season. Walleye, as a coolwater species, are primarily targeted and caught during the cool and cold water periods of the year and directed effort generally tends to pick up beginning in September and continues through to the following May or June. Delaware River and Estuary Log data and other creel surveys bear this out (Pierce 2008). Ice fishing for walleye is also popular, so ice fishing creel surveys should continue as well. If an area fisheries manager suspects significant angler effort directed at walleye occurs at night, this period should be included in the survey sample period.

In some waters, we are ineffective at capturing walleye with our current array of sampling gears. In these waters, a creel survey that shows substantial angler effort, catch and harvest directed at walleye and satisfactory angler opinions of walleye management may be necessary to prove success.

Future Additions to the Plan

This plan can be strengthened in the future, time permitting, from further analysis of data already available. Other activities that can potentially increase the value and completeness of this plan include: 1). Incorporation of the extensive volume of peer reviewed research on walleye management in North America, 2). Determining the interaction between walleye and other species, primarily largemouth bass, 3). Relating survival of stocked walleye in lakes and reservoirs to biotic and abiotic factors, 4). Development of abbreviated creel survey procedures effective at current staffing levels and 5). Relating our sample catch rates to angler use, angler catch rates and angler satisfaction to discover if their definition of a high quality fishery matches ours.

Literature Cited

Anonymous. 1987. Evaluation of YOY Walleye and Striped Bass x White Bass Hybrid Sampling Methods, March 1, 1984 thru February 28, 1987. Final Report Federal Aid Project No. F-37-R. Oklahoma Department of Wildlife Conservation (DOWC).

Pierce, D.J. and J.L. Myers. 2008. Delaware River and Estuary Angler Log 2005 & 2006. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Burkholder, B.D. 2001. Relationship between Electrofishing Catch Rates Age-0 Walleyes and Water Temperatures in Minnesota Lakes. North American Journal of Fisheries Management 21: 318 – 325.

Chevalier, J.T. 1973. Cannibalism as a Factor in First Year Survival of Walleye in Oneida Lake. Transactions of the American Fisheries Society 4: 739 – 744.

Copeland, T. 1997. Walleyes in the Susquehanna River, North Branch, 1992 – 1996 investigations, DRAFT. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Gelwicks, G.T. 2001. Federal Aid to Fish Restoration Completion Report Stream Fisheries Investigation Project F-160-R. Iowa Department of Natural Resources, Des Moines, Iowa.

Hansen, M.J., S.P. Newman and C.J. Edwards. 2004. A Reexamination of the Relationship between Electrofishing Catch Rate and Age-0 Walleye Density in Northern Wisconsin Lakes. North American Journal of Fisheries Management 24: 429 – 439.

Hoopes, R.L. 1989. Lake Examination Manual. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. 1989. Memo dated December 8, 1990 to Area Fisheries Managers Subject: 1990 Revised Production Request Procedures. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. 1990. Pymatuning Lake TC tagging of YOY Walleye. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. and R.M. Burman. 1990. 1989 Tetracycline tagging and evaluation of YOY walleye. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. and R.M. Burman. 1991. 1990 Tetracycline tagging and evaluation of YOY walleye. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. and R.M. Burman. 1992. 1991 Tetracycline tagging and evaluation of YOY walleye. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R.L. and C.C. Cooper. 1984. The Strategic Plan for Pennsylvania's Warmwater/Coolwater Fisheries. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Hoopes, R. and L. Young. 1988. Walleye Plan for Pennsylvania. Bureau of Fisheries, Division of Fisheries Management. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Lorantas, R. and R. M. Burman. 1993. Fisheries Management Division Artificially Cultured Walleye Survival Assessments Fall forage Seining and Juvenile Walleye Electrofishing Procedures. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Lorantas, R. 1995. Memo to R. Snyder; Walleye Survival Study Synopsis (Lakes and Impoundments). PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Lorantas, R. 2001. Memo to R. Lee, Area 2 Manager Subject: Walleye Study Synopsis. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Lorantas, R. 2010. Warm/Coolwater fish stocking request for 2011. Pennsylvania Fish & Boat Commission, 450 Robinson Lane, Bellefonte, PA.

Marcinko, M. 1988. Stream Examination Manual. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Selcher, J.W. and C.C. Cooper. 1976. The Warmwater Rationale. Pennsylvania Fish Commission, Fisheries Management Section. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

Serns, S.L. 1982. Influence of Various Factors on Density and Growth of Age-0 Walleyes in Escanaba Lake, Wisconsin, 1958 – 1980. Trans. of the American Fisheries Society 111: 299 – 306.

Serns, S.L. 1983. Relationship between electrofishing catch per unit effort and density of walleye yearlings. North American Journal of Fisheries Management 3: 451 – 452.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting and Wildlife Associated Recreation.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 1996 National Survey of Fishing, Hunting and Wildlife Associated Recreation.

Willis, D.W. 1987. Use of Gillnet Data to Provide a Recruitment Index for Walleyes. North American Journal of Fisheries Management 7: 591 – 592.

Wisner, B. 2009. Stocked Trout Program: Cost Report. Pennsylvania Fish & Boat Commission, Bureau of Fisheries, Division of Fish Production. PFBC files. 450 Robinson Lane, Bellefonte, PA 16802.

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PFBC Mission:

The mission of the Pennsylvania Fish & Boat Commission is to protect, conserve and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities.