New York State
Department of Environmental Conservation
Division of Fish and Wildlife

MANAGEMENT PLAN FOR LAKE ERIE STEELHEAD 2016 – 2025

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Bureau of Fisheries
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MANAGEMENT PLAN FOR LAKE ERIE STEELHEAD 2016 – 2025

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Date

MANAGEMENT PLAN FOR LAKE ERIE STEELHEAD

MISSION OF THE BUREAU OF FISHERIES

Conserve and enhance New York State's abundant and diverse populations of freshwater fishes while providing the public with quality recreational angling opportunities.

MANAGEMENT PLAN FOR LAKE ERIE STEELHEAD

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EXECUTIVE SUMMARY

Rainbow trout and/or steelhead have been stocked in Lake Erie since the late 1800s and are now considered a naturalized species. The population is sustained primarily through stocking and supports high-quality tributary fisheries that generate millions of dollars annually to local economies. In recent years the tributary fishery has declined compared to the mid-2000s period, but compared with other significant Great Lakes and West Coast steelhead fisheries, our current catch rates remain among the highest in the country. Information describing characteristics of New York's Lake Erie tributary steelhead fishery were limited until consistent angler surveys began in 2003/04. These ongoing surveys effectively characterize the fishery and provide insights into angler views on management topics. This information provided the foundation for development of this management plan for steelhead fisheries in New York's Lake Erie tributaries through 2025.

This steelhead plan outlines New York's goals, objectives, and management strategies for the Lake Erie tributary fishery while remaining consistent with broader fish community goals and objectives shared by all Lake Erie jurisdictions. New York's overall goal is to maintain a high quality fishery that provides diverse angling experiences and broad angler satisfaction. Six objectives are listed in the plan to accomplish this goal: 1) maintain average catch rates of 0.33 fish/hour, 2) foster production of wild steelhead in areas with suitable water quality and habitat, 3) increase stream access, 4) protect and enhance stream habitat, 5) maintain simple and effective regulations, and 6) promote responsible stewardship of the resource. Some of the prominent strategies to achieve these objectives include: developing more effective stocking strategies, simplify angling regulations, improve steelhead access to high quality spawning areas, protect and improve habitat, expand angler access, and increase public outreach. Various surveys will be employed to evaluate the progress towards achieving plan objectives, and knowledge gained from ongoing scientific investigations will guide future management strategies.

INTRODUCTION

Rainbow trout and/or steelhead (*Oncorhynchus mykiss* - referred to as steelhead hereafter) have long supported important sport fisheries in Lake Erie, especially in the tributaries of Ohio, Pennsylvania, and New York. Over 180,000 angler-hours were spent in New York tributaries alone during the 2011-12 steelhead season (Markham 2012). While the tributary fishery is substantial, New York's portion of Lake Erie supports an insignificant open lake steelhead fishery. Hence, this plan focuses on the larger tributary component. The tributary fishery has a large economic impact to the Western New York area; anglers pursuing tributary steelhead in 2007-08 spent an estimated $3.2 million within the three local counties (Reinelt et al. 2013). Fishing quality over the past 15 years has been very good, with occasional exceptions. Because steelhead roam widely and become a shared resource throughout the lake, they are managed under the governance structure of the Great Lakes Fishery Commission's (GLFC) *Joint Strategic Plan for the Management of Great Lakes Fisheries (Joint Plan).* New York State is signatory to the *Joint Plan* and is responsible for participating in inter-agency management initiatives for

highly valued and broadly shared Great Lakes fisheries resources. The GLFC's Lake Erie Committee (LEC) is comprised of representatives from Lake Erie's five fisheries management agencies (Ohio, Michigan, Ontario, New York, and Pennsylvania), and the LEC utilizes the consensus-based decision making process outlined in the *Joint Plan*, guided by the LEC's Lake Erie Fish Community Goals and Objectives (FCGOs) (Ryan et al. 2003). The FCGO lists nine guiding principles as being important for determining fish-community objectives for Lake Erie. Steelhead, although not native to Lake Erie, are considered a naturalized component of the fish community with objectives of providing sustainable harvests in the central and eastern basins. This management plan formalizes New York's goals and objectives for this fishery, identifies standard metrics to evaluate fishing quality, and specifies management strategies to maintain acceptable fishing quality while being responsive to the needs of the angling community.

BACKGROUND

Steelhead have been stocked in the Lake Erie system since the late 1800s, mainly to support recreational fisheries (Crawford 2001). Populations became established in the tributaries during the early decades of the 1900s (MacCrimmon 1977), and then declined in the 1940s and 1950s due to lack of stocking, sea lamprey (*Petromyzon marinus*) predation, and degradation of water quality (Berst and Wainio 1967; Kustich and Kustich 1999). Populations rebounded in the 1970s, mainly due to a renewed stocking effort that began in 1975 (Crawford 2001). By 1989, 1.1 million yearling steelhead were being stocked lakewide (Figure 1) (Coldwater Task Group 2012). While the 1990s brought significant ecosystem changes to Lake Erie primarily due to the invasion of the zebra mussel (*Dreissena polymorpha*), steelhead fisheries continued to thrive while Pacific salmon fisheries declined. Eventually Pacific salmon stocking was phased out and many stocking programs were redirected to steelhead. By the early 1990s, annual steelhead stocking had increased to over 1.7 million yearlings. Lakewide stocking levels of steelhead have since stabilized and range from 1.75 to 2.0 million yearlings annually.

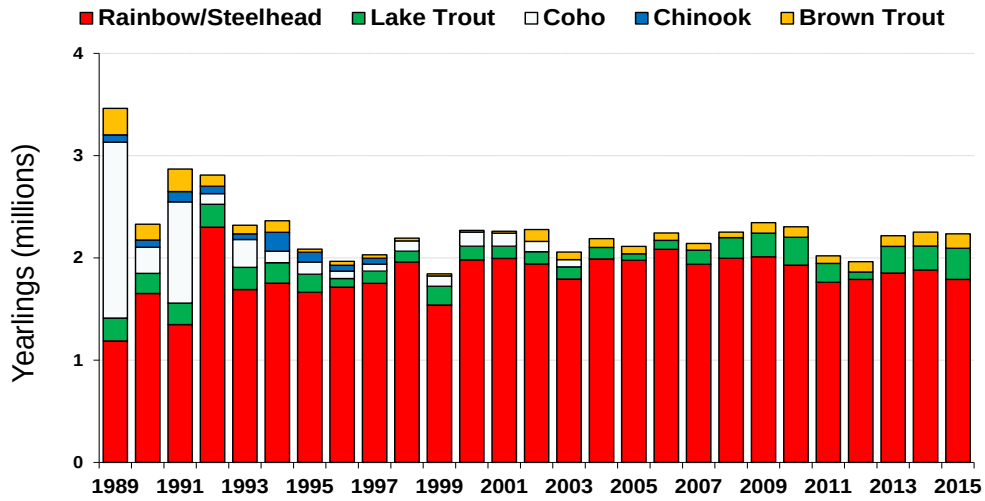

FIGURE 1. Annual salmonid stockings (millions of yearlings) in Lake Erie by all jurisdictions, 1989-2015.

In the New York waters of Lake Erie, steelhead stocking was intermittent until the mid-1980s with the majority of the salmonid stocking directed at domestic rainbow trout and brown trout (*Salmo trutta*) along with Chinook *(Oncorhynchus tshawytscha)* and coho *(Oncorhynchus kisutch)* salmon (Figure 2). However, in 1985 steelhead stocking increased to 100,000 yearlings upon completion of the New York State Department of Environmental Conservation's (Department) Salmon River Fish Hatchery, and continued to increase to 214,000 fish by 1993 as Chinook and coho salmon stockings were phased out. The current stocking target is 255,000 Washington strain steelhead yearlings which are distributed to nine tributaries. Steelhead stocked in other jurisdictions, especially Pennsylvania, are known to contribute to New York's fisheries as well.

In addition to stocking, the steelhead population is augmented by natural reproduction in New York's tributaries (Einhouse et al. 2007, Roth 2002). Studies of Cattaraugus Creek by Mikol (1976) and Goehle (1998) using scale analysis concluded that approximately 22% and 25%, respectively, of the spring spawning steelhead were naturally produced in that system. However, more recent investigations using otolith microchemistry indicate that only 5% of the steelhead runs in both Cattaraugus Creek and Chautauqua Creek are naturally produced (Dr. Jeffrey Miner, Bowling Green State University, unpublished data). Although these studies found modest contributions of naturally produced fish in some of Lake Erie's highest quality tributaries, it is important to note naturally produced steelhead do not comprise a significant portion of the overall lake wide population.

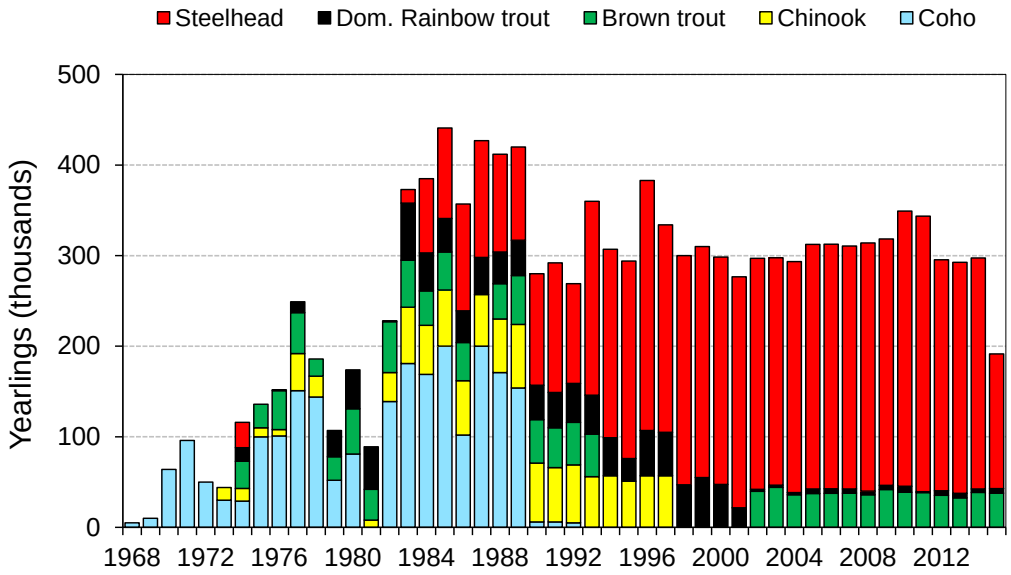

FIGURE 2. Annual salmonid stockings (thousands of yearlings) in the New York waters of Lake Erie, 1968-2015.

ANGLING REGULATIONS

Current steelhead angling regulations for Lake Erie tributaries in 2016 are as follows:

- Daily limit – 3 in any combination of brown or rainbow trout/steelhead or salmon species
- Minimum length – 12 inches
- Multiple hook points are permitted, including on tandem flies
- Year-round catch & release, artificial lure only fishing sections
    - Eighteen Mile Creek Main Branch (1.7 miles)
    - Chautauqua Creek (1.3 miles)
- Additional seasonal regulations (September 1 to March 31) address fishing hours, hook, leader and weight restrictions

STATUS OF THE RESOURCE

Direct assessments of Lake Erie's adult steelhead population have not been possible as this species is not typically encountered in any of the Department's open lake monitoring programs (such as gill net and trawl surveys). Instead, we rely on fishery-dependent measures such as an annual angler diary program, and more recently a periodic (every 3rd year), comprehensive tributary angler survey to provide information about the sport fishery and the status of the steelhead population. In the future, a weir may be installed on Cattaraugus Creek at the Springville Dam as an element of a fish passage project that may provide an opportunity for direct assessment of the adult population. Juvenile trout surveys have also been conducted to provide an understanding of the extent of natural reproduction in New York's Lake Erie tributaries.

Assessment of the Fishery

The Lake Erie Salmonid Angler Diary Program began in 1983 to acquire data to describe the open water and tributary salmonid fishery. The diary program has provided an efficient long term and low cost means of monitoring some general characteristics of the salmonid fishery such as angling preferences, length frequency of the catch, catch-and-release practices, and performance of various species and stockings. The program also serves an outreach function, connecting anglers to resource managers. However, due to inherent biases of angler diary programs representing only a relatively small and select group of anglers, the program is unable to objectively assess trends in overall fishing effort and fishing quality experienced by the broader angling population - information that is needed for effective fisheries management.

To better inform fisheries management decisions, a comprehensive direct contact tributary angler survey began in 2003-04 to obtain estimates of effort, catch and harvest, and information on angler demographics and angler opinions on management issues. Angler surveys have been conducted from fall through spring in 2003/04, 2004/05, 2007/08, 2011/12 and 2014/15 in New

York's stocked tributaries (Markham 2006; Markham 2008; Markham 2012; Markham 2015). Prior to these re-occurring surveys, the only previous survey was a benchmark comprehensive Great Lakes angler survey conducted in 1984 (NYS DEC 1989). The 1984 survey found spring tributary effort was mainly directed at steelhead while fall fishing targeted a variety of salmonid species. Recent angler surveys revealed this tributary fishery has essentially become solely dominated by steelhead angling from fall through spring. Angler catch rates from surveys conducted between 2003/04 and 2007/08 remained consistent around 0.60 fish/hour, but declined 42% in the 2011/12 survey to 0.34 fish/hour (Figure 3). Total catch declined 47% over this same time period. Catch rates similar to 2011/12 were also observed in the most recent, 2014/2015 survey. This decline was not unique to New York's portion of Lake Erie as Ohio and Pennsylvania biologists also reported similar declines in tributary steelhead fishing quality during this period. The reasons for the recent decline in steelhead fishing quality remain unclear, but biologists speculate it may be related to predation on juveniles from a large walleye population, predation on adult steelhead from an increasing sea lamprey population, or perhaps a combination of these and other unknown factors.

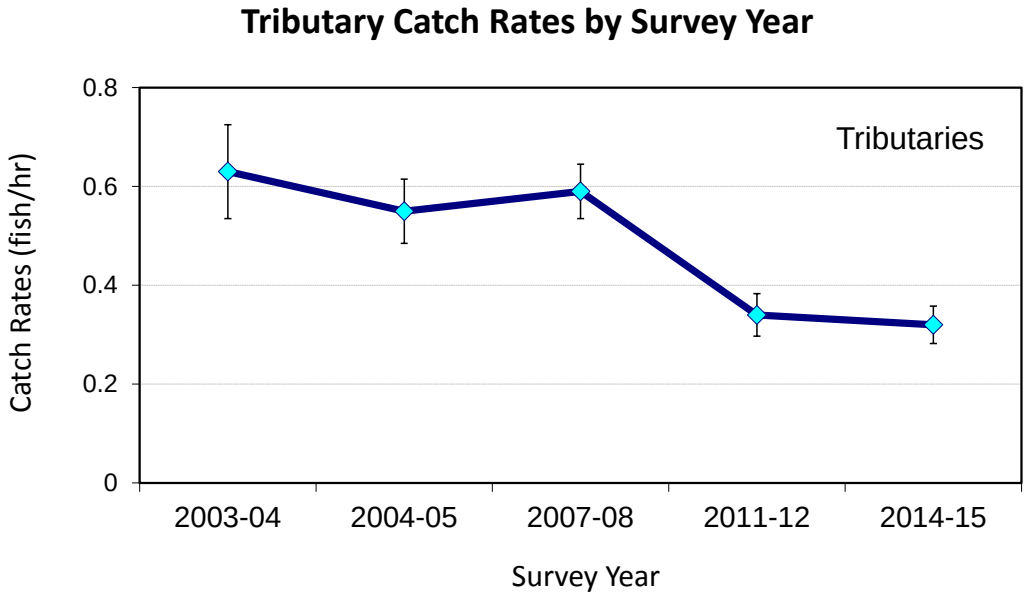

FIGURE 3. Targeted catch rates (fish/hr) of steelhead from New York's Lake Erie tributaries estimated from angler surveys in 2003/04, 2004/05, 2007/08, 2011/12, and 2014/15. Error bars are 2 standard errors of the catch rate.

Assessment of Natural Reproduction

Juvenile steelhead surveys have been conducted since 1995 to assess natural reproduction in some of the higher quality tributaries. Initial surveys began on Spooner Creek, the uppermost tributary of Cattaraugus Creek downstream of the impassable dam in Springville (Culligan et al. 1996). Surveys on Spooner Creek continued each fall through 2001 with population estimates ranging between 3,918 age-0 (young-of-the-year or YOY) steelhead in 1999 to 14,853 YOY in

2001. Sampling also documented natural reproduction in other Cattaraugus Creek tributaries such as Derby Brook, Coon Brook, Clear Creek, North Branch Clear Creek, and Connoisarauley Creek, although to a lesser degree than Spooner Creek (Culligan et al. 1999).

A comprehensive, multi-year electrofishing survey of Lake Erie tributaries for steelhead reproduction potential began in fall 2002 which included all streams suspected to support adult steelhead spawning runs. By 2006, an additional 30 Lake Erie tributaries were evaluated, bringing the total number of streams inventoried to 38 (Markham 2007). While the majority of the streams sampled were judged to have a low potential for producing wild steelhead, thirteen streams did show a higher potential. Five streams (Spooner Creek, Chautauqua Creek, Derby Brook, Little Chautauqua Creek, North Branch Clear Creek) were judged to have a high potential for producing wild fish while three other streams (Clear Creek, Connoisarauley Creek, Coon Brook) had moderate potential. Despite the findings that there is varying potential for natural reproduction in many tributaries, together it is not thought to be sufficient for sustaining viable tributary steelhead fisheries without supplemental annual stocking.

GUIDING PRINCIPLES

This plan embraces the following principles as a foundation for steelhead management in New York's Lake Erie tributaries that are consistent with the *Joint Plan* and Lake Erie's fish community goals and objectives. Management efforts will:

- remain consistent with broader fisheries management efforts by DEC and member agencies of the Lake Erie Committee (LEC)
- be science based, recognizing biological limits of the ecosystem, the fishery, and agency resources
- be responsive to the needs of the angling community

GOAL

The goal for the Lake Erie tributary steelhead fishery is to maintain a high quality fishery that provides diverse angling experiences and broad angler satisfaction.

OBJECTIVES

To achieve this goal, six primary objectives are identified:

1. Maintain average steelhead catch rates at or above 0.33 fish/hour (equal to 1 fish every 3 fishing hours) as measured in Lake Erie tributary angler surveys.
2. Maintain, and increase where practical, wild steelhead production.
3. Maintain existing access, add five angler parking areas, and increase Public Fishing Rights (PFR) easements by at least 0.5 miles by 2025.
4. Protect existing habitat and support five habitat projects that improve quality trout habitat in the Lake Erie tributaries by 2025.
5. Maintain regulations that are science based, easily understandable, and enforceable.
6. Promote responsible stewardship of the resource through public outreach.

MANAGEMENT STRATEGIES

OBJECTIVE 1: Maintain average steelhead catch rates at or above 0.33 fish/hour (equal to 1 fish every 3 fishing hours) as measured in Lake Erie tributary angler surveys

Catch rates in tributary angler surveys during 2003/04, 2004/05, and 2007/08 were at levels (0.60 fish/hr) far exceeding our objective but declined in surveys conducted in 2011/12 and 2014/15 to near objective levels. As previously discussed, reasons for this decline are unclear, but stocking numbers and strategies have remained generally stable throughout this period. While we realize that the catch rates experienced in the mid-2000's were achieved for a period of time, we also believe that those high rates were well above what might be considered as a long term, sustainable target for a fishery of this nature. Compared with other significant Great Lakes and West Coast tributary steelhead fisheries, the most recent measures of steelhead catch rates in Lake Erie tributaries (0.32 fish/hr) remain among the highest measured in the entire country. Ongoing research is exploring whether changes in New York's stocking strategies may improve post-stocking survival and returns of adult steelhead, and this knowledge will be used to guide future stocking efforts. The following strategies will be employed to fulfill the steelhead catch rate objective.

Strategy 1.1. *Maintain current stocking targets in individual tributaries*

The current annual stocking policy for Lake Erie tributaries is 255,000 yearling steelhead (Table 1). Our recommendation is to maintain the current stocking targets in each tributary until new information becomes available indicating the need for change. We also recognize that many other factors can potentially influence catch rates independent of New York's stocking levels; examples include steelhead mortality due to varying sea lamprey abundance, variability in post-stocking survival, and changes to stocking strategies or post-stocking survival in other Lake Erie jurisdictions.

Steelhead stocking targets for individual streams were originally determined with consideration of stream size and availability of public access. Only a few changes to these long standing targets have occurred in recent years (i.e. moving 10,000 yearlings from Chautauqua Creek to Cazenovia Creek; moving 10,000 Dunkirk Harbor pen-reared fish to Silver and Walnut Creeks (5,000 each)). More recently the decision was made to halt stocking Cazenovia Creek due to poor performance, and instead redirect the former Cazenovia Creek allocation (10,000 yearlings) equally between Buffalo Creek and Chautauqua Creek. Tributary angler surveys have shown that angler success varies both between streams within the same year and between years on a single stream, most likely due to fluctuating environmental factors including stream flow and temperature. Historic angler survey data also suggest that current stocking targets in all monitored tributaries are capable of achieving catch rates that meet or exceed this Plan's catch rate objective. As such, we recommend maintaining the current allocation of steelhead among individual streams until new evidence emerges to prompt a modification of this strategy. Future consideration of other streams for steelhead stocking will continue to be founded upon our

original considerations of stream size, availability of public access, and hatchery production capacity.

TABLE 1. Steelhead stocking targets in the New York waters of Lake Erie.

Tributary	Stocking Target
Chautauqua Creek	45,000
Canadaway Creek	20,000
Walnut Creek	10,000
Silver Creek	10,000
Cattaraugus Creek	90,000
Eighteen Mile Creek	40,000
Cayuga Creek	15,000
Buffalo Creek	15,000
Buffalo River net pens	10,000
TOTAL	**255,000**

Strategy 1.2. *Determine and implement a realistic stocking size target and stocking strategy to maximize adult returns*

New York's Lake Erie long standing tributary stocking strategy has been to stock steelhead as far upstream in the watershed as practical. This stocking strategy is based on the theory that survival of small, juvenile steelhead (average stocking size = 4.5-5.0 inches) is better in upstream areas, and upstream stocking allows fish additional time to grow prior to smolting. Smolting is a physiological process whereby migratory trout and salmon imprint on the tributaries they inhabit, leave to migrate downstream to the ocean (or in this instance Lake Erie), then return to spawn in their "natal" tributary (McCormick et al. 1998). Smolting is related to fish size, and various studies (Wallis 1968; Chrisp and Bjornn 1978; Bjornn et al. 1978; Bjornn et al. 1979; Seelbach 1987) indicate that steelhead should average a minimum of 6.3 inches at stocking to maximize post-stocking survival. Ideally, steelhead should be stocked as smolts that are physiologically ready to imprint and then migrate quickly from the river (Wagner 1968). Stocking steelhead downstream near the mouths of Lake Ontario tributaries has been effective, however, fish habitat and predators in the Lake Ontario system may differ. Ongoing research to assess different stocking strategies (stocked high upstream or downstream near mouth) and stocking size (small vs large) will determine which stocking strategy produces the highest returns of adult steelhead. These findings will be used to develop a recommendation for the optimal stocking location and a recommended stocking size, attainment of which will be subject to hatchery limitations.

Strategy 1.3. *Pursue a sustainable, science-based harvest strategy*

The current angling regulations for trout and salmon in Lake Erie and its tributaries are a daily limit of three fish/day (any salmonids in combination) with a minimum length limit of 12 inches and no closed season. These regulations have remained static while the fishery has mostly

flourished and expanded through the last 30+years, and while anglers can potentially harvest 3 steelhead/day, creel survey results consistently indicate angler release rates exceeding 85%. However, a reduced steelhead creel limit and/or increased size limit could be implemented in the future if angler catch rates are consistently below the objective.

OBJECTIVE 2. Maintain, and increase where practical, wild steelhead production

Although it is difficult to distinguish between stocked and wild steelhead as adults, having the opportunity to catch wild steelhead is important to many Lake Erie tributary steelhead anglers. During the 2003-04 tributary angler survey, 68% of anglers interviewed indicated that catching wild steelhead was important to their fishing experience; less than 17% felt it was unimportant (Markham 2006). We surmise that catching a wild steelhead is indicative of desirable conditions which include excellent water quality, ideal stream habitat, and healthy trout populations - general qualities that also reflect a healthy ecosystem, and that wild fish are more highly valued than stocked fish. However, exclusively managing for wild populations on a lake wide scale is inconsistent with achieving the catch rate goal given the limited availability of quality spawning and juvenile habitat. Moreover, projected long term increases in water temperature and frequency of severe storms as a result of climate change may have negative impacts on natural reproduction in the future. Therefore, a robust stocking effort remains essential for maintaining our overall tributary steelhead fishery while continuing to foster natural reproduction where possible and practical. The following strategies will be employed to maintain a wild steelhead component in this fishery.

Strategy 2.1. *Improve fish access to high quality spawning areas*

The most direct method to increase wild steelhead production is to create access to high quality spawning and juvenile habitat. However, removal of dams or other barriers must take into consideration and balance issues such as impacts to upstream fish communities and fisheries, increasing access to invasive species (especially sea lamprey), evaluation of available habitat, and availability of public access. Dam removals are usually protracted, costly endeavors with many accompanying issues such as dam ownership, changes to stream hydraulics, and sediment management (see Council of Lake Committees position statement: http://www.glfc.org/boardcomm/cglfa/CGLFA_dams_barriers_decision_support_protocol_FEB2013.pdf).

Some fish passage initiatives have already been completed or are currently underway. A fish passage project (a notch on a lower dam and a rock ramp on an adjacent upper dam) was completed in July 2012 on Chautauqua Creek through the Great Lakes Fishery and Ecosystem Restoration (GLFER) program. Although this project suffered significant damage during Superstorm Sandy, necessary repairs and improvements to this project have now been completed through an effort led by the Chautauqua County Soil and Water Conservation District and funded through the Great Lakes Basin Fish Habitat Partnership. Another fish passage project is being investigated at the Springville Dam on Cattaraugus Creek through the GLFER program. Fish passage on Cattaraugus Creek has the potential to significantly increase wild production of

steelhead due to an abundance of high quality spawning and rearing habitat above this dam. Some other potential fish passage projects include Silver Creek, Buffalo Creek, and Thatcher Brook.

Strategy 2.2. *Explore whether special fishing regulations can foster natural reproduction*

Where appropriate, special fishing regulation zones can limit harvest in some areas particularly suitable for wild steelhead production. Seasonal closures (Jan-1 to March-31) were established on two small headwater tributaries (Spooner Creek and N. Branch Clear Creek) because of their value as steelhead spawning and nursery streams, and an accompanying perception that removal of spawning-phase steelhead in these streams would negatively affect wild steelhead production. These two streams are New York's only Great Lakes tributaries with seasonal closures addressing the objective of benefitting wild steelhead production. In addition, current special fishing areas on Lake Erie tributaries, such as the "Catch and Release – Artificials Only" area on Chautauqua Creek, were developed with these objectives, as well as to provide a unique fishing experience desired by some anglers.

In principle, limiting harvest of spawning-phase steelhead in selected areas particularly suitable for natural reproduction is consistent with the objective of increasing wild steelhead production. However, whether these seasonal closures and catch-and-release regulations produced the intended benefits has never been evaluated. Wild steelhead production is usually more limited by the availability of suitable spawning and rearing habitat than by insufficient numbers of adult steelhead. In this regard, all candidate special fishing regulation areas will be assessed to determine their potential for achieving desired objectives. Examination of tributary angler survey results, surveys of wild steelhead production, and available scientific literature should provide an effective, science-based evaluation of the effectiveness of these special regulations.

OBJECTIVE 3. Maintain existing access, add an additional five angler parking areas, and increase Public Fishing Rights (PFR) easements by at least 0.5 miles by 2025.

A major impediment to Lake Erie steelhead fisheries is limited angler access. Many privately owned areas once available for fishing are now posted. In a few instances, landowners are charging fees for access to their properties. Due to a number of factors, including increasing land values, leases to guides, and poor angler/landowner interactions, DEC has only acquired five new parking areas and 0.5 miles of PFR on Lake Erie tributaries over the last ten years, and this situation is unlikely to improve in the near future. Our objective is to obtain at least the same number of parking areas and additional stream access over the next decade. While it remains worthwhile to continue to search for and obtain PFR on our larger stocked streams when opportunities arise, there may be unexplored opportunities to acquire access on other smaller, non-stocked Lake Erie tributaries that support healthy steelhead runs and have the potential to provide additional angling opportunities. Some possible candidate streams include Delaware Creek, Big Sister Creek, and Smokes Creek.

OBJECTIVE 4. Protect existing habitat and support five habitat projects that improve quality trout habitat in the Lake Erie tributaries by 2025.

Protecting and improving the existing habitat is essential for the future of the fishery. Poor water quality due to increased temperatures, excessive siltation, or lack of in-stream habitat results in reduced survival of stocked fish, lower adult returns, and limited natural reproduction. The possibility of increased water temperatures and frequency of strong storms and runoff events due to climate change will make habitat improvement projects, such as bank and stream stabilization, increasingly important. Over the past decade there have been at least five completed projects that improved or maintained the existing stream habitats in Lake Erie tributaries, and our objective is to complete at least this same number of new projects over the next decade.

Strategy 4.1. *Increase habitat for age-1 and older steelhead*

Both stocked and naturally produced steelhead would benefit from habitat improvement projects in many of New York's Lake Erie tributaries. Studies by the Lake Erie Unit have found good production of age-0 wild steelhead in many tributaries, but fewer numbers of wild age-1 fish. These results are consistent with other studies (Seelbach 1993; Mitro and Zale 2002; Mitro et al. 2003; Roth 2002) that found that over-winter stream discharge and lack of habitat reduced the number of age-0 steelhead that remained in the stream to age-1. Others studies by Stauffer (1972), Kwain (1983), and Roth (2002) found that large numbers of wild steelhead in the Great Lakes emigrate as age-1 pre-smolts, presumably due to limitations in the quantity of available suitable habitat. Based on this knowledge of important factors limiting juvenile survival and emigration behavior, we recommend that future stream projects incorporate features that increase habitat for age-1 and older steelhead. Potential habitat improvements include riparian tree and shrub plantings, bank stabilization, in-stream improvements such as the creation of pools or lunkers, and the addition of woody debris and large rocks. These types of habitat improvements provide shade and improved water temperatures, increase habitat diversity, and decrease turbidity, thereby increasing available steelhead spawning, rearing, and holding habitat for age-1 and older juvenile steelhead. A few habitat improvement projects have already been implemented, including bank stabilization and stream channel improvement projects on Chautauqua and Canadaway Creeks, and riparian plantings for bank stabilization and shading on Spooner Creek. Some additional candidate streams for similar habitat improvement work could include Clear Creek, Connoisarauley Creek, Coon Brook, and Derby Brook.

Strategy 4.2. *Protect current stream habitat through DEC Protection of Waters Program (Article 15 Environmental Conservation Law)*

In addition to improving existing habitat in Lake Erie tributaries, it is critical that existing high quality habitat be protected. Many tributaries containing runs of steelhead currently require permits under Article 15 of NYS Environmental Conservation Law for projects potentially disturbing stream beds and banks. Projects requiring Article 15 permits will be issued only when the plans will not result in a decrease of available spawning, rearing and adult trout habitat in the

stream. Biologists and permit analysts will work with applicants to modify application plans to improve habitat conditions for trout in the proposed projects. Conditions in issued permits will include in-water work restriction dates during spawning and rearing periods for trout.

A number of Lake Erie tributary streams are not currently classified as trout spawning waters under the DEC Division of Water's water quality classification system, thus these streams are not protected under Article 15.Water quality classifications for these waters should be upgraded at the earliest possible opportunity.

OBJECTIVE 5. Maintain regulations that are science based, easily understandable, and enforceable.

Simple and consistent regulations allow anglers to enjoy the fishery with a clear understanding of the rules as they employ their favored angling technique (fly fishing, artificial lures, bait, etc.). We assert that complex and confusing regulations discourage participation by some ethical anglers who become wary of breaking a rule they may not fully understand. Complicated regulations can also be problematic for effective enforcement. Although efforts have been made in recent years to simplify Lake Erie tributary regulations, we will continue to explore opportunities to improve regulations to provide clear guidance, maintain/enhance legitimate angling opportunities, and address enforcement issues.

OBJECTIVE 6. Promote responsible stewardship of the resource through public outreach.

Landowners are understandably sensitive to irresponsible actions by anglers such as leaving behind trash, exhibiting unethical or illegal fishing techniques, gutting fish in or near the stream, walking through yards, etc. Eventually some landowners decide that prohibiting access to the stream is the best option to solve these issues. In order to maintain or expand public access to the tributaries, it will be important to continually promote respectful use of private property, adherence to angling regulations, and proper stewardship of fishery and stream resources. Promotion of these ideas is best accomplished through public outreach.

Strategy 6.1. *Increase use and improve access to existing outreach information*

A variety of public information on the Lake Erie tributary steelhead fishery has been developed over the past decade and is now available on the DEC website (www.dec.ny.gov). This information includes maps (public fishing rights or public fishing access) of the four major Lake Erie tributaries (Cattaraugus, Eighteenmile, Canadaway, Chautauqua Creeks) and fishing hotlines that are updated weekly. DEC also recently revised its "Guide to Great Lakes Fishing" brochure with up-to-date information on fishing destinations, and links to additional resources (http://www.dec.ny.gov/docs/fish_marine_pdf/glfishing.pdf). In addition, New York's fishing regulations guide is also posted on the website and is available as a web-based application for smart phones. Anglers increasingly access these resources as evidenced by tracking use of weekly hotlines (Todd 2016) and visits to fishing maps on the DEC website.

The recent advances in technology and information sharing affords us an opportunity to improve public education on the resource and its associated issues. This may be accomplished through added language in brochures and fishing maps, an educational handout that can be distributed to anglers during tributary angler surveys or at kiosks, through verbiage added to the weekly fishing hotline, and through messages on Facebook and Twitter.

Strategy 6.2. *Install kiosks at major fishing access sites*

Kiosks are frequently used at inland stream parking areas and other state facilities such as state forests and parks, but have not been utilized at our Lake Erie tributary access sites. They provide an additional avenue to directly deliver information to anglers such as stream maps, educational material on responsible fishing ethics and stewardship of the resources, and fishing regulations. While it is not practical to place information kiosks at every steelhead access area, there are some popular access spots identified through the tributary angler survey that can be initially targeted.

Strategy 6.3. *Support local stream revitalization events*

Some angler groups devote considerable energy toward stewardship of trout streams, mainly in the form of stream habitat improvement projects. However, additional projects occur that include maintaining aesthetics of the stream, and these projects not only provide environmental protection but also help prevent loss of access from posting. An example of an ongoing effort is an angler-sponsored annual clean-up program on Canadaway Creek. This event, which started in 2006, enlists volunteers to collect trash, plants trees and shrubs to protect stream habitat, and remove invasive species in order to nurture and protect this local stream. Such programs are currently rare on Lake Erie tributaries but vital in maintaining angler access to our steelhead streams and should be supported and expanded as opportunities arise. Encouraging local fish and sporting clubs to start an "Adopt a Stream" program may be one way to get more community involvement in their local streams while improving aesthetics, landowner relationships, and stewardship of the resource.

EVALUATION

Evaluation of progress toward achieving plan objectives will be accomplished through a variety of programs and surveys.

- **The Angler Diary Program** (Objective 1) provides a long-term view of fishery performance, including diary angler catch rates in both the tributaries and open waters of Lake Erie. However, perhaps the most valuable information this program provides is a length-frequency distribution from angler catches. These data are required for anglers participating in the program and currently not available through any other survey. Diary anglers typically catch and record information from over 900 steelhead annually, and these data provide insights into steelhead recruitment and longevity. This survey addresses

Objective 1 through evaluation of the trends of the fishery and size distribution of the population. We recommend this long standing program continue and maintain at least 35 active tributary participants.

- **Tributary and Harbor Angler Surveys** (Objectives 1, 3, 5) began in the 2003-04 fishing season and have proved invaluable for providing statistically rigorous estimates of fishing effort, catch and harvest rates, and overall catch and harvest for each of the stocked tributaries and the overall tributary fishery. In addition, the survey has provided an improved understanding of angler demographics and opinions on management issues and proposed regulations. This survey provides the direct measure of catch rates utilized in Objective 1 and will determine if the management strategies are achieving the desired goal of the objective. This survey also utilizes the main points of access for the steelhead fishery and provides an ongoing count of prominent access sites for evaluation of Objective 3. Additionally, this survey collects angler opinion data which will be used to determine prevailing fishing regulations remain easily understandable (Objective 5). We recommend that this survey be conducted every third year.

- **Wild Steelhead Production Surveys** (Objective 2) have identified streams and habitats with measurable production of wild steelhead. In some locations, such as Chautauqua Creek, these surveys also assess the success of an upstream fish passage management action. We recommend that these surveys continue as needed to evaluate the success of management actions fostering production of wild steelhead addressed in Objective 2.

- **Post-Stocking Steelhead Surveys** (Objective 1) have improved our understanding of stocked steelhead emigration patterns and sources of post-stocking mortality. In spring 2013 the Lake Erie Fisheries Research Unit performed a pilot study to examine various aspects of post-stocking emigration and whether predation by predator fishes is a significant source of mortality. The results of that pilot study lead to a more comprehensive investigation to reveal whether alternative stocking strategies might maximize survival of stocked steelhead and ultimately adult returns. Adult returns will be evaluated in tributary angler surveys and address Objective 1.

- **Trap and Sort Assessments** (Objectives 1, 2) at fish passage weirs, while currently not available, would provide an opportunity to obtain important information on the status of the adult population including migration patterns, age and size structure, growth, condition, mortality, and sea lamprey wounding rates. Such an assessment could provide an opportunity to evaluate emigration and population characteristics of wild and stocked juvenile steelhead. A trap and sort weir is in the project design for the proposed Springville Dam fish passage project on Cattaraugus Creek.

- **Adult Spawning Surveys** (Objective 1) would provide an annual sample to assess age and size distribution, growth, condition, and sea lamprey wounding. Adult surveys also provide a means to gather a sample of fish to evaluate tagging efforts. These surveys should be

conducted in a standard fashion throughout the fall and spring and in representative streams in order to characterize the adult steelhead population.

RESEARCH NEEDS

We recommend research through 2025 be pursued as lake wide in scale and focus on the following research questions to inform Lake Erie steelhead management efforts:

- What is the contribution of wild steelhead to the overall Lake Erie adult population and to specific tributaries (Objective 2)?
- What is the contribution to the overall Lake Erie adult population by steelhead stocking programs of each Lake Erie jurisdiction and to specific tributaries (Objective 1)?
- What are the relative survival rates experienced by the different stocked steelhead strains in Lake Erie (Objective 1)?
- Do sea lamprey wounding rates differ by steelhead strain (Objective 1)?
- What are the maturity schedules, growth trajectories, and longevity of the different steelhead strains stocked in Lake Erie (Objective 1)?
- What are the thermal regimes and associated in-stream and riparian habitat characteristics of Lake Erie tributaries (Objective 4)?
- Which Lake Erie tributaries would benefit most from habitat improvements aimed at restoring or expanding trout habitat (Objectives 2, 4)?

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