2022 Sport Fish Restoration Project Award – Sport Fishery Development and Management

Project Title: Evaluation of Steelhead Stocking Size and Location on Emigration and Adult Returns in Chautauqua Creek, NY

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Project Narrative:

New York's Lake Erie tributaries have long supported important steelhead (*Oncorhynchus mykiss*) sport fisheries, attracting anglers from across the country and generating substantial economic benefits to the Western New York area. The goal of New York's Lake Erie steelhead management program is to maintain a high-quality fishery that provides diverse angling experiences and broad angler satisfaction. An effective stocking program resulting in steelhead returning to the streams in which they were stocked is an essential part of maintaining this high-quality fishery. This requires sufficient numbers of stocked fish to survive, imprint, and return to these streams as adults. Constraints within the NY hatchery system result in steelhead being stocked at relatively small sizes resulting in reduced survival, imprinting, and less than optimal adult returns. Recent research has also demonstrated New York's dependence on "stray" steelhead from other Lake Erie jurisdictions, making New York fisheries vulnerable to management decisions outside of our control. The goal of this study was to identify strategies that would maximize the return of steelhead stocked in NY waters, resulting in improved fishery performance and resiliency. The general objective was to develop a better understanding of how size-at-stocking and stocking location interact to influence emigration and adult returns. This study took an experimental approach, stocking two different uniquely tagged size groups (large: ~140 mm (5.5 inches), small:
~100 mm (4.0 inches)) of yearling steelhead at two stream locations (upper site: 4 miles upstream; lower site: near the stream mouth), then monitoring in-stream juvenile emigration and adult returns for each group. This study was completed over five years and required close coordination between hatchery, research, and management staff.

This study revealed that most of the stocked yearling steelhead >150 mm (5.9 inches) had emigrated from the stream by the end of May, but that many of the smaller yearling steelhead remained in the stream with some migrating upstream. Steelhead that remained in the stream appeared to lose body condition over time and likely experienced high mortality. The large size group of fish (140 mm average) stocked in the upstream location resulted in the highest number of returning adults—over four times the rate of the next highest performing group. Because New

York's Lake Erie stocked steelhead typically average less than 150 mm (usually 127 mm or 5.0 inches), this study indicated that many of the yearling steelhead stocked by New York are too small to imprint, instead remaining stream residents where they experience poor survival and ultimately make minimal contributions to the adult steelhead fishery. This work resulted in the following management recommendations all of which were adopted:

1. Explore measures to increase the size of our stocked steelhead to a minimum of 150 mm through hatchery experimentation (e.g. rearing density reduction, grading, diet) and infrastructure improvements.
2. Continue the practice of stocking steelhead well upstream of the lake confluence to facilitate imprinting.
3. Provided steelhead >150 mm are available, stock these fish beginning in late March or early April to allow fish more time to acclimate, imprint, and emigrate prior to May temperature increases.

This work resulted a change in steelhead stocking policy for all of New York's Lake Erie tributaries. Steelhead stocking sites were moved higher up in watersheds and there was a 50% reduction in New York's Lake Erie Steelhead stocking. This reduction gave hatchery staff at the Salmon River Fish Hatchery the flexibility necessary to increase the size of stocked steelhead through modified rearing techniques. The modified rearing techniques developed for juvenile steelhead by Salmon River Hatchery staff significantly increased the average size (both length and weight) of the yearling fish stocked, provided a more consistent stocking product (i.e., reduced length variation). The percentage of yearling steelhead >150 mm in 2020 (55%) was five times higher than prior to the stocking reduction resulting in an effective stocking number in 2.7 times higher than before the stocking reduction despite stocking half the number of yearling steelhead. This work was further evaluated with an angler survey in 2021 and 2022 following the stocking policy changes that showed no reductions in in fishing quality because of the stocking reduction.

This work resulted in two technical reports and one peer reviewed publication:

Markham, J.L., and J.M. Robinson. 2019. Evaluation of steelhead stocking size and location on emigration and adult returns in Chautauqua Creek, NY. New York State Department of Environmental Conservation, Albany, New York, USA.

Markham, J. L., T. E. Kielbasinski, J. Hentges, and P. Kinney. 2020. Experimental Fish Culture Techniques at the Salmon River Hatchery to Improve Steelhead Stocking Size. Bureau of Fisheries Technical Brief, New York State Department of Environmental Conservation, Albany, New York, USA.

Markham, J. L., and J. M. Robinson. 2021. Evaluation of Steelhead stocking size and location on emigration and adult returns. North American Journal of Fisheries Management. 41:1652– 1664.