Title

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Publication Date

2001-09-24

MITIGATION MEASURES FOR IMPACTS TO FISH HABITAT: MAINE TURNPIKE MODERNIZATION AND WIDENING — A CASE STUDY

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Abstract
Funding Source: Maine Turnpike Authority
Total Budget: $25,000

Problem Statement
A 30-mile segment of Maine Turnpike from mile 12 in the Town of York to mile 42 in Scarborough is proposed for widening and modernization. There are 53 different crossings associated with various streams, rivers and unnamed tributaries that are part of Maine's southern coastal drainage system. At least 17 out of the 51 streams support native populations of brook trout or brown trout. An estimated 1,892 linear feet of streambed will be lost due to extensions of existing culverts. This represents an average of about 36 feet per stream or 18 feet of streambed on each side of the Turnpike. There are also 17 streams in which some portion of the channel will need to be relocated due to either encroachment from the new embankment location or to connect the stream to the new culvert outlet location.

Project Objective
To mitigate for impacts to fish habitat caused by the stream crossings and relocations through a combination of habitat enhancement measures and fish passage improvements.

Methodology
Habitat Enhancement – The habitat enhancement measures were designed to improve the productive habitat and carrying capacity in selected streams that are degraded by implementing instream habitat enhancement measures. Two streams designated by Maine Department of Inland Fisheries and Wildlife (MDIFW) as high quality trout streams deserving of special consideration were selected for instream habitat enhancement. Both streams contained segments in the immediate vicinity of the Turnpike crossings where existing habitat conditions could be substantially improved. The segments targeted for improvements in each of the streams provided relatively homogeneous habitat conditions with limited instream cover due to a general lack of boulders, woody debris and undercut banks. One of the habitat enhancement measures implemented was installation of log flow deflectors, which have been found to increase the depth and velocity of the main channel, create pools, scour fine sediments and divert water flow from an eroding bank. Another enhancement measure involved installation of submerged woody debris and boulder clusters to provide additional instream cover. A third enhancement measure involved construction of submerged log bank undercut structures to provide additional instream cover and stabilize the stream bank.

At six of the streams that need to be relocated additional habitat enhancement will be accomplished by creating new channels for sections of the six streams that now flow within roadway drainage swales. This will be done by either benching the swale into the embankment above the new streambed or by building a low profile berm between the swale and the stream at the same grade elevation. The substrate of the new stream channel will consist of a mixture of gravel and cobble material.

Fish Passage Improvements – The fish habitat improvement measures were designed to enable fish to enter and pass through culverts more freely by concentrating or backing up flow to increase water depths within the culverts under normal low flow conditions. Corrective actions that were implemented included creation of low flow channels through single barrel culverts, placement of a dam across one side of a two-barrel culvert to increase water depth on the other side during low flow periods and elimination of hydraulic jumps resulting from the culvert apron being higher than the existing streambed. Grades were also evened and redirected to facilitate entry into the channel within the culvert.

Summary of Findings

The above stream mitigation plan involved a combination of effective measures that are known to enhance instream habitat conditions. These habitat improvement measures were implemented in two separate reaches of high quality trout streams that lacked habitat structure and cover. The combined net benefit of all these measures adequately offset the net loss of streambed habitat associated with the proposed project. It should be noted that although the benefits associated with both the fish passage improvements and the separation of existing streams from swales are difficult to quantify, these efforts will result in substantial improvements over existing conditions. Improving fish passage opportunities at the various culverts will allow fish species to utilize additional productive habitat upstream of the Turnpike.

Implications for Future Research/Policies

The results of this mitigation effort have demonstrated that our understanding of the science and technology of fish habitat improvement enables fishery scientists to design and implement a variety of plans that can mitigate for unavoidable impacts of highway improvement projects on fish habitats.