

**NORTH COASTAL WATERSHED  
2007 Fish Population Data**

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**Commonwealth of Massachusetts**  
**Executive Office of Energy and Environmental Affairs**  
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**Massachusetts Department of Environmental Protection**  
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**Bureau of Resource Protection**  
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## Introduction

In late summer and early fall of 2007, fish population surveys were conducted in the North Coastal Watershed at six stations using techniques similar to Rapid Bioassessment Protocol V as described originally by Plafkin et al. (1989) and later by Barbour et al. (1999) (See Table 1). Standard Operating Procedures are described in *Fish Collection Procedures for Evaluation of Resident Fish Populations* (MassDEP 2006). Fish surveys also included a habitat assessment component modified from that described in Barbour et al. (1999).

## Methods

### Fish Collections

Fish collections were conducted by electrofishing using a Smith Root Model 12 battery-powered backpack electrofisher. A reach of between 70m and 100m was sampled by passing a pole mounted anode ring side to side through the stream channel and in and around likely fish holding cover. All fish shocked were netted and held in buckets. Sampling proceeded from an obstruction or constriction, such as a waterfall or shallow riffle, upstream to an endpoint at another obstruction or constriction. Following completion of a sampling run, all fish were identified to species, and a sub-sample were measured and weighed, after which all fish were released.

### Habitat Assessment

An evaluation of physical habitat quality is critical to any assessment of ecological integrity (Karr et al. 1986; Barbour et al. 1999). Habitat assessment helps to support understanding of the relationship between physical habitat quality and biological conditions, identifies obvious constraints on the attainable potential of a site, assists in the selection of appropriate sampling stations, and provides basic information for interpreting biosurvey results (US EPA 1995). Before leaving the sample reach during the 2007 fish population surveys, habitat qualities were scored using a modification of the evaluation procedure in Barbour et al. (1999). The matrices used to assess habitat quality are based on stream flow, key physical characteristics of the water body, and riparian area. Most parameters evaluated are instream physical attributes often related to overall land use and are potential sources of limitation to the aquatic biota (Barbour et al. 1999). The ten habitat parameters for moderate to high gradient streams are as follows: instream cover for fish, epifaunal substrate, embeddedness, sediment deposition, channel alteration, velocity/depth combinations, channel flow status, right and left bank vegetative protection, right and left bank stability, and, right and left bank riparian vegetative zone width. For moderate to low gradient streams, instream cover for fish is replaced with bottom substrate/available cover, epifaunal substrate is replaced with pool substrate characterization, embeddedness is replaced with pool variability, and velocity-depth combinations is replaced with channel sinuosity. Habitat parameters are scored, totaled, and when appropriate compared to a reference station to provide relative habitat ranking.

## Results

Results of the fish population surveys can be found in Table 2. It should be noted that young of the year (yoy) fish from most species (with the exception of salmonids) were not targeted for collection. Young of the year fishes that were collected, intentionally or not, are noted in Table 2. Scientific names of fishes are taken from American Fisheries Society Special Publication 29 (Nelson et al. 2004). A total of ten species were collected. Three of the ten species that were collected are classified as being "fluvial". Sampling was reported as being poor at SM03 and BB01A due to turbidity, and at NR01 due to a very shallow pebbly bottom. With regard to the habitat assessments, four stations were scored using low to moderate gradient criteria and two stations were scored using moderate to high gradient criteria. Results of the habitat assessments can be found in Table 3.

The RBP V protocol (Plafkin et al. 1989 and Barbour et al. 1999) calls for the analysis of the data generated from fish collections using an established Index of Biotic Integrity (IBI) similar to that described by Karr et al. (1986). Since no formal IBI for Massachusetts currently exists, the data provided by this sampling may be used to qualitatively assess the general condition of the resident fish population as a function of the overall abundance (number of species or richness, as well as individuals) and species composition (classifications listed below).

**Tolerance Classification** - Classification of tolerance to environmental stressors similar to that provided in Plafkin et al. (1989), Barbour et al. (1999), and Halliwell et al. (1999). Final tolerance classes are those provided by Halliwell et al. (1999).

**Macrohabitat Classification** – Classification by common macrohabitat use as presented by Bain and Meixler (2000) modified regionally following discussions between MassDEP and Massachusetts Department of Fish and Game (MA DFG) fishery biologists.

## Literature Cited

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**Table 1.** List of biomonitoring stations sampled for fish during the 2007 North Coastal Watershed survey including selected watershed and flow characteristics determined from USGS StreamStats (USGS 2013).

Station ID	Unique ID	Drainage Area (mi <sup>2</sup> )	Waterbody Name	Site Description	Sampling Date	7-Day, 10-Year Low Flow (cfs)	Urban Land cover (%)	Impervious Cover (%)
SB01	P0122	2.93	Shute Brook	upstream of Central Street (upstream of railroad tracks), Saugus	5-Oct-2007	0.079	84.4	46.8
NR01	P0127	10.7	Proctor Brook	just downstream from Howley Street Peabody	5-Oct-2007	0.58	75.4	40.2
SM03	P0124	3.98	Cat Brook	just upstream from Lincoln Street, Manchester	27-Sept-2007	0.049	19.7	5.27
BB01A	P0126	1.51	Beaverdam Brook	upstream at Chestnut Street, Lynnfield	27-Sept-2007	0.09	63.8	17
BP01	P0123	3.13	Bennetts Pond Brook	at Mall entrance south off Lynn Fells Parkway and east of Forest Street, Saugus (approximately 0.3 miles from confluence with Saugus River)	5-Oct-2007	0.22	75.5	31.7
HB02	P0125	1.32	Hawkes Brook	north of Hawkes Pond, upstream from Salem Street/Route 129, Lynnfield]	27-Sept 2007	0.0189	60.9	21.7

**Table 2.** Species and counts for fish collected during the 2007 North Coastal Watershed biomonitoring survey. Refer to Table 1 for a listing and description of sampling stations.

Common name	Scientific name	Tolerance <sup>1</sup>	Macrohab. Class. <sup>2</sup>	Station					
				SB01	NR01	SM03	BB01A	BP01	HB02
American eel	<i>Anguilla rostrata</i>	T	FD	21	~60	>100	~12	13	
white sucker	<i>Catostomus commersonii</i>	T	FD					6	
redfin pickerel	<i>Esox americanus</i>	T	MHG				6	68	9(1)
brook trout	<i>Salvelinus fontinalis</i>	I	FS			2			
mummichog	<i>Fundulus heteroclitus</i>	T	MHG		>139				
killifish or mummichog	<i>Fundulus</i> sp.	T	MHG			5			
banded killifish	<i>Fundulus diaphanus</i>	T	MHG	253					
nine-spined stickleback	<i>Pungitius pungitius</i>	T	MHG		1				
pumpkinseed	<i>Lepomis gibbosus</i>	T	MHG			48			1
largemouth bass	<i>Micropterus salmoides</i>	T	MHG			4		1	
yellow perch <sup>3</sup>	<i>Perca flavescens</i>	T	MHG						(43)

<sup>1</sup> Tolerance Classification from Halliwell et al. (1999).

T = tolerant, I = intolerant, M = moderately tolerant

<sup>2</sup> Macrohabitat Classification from Bain and Meixler (2000).

FD = fluvial dependant, MHG = macrohabitat generalist, FS = fluvial specialist

<sup>3</sup> most yellow perch appeared to be young of the year

**Table 3.** Habitat assessment summary for fish stations sampled during the 2007 North Coastal Watershed survey. For within-reach parameters, scores ranging from 16-20 = optimal; 11-15 = suboptimal; 6-10 = marginal; 0-5 = poor. For riparian parameters, scores ranging from 9-10 = optimal; 6-8 = suboptimal; 3-5 = marginal; 0-2 = poor. Maximum habitat score for any site = 200. Refer to Table 1 for a listing and description of sampling stations.

<b>Stations</b>	<b>SB01</b>	<b>NR01</b>	<b>SM03</b>	<b>BB01A</b>	<b>BP01</b>	<b>HB02</b>
<b>PARAMETERS (within reach)</b>						
Bottom Substrate Available Cover for Fish	3	8	13	13	n/a	n/a
Instream Cover for Fish <sup>1</sup>	n/a	n/a	n/a	n/a	16	16
Pool Substrate Characterization	5	5	12	15	n/a	n/a
Epifaunal substrate <sup>1</sup> (in sampled areas only)	n/a	n/a	n/a	n/a	13	18
Pool Variability	2	2	16	10	n/a	n/a
Embeddedness <sup>1</sup> (riffles and runs)	n/a	n/a	n/a	n/a	17	18
Channel Alteration	1	11	18	20	11	18
Sediment Deposition	20	19	13	15	16	17
Channel Sinuosity	1	3	8	13	n/a	n/a
Velocity Depth Combinations <sup>1</sup>	n/a	n/a	n/a	n/a	12	8
Channel Flow Status	20	15	9	16	16	2
<b>PARAMETERS (riparian)</b>						
Bank Vegetative Protection-Left Bank	5	10	9	10	7	8
Bank Vegetative Protection-Right Bank	10	10	9	10	2	8
Bank Stability-Left Bank	10	8	4	9	8	7
Bank Stability-Right Bank	10	8	4	10	8	7
Riparian Vegetative Zone Width-Left Bank	3	2	9	10	3	3
Riparian Vegetative Zone Width-Right Bank	10	4	5	10	2	8
<b>Total</b>	<b>100</b>	<b>105</b>	<b>129</b>	<b>161</b>	<b>131</b>	<b>138</b>

<sup>1</sup> moderate to high gradient habitat assessment form  
n/a = not applicable