

Technical Memorandum
Chicopee River Watershed 2008
Fish Population
Monitoring and Assessment



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Commonwealth of Massachusetts
Executive Office of Environmental Affairs
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Department of Environmental Protection
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Bureau of Resource Protection
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Introduction

Fish population surveys were conducted in the Chicopee River 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 Figure 1). Standard Operating Procedures are described in MassDEP Method CN 075.1 *Fish Collection Procedures for Evaluation of Resident Fish Populations* (MassDEP 2006). Surveys also included a habitat assessment component modified from that described in the aforementioned document (Barbour et al 1999).

Fish populations were sampled by electrofishing using a Smith Root Model 12 battery powered backpack electrofisher. A reach of between 80m 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, upstream to an endpoint at another obstruction or constriction such as a waterfall or shallow riffle. Following completion of a sampling run, all fish were identified to species, measured, and released. Results of the fish population surveys can be found in Table 1. It should be noted that young-of-the-year (yoy) fish from most species (with the exception of salmonids) are not targeted for collection. Young-of-the-year fishes that are collected, intentionally or not, are noted in Table 1.

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 supports 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 2008 Chicopee River Watershed fish population surveys, habitat qualities were scored using a modification of the evaluation procedure in Barbour et al. (1999). The matrix used to assess habitat quality is based on key physical characteristics of the water body and riparian zone. 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 are as follows: instream cover for fish, epifaunal substrate, embeddedness, sediment deposition, channel alteration, velocity/depth combinations, channel flow status, right and left (when facing downstream) bank vegetative protection, right and left bank stability, right and left bank riparian vegetative zone width. Habitat parameters are scored, totaled, and when appropriate compared to a reference station to provide relative habitat ranking (See Table 2).

Fish Sample Processing and Analysis

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 effort were used to qualitatively assess the general condition of the resident fish population as a function of the overall abundance (number of species and individuals) and species composition classifications listed below.

1. 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).
2. Macrohabitat Classification - Classification by common macrohabitat use as presented by Bain (1996) modified regionally following discussions between MassDEP and MA Division of Fish and Game (DFG) fishery biologists.
3. Trophic Classes - Classification which utilizes both dominant food items as well as feeding habitat type as presented in Halliwell et al.(1999).

Station Habitat Descriptions and Results

CHB4.5, Chicopee Brook upstream of Cushman St. in Monson.

Chicopee Brook at Cushman Street is a third order stream with a drainage area of approximately 41 Km². Although the brook flows through a small impoundment in South Monson (Zero or Ellis Mill Pond), it is essentially a free-flowing brook of moderate gradient at the sampling location. Only two of the seven primary habitat parameters (channel flow status and velocity depth combinations) scored optimal within this reach. Instream cover for fish, embeddedness, channel alteration, and sediment deposition scored suboptimal (epifaunal substrate was not scored). For secondary parameters, bank vegetative protection scored optimal, bank stability scored suboptimal, and riparian vegetative zone width scored optimal and marginal in the right and left zones respectively. The final habitat score was 138 (of a possible 180) (See Table 2). The watershed upstream of the sampling station is primarily forested with some mining, medium density residential, and agricultural land use mixed in.

Fish species captured in order of abundance included eastern blacknose dace *Rhinichthys atratulus*, longnose dace *Rhinichthys cataractae*, white sucker *Catostomus commersonii*, common shiner *Luxilus cornutus*, brown trout *Salmo trutta*, and rainbow trout *Oncorhynchus mykiss*. The total dominance by fluvial dependants/specialists and the presence of reproducing brown trout, which are classified as intolerant to pollution, are indicative of a stable flow regime and excellent water quality. The relatively low number of brown trout may be reflective of some less than ideal habitat conditions such as sedimentation.

Chicopee Brook is listed Class B Cold Water in the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b). The Massachusetts Department of Fisheries and Game (MA DFG) however, does not identify Chicopee Brook as a "Cold Water Fishery Resource" (MA DFG 2007). It is unclear why Chicopee Brook is absent from MA DFG's list. Additional monitoring should be conducted to document the extent of the cold water fishery.

CHB5.1, Chicopee Brook downstream of Bliss Street (and Zero Manufacturing Company Dam) in Monson.

Located approximately 300 meters downstream of the nine acre impoundment named Zero Mill Pond (Ellis Mill Pond) and approximately 1 Km upstream of CHB4.5 (described above), Chicopee Brook downstream of Bliss Road (CHB5.1) is a third order stream with a drainage area of approximately 38.8 Km². The brook is of moderate gradient at this location with a large pool located at the top of the sampled reach. Four of the seven primary habitat parameters scored optimal. Embeddedness and sediment deposition scored suboptimal (epifaunal substrate was not scored). For secondary parameters, bank vegetative protection and bank stability scored optimal and riparian vegetative zone width scored optimal and marginal in the left and right zones respectively. The marginal scoring in the right zone was due to the presence of a lawn at the Polish American Club. The final habitat score was 151 of a possible 180 (See Table 2). The watershed upstream of the sampling station is primarily forested with some mining, low density residential, and agricultural land use mixed in.

Fish species captured in order of abundance included eastern blacknose dace *Rhinichthys atratulus*, white sucker *Catostomus commersonii*, longnose dace *Rhinichthys cataractae*, brook trout *Salvelinus fontinalis*, tessellated darter *Etheostoma olmstedii*, common shiner *Luxilus cornutus*, brown bullhead *Ameiurus nebulosus*, yellow perch *Perca flavescens*, and redbreast sunfish *Lepomis auritus*. The dominance by fluvial dependants/specialists and the presence of what appeared to be wild brook trout, which are classified as intolerant to pollution, are indicative of a stable flow regime and excellent water quality. The brown bullhead, redbreast sunfish and yellow perch most likely originated in the small impoundment located upstream.

Chicopee Brook is listed Class B Cold Water in the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b), however, the Massachusetts Department of Fisheries and Game (MA DFG)

does not identify Chicopee Brook as a “Cold Water Fishery Resource” (MA DFG 2007). It is unclear why Chicopee Brook is absent from MA DFG’s list. Additional monitoring should be conducted to document the extent of the cold water fishery.

COB5.88, Conant Brook downstream of Route 32 in Monson

Originating from a number of small drinking water reservoirs, Conant Brook downstream of Maple Street is a third order stream with a drainage area of approximately 23 Km². The sampled reach included a small partially breached dam and was of moderate gradient. Four of the seven primary habitat parameters scored optimal within this reach. Channel alteration and sediment deposition scored suboptimal (epifaunal substrate was not scored). For secondary parameters, bank vegetative protection scored suboptimal, bank stability scored optimal and suboptimal on the left and right banks respectively, and riparian vegetative zone width scored marginal and poor in the left and right zones respectively. The marginal and poor scores for riparian vegetative zone width were due to a mowed christmas tree farm on the right and lawns on the left. The final habitat score was 139 of a possible 180 (See Table 2). The watershed upstream of the sampling station is primarily forested with some medium density residential land use interspersed.

Fish species captured in order of abundance included eastern blacknose dace *Rhinichthys atratulus*, fallfish *Semotilus corporalis*, common shiner *Luxilus cornutus*, white sucker *Catostomus commersonii*, brook trout *Salvelinus fontinalis*, tessellated darter *Etheostoma olmstedii*, bluegill *Lepomis macrochirus*, and brown bullhead *Ameiurus nebulosus*. It should be noted that all three bluegill were young of the year (YOY). The heavy dominance by fluvial dependants/specialists and the presence of multiple age classes of reproducing brook trout, which are classified as intolerant to pollution, are indicative of a stable flow regime and excellent water quality. The relatively low number of brook trout may be reflective of some less than ideal habitat conditions such as sedimentation and/or channel alterations.

Conant Brook is not listed and therefore classified (by default) as Class B the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b). The Massachusetts Department of Fisheries and Game (MA DFG) identifies Conant Brook as a “Cold Water Fishery Resource” (MA DFG 2007). Although “wild” brook trout were present, numbers were very low and therefore additional monitoring should be conducted before considering any changes to current classification in the SWQS.

Middle Branch of the Swift River at Neilson Rd. in North New Salem

Middle Branch Swift River adjacent to Neilson Road is a small third order stream with a drainage area of approximately 12 Km². The sampled reach is free flowing and of moderate to high gradient at the sampling location. Five of the seven primary habitat parameters scored in the optimal category. Sediment deposition and channel flow status scored suboptimal. Sediment deposition appeared to be the result of road construction which was ongoing at the time of sampling. For secondary parameters, bank vegetative protection and riparian vegetative zone width scored optimal and bank stability scored optimal and suboptimal on the right and left banks respectively. The final habitat score was 174 of a possible 200 (See Table 3). The watershed upstream of the sampling station is primarily forested with a very small amount of agricultural and residential landuse mixed in.

Fish species captured in order of abundance included eastern blacknose dace *Rhinichthys atratulus*, creek chub *Semotilus atratulus*, brook trout *Salvelinus fontinalis*, white sucker *Catostomus commersonii*, common shiner *Luxilus cornutus*, and creek chubsucker *Erimyzon oblongus*. The total dominance by fluvial dependants/specialists and the presence of multiple age classes of reproducing brook trout, which are classified as intolerant to pollution, are indicative of a stable flow regime and excellent water quality.

The Middle Branch Swift River is tributary to Quabbin Reservoir and is therefore classified a Class A Public Water Supply in the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b). The Massachusetts Department of Fish and Game (MA DFG) identifies the Middle Branch Swift River as a “Cold Water Fishery Resource” (MA DFG 2007).

West Branch Swift River 1.25 Km upstream of Jennison Road (adjacent to Cooleyville Road) in Wendell

The West Branch Swift River at this location is a first-order moderate gradient stream with a drainage area of only 5 Km². The sampled reach was just upstream of an old beaver dam. All habitat parameters scored within the optimal category. Although all four velocity depth combinations were present, it was noted that there was a lack of deep water habitat. The final habitat score was 190 of a possible 200 (See Table 3). The watershed upstream of the sampling station is almost entirely forested with the exception of few isolated residences.

Fish species captured in order of abundance included brook trout *Salvelinus fontinalis*, slimy sculpin *Cottus cognatus*, and Atlantic salmon *Salmo salar*. The total dominance by intolerant, coldwater, fluvial dependants/specialists as well as multiple age classes of reproducing brook trout is indicative of a stable flow regime and excellent water quality.

The West Branch Swift River is tributary to Quabbin Reservoir and is therefore classified a Class A Public Water Supply in the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b). The Massachusetts Department of Fish and Game (MA DFG) identifies the West Branch Swift River as a "Cold Water Fishery Resource" (MA DFG 2007).

Moose Brook upstream of Brook Road in Hardwick

Moose Brook 1.15 Km upstream of Brook Road in Hardwick is a large second order stream with a drainage area of approximately 22 Km². Although the brook flows through a small impoundment located a short distance upstream, the sampled reach was free flowing and of moderate gradient. All habitat parameters scored within the optimal category and the final habitat score was 178 of a possible 200 (See Table 2). The watershed upstream of the sampling station is primarily forested with some low density residential and agricultural land use mixed in.

Fish species captured in order of abundance included eastern blacknose dace *Rhinichthys atratulus*, longnose dace *Rhinichthys cataractae*, white sucker *Catostomus commersonii*, common shiner *Luxilus cornutus*, brown bullhead *Ameiurus nebulosus* and an individual brook trout *Salvelinus fontinalis*. The dominance by moderately tolerant fluvial dependants/specialists is indicative of a stable flow regime and good water quality. The relatively low number of brook trout or other cold water fish species is most likely reflective of warmer summer water temperatures.

Moose Brook is unlisted and therefore classified (by default) as Class B in the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP 2006b). The Massachusetts Department of Fisheries and Game (MA DFG) does not identify Moose Brook as a "Cold Water Fishery Resource" (MA DFG 2007).

This memorandum will be forwarded to the Massachusetts Department of Fisheries and Game (MA DFG) Division of Fisheries and Wildlife (MassWildlife) Field Headquarters and MassWildlife District Offices in the districts where sampling was conducted

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Figure 1.
Location of sampling stations
Chicopee River Watershed
Fish Population Survey 2008

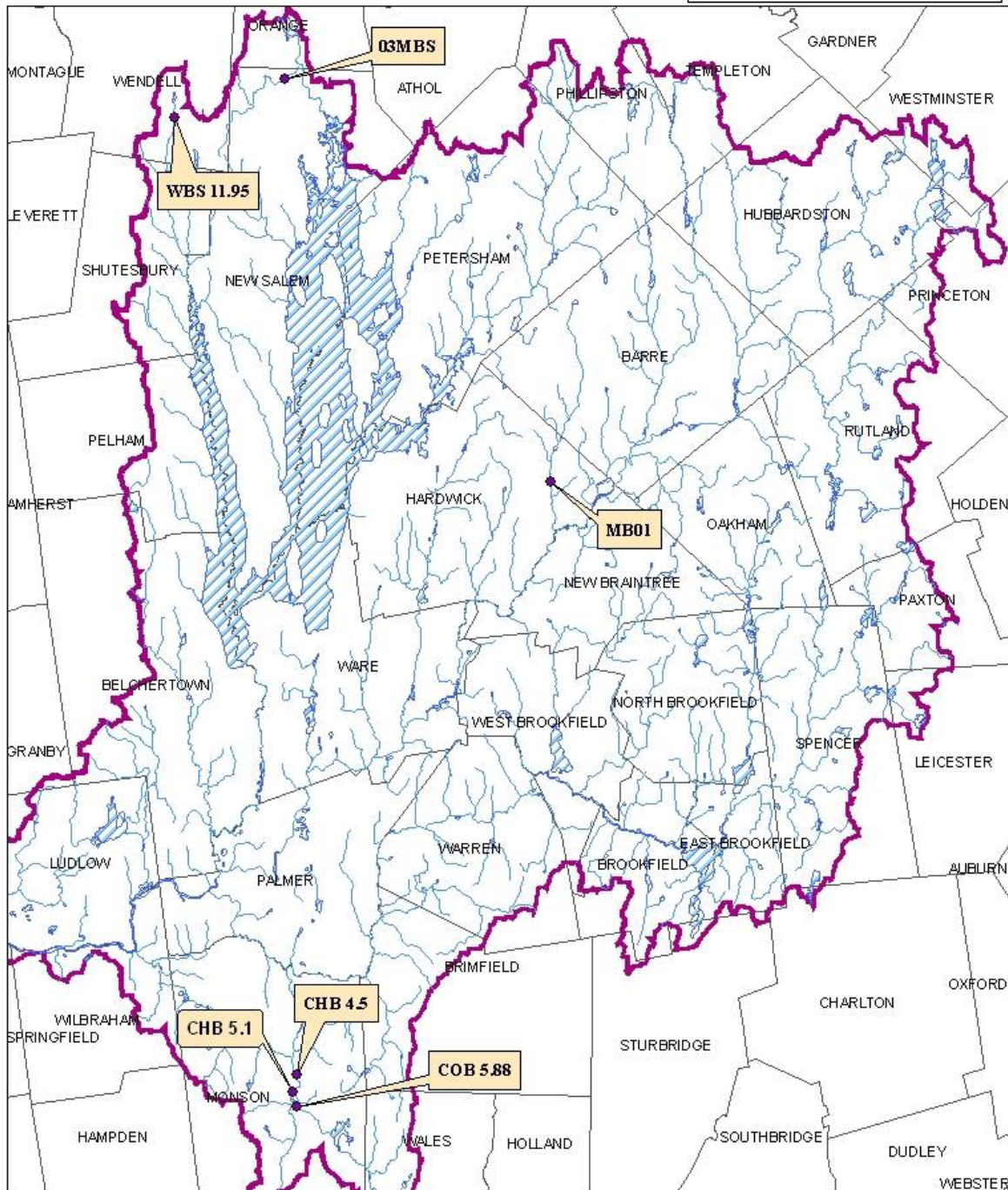
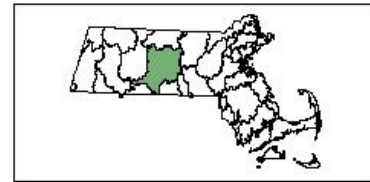


Table 1. List of fish population survey station locations and results from the 2008 Chicopee River Watershed survey.

Station Description	Date	Species Code ¹																	COMMENTS
		CRC	SC	FF	BG	BB	CS	WS	EBT	RBS	LND	TD	AS	CCS	BT	YP	RT	BND	
CHB4.5, Chicopee Brook, Monson, beginning at Cushman St. and running approximately 80 meters upstream	21 Aug. 2008			-	-	-	4	9	-	-	18	-	-	-	3(1)	-	1	19(1)	BT ≤ 70 mm counted as YOY, BND ≤ 40 mm counted as YOY
CHB5.1, Chicopee Brook, Monson, beginning below the Polish American Club off Bliss St. and running approximately 80 meters upstream	21 Aug. 2008			-	-	2	2	15(1)	7	(1)	9(1)	7	-	-	-	2(1)	-	39(2)	BND ≤ 40 mm counted as YOY, WS ≤ 51 mm counted as YOY, FF ≤ 41 mm counted as YOY, EBT < 73 mm counted as YOY
COB5.88, Conant Brook, Monson, beginning downstream of Rt. 32 and running approximately 80 meters upstream	21 Aug. 2008			24(1)	(3)	1	15	11(2)	5(2)	-	-	5	-	-	-	-	-	32(1)	BND ≤ 36 mm counted as YOY, WS ≤ 40 mm counted as YOY, LND ≤ 30 mm counted as YOY, YP < 60 mm counted as YOY, RBS ≤ 60mm counted as YOY
WM03MBS, Middle Branch of the Swift River, North New Salem, running approximately 100 meters adjacent to Nellson Rd.	22 Aug. 2008	37	-	-	-	-	2	5	26	-	-	-	-	1	-	-	-	40	Pickup approximately 70%
WBS11.95, West Branch of the Swift River, Wendell, running approximately 80 meters adjacent to Cooleyville Rd.	22Aug. 2008	-	8(1)	-	-	-	-	-	68(15)	-	-	-	2	-	-	-	-	-	EBT ≤ 60 mm counted as YOY, SC ≤ 30 counted as YOY
MB01, Moose Brook, Hardwick, running approximately 80 meters adjacent to Brook Rd.	Aug 22 2008			-	-	1	20	27(3)	1	-	50(2)	-	-	-	-	-	-	140(4)	WS ≤ 50 mm counted as YOY, LND ≤ 45 counted as YOY

¹ SPECIES CODE	COMMON NAME	SCIENTIFIC NAME	TOLERANCE/MACROHABITAT CLASSIFICATION
CRC	creek chub	<i>Semotilus atromaculatus</i>	moderately tolerant / fluvial dependant
SC	slimy sculpin	<i>Cottus cognatus</i>	intolerant / fluvial dependant
FF	fallfish	<i>Semotilus corporalis</i>	moderately tolerant / fluvial dependant
BG	bluegill	<i>Lepomis macrochirus</i>	tolerant / macrohabitat generalist
BB	brown bullhead	<i>Ameiurus nebulosus</i>	tolerant / macrohabitat generalist
CS	common shiner	<i>Luxilus cornutus</i>	moderately tolerant / fluvial specialist
WS	white sucker	<i>Catostomus commersonii</i>	tolerant / fluvial dependant
EBT	brook trout	<i>Salvelinus fontinalis</i>	intolerant / fluvial dependant
RBS	redbreast sunfish	<i>Lepomis auritus</i>	tolerant / macrohabitat generalist
LND	longnose dace	<i>Rhinichthys cataractae</i>	intolerant / fluvial dependant
TD	tessellated darter	<i>Etheostoma olmstedii</i>	moderately tolerant / fluvial specialist
AS	Atlantic salmon	<i>Salmo salar</i>	intolerant / fluvial dependant
CCS	creek chub sucker	<i>Erimyzon oblongus</i>	intolerant / fluvial specialist
BT	brown trout	<i>Salmo trutta</i>	tolerant / macrohabitat generalist
YP	yellow perch	<i>Perca flavescens</i>	tolerant / macrohabitat generalist
RT	rainbow trout	<i>Oncorhynchus mykiss</i>	intolerant / fluvial dependant
BND	eastern blacknose dace	<i>Rhinichthys atratulus</i>	moderately tolerant / fluvial specialist

^{*} number in parentheses indicate the number of total which were young-of-the-year (YOY).

Table 2. Habitat assessment summary for fish population stations sampled during the 2008 Chicopee River watershed survey. For primary parameters, scores ranging from 16-20 = optimal; 11-15 = suboptimal; 6-10 = marginal; 0-5 = poor. For secondary parameters, scores ranging from 9-10 = optimal; 6-8 = suboptimal; 3-5 = marginal; 0-2 = poor. Refer to Table 1 for a listing and description of sampling stations.

Stations		Chicopee Brook (Cushman St.)	Chicopee Brook (Bliss St.)	Conant Brook	Middle Branch Swift River	West Branch Swift River	Moose Brook
Primary Habitat Parameters		Score (0-20)					
INSTREAM COVER (for Fish)		13	18	19	19	18	18
EPIFAUNAL SUBSTRATE		NA	NA	NA	19	19	18
EMBEDDEDNESS		12	15	16	16	18	18
CHANNEL ALTERATION		15	17	15	19	20	17
SEDIMENT DEPOSITION		15	13	15	14	19	18
VELOCITY-DEPTH COMBINATIONS		17	19	19	19	16	17
CHANNEL FLOW STATUS		19	19	20	12	18	16
Secondary Habitat Parameters		Score (0-10)					
BANK VEGETATIVE PROTECTION	left	9	9	8	9	9	9
	right	9	9	7	9	9	9
BANK STABILITY	left	8	9	9	8	9	9
	right	8	9	7	10	9	9
RIPARIAN VEGETATIVE ZONE WIDTH	left	3	10	3	10	10	10
	right	10	4	1	10	10	10
Total Score		138*	151*	139*	174	184	178

N/A not assessed
* of a possible 180