Because the Presumpscot River basin is one of the most highly urbanized basins in the state, the growing recognition of the serious biological impacts of urbanization on small streams will direct increased assessment activities to these systems. These streams are typically small, with a large percentage of their watershed covered by impervious surfaces, resulting in rapid, unattenuated delivery of stormwater runoff.

Introduction

Geography

The Presumpscot River basin contains approx. 1,070 sq. miles of surface area and 1,124 linear miles of rivers and streams. The second largest lake in the state, Sebago Lake, serves as both the headwaters for the Presumpscot River and as a drainage basin for the Crooked River. Three miles south of Bethel, the Crooked River begins meandering southward out of Songo Pond towards Sebago Lake. It passes through the forests, hills, and alder swamps of Albany Township, Waterford, and Harrison before flowing into the developed Long Lake/Sebago Lake watershed at the north end. The total length of this river mainstem is approximately 58 miles. On the eastern side of Sebago Lake in Standish, just outside of the developed area of North Windham, the Presumpscot River begins its journey southward towards the very developed areas of Westbrook and the major coastal city of Portland. The Pleasant River enters in Windham, having originated out of an area 8 miles East of Sebago Lake. The Presumpscot River runs through a mixture of rural, urban and heavy urban areas along its route before emptying into Casco Bay. A third significant river within this basin is the Royal River which rises out of Sabbathday Lake in New Gloucester 9 miles northeast of Sebago Lake. It runs east, north, and then south in that town, and continues southward through the developed town of Gray and into the very developed coastal areas of North Yarmouth and Yarmouth. There are ten other sampled streams within this basin listed in Basin Table 8, p. 153.

Biomonitoring Activities in the Basin

Period of Record: 1984 – 1997
Waterbodies Sampled: 18
Established Stations: 52
Number of Sampling Events: 86

Wastewaster Discharges

One paper mill and two municipal treatment plants. (Pulping portion of mill closed in 1999)

Note: There are also 9 other municipal treatment plants discharging into tidal waters in this basin. These impacts are not measured by the Biological Monitoring Program.

Other Sources

Biochemical Oxygen Demand from fish hatcheries; a naval air station; miscellaneous industrial discharge; urban runoff; combined sewer overflows.

Flow Regulation

Water level controlled by approx. 65 dams including 8 FERC hydro projects, all <10,000 KW (total capacity). Flows on the mainstem of the Presumpscot are highly regulated by Eelweir Dam on Sebago Lake.

Quality

Good to excellent in the upper basin but overall decline in many stations proceeding towards Casco Bay.

Drainage area	Average Annual Discharge	Wastewater Flow Volume (Major Industrials and All Municipal Discharges Only)	Mainstem Average Dilution
Presum.---641mi2 (at Smelt Hill Dam)	Presum.---639 cfs (at Smelt Hill Dam)	25.5 mgd (39.5 cfs)	16:1

Overview of Biological Monitoring Activities

Biological monitoring activities in the Presumpscot River basin may be categorized as addressing four primary issues: mainstem dams and point sources; non-point sources including urban and agricultural impacts; toxic contamination and fish hatcheries.

In all, 55 stations have been established in the basin, 12 of which occur on the mainstem. Much of the biological monitoring data from the basin was collected within the last three years and nearly all stations have been visited within the last five years. Four new stations were established in 1998 (Stas. 337, 338, 339, 348). The next round of intensive NPDES

data collection is scheduled to occur during the 1999 field season in preparation for permit renewals in 2000.

Eighteen stations are falling below the standards of their assigned aquatic life classification according to the most recent sampling event available. Six stations are exceeding assigned aquatic life standards and attaining the standards of the next higher classification (Basin Table 8, p. 153; Basin Map 8, p. 169). Two stations have improved over the period of record, raising attainment to the next higher classification (Basin Map 8, Stas. 66 and 70).

The primary point source issue is the S.A.P.P.I Company S.D. Warren paper mill in Westbrook (Stas. 71, 72, 238, 295, 296). Because the discharge from the paper mill is five to ten times greater in volume than any other discharge in the basin, it has been the focus of much monitoring and regulatory activity (see Case Study 11: *Biocriteria as a TMDL Modeling Endpoint, Lower Presumpscot River* and Current Status and Issues). A further issue associated with the S.A.P.P.I mill is the operation of five dams owned by the company beginning with Eelweir Dam on Sebago Lake. These dams are currently in the second stage of the relicensing process. A discussion on the biological effects of flow alteration such as is caused by the construction of dams, may be found in Part I Chapter 1, p. 16.

Capisic Brook (Stas. 256, 257) flows through a highly urbanized area and is monitored to assess urban non-point sources. Monitored waterbodies that are affected by agricultural NPS and/or urban runoff include Cole Brook, Trout Brook, the Pleasant River, the Royal River, and the Crooked River.

Evaluation of potential or known in-place contamination (toxic materials) is the focus in Mare Brook, Goosefare Brook and Red Brook. Fish hatcheries are found on Eddy Brook and Hatchery Brook. Additional stations in the Presumpscot River Basin are monitored to assess background ambient conditions or as regional reference stations.

Historical Perspective

Milestone Events in the Basin

YEAR	WATERBODY	AFFECTED STATIONS	EVENT
1730	Mainstem	72, 295, 296	Construction of the first dam at Presumpscot Falls (site of current Smelt Hill dam)
1898	Mainstem	72; 295; 296	Hydor-electric generating capabilities added at Smelt Hill dam
1993	Mainstem	72, 295, 296	Floodwaters temporarily breach the Smelt Hill Dam and destroy generating capabilities
1990	Basin	All stations	Casco Bay Watershed National Estuary Project funded by US EPA

1997	Goosefare Brook	48, 49, 50, 271, 272, 337, 338, 339	S.W.A.T. funded Univ. of Maine study to investigate biological impacts of in-place contamination and interstate crossings
1998	Mainstem	72, 295, 296	TMDL approved by EPA for control of TSS and BOD

Current Status and Issues

Biological Impacts Associated with Human Activities:

Alteration of hydrologic regime is the cause of many changes to the benthic biological community in the Presumpscot River basin. In particular, the mainstem dam (Smelt Hill) below the South African Pulp Paper Industry (SAPPI) paper mill further serves to exacerbate the detrimental effects of the mill discharge. See Part I Chapter 1 p. 16, for a general discussion of biological impacts of dams in rivers.

Samples of the benthic macroinvertebrate community collected within impoundments in the Presumpscot River generally reflect the unfavorable ponded conditions by revealing low numbers of organisms, a reduced number of different types of organisms, and a greater or lesser loss of typical riverine organisms, with replacement by sediment dwelling organisms having faster generation times. Impounded situations where water quality conditions are generally good, typically result in attainment of Class C aquatic life standards (MRSA Section 464.10: structure and function is maintained; some replacement of sensitive taxa by taxa more tolerant of altered conditions), for example Stations 325-329. However, input of an excessive pollutant load into an impoundment often results in conditions sufficiently compromised to result in non-attainment of minimum aquatic life standards (see Case Study 11, and Basin Map and Basin Table 8, Stations 72 and 296). Biological Monitoring Program sampling protocols allow for a longer exposure time for samplers in impoundments (56 days versus the typical 28 days) to accommodate the slower organism recruitment rate in impoundments.

Urban non-point source impacts have been assessed in several streams in the lower Presumpcot River basin, including Capisic Brook, Trout Brook and Kimball Brook. These streams are typically small, with a large percentage of their watershed covered by impervious surfaces, resulting in rapid, unattenuated delivery of stormwater runoff (including a heavy sediment load and toxic substances) to the stream. Removal of tree canopy cover results in increased solar gain and elevated temperature regimes. In Capisic Brook continuous temperature recording during August of 1996 revealed that the urbanized site (Sta. 257) had an average temperature nearly 10 degrees warmer than the upstream reference site (Sta. 256). See Case Study 1, p. 31, for a synopsis of findings in Capisic Brook. The resulting community in a severely impacted stream like Capisic Brook typically consists of highly tolerant non-insect taxa like leeches, worms and mollusks. Insect taxa are lost due to altered physical (temperature, habitat, flow volume) and chemical (dissolved solids, toxics, low oxygen, etc.) conditions.

Fish hatcheries are found on several spring-fed streams draining to the Pleasant River, north of Gray, Maine (Sta. 142 and 220). Fish hatcheries were formerly considered quite benign and, though licensed, were not held to strict discharge limits for solids and biochemical oxygen demand. Biological monitoring of benthic communities downstream of fish hatcheries has revealed detrimental impacts, however, due to enrichment effects of high nutrients and suspended organic solids. These inputs typically cause a significant increase in the abundance of organisms, with a predominance of filter-feeding caddisflies and black fly larvae. While this effect may be considered beneficial in terms of the ability of the down-stream reaches to produce fish, it should be borne in mind that the aquatic life indigenous to Maine's naturally nutrient-poor streams are not adapted to such enriched conditions. The alteration tips the balance in favor of opportunistic, generalist taxa that may out-compete and displace indigenous, rare and specialized organisms. The Department is in the process of relicensing all the hatcheries in the State and will be imposing stricter limits for biochemical oxygen demand, total suspended solids and, in some cases, for phosphorus.

Hatchery Bk. downstream of MDIFW Dry Mills Fish Hatchery, August, 1999

Future Needs

Because the Presumpscot River basin is one of the most highly urbanized basins in the state, the growing recognition of the serious biological impacts of urbanization on small streams will direct increased assessment activities to these systems. Streams monitored for urban non-point source pollution in the Presumpscot basin to date include Capisic Brook, Frost Gully Brook, Trout Brook, Kimball Brook, and Goosefare Brook. Most of the monitored stations are failing to attain the aquatic life standards of their assigned classification. The Presumpscot River TMDL (Case Study 11) directs that the license

limits for total suspended solids and biochemical oxygen demand for the SAPPI pulp and paper mill are provisional until it can be demonstrated that the biological community is in attainment of applicable standards. Therefore, the State and the mill will work collaboratively to annually monitor the effects of the changes in discharge quality on the benthic community, for several years. Overshadowing all these negotiations however, is the announcement by the S.A.P.P.I Company of its plans to eventually shut down the pulping operations at the Westbrook mill. Current plans call for continued paper-making at the mill. This change in operations would eliminate the prevailing water quality problems in the mill effluent as well as in the Presumpscot River itself. A related factor is the proposed removal of the Smelt Hill Dam. The Corps of Engineers has drawn down the Smelt Hill impoundment, temporarily, during the summer of 1999, in order to facilitate investigations related to subsequent dam removal. This temporary activity, as well as the probable, permanent removal of the dam, have major positive implications for the status of the river's aquatic community. With the granting of state and federal approval to remove the actively generating Edwards Dam on the Kennebec River in Augusta (see Part I Chapter 1 p. 19), a national precedent has been set directing responsible parties to seriously consider dam decommissioning as an alternative to relicensing, if the power generation benefits are out-weighed by the environmental or ecological damage caused by the dam. The Edwards Dam was breached in a public ceremony attended by the Governor of the State of Maine and the Secretary of the United States Department of the Interior, in July of 1999. It should be a State priority to thoroughly document the biological consequences of these major restorations of the hydrologic regime of two of the State's significant rivers.

Case Study 10

Investigation of Impacts from Multiple Sources of Toxic Contamination, Goosefare Brook

Goosefare Brook is a small stream that originates in The Heath in Saco and empties into Saco Bay. The Maine Turnpike crosses the stream in several locations resulting in extensive culverting and relocation of the original stream bed. The stream also flows through an area of extensive industrial development which includes Saco Defense, Inc., Saco Steel and some smaller businesses.

Goosefare Brook is classified as Class B. The control site (Sta. 48), located upstream of the Maine Turnpike, attains Class B aquatic life standards. Examination of the raw data and computed variables reveals a high diversity of pollution sensitive taxa (Fig. 19-c *Line #505*; Fig 20-*Above*). Appendix 1 provides a description of the variables and Appendix 2 explains box plot data summaries. No other sampled locations downstream of the control site (Stas. 49; 50; 271 and 272) attain standards for their statutory classification, Class B. Examination of community structure results at stations 49 and 271 indicate toxic impacts, probably from a combination of point and non-point sources, when compared to the control site (Sta. 48), located above the Maine Turnpike. This can be seen in the extremely low number of organisms (Fig.19-a, *Line #506 & 507*) and the sparse richness (Fig.19-b, *Line #506*; Fig 20). Station 271 is the most severely impacted location and fails to meet the minimum provisions of the State's aquatic life standards due to low total abundance of organisms (Fig.19-a *Line # 506)*. This location is an isolated, undisturbed wooded area immediately downstream of the Saco Steel property and about 1/4 mile downstream of a major culverting and relocation of the stream under the Maine Turnpike and Exit 5. Visually, the water quality of the stream changes from clear and colorless above the Turnpike to opaque, dusky orange at Station 271, to opaque dusky grey at Station 49. Iron bacteria was evident at both these stations. Conductivity is a useful, measure of non-specific contaminants in water that carry an electrical charge, such as ions and dissolved solids. This can be caused by dissolved metals or salts. The conductivity at Station 271 is 6 times higher than at the control site, Station 48 (Table 14). High levels continue downstream all the way to the Old Orchard Rd. site. Field investigations in September, 1995 revealed the existence of a small tributary to Goosefare Brook having iron levels seven times higher than the chronic toxic standard for

aquatic life (Table 14). This tributary enters the Brook about 75 yards upstream of Station 271. However, levels of iron were also slighty over the chronic level at a point apparently upstream of Saco Steel property surface water drainage, but downstream of the interstate system. Conductivity was also high at this location. The downstream-most site (Station 272) revealed a significant rebound in numbers of organisms and richness of taxa (Fig 19a & b- *Line #508*; Fig. 20) although it still fails to attain Class B standards due to poor representation by pollution-sensitive taxa (Fig. 19-c *Line #508*). The distribution and abundance of taxa at this station suggests, though, that toxic contamination is no longer a factor in determining community structure .

A combination of causes have probably contributed to the severe impact on the aquatic community in the vicinity of Exit 5 of the Maine Turnpike. Saco Defense Inc. discharged heavy metals into the stream prior to May 1987, and volatile organic carbons were detected by MDEP in a groundwater discharge to surface water. This discharge is currently being mitigated by a barrier well system. A number of semi-volatile organic compounds have been detected below the Maine Turnpike but above Saco Defense Inc. property. Saco Steel Company is upstream of Saco Defense, Inc. and just upstream of the sampled tributary to Goosefare Brook. There is known groundwater and soil contamination by metals and hydrocarbons, including PCBs on this property. It was operated as a junkyard between the 1970's and 1980's, and in May 1990 received a license to be operated as a metal processing facility. Violations of environmental protection provisions of this license have been documented since its issuance. A number of other non-point sources below the Maine Turnpike are probable contributors to the Brook.

Because of the complicated convergence of multiple stressors on this waterbody, funding was secured in 1997, through the Surface Water Ambient Toxics Program, to further investigate aquatic life and water quality impacts. Dr. Alexander Huryn and graduate student, Thomas Woodcock, of the University of Maine, Orono Campus, conducted benthic macroinvertebrate and leaf decomposition studies during the 1997 and the 1998 field seasons. The goal of this effort is to investigate changes in secondary production and to more clearly define the stressor:response relationships in this stream. The implications of significant impacts from the interstate system alone, as distinct from the site specific problems in Goosefare Brook watershed, make this an important question to resolve especially in light of plans to widen the Maine Turnpike. Preliminary approval for additional funding to the University of Maine has been granted through a US EPA supplemental grant program for watershed restoration. The focus of this work will be development of a Total Maximum Daily Load (TMDL) model for Goosefare Brook.

Table 14 Values for water chemistry parameters in Goosefare Brook in the vicinity of Exit 5 of the Maine Turnpike in Saco, Maine.

PARAMETER	LOCATION				
	Above ME. Turnpike	**Trib to GFB above Saco Steel; below Pike**		**below Saco Steel; below Pike**	**Old Orchard Rd**
Conductivity	111			**685**	**369**
Lead	ND .002	ND .002	ND .002	ND .002	
Zinc	0.003	0.008	0.008	0.008	
Iron	0.21	**7.2**	**1.1**	**1.5**	
Chromium	ND .0005	ND .0005	ND .0005	ND .0005	

Figure 19

Box plots showing values of community structure variables (a.) total abundance; b.) richness; c.) EPT) for the Goosefare Brook at four sites above and below the Turnpike and industrialized areas in Saco. Values are compared to the distribution of all values for all sampling events within a given class in the Maine DEP Biological Monitoring Program database.
N=490 n_A=115 n_B=162 n_C=123 n_{NA}=90

505= Control (Sta.48) **506= Below Turnpike (Sta.271) 507= Below I-195 and industries** (**Sta.49**) 508= Recovery (Sta.272)

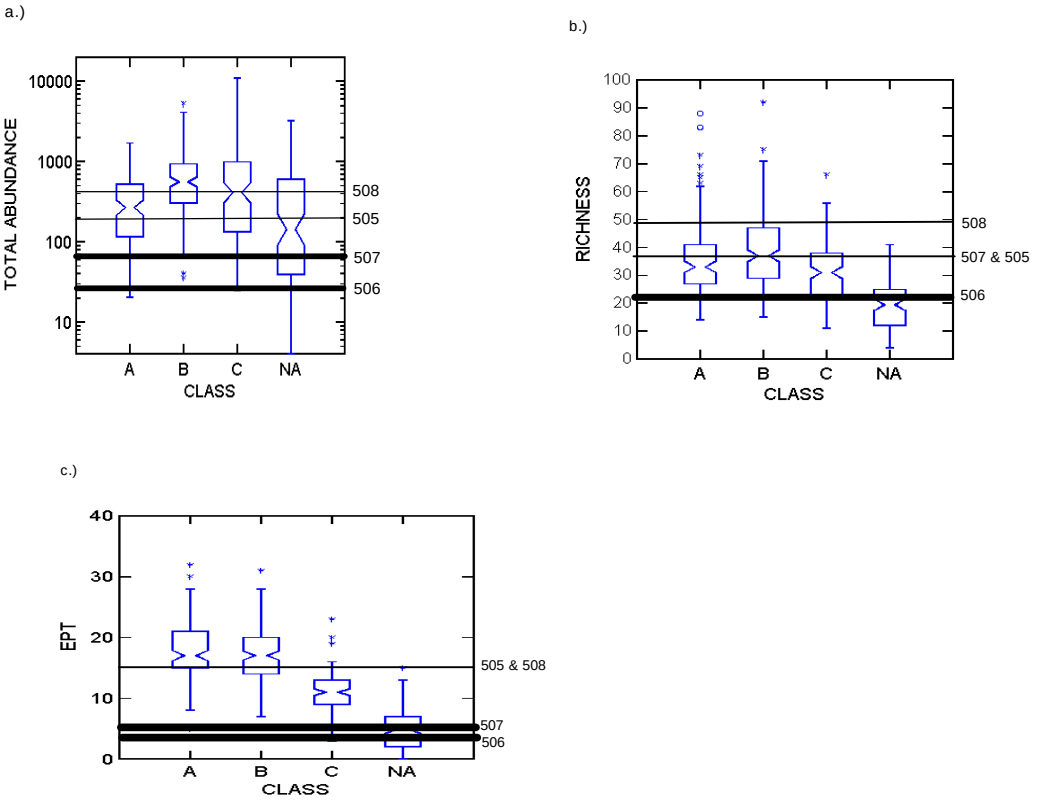

Figure 20 Community structure differences between sites on Goosefare Brook above and below industrial development and the Maine Turnpike in Saco, Maine

CASE STUDY 11

Biocriteria as a TMDL Modeling Endpoint, Lower Presumpscot River

The Presumpscot River exhibits non-attainment of aquatic life standards in several locations. In recent years EPA has required that a Total Maximum Daily Load (TMDL) be established for impaired river systems, such as the Presumpscot, for which existing, required pollution controls are inadequate to attain applicable water quality standards. In December, 1998 the Headquarters office of the Environmental Protection Agency, in Washington, D.C., approved a Total Maximum Daily Load (TMDL) finding, prepared by Maine Department of Environmental Protection, for the Presumpscot River. This approval was significant for several reasons: it is the first TMDL to be approved in Region I EPA (the New England States); and it is the first time in New England and in the Nation, that biocriteria and bioassessment findings have been used to identify a specific pollutant stressor and to serve as the quantitative response variable, from which to develop a pollutant discharge limit. The wastewater discharge license that has resulted from this effort requires an initial 30% reduction in the discharge of total suspended solids and biochemical oxygen demand from the SAPPI, S.D. Warren Pulp and Paper mill in Westbrook. Provisions are included in the license for further reductions (up to 61%) if the initial levels still fail to provide for attainment of aquatic life standards. The Department was able to apply this innovative approach to improving water quality and aquatic life conditions in the Presumpscot River because of the convergence of several factors:

- The State has a sound legal basis for use of biological monitoring findings to force action because clearly defined aquatic life standards exist in the Water Quality Classification law and technically defensible numeric criteria have been established by the Department;

- Data essential to the modeling of the recommended total suspended solids load reductions on the Presumpscot River, had been collected to assess aquatic life issues on the Androscoggin River, under State requirements for a 401 Water Quality certification for a hydropower license renewal;

- Teamwork and collaboration between MDEP water quality modelers and aquatic biologists resulted in an approach that integrated technical information and expertise from both disciplines, and provided a means for the Department to control a stressor for which the State has no standards.

The Presumpscot River, the outlet of Maine's largest lake, Sebago Lake, flows through the most densely populated county in the State of Maine. As the State's industrial receiving waters go, the Presumpscot is a very small river, having a drainage area of 641 square miles, less than $1/10^{th}$ that of the Penobscot River. It is these unfortunate circumstances that contribute to the very poor water quality in the lower Presumpscot River. The average mainstem dilution ratio (available river volume to combined major industrial and municipal wastewater flow volume) to assimilate industrial and municipal waste inputs is only about half that available on the Penobscot or Kennebec Rivers. The Department of Environmental Protection issues wastewater discharge licenses that set the allowable amounts of pollutants that industries may discharge to waters of the State. These limits are scientifically determined in order to preserve water quality sufficient to maintain all designated uses and criteria established, by law, for the river. Typically, the wasteload allocation is based on complex engineering models of the projected effect of the discharge on dissolved oxygen levels. Dissolved oxygen sags due to input of oxygen-consuming wastes are one of the most important negative effects of wastewater discharges. However, major advances in our ability to detect changes in instream biological communities are revealing detrimental effects caused by stressors that might previously have been unrecognized or thought insignificant. This is one of the greatest strengths of biological monitoring: to detect real instream, ecological problems caused by unmonitored and unrecognized stressors. This case study explores one such stressor, total suspended solids (TSS) and the means by which the Department developed a TMDL, based on findings about the biological community.

Biological monitoring in the Presumpscot River in Westbrook, below the SAPPI S.D. Warren Pulp and Paper mill discharge (Stas. 72, 296), has consistently revealed non-attainment of Class C aquatic life standards (1984, 1994, 1995, 1996) using standard Department methods (rock basket artificial substrates). Upstream samples (1996) indicate attainment of Class C aquatic life standards. The MDEP numeric aquatic life criteria are based on statewide data collections over a 14 year period with analysis of over 400 sampling events. The criteria are in the form of a statistical model (linear discriminant model) that yields the probability that a test sample belongs to one of four statistical classes that correspond to the aquatic life standards in the Water Quality Classification law (Class AA/A; Class B; Class C and Non-attainment of standards). Probabilities equal to or greater than 60% are required for a sample to be considered in attainment of a given class (Part I Chapter 1).

The Presumpscot River biological monitoring samples reveal a shift in the benthic macroinvertebrate community from 90% insects above the mill to about 50% insects below the mill, with 15%-35% loss of taxonomic richness and 46%-60% loss of the sensitive Ephemeroptera-Plecoptera-Trichoptera (EPT) groups. Pollution-sensitive insect taxa were replaced, in the downstream samples, by a predominance of snails and worms, adapted to utilization of settled solids. The SAPPI mill accounts for 80% of the total suspended solids load, at low flow, in the Presumpscot River. Below the mill the dilution ratio is only 9:1 during low flow (7Q10) conditions. In comparison to other paper mills in the State, the SAPPI mill effluent is considered high strength for solids. Calculated mean ambient concentrations of total suspended solids in the Presumpscot below the mill were 32% to 39% greater than ambient levels on the Androscoggin river below two different paper mills, with the same documented values for background TSS concentrations. For the most part the incremental TSS increase on the Androscoggin River, due to paper mill discharges, is within 1 ppm of background, while on the Presumpscot the mill discharge resulted in a three times greater increase. Direct observations in the river during macroinvertebrate and fish tissue sampling revealed a heavy suspended and settled solids load. Samplers and gill nets were coated with flocculent fibers and water clarity was dramatically reduced. Upstream of the SAPPI outfall, it was possible to see samplers on the river bottom at 2.5 meters of depth while in the effluent plume, just 600 m downstream, visibility was less than 0.5 meter. Visibility at a sampling station 3.2 km downstream of the outfall remained significantly impaired. Data collected during the same time period as the biological monitoring indicated there were no violations of criteria for dissolved oxygen or toxic materials. The Department concluded that the cause for non-attainment of aquatic life standards was excessive loading of solids from the SAPPI discharge.

The conclusion that a heavy solids load was the cause of non-attainment of aquatic life standards was supported by data and observations from the Androscoggin River during re-licensing investigations for four hydropower dams in the vicinity of the International Paper (IP) mill in Jay, Maine. In both the Presumpscot and the Androscoggin Rivers, paper mill discharges are to impoundments with similar hydraulic properties such as velocity and depth. The rivers upstream of both mills are also impounded by two or more dams, yet all upstream impoundments attain at least Class C aquatic life standards. Low flow conditions exacerbate the impacts of heavy solids loads to the benthic community because the solids settle to the river bottom, rather than being carried, in suspension, downstream. As was the case on the Presumpscot River, aquatic life standards were similarly not met in the impoundments downstream of the IP discharge outfall in 1995, a low flow year. In 1996, increased dilution of IP's discharge was gained from a wetter than normal summer and in addition, the mill experimented with polymer addition that resulted in a reduction of TSS discharge of about 63%**.** Biological monitoring data collected the summer of 1996 revealed a dramatic positive response in the benthic macroinvertebrate community, resulting in the attainment of aquatic life standards throughout the study area. As compared to 1995, the abundance of individuals in 1996 was three times higher; the proportion of insects increased from 9% to 88**%;** richness was doubled; and EPT tripled in the impoundment directly downstream of the IP outfall. Further confirmation of solids as the probable cause for non-attainment the previous year was made by SCUBA diver observations of the accumulation of a flocculent deposit of solids on the substrate during the low flow/high solids load year (1995) in the Androscoggin River impoundments. Solids did not accumulate in 1996 when discharge of TSS was reduced.

To determine the appropriate TSS limits for the SAPPI discharge on the Presumpscot River a method was developed that considered both the Androscoggin River data and Presumpscot River data. The decision was based on two years of sampling on the Presumpscot River and 3 years of sampling on the Androscoggin. The method used aquatic life attainment versus non-attainment status, river flows during macroinvertebrate sampler colonization periods, and mill discharge of TSS during sampler colonization periods (the summer low flow period). The mill TSS mass effluent loads were prorated to 10 year low flow conditions in order to compute sufficiently protective TSS limits. These values were then plotted against aquatic life attainment or non-attainment results for each river. They are summarized in Table 15 and Figures 21 and 22. The Androscoggin River plot showed that attainment occurred at loads under 7,000

lbs/day of TSS. In the Presumpscot River, with much lower dilution available, non-attainment conditions were documented at about 5,900 lbs/day. From this analysis it was concluded that it would require a maximum TSS load of, at most, 5500 lbs/day on the Presumpscot to begin to see any improvement in the resident biological community. This figure represents a 61% reduction in the then-existing license limits for solids and will be imposed in July of 2001 if aquatic life attainment has not been achieved by the initial 30% reduction. An additional 10% reduction will be imposed if standards are not achieved by July of 2003.

The 5,500 lbs/day monthly TSS average on the new SAPPI mill license is a seasonal limit only, applicable between May 1 and September 30. It was allowed that limits this low might not be necessary during cold, higher flow winter months, when there is a lower level of biological activity. Winter limits were set at past demonstrated performance or a monthly average of 9,950 lbs/day from October 1 through April 30. The TMDL, and thus the license, are written as a phased approach, requiring on-going, annual monitoring of the benthic macroinvertebrate community to determine if attainment is achieved at the initial recommended levels. There are provisions to further decrease the allowable TSS limits if attainment is not achieved, or to lock in levels that successfully result in aquatic life attainment.

Table 15 Summary of TSS TMDL Calculations for the Presumpscot River					
	SDW 1995	**SDW 1996**	**IP 1995**	**IP 1996**	**IP 1997**
Aquatic Life Status	N/A	N/A	N/A	A	A
Months	June-Aug	Aug-Sept	June-Aug	Aug-Sept	June-Aug
Flow (cfs)	418	463	2114	2982	4116
30Q10 Flow (cfs)	330	330	1900	1900	1900
30Q10 Dilution	10.1	10.1	24.0	24.0	24.0
TSS Discharged	7454	8795	19804	5750	13495
TSS Prorated 30Q10	5885	6269	17800	3663	6229

Figure 21
International Paper Loads Prorated to Androscoggin River 30Q10 1900 cfs

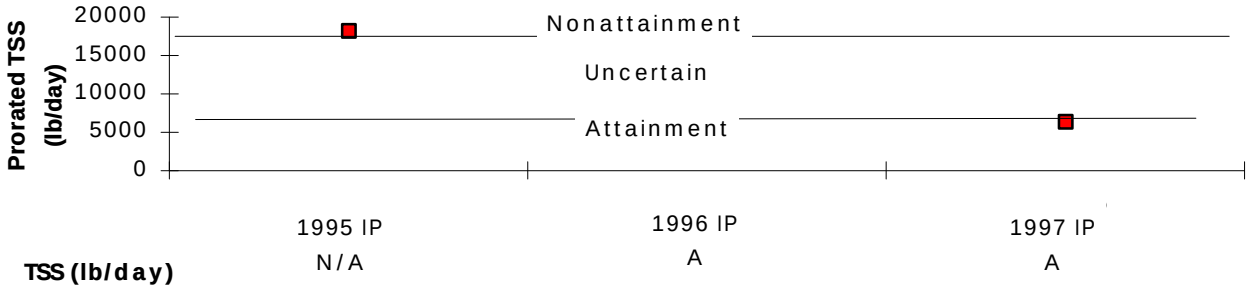

Figure 22
SDW Loads Prorated to Presumpscot River 30Q10
330 cfs