Mousam River near Sanford, Maine

The majority of sampling effort in the Salmon Falls basin has focused on stations on the mainstem affected by dams and wastewater discharges. The Salmon Falls River has been managed as Class B for many years but has experienced continual problems attaining Class B standards for dissolved oxygen, bacteria and aquatic life, in the lower reaches,. All aquatic life monitoring stations downstream of the Berwick sewage treatment plant fail to attain assigned Class B standards.

Introduction

Geography

The Saco River basin covers 1,696 square miles. The River originates at Saco Lake just north of Crawford Notch, New Hampshire and flows through the Mt. Washington Valley. About half of the drainage area is in the State of New Hampshire. Just east of Conway, New Hampshire it crosses into Maine, near Fryeburg, winds northeast for a short distance, and then meanders south-southeast through the mountains and hills of Western Maine. The Saco River continues southeast towards the urban coastal areas of Biddeford and Saco before emptying into Saco Bay. The total length from the Maine/New Hampshire border is approximately 85 miles. There are four other sampled streams in the Saco River basin listed in Basin Table 9.

The Piscataqua/Salmon Falls River basin covers 1,356 sq. miles. The Piscataqua River is the tidal portion of the Salmon Falls River. The Biological Monitoring Program has not conducted any sampling in the tidal portions of the river so the remainder of this report will focus on the Salmon Falls River. For its entire length, including below head of tide, the River forms the Maine/New Hampshire border. A little more than half of the drainage area is in New Hampshire. A dam at Milton Pond, the headwaters of the Salmon Falls, regulates flows for the entire river. The lower section of the Salmon Falls is essentially entirely impounded by four dams within the last five miles of river,

before head of tide at South Berwick. The Great Works River, the largest tributary to the Salmon Falls, enters just south of South Berwick, Maine. The Mousam R. is another sampled river within this basin. It flows through the industrialized and urban areas of Sanford and coastal Kennebunk before joining the Gulf of Maine above the mouth of the Piscataqua. There are three other sampled streams within the Salmon Falls/Piscataqua River basin listed in Basin Table 9.

Basin Summary Statistics	
Biomonitoring Activities in the Basin	**Period of Record**: 1984-1995 **Waterbodies Sampled**: Total of 13 (Saco basin: 5; Salmon Falls basin: 8) **Established Stations**: Total of 30 for both basins combined **Number of Sampling Events**: Saco basin: 14; Salmon Falls: 25
Wastewater Discharges	**Saco River. Basin**--3 municipal treatment plants; 1 energy recovery facility. **Salmon Falls River Basin**--5 municipal treatment plants (3 of which are in New Hampshire) **Note:** There are also 4 other municipal treatment plants in the Saco R. basin and 5 municipal treatment plants in the Piscataqua R. basin discharging into tidal waters. These impacts are not measured by the Biological Monitoring Program.
Other Sources	Contaminated tannery site; urban runoff; CSO's; NPS nutrients
Flow Regulation *(Total Capacity)	**Saco R. Basin**--Water level controlled by approximately 47 dams including 11 FERC-licensed hydro-electric projects: 9 are greater than 10,000KW* **Salmon Falls R. Basin**--Water level controlled by approximately 38 dams including 12 FERC-licensed hydro-electric projects, all less than 10,000KW*.
Quality	**Saco River**: good except for impacts of hydrologic alteration from multiple dams **Salmon Falls River**: fair to good in the upper reaches; poor in impoundments and the estuary below Berwick, Maine

Drainage Area	**Average Annual Discharge**	**Wastewater Flow Volume (Major Industrials and All Municipal Discharges Only)**	**Mainstem Average Dilution (approx.)**
Salmon Falls R.--326 mi^2 (at So. Berwick)	Salmon Falls R 110 cfs (min. flow requirement at Somersworth, NH)	Salmon Falls R.: 2.61mgd * (4.04 cfs) (*current actual point source flows)	27:1

Overview of Biological Monitoring Activities

The Saco and Salmon Falls River basins were last scheduled for intensive NPDES monitoring in 1995 and are due again in the 2000 field season. In 1995 one new station was added in the Saco and 6 new stations were added in the Salmon Falls basin. Of eleven stations in the Saco River basin eight meet or exceed assigned aquatic life standards (Basin Table 9, p. 157; Basin Map 9, p. 170). Station 120 on Cooks Brook was sampled only once in 1987, and has since been discontinued. It is downstream of a site of groundwater contamination that has since been cleaned up. Monitoring at Station 68, upstream of Station 120, nearer the zone of influence of the contaminated groundwater, showed improvement from non-attainment of minimum standards in 1987 to Class A by 1993, as a result of remediation activities. A return visit to Station 68 in 1995 revealed that Class A standards are still met in Cooks Brook. It is probable that non-attainment on Deep Brook can be explained by slow moving flows and a shifting, unstable habitat, but the stream should be re-sampled, with an effort made to establish a new sampling station in a riffle area. The remaining attainment problems in the Saco River basin are in the vicinity of mainstem dams (Stas. 166 and 167). Aquatic life monitoring for water quality certification, as a requirement of dam re-licensing, uncovered attainment problems downstream of the Skelton Dam in Dayton and downstream of the West Buxton Dam in Standish. Non-attainment was attributed to release of inadequate minimum flows from these dams. Re-licensing negotiations have resulted in higher minimum flow requirements and provisions for on-going monitoring of the benthic macroinvertebrate community to assess aquatic life attainment under the new operating regime.

Monitoring in the Salmon Falls basin includes stations on a number of small streams (Adams, Branch, and Carpenter Brooks, etc.) as well as a series of stations on the Mousam Rver and the Salmon Falls mainstem (Basin Table 9, p. 157; Basin Map 9, p. 170). Carpenter Brook was sampled to determine if impacts were detectable from in-place chromium contamination from the site of a former tannery. Although the upstream site only attained Class C standards, it is likely that a soft-bottom, slow moving habitat is the cause. Station 217, located below the tannery degreasing lagoons attained Class B standards.

The Mousam River was sampled in 3 locations for the first time in 1995 (Stas. 258; 259; 275). The upstream-most station (Sta. 258) did not attain minimum standards of Class C. This station is located within about 150 meters downstream of the Mousam Lake Dam. Because of the high concentration of suspended organic matter associated with lake outlet flows, macroinvertebrate communities downstream of dams are typically dominated by filter-feeding caddis flies and blackflies. These organisms “bloom” as a result of the abundant available food source. Station 258 was non-attainment due to the fact that the community was 77% filter-feeding Hydropsychid caddisflies. This hyper-

dominance of one type of organism is considered to be a natural, lake outlet phenomenon. The two remaining stations on the Mousam attain Class C standards but the station downstream of the Sanford sewage treatment plant was ruled as borderline between Class C and non-attainment. Only about 100 organisms were collected, with a low abundance of sensitive and filter-feeding taxa that are usually associated with the enriched conditions downstream of sewage treatment plants. The Department has been monitoring the plant due to toxicity limits set for the license (ammonia, aluminum and copper). Station 259 is located downstream of the Sanford landfill and was sampled to assess detrimental effects of landfill contamination. During the 1999 field season additional stations were established on the Mousam, to provide additional information to sort out environmental conditions on this river. Some new stations serve as local, upstream references, relative to the landfill and the treatment plant.

The majority of sampling effort in the Salmon Falls basin has focused on stations on the mainstem affected by dams and wastewater discharges. The sequence of stations from upstream to downstream, beginning with Station 51, above the Great Falls Upper Dam impoundment in Berwick is Station 51; 276; 52; 273; 274; and 243. See Basin Table 9, p. 157 and Basin Map 9, p. 170, for sampling locations. The Salmon Falls River has been managed as Class B for many years but has experienced continual problems attaining Class B standards, for dissolved oxygen, bacteria and aquatic life, in the lower reaches. All aquatic life monitoring stations downstream of the Berwick sewage treatment plant fail to attain assigned Class B standards. There are five sewage treatment plants on the Salmon Falls between Milton, New Hampshire and head of tide in South Berwick and collectively they account for about 20% of the river flow. The Berwick and the Somersworth, New Hampshire plant combined, contribute about 80% of the effluent load. Non-point sources account for only about 10% (Mitnik, P.J. 1999). The detrimental effect of the considerable load is exacerbated by the fact that discharges are to impoundments in the river. The resulting stagnation of flow eliminates re-aeration and contributes to conditions favorable for excessive algae growth. Algal respiration further contributes to dissolved oxygen problems in the river. Toxicity from ammonia, discharged by the largest treatment plants, further degrades the river's ability to support aquatic life. The Department has been involved in extensive negotiations with the State of New Hampshire, affected towns in Maine and New Hampshire, and the EPA, to develop a phased Total Maximum Daily Load (TMDL) for the Salmon Falls to bring the river into attainment of dissolved oxygen standards. It has been concluded that Class B standards are unattainable, without dam removals, for a five mile segment between the Route 9 bridge in Berwick and head of tide in South Berwick. A public hearing was held in January, 1999, to commence a Use Attainability Analysis, with the recommendation that it be legally downgraded to Class C. The Maine State Legislature approved the downgrade of the river from Class B to Class C in May, 1999. The US EPA formally approved the TMDL for the Salmon Falls River in November, 1999. Ongoing monitoring of the benthic

macroinvertebrate community, following implementation of the provisions of the TMDL, will track the degree of improvement in aquatic life conditions resulting from river management activities.