2007

Dioxin Monitoring Program 2006 Report

Maine Department of Environmental Protection

DIOXIN MONITORING PROGRAM

(Including data on Dioxin-like PCBs collected in the Surface Water Ambient Toxics Monitoring Program)

2006

REPORT

DEPARTMENT OF ENVIRONMENTAL PROTECTION
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TABLE OF CONTENTS PAGE

LIST OF FIGURES PAGE

LIST OF TABLES PAGE

GLOSSARY

CTEh- Coplanar PCB toxic equivalents with non-detects at half the detection level

DMP- Dioxin Monitoring Program

DTEd- Dioxin toxic equivalents with non-detects at the detection level

DTEh- Dioxin toxic equivalents with non-detects at half the detection level

DTEo- Dioxin toxic equivalents with non-detects as zero

FTALr- Fish Tissue Action Level for reproduction

FTALc- Fish tissue Action Level for cancer

pFTAL- potential Fish Tissue Action Level

MCDC- Maine Center for Disease Control and Prevention (formerly Maine Bureau of Health)

SWAT- Surface Water Ambient Toxics monitoring program

TAG- SWAT Technical Advisory Group

TCDD- 2378-tetrachlorodibenzo-p-dioxin, i.e. the most toxic dioxin

TCDF- 2378-tetrachlorodibenzofuran

TEF- Toxicity equivalency factor

OVERVIEW

This report contains the findings from the 2006 Dioxin Monitoring Program with respect to the goal of the program, "to determine the nature of dioxin contamination in the waters and fisheries of the State". The three primary objectives are:

1. Human health assessment, Fish Consumption Advisories
2. Trends evaluation
3. 1997 Dioxin law, no discharge provision, continued compliance

The figures in this report also contain the (dioxin-like) coplanar PCB data gathered as part of DEP's Surface Water Ambient Toxics (SWAT) monitoring program. Coplanar PCB data are included in order to show the total exposure to dioxin-like compounds from consumption of certain fish from several Maine rivers in order for the Maine Center for Disease Control (MCDC) to make a complete assessment of the fish consumption advisories. The coplanar PCB data are distinct from the dioxin data and the reporting requirements of the Dioxin Monitoring Program. Sources of the coplanar PCBs are not known, but likely include historic use and discharge in Maine and long range transport and atmospheric deposition.

1. HUMAN HEALTH ASSESSMENT, FISH CONSUMPTION ADVISORIES

- MCDC has issued Fish Consumption Advisories for the Androscoggin, Kennebec, Penobscot, Sebasticook, and Salmon Falls Rivers, due to dioxins or a combination of dioxins and dioxin-like coplanar PCBs. These advisories are more restrictive than the statewide mercury advisory.

- An evaluation of the health implications of dioxin/furan concentrations in fish in Maine Rivers requires a comparison to a health benchmark. MCDC uses a health benchmark that is expressed as a specific fish tissue concentration of dioxins and furans, referred to as a "Fish Tissue Action Level" or FTAL[1]. For the present report, MCDC compares the most recent data on dioxins and furan levels in fish tissue to its current FTALc of 1.5 parts per trillion (ppt) for protection of cancer-related effects. MCDC also compares the sum of dioxin, furans, and coplanar PCB levels to its FTALr of 1.8 parts per ppt for protection of noncancer or reproductive related effects. MCDC additionally compares all data to a lower pFTAL of 0.4 ppt, which is under consideration as a potential revision to current FTALr, to account for background dietary exposure to dioxins and furans.

- Concentrations of dioxins and furans (DTEh) in bass, trout and white perch at all sampling locations were below the current FTALc of 1.5 ppt (Figure 1). Concentrations in white suckers below the bleached kraft pulp and paper mills on the Androscoggin River were at or exceeded the FTALc but concentrations in white suckers on the Kennebec and Penobscot rivers were below the FTALc (Figure 2).

- Concentrations of dioxins and furans in fish from some stations on the Androscoggin and Sebasticook rivers below pulp and paper mills, a tannery, and a former textile mill were at or

above the pFTAL of 0.4 ppt (Figure 1). They were also above levels found in fish at reference stations unaffected by point source discharges (~0.2 ppt).

- When the concentrations of dioxin-like coplanar PCBs (CTEh) were added to the dioxin concentrations, total toxic equivalents approached or exceeded the current FTALr of 1.8 ppt at 3 locations (Sebasticook River, Androscoggin River, and Androscoggin Lake) (Figure 1). Coplanar PCB data were collected in the Surface Water Ambient Toxics (SWAT) monitoring program. Sources are unknown but likely include historic use and discharge in Maine and long-range transport and atmospheric deposition.

- Mean dioxin and furan levels in Androscoggin Lake have not been reported above the current FTALc in any species since 1996, but the mean concentration was at the pFTAL in white perch in 2006 (Figure 1). Addition of coplanar PCBs resulted in an exceedance of the pFTAL in bass and a near exceedance of the FTALr in white perch.

Figure 1. Dioxin (DTEh) and coplanar PCB (CTEh) toxic equivalents (95th UCL) in bass (and brown trout BNT, rainbow trout RBT, and white perch WHP) in the Androscoggin, Kennebec, Sebasticook,Presumpscot, and Salmon Falls rivers, 2006

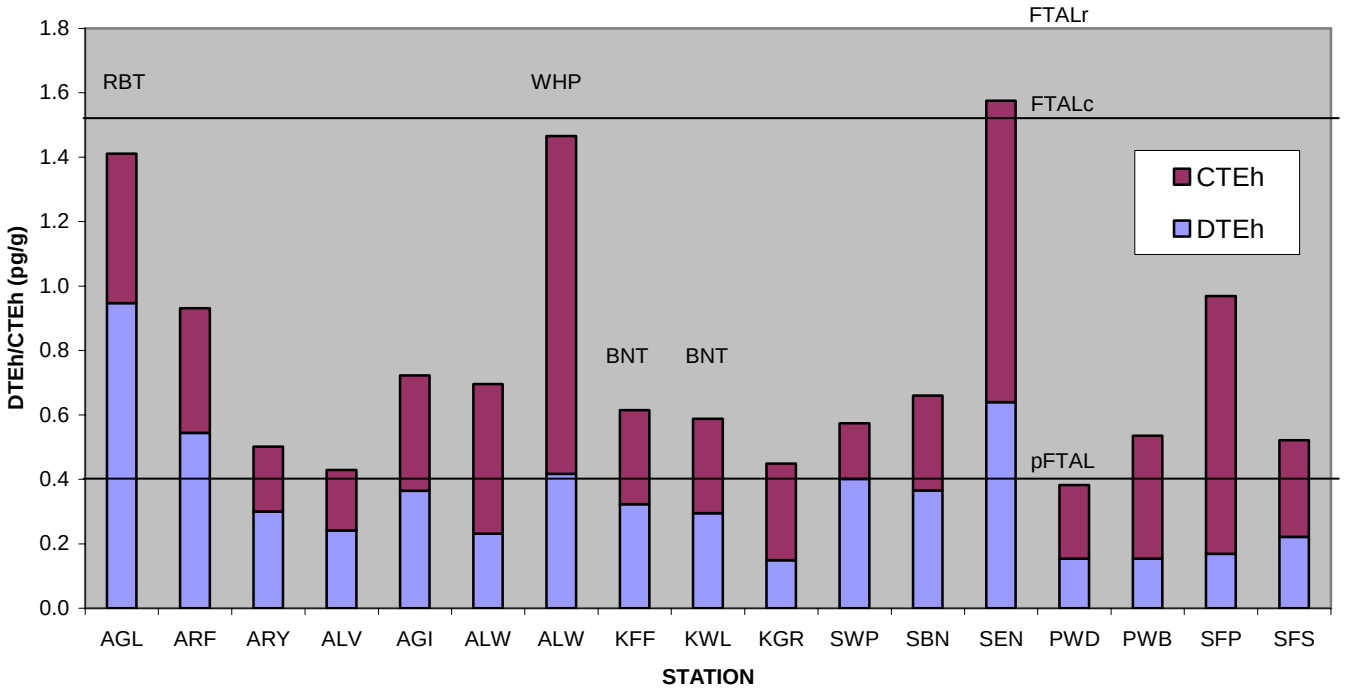
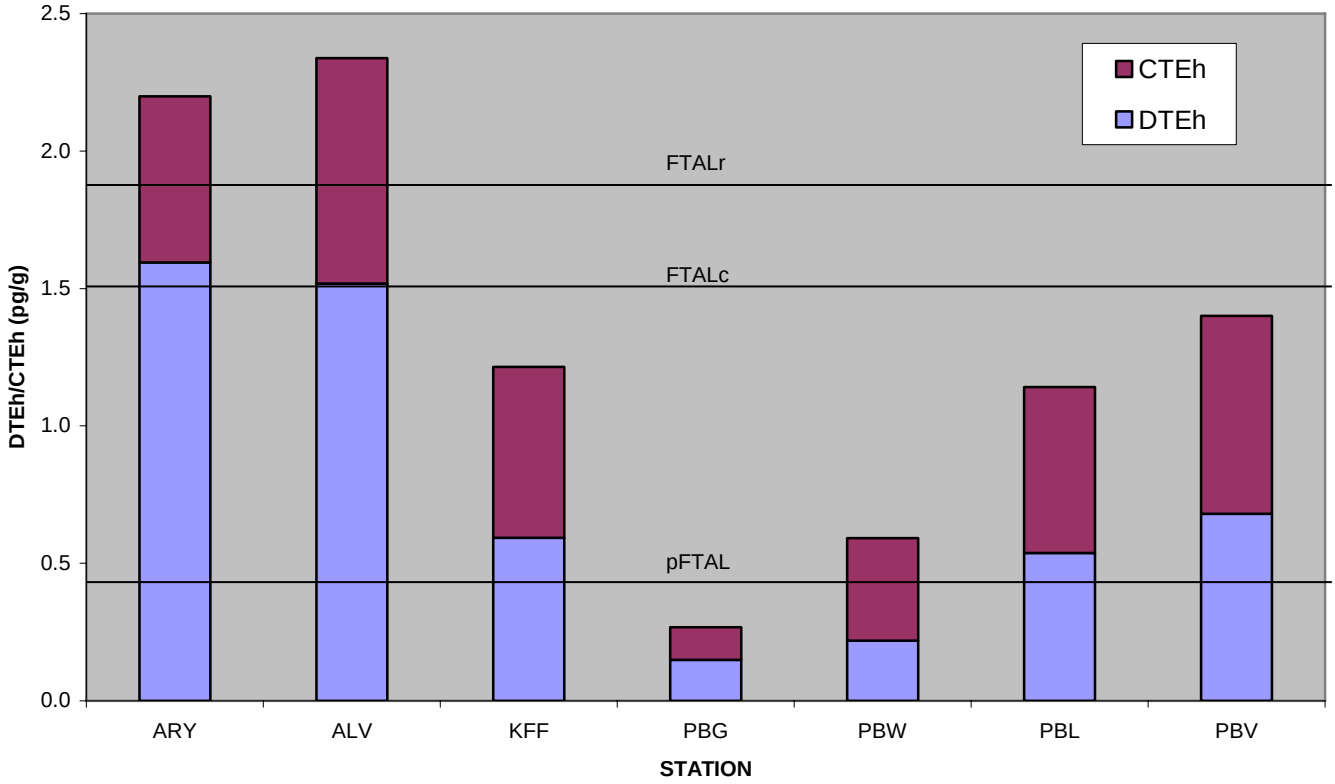


Figure 2. Dioxin (DTEh) and coplanar PCB (CTEh) toxic equivalents (95th UCL) in white suckers from the Androscoggin, Kennebec, and Penobscot rivers, 2006



2. TRENDS

There is a trend of generally declining concentrations of dioxins and furans in smallmouth bass and white suckers averaged over all stations for each of the Androscoggin, Kennebec and Penobscot rivers since 1997 (Figures 3, 4) no doubt due to reductions in discharges at the mills. Despite the overall declining trend, concentrations sometimes increase from one year to the next, due to variability or unknown cause. Trends at specific locations may not follow the general trend and will be discussed for each in the following sections.

Figure 3. Mean dioxin concentration (DTEhucl) in bass below bleached kraft pulp and paper mills on the Androscoggin, Kennebec, and Penobscot rivers

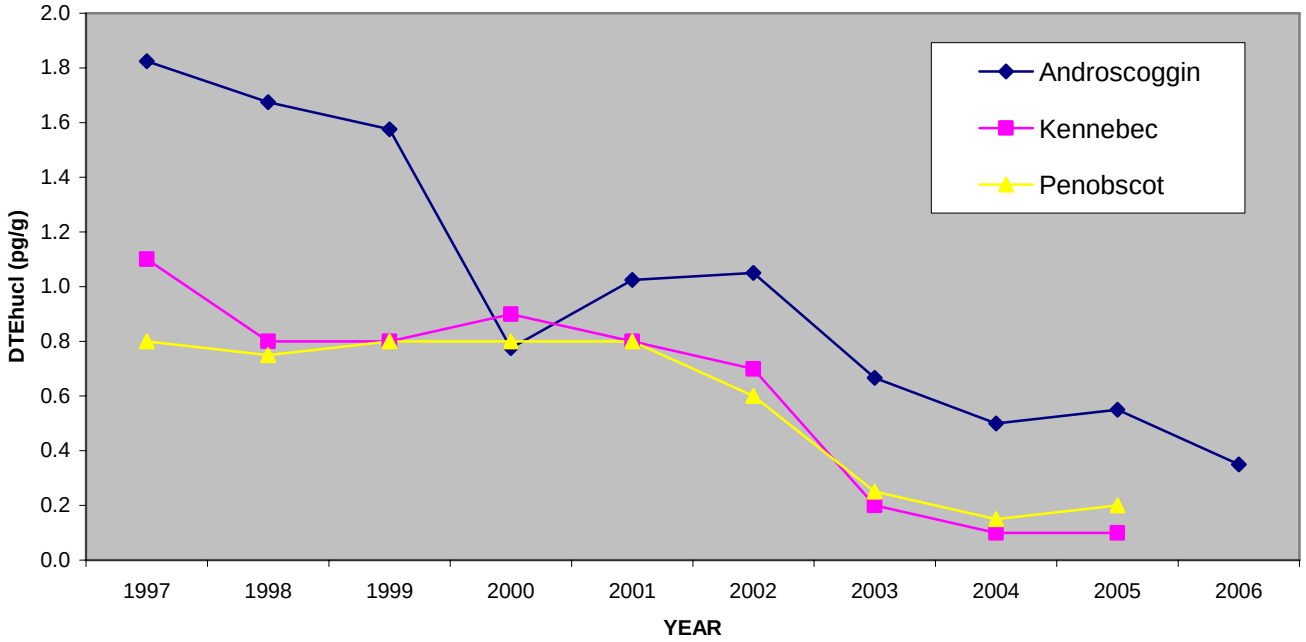
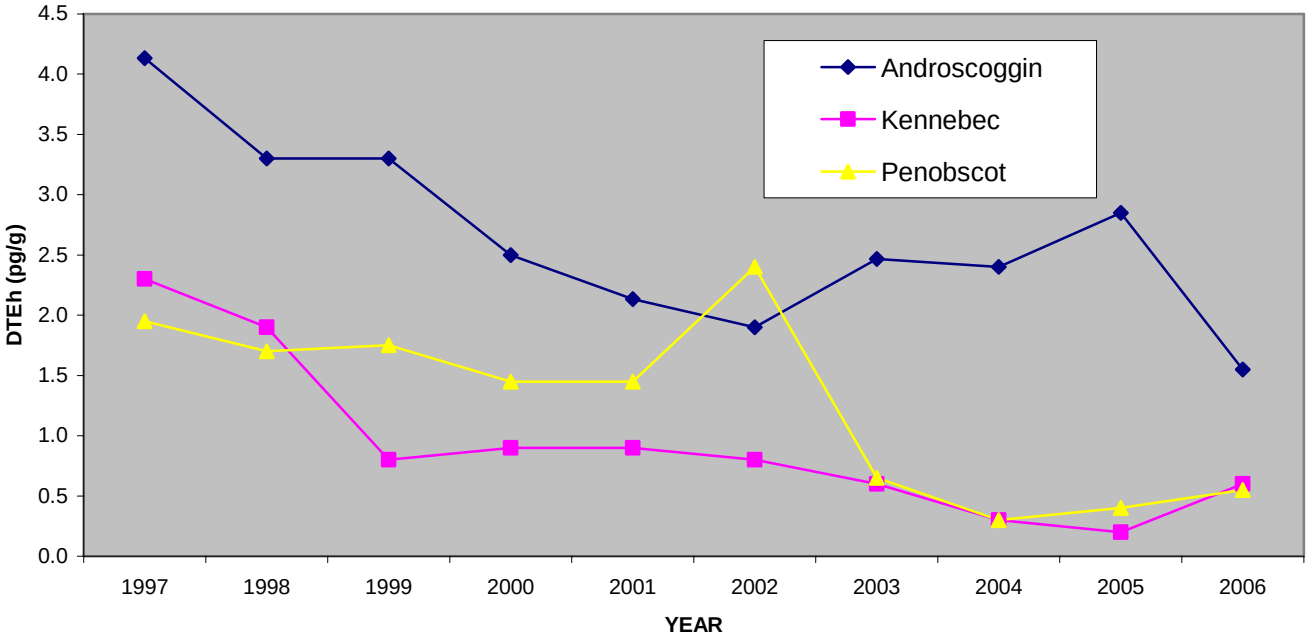


Figure 4. Mean concentrations of dioxin (DTEh, 95th UCL) in white suckers below bleached kraft pulp and paper mills on the Androscoggin, Kennebec, and Penobscot rivers



3. 1997 DIOXIN LAW, NO DISCHARGE PROVISION, CONTINUED COMPLIANCE

- The 2003-2005 results indicate that all the mills passed the A/B test and were not discharging measurable amounts of dioxin .

- Continued annual compliance with the no-discharge provision in 38 MRSA section 420 may be demonstrated by either of three methods. 1) Bleach plant effluent concentrations, monitored at quarterly and reported at the actual concentrations rather than the nominal 10 ppq limit, must remain as low as in the years in which a mill demonstrated compliance with the A/B test. 2) Bleach plant effluent concentrations must be tested as above at least once a year. In addition, the mills must provide a dioxin/furan certification that the bleach plant and defoamers continue to be operated and used in a manner similar to that in 2003 and 2004. 3) A facility may repeat and must pass the A/B fish test. Continued compliance in 2006 was demonstrated by all mills by methods 1 or 2. Nevertheless, fish samples from below Lincoln Paper and Tissue had slightly higher dioxin levels than fish upstream, unlike recent years, and warrants repeat sampling in 2007.

- Continued elevated levels above background at some locations below mills in these rivers are the legacy of the long history of discharges to the rivers.

- The current Dioxin Monitoring Program is scheduled to end in 2007. Monitoring needs to be continued to allow the Maine Center for Disease Control and Prevention's (MCDC) periodic review of Fish Consumption Advisories that are due wholly or in part to dioxin. Due to inter-annual variability, at least two consecutive years of monitoring data that show levels of dioxins below the appropriate Fish Tissue Action Level are needed before advisories should be relaxed.

BACKGROUND ON DIOXIN

Due to continuing controversy over the effects of dioxin on human and ecological health, the US Environmental Protection Agency (EPA) announced in 1991 it would begin a thorough scientific reassessment of dioxin. EPA proposed that the process would be open to the public and consequently held several meetings to share information and receive comments. A draft report was issued in 1994 and subsequent review in 1995 by EPA's Science Advisory Board called for revisions of some chapters. Revised drafts published in 2000 indicate that dioxin may exhibit reproductive and developmental effects, immuno-toxic effects, neuro-toxic effects, and cancer. In addition, the report found that concentrations of dioxin in the environment have decreased since the 1970s. Also 'EPA currently estimates that the amount of dioxin in tissues of the general human population approaches, within a factor of 10, the levels at which adverse effects might be expected to occur'. In March 2001 EPA's Scientific Advisory Board published its draft review of EPA's new revisions and is divided on whether or not dioxin is a carcinogen, but does believe EPA has underestimated non-cancer effects. The Scientific Advisory Board also does not agree that there is enough evidence to support EPA's statement about current body burdens and probable adverse health impacts.

DIOXIN MONITORING PROGRAM

Dioxin was first discovered to be a problem in Maine in 1985, when the results of an analysis of fish collected in 1984 from the Androscoggin River by the Maine Department of Environmental Protection (the Department), used as a reference station for EPA's National Dioxin Study, documented significant concentrations of dioxin. Consequently, the Maine Center for Disease Control and Prevention issued Maine's first fish consumption advisory in 1985. Additional sampling in 1985 and 1986 found similar levels in fish from other rivers below bleached kraft pulp and paper mills, but not from rivers or lakes without such sources. This led to including parts of the Kennebec River and Penobscot River in a revised fish consumption advisory in 1987. As a result there was a bill before the Maine legislature in 1988 to ban the discharge of dioxin. The bill was amended to establish a monitoring program, Maine's Dioxin Monitoring Program (DMP) and enacted into law (38 MRSA section 420-A) to end in 1990. Discovery of continuing significant concentrations in fish from these and other rivers resulted in the DMP being reauthorized in 1990, 1995, 1997, and most recently in 2002 extending until 2007. The Department has issued reports of the results of monitoring annually. Fish consumption advisories have been issued or modified in 1985, 1987, 1990, 1992, 1994, 1997, and 2000.

The goal of Maine's Dioxin Monitoring Program is "to determine the nature of dioxin contamination in the waters and fisheries of the State". Charged with administration of the program, the Department is required to sample fish once a year below no more than 12 bleached pulp mills, municipal wastewater treatment plants, or other known or likely sources of dioxin. Costs for equipment, supplies, and analysis are assessed to the selected facilities annually, and could not exceed $168,000 until 1997 when the limit was raised to $250,000 to incorporate development of the Above/Below (A/B) fish test. In recent years, much less has been spent.

The Department is advised by the Surface Water Ambient Toxic (SWAT) Monitoring Program Technical Advisory Group in implementation of the program. An annual report is required to be submitted to the Natural Resources Committee of the Maine Legislature by March 31 with the results

from the previous year, including status of progress toward meeting the requirements of the Dioxin/Color law.

The primary objective of the Dioxin Monitoring Program is to monitor dioxin in fish for assessment of human health and ecological impact.

A second objective is to measure trends, progress toward reduction in environmental concentrations, and effectiveness and need for further controls.

The monitoring program is coordinated with other ongoing programs conducted by the Department, US Environmental Protection Agency (EPA), or dischargers of wastewater. The proposed annual monitoring plan must be submitted to the Surface Water Ambient Toxic (SWAT) monitoring program Technical Advisory Group (TAG), created under 38 MRSA section 420-B, for review and advice. The selected facilities must be notified of their inclusion in the proposed program at least 30 days prior to submittal to the TAG. The Department must incorporate the results of all studies into a report due the Natural Resources Committee by March 31 of the following year. A draft of the report is reviewed by the TAG before completion of the final report. Costs of sample collection and analysis are assessed as a fee to the selected facilities. Payment of the fees is a condition of the waste discharge license granted by the State for continued operation and discharge of wastewater to waters of the State. However, if the selected facility is a publicly owned treatment works (POTW), then the fees may be assessed to the known or likely industrial generator of dioxin, and payment will not be a condition of the waste discharge license of the POTW.

1997 DIOXIN/COLOR LAW

A third objective, integrated into the DMP, comes from the Dioxin/Color law. In 1997 the Maine Legislature enacted LD 1633 "An Act to Make Fish in Maine Rivers Safe to Eat and Reduce Color Pollution", the Dioxin/Color law [38 MRSA section 420(2)(I)]. The key requirement is that ‘a (bleach kraft pulp) mill may not discharge dioxin into its receiving waters after December 31, 2002. To determine compliance, there are interim tests and a final test. Two interim tests, of effluent from the bleach plant require that 1) TCDD (2378-tetrachlorodibenzo-p-dioxin, the most toxic of the 17 toxic dioxins and furans) must be below 10 ppq, parts per quadrillion or picograms per gram, pg/g by July 31, 1998 and 2) TCDF (2378-tetrachlorodibenzofuran) must be below the same detection limit by December 31, 1999. As the final test to confirm that there is no discharge, by December 31, 2002 fish (or surrogate) below a bleached kraft pulp mill must have no more dioxin than fish (or surrogate) above the mill, the so-called "above/below (A/B) fish test".

Since contamination levels in fish are likely to be highest in late summer to early fall, sampling for compliance with the December 31, 2002, deadline could not begin until summer 2003. Because laboratory results of summer data are not available in time to report by December 31 of any given year, the legislature amended the 1997 Dioxin/Color law in 2003 to delay the date of DEP’s report by a year, to February 16, 2004. The amendment also delayed the date by which a mill must demonstrate it no longer discharges, if the Department finds that it does in fact discharge, for a year after that. The amendment also requires the mills to make the demonstration annually. Additional legislation has combined reporting of compliance with the law with the annual Dioxin Monitoring Program report due March 31 of the year following data collection.

ABOVE/BELOW (A/B) TEST

DEP's report 'Dioxin Monitoring Program 2002-2003, Status of Dioxin in Maine's Rivers' dated February 25, 2004 established the A/B test as follows:

1) The test will measure contaminant concentrations in 3 separate species: a) bass b) suckers, and c) caged mussels.

2) A preponderance of evidence (POE) approach will be used where passage of 2 of the 3 tests will be used to indicate no discharge.

3) To achieve an overall 95% confidence with the POE approach, the level of significance for each individual test is 0.135 for both type I and II errors.

4) Compounds to be measured will be 2378-TCDD and 2378-TCDF, combined into a single metric, TCDD + (TEF x TCDF), to equivalently weight both congeners.

5) Concentrations of these compounds will be based on lipid normalized values if there is a significant relationship between contaminant concentration and lipid from linear regression, or wet weight values if there is no significant correlation.

6) Concentrations less than the detection limit (<DL) will be calculated at ½ the DL.

7) Where all of the values for the samples at an above or below station are <DL, no statistical determination will be made.

8) To compensate for the sensitivity of the tests, a mill must show no evidence of a discharge for 2 consecutive years before being deemed in compliance. Once a mill has passed the A/B test, continued compliance may be demonstrated by annual (1/year) testing of the bleach plant effluent that shows concentrations are below 10 ppq and certification that the bleach plant operation meets the following criteria:

CRITERIA FOR CERTIFICATION OF BLEACH PLANT OPERATION

In lieu of 1/Month monitoring of the bleach plant waste stream for 2,3,7,8 TCDD (dioxin) and 2,3,7,8 TCDF (furan) (40 CFR Part 430), by December 31 of each calendar year *(PCS Code 95799),* the permittee shall sample (1/year) and report the results for said parameters and provide the Department with a certification stating:

a. Elemental chlorine gas or hypochlorite was not used in the bleaching of pulp.

b. The chlorine dioxide (ClO_2) generating plant has been operated in a manner which minimizes or eliminates byproduct elemental chlorine generation per the manufacturers/suppliers recommendations.

c. Documented and verifiable purchasing procedures are in place for the procurement of defoamers or other additives without elevated levels of known dioxin precursors.

d. Fundamental design changes that affect the ClO_2 plant and/or bleach plant operation have been reported to the Department prior to their implementation and said reports explained the reason(s) for the change and any possible adverse consequences.

FISH CONSUMPTION ADVISORIES

There is a statewide fish consumption advisory due to mercury for all fresh waters. There are additional advisories for a number of rivers due to 1) dioxins and dioxin-like (coplanar) PCBs, 2) total PCBs, and 3) DDTs (Appendix 1).

There are 75 dioxins and 135 related furans, 17 of which are considered toxic, but with different toxicity potencies. The total toxicity of a sample (dioxin toxic equivalents=DTE or toxic equivalents=TEQ) can be calculated as the sum of the product of the concentration and toxicity equivalency factor (TEF, relative to the most toxic dioxin, TCDD) for each of the 17 dioxin and furans.

The Maine Center for Disease Control and Prevention (MCDC) publishes fish consumption advisories to inform the public about potential risk from consuming fish contaminated with dioxin and dioxin-like compounds. These advisories are based on a comparison of a Fish Tissue Action Level (FTAL) for dioxin toxic equivalent (DTE) concentrations with the 95^{th} percentile upper confidence limit on the mean DTE in fish tissue. Should a tissue concentration exceed an FTAL, a fish consumption rate (e.g., # meals per month), which is unlikely to result in toxic effects, is determined. Two FTALs have been derived for evaluating potential toxic effects from exposure to dioxins and dioxin-like compounds. Both FTALs were developed using standard USEPA risk assessment methods (EPA 1997). For potential carcinogenic effects associated with long-term exposure, MCDC has developed a FTALc of 1.5 ppt, while for reproductive and developmental effects potentially arising from shorter exposure durations, MCDC has developed a FTALr of 1.8 ppt (Frakes, 1990). The FTALr for reproductive and developmental effects is relevant to women of childbearing age, pregnant women, and lactating women. The FTALs are compared to the concentration of DTE in edible portions of the fish, skinless filet data. Where whole fish data are reported, the DTE concentration is divided by a factor of 3.5, determined from previous studies with white suckers, to estimate skinless filet concentration. In this report all comparisons with DTE in fish are made with FTALc, since that is the lower of the two and protective against both effects.

WORKPLAN DESIGN

The primary emphasis of the 2006 workplan was to collect fish samples from the appropriate stations and species from each river such that accurate, complete, and current data are available to assess impact to wildlife and human consumers. The workplan design included sampling at least one station below each major source to document trends and sampling of historic stations that showed dioxin above background whether or not any fish consumption advisories were issued.

The 2006 workplan was initially drafted by DEP according to the objectives listed above and sent to participating facilities for comment in early May 2006. After discussion of the draft workplan at a meeting of the SWAT Technical Advisory Group (TAG) on June 20, 2006, a final workplan was determined by the Commissioner. In 2006, many historical stations were monitored for ecological and/or human health assessment and trends under this program. Fish were also collected at other stations as part of the SWAT program at the request of MCDC, for assessment of the Fish Consumption Advisories. The workplan directed at least 5 fish to be collected from each station (Table 1).

Table 1. 2006 Dioxin Monitoring Program and SWAT monitoring program

STATION	SMB	WHS	MUSSELS	OTHER	FUNDING SOURCE
Androscoggin R					
Gilead				5 RBT	SWAT
Rumford	5				Rumford Paper Co.
Riley	5	5			SWAT/Rumford Paper Co.
Livermore Falls	5	5			SWAT/International Paper
Turner (GIP)	5				International Paper
Androscoggin L	2C5			2C5 WHP	IP & Rumford Paper Co
Kennebec R					
Fairfield		5		5 BNT	SAPPI
Sidney				5 BNT	KSTD
Penobscot R					
E Br		5			SWAT
Woodville		5			SWAT
S Lincoln		5			Lincoln Paper & Tissue
Veazie		5			Georgia Pacific
Bangor				5 EELS	Georgia Pacific
Presumpscot R					
Windham	5				SWAT
Westbrook	5				SWAT
Salmon Falls R					
Lebanon, Spaulding P	5				SWAT
S Berwick	5			4 sludge	SWAT/Prime Tanning
Somersworth			SWAT	4 sludge	SWAT
E Br Sebasticook R					
Corinna	5				SWAT
W Br Sebasticook R					
Palmyra	5				Town of Hartland
Sebasticook R					
Burnham	5				SWAT

We were able to collect all samples except that we collected only 3 brown trout of the right size from the Kennebec River at Fairfield and no eels from the Penobscot River in Bangor.

All samples were analyzed for all 2378-substituted dioxins and furans as skinless filets.

The preferred sampling time is late in the summer when fish are likely to be most contaminated after being exposed to higher concentrations of dioxin during low river flows and after significant growth has occurred. At some locations there has been a problem collecting enough fish later in the summer. At

those locations sampling began in mid-May to try to insure that a suitable sample was collected. These stations were also visited after the beginning of July if there was time. If fish were captured during the later period, those samples were submitted for analyses. Otherwise, the fish collected during the early period were used. Sampling at other stations began in July. Actual dates of collection are shown in Appendix 5.

SAMPLING PROCEDURES

Fish were collected by DEP with assistance of the Penobscot Indian Nation on the Penobscot River. Upon capture, fish were immediately killed, weighed and measured, rinsed in river water, wrapped in aluminum foil with the shiny side out, labeled, and placed in a cooler on ice for transport to the DEP lab. Chain-of-custody forms were used to record all field information and document all transfers. In the lab, all fish samples were frozen and later transported whole to the Pace Analytical Services lab in Minneapolis, Minnesota for analysis. All other procedures followed EPA's Sampling Guidance Manual for the National Dioxin Study (July 1984). A laboratory log was kept for an inventory of samples in the lab at any time and final disposition.

Most of the facilities in the program already sample sludge or effluent as part of their Maine Sludge Spreading Permit or Waste Discharge License or Federal NPDES permit. Data from those programs provide adequate information about sources of dioxin. Therefore, no additional sludge samples were collected as part of this program in 2006. Effluent data are also used when available to indicate sources and any trends.

CALCULATIONS

In this report, dioxins are reported in different ways for each goal of the program. Given the uncertainty of true values when results are below the detection level, for the purpose of determining the range of possible concentrations, DTE are shown as a range with non-detects calculated at zero (DTEo) and at the detection limit (DTEd) as a mean for all samples of a given species at each station (Appendix 6). For human health assessment, DTEh, calculated using non-detects at 1/2 the detection limit consistent with the policy of the Maine Center for Disease Control (MCDC, formerly Maine Bureau of Health) were compared with the FTALc. The upper 95^{th} percentile confidence limit (UCL) was used for these comparisons, consistent with the policy of the BOH. For trends analysis TCDD and DTEh were evaluated.

A related issue is that of estimated maximum possible concentrations (EMPC). Some compounds, particularly hydroxydiphenyl ethers (DPEs), are coextracted with furans. Various steps have successfully been taken to minimize these interferences, but some DPEs remain. In this report, EMPCs were treated as non-detects.

Statistical analyses of differences in DFTEh between stations were performed using either the t-test or non-parametric Mann-Whitney test at $p=0.05$.

RESULTS AND DISCUSSION.

Results for each sampling station are discussed with respect to the three objectives of the program, 1) human health assessment, 2) trends, and 3) 1997 Dioxin law, no discharge provision, continued compliance. See Appendix 2 for raw dioxin data for 2006, Appendix 5 for fish sample data, and Appendix 6 for all historical dioxin data.

Dioxin concentrations in fish generally continued to decline from previous years, but there is some year-to-year variation among species and stations within the trends. Concentrations remained elevated above natural background levels in fish at some stations, particularly on the Androscoggin and Sebasticook rivers, but approached background levels at some stations on other rivers. Dioxin toxic equivalents (DTEh), most likely from historical discharges from the mills, exceeded or, combined with (dioxin-like) coplanar PCBs (CTEh) contributed significantly to exceedances of the Bureau of Health's Fish Tissue Action Levels at several stations (Figures 1 & 2). DTEh are compared to existing FTALc and potentially new pFTAL for the cancer endpoint. The sum of DTEh and CTEh are compared to the existing FTALr for the reproductive endpoint. Sources of CTEh, measured in DEP's SWAT program, are unknown but likely include combustion with long range transport and atmospheric deposition from local, regional, and national sources. Details are discussed below for each river and station.

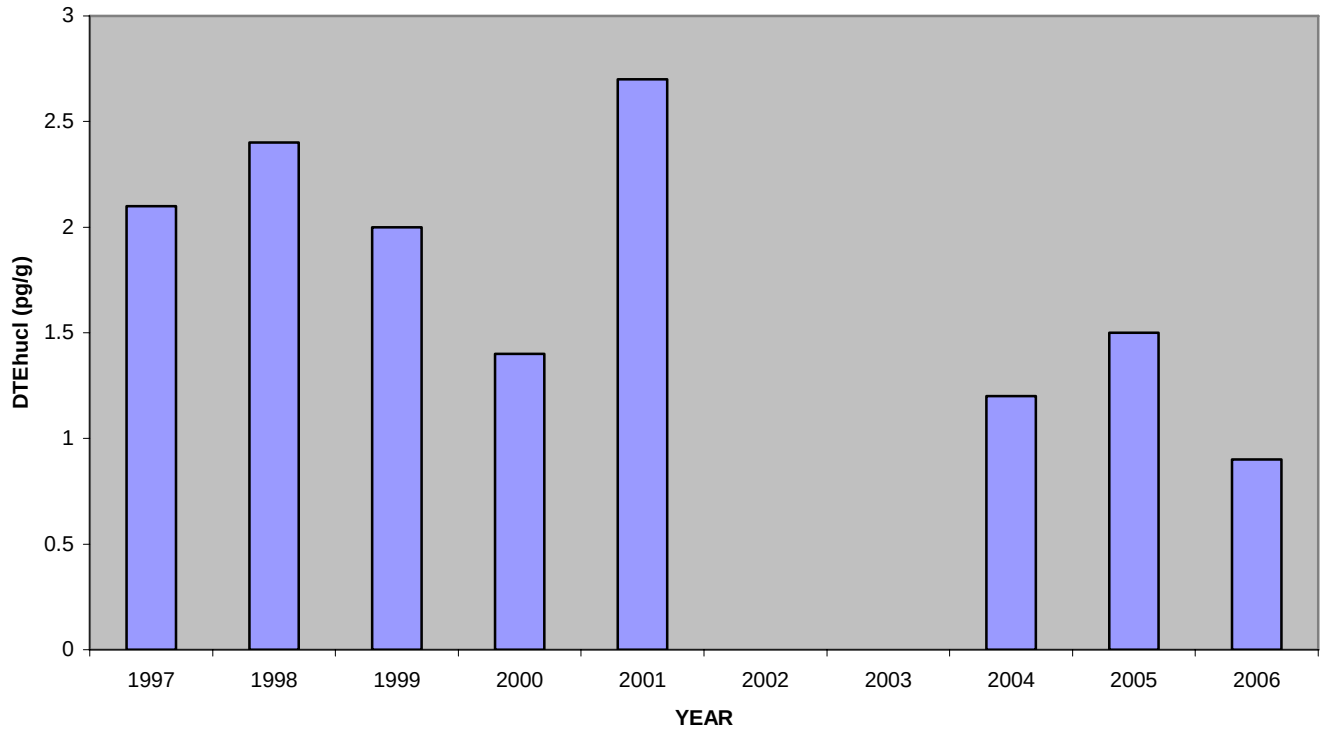
Androscoggin River

Gilead - (AGL) A total of 5 rainbow trout were collected near Peabody Island in Gilead (Appendix 5). This station is downstream of Fraser Paper Co's bleached kraft mill in Berlin, New Hampshire, but upstream of all Maine mills.

DTEh concentrations were below the FTALc (63%) but exceeded the pFTAL (Figure 1, Appendix 2). They were the highest of all fish species and stations in the state. The addition of dioxin-like (coplanar) PCBs to DTEh results in even higher levels of total toxic equivalents (TTEh).

Every year measured, DTEh in fish have been significantly higher at this station than in fish from reference stations in Maine (Appendix 6). There was no significant trend for the period 1997-2006 for rainbow trout or any other species captured at this station in the past, although concentrations of DTEh have decreased significantly in the past 3 years (Figure 5). The mill in Berlin, New Hampshire, has reported the switch to elemental chlorine free (ECF) bleaching (chlorine dioxide) in 1994. The mill closed in 2001 but the paper and pulp mills were purchased by Fraser and reopened in 2002 and 2003 respectively and then the pulp mill closed again in September 2006. The paper mill uses pulp purchased from a variety of sources including post consumer waste.

Figure 5. Dioxin concentrations (DTEhcul) in rainbow trout from the Androscoggin River at Gilead, Maine (AGL)



Rumford - (ARF) A total of 5 smallmouth bass were collected from the river reach from just below the discharge from NewPage Corporation's bleached kraft pulp and paper mill in Rumford downstream about 4 miles to Dixfield (Appendix 5).

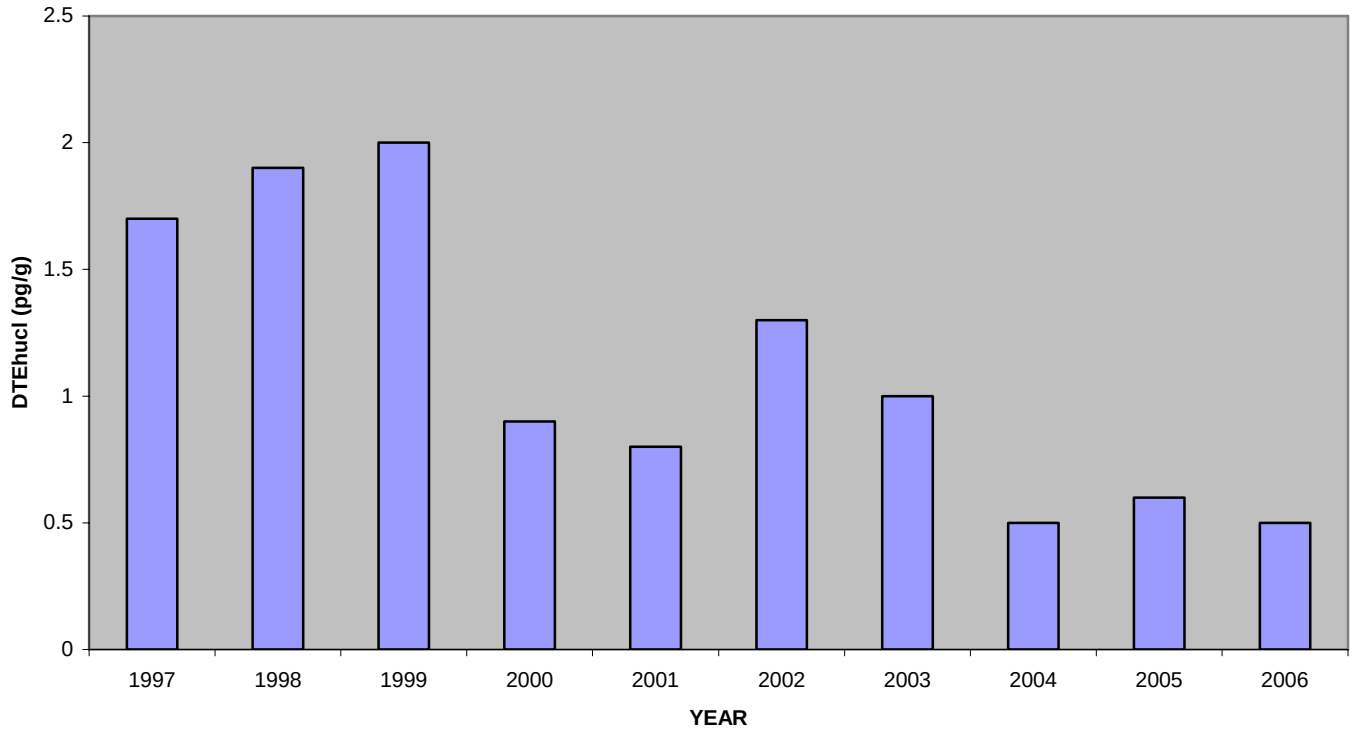
Concentrations of DTEh in the bass were 36% of the FTALc but exceeded the pFTAL (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh resulted in higher levels of total toxic equivalents (TTEh**)** that were still well below (52%) the FTALr.

There is a significant declining trend for TCDD and DTEh for bass during the period 1997-2006 (Figure 6). TCDD was no longer much greater than reference stations unimpacted by point source discharges on other Maine rivers but DTE are still elevated (Appendix 6). Continued elevated levels of DTE below the mill are likely the legacy of the long history of discharges. This fact warrants some continued monitoring for assessing the fish consumption advisories, and can also be used to document continuing compliance with the no discharge provision, all within the Dioxin Monitoring Program.

Fish sampling in 2003 and 2004 documented that the mill was no longer discharging measurable amounts of dioxins. In a letter dated December 15, 2006, the mill partially demonstrated continued compliance with the 'no discharge' provision of the 1997 Dioxin law by certifying that it has met the

performance criteria established by DEP for the bleaching process and defoamer usage (Appendix 7). An annual sample of the bleach plant effluent was analyzed for dioxins within 1 year of issuance of the Maine Pollution Discharge Elimination System permit September 21, 2005 on January 1, 2006. Concentrations of both TCDD and TCDF have been reported below a nominal 10 ppq detection limit in bleach plant effluent from 1998-2005 and below an actual and lower detection limit for the 2006 sample, all showing continued compliance (Appendix 4).

Figure 6. Dioxin concentrations (DTEhucl) in smallmouth bass from the Androscoggin River below Rumford



Riley - (ARY) A total of 5 smallmouth bass and 5 white suckers were collected from the river above the Riley Dam about 19 miles downstream of NewPage Corporation and upstream of the Verso Paper (formerly International Paper Company) discharge as part of the SWAT monitoring program and the DMP respectively (Appendix 5).

Concentrations of TCDD in bass were similar to those of historical reference stations unimpacted by point source discharges (Appendix 6). Concentrations of DTEh not much higher than those reference stations (20% of the FTALc) and below the pFTAL. When combined with dioxin-like coplanar PCBs, DTEh exceeded the pFTAL (Figure 1).

Concentrations of TCDD in suckers were slightly elevated over historical data from reference stations (Appendix 6). DTEh in the suckers exceeded the FTALc (107%, Figure 2, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in total toxic equivalents (TTEh) that exceeded the FTALr**.**

There is a trend of declining TCDD and DTEh concentrations in bass but not in white suckers at Riley for the period 1997-2006 (Figures 7,8). Nevertheless, TCDD and DTEh concentrations in suckers continue to be greater than those at reference stations on other Maine rivers (Appendix 6). The difference between species may reflect the impounded nature of this station, which may result in a greater exposure of the benthic dwelling suckers than the more pelagic bass to contaminated sediments.

Figure 7. Dioxin concentrations (DTEhucl) in smallmouth bass from the Androscoggin River at Riley, above Jay, Maine

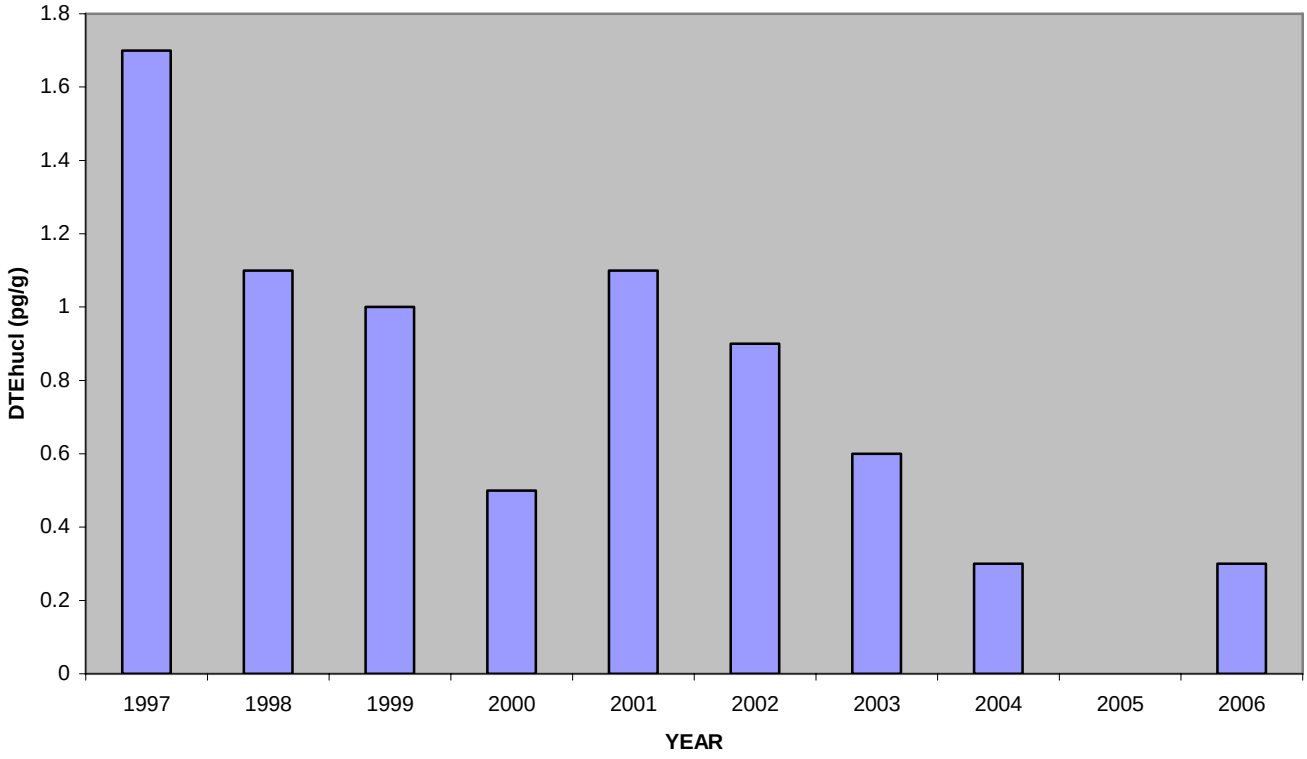
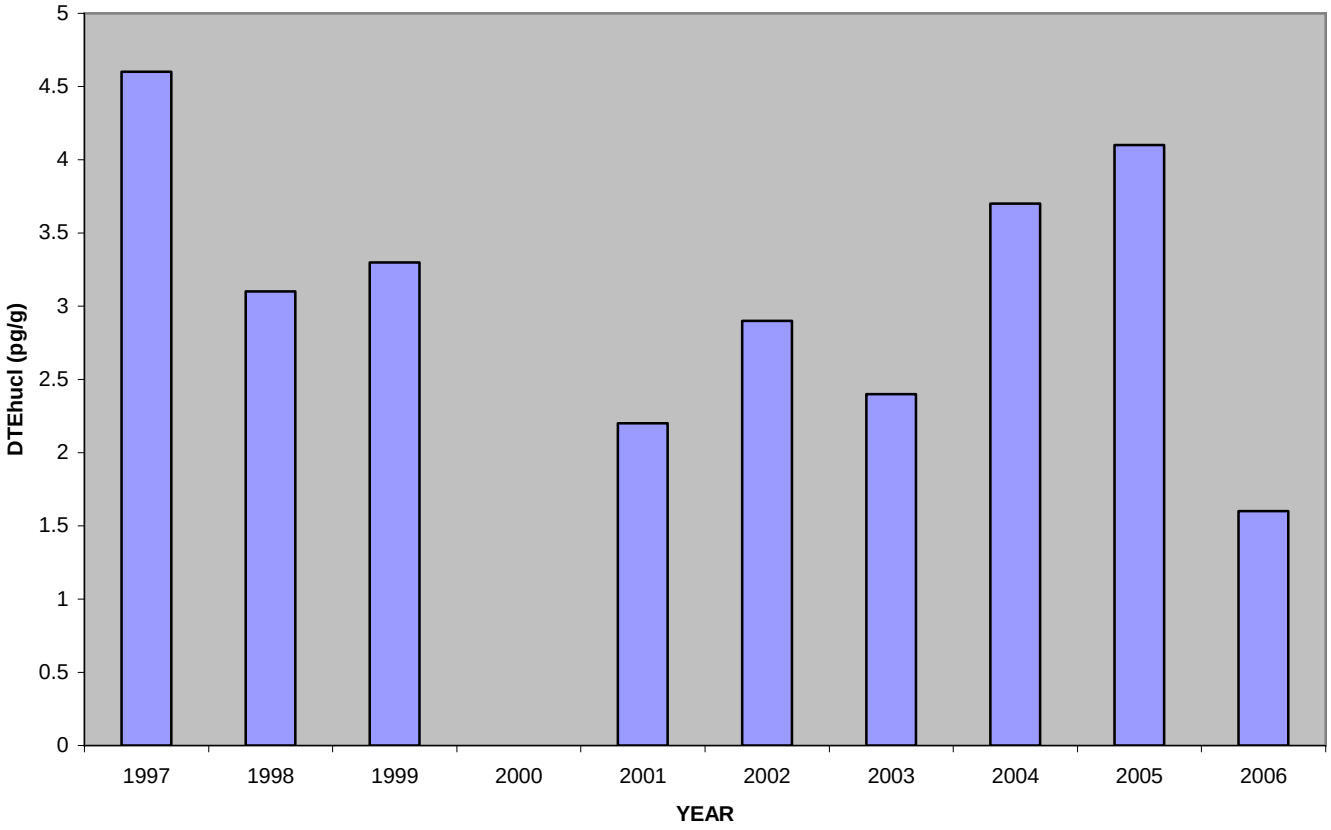


Figure 8. Dioxin concentrations (DTEhucl) in white suckers from the Androscoggin River at Riley, above Jay, Maine



Given that this station is below NewPage Corporation's discharge with no known intervening discharges of dioxins, then the demonstration of continued compliance with the 1997 Dioxin Law discussed above for the Rumford station applies here as well.

Livermore Falls- (ALV) A total of 5 smallmouth bass and 5 white suckers were captured in the Otis Impoundment approximately 2 miles downstream of the discharge from Verso Paper's Jay mill discharge as part of the SWAT monitoring program and the DMP respectively (Appendix 5).

Concentrations of TCDD and DTEh in bass were below the pFTAL and not significantly different than those from historical reference stations unimpacted by point source discharges (Appendix 6, Figure 1). The addition of dioxin-like (coplanar) PCBs to DTEh results in total toxic equivalents (TTEh) that exceeded the pFTAL**.**

Concentrations TCDD in suckers were slightly elevated over those of historical reference stations unimpacted by point source discharges (Appendix 6). DTEh in the suckers were 101% of the FTALc

(Figure 2, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in total toxic equivalents (TTEh) that exceeds the FTALr .

There is a significant declining trend for TCDD and DTEh in bass and suckers for the period 1997-2006 (Figure 9,10). Nevertheless, TCDD and DTEh in suckers are still significantly greater than reference stations on other Maine rivers (Appendix 6), likely the legacy of the long history of discharges. This fact warrants some continued monitoring, which can also be used to document continuing compliance with the no discharge provision.

Figure 9. Dioxin Concentrations (DTEhucl) in smallmouth bass from the Androscoggin River at Livermore Falls, Maine

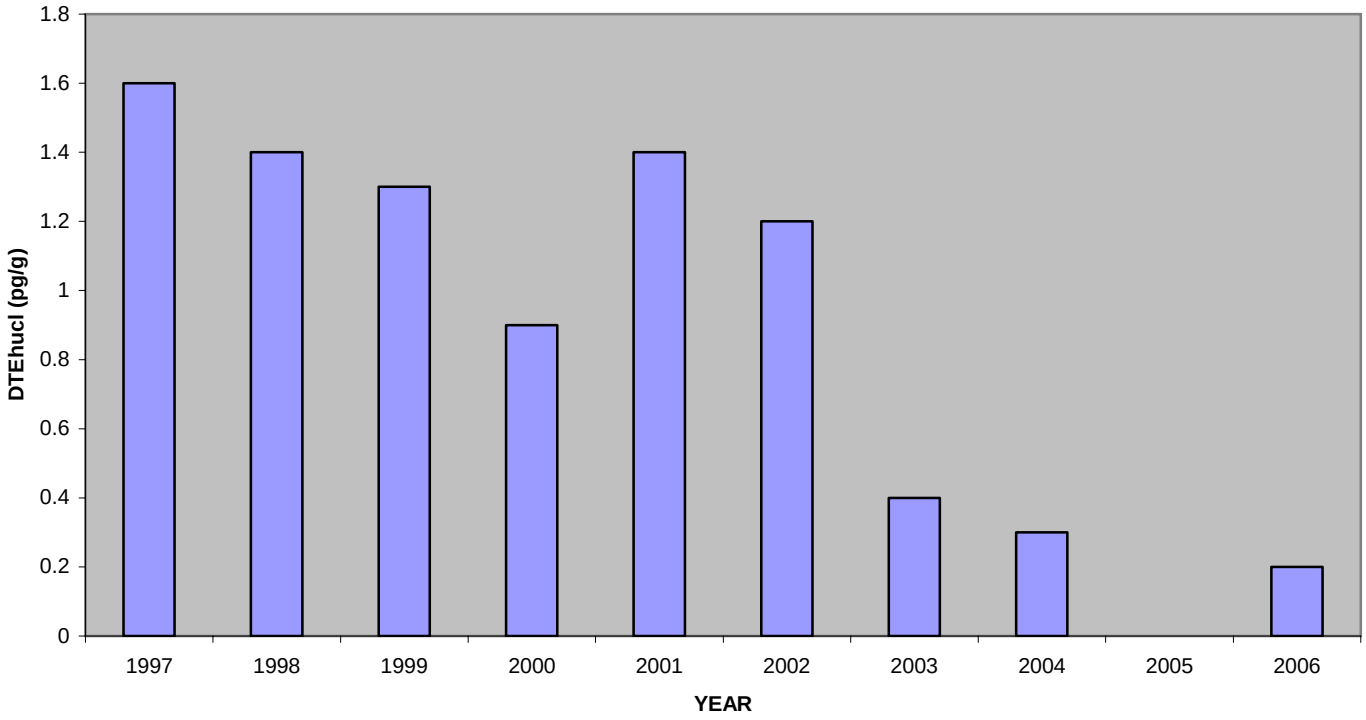
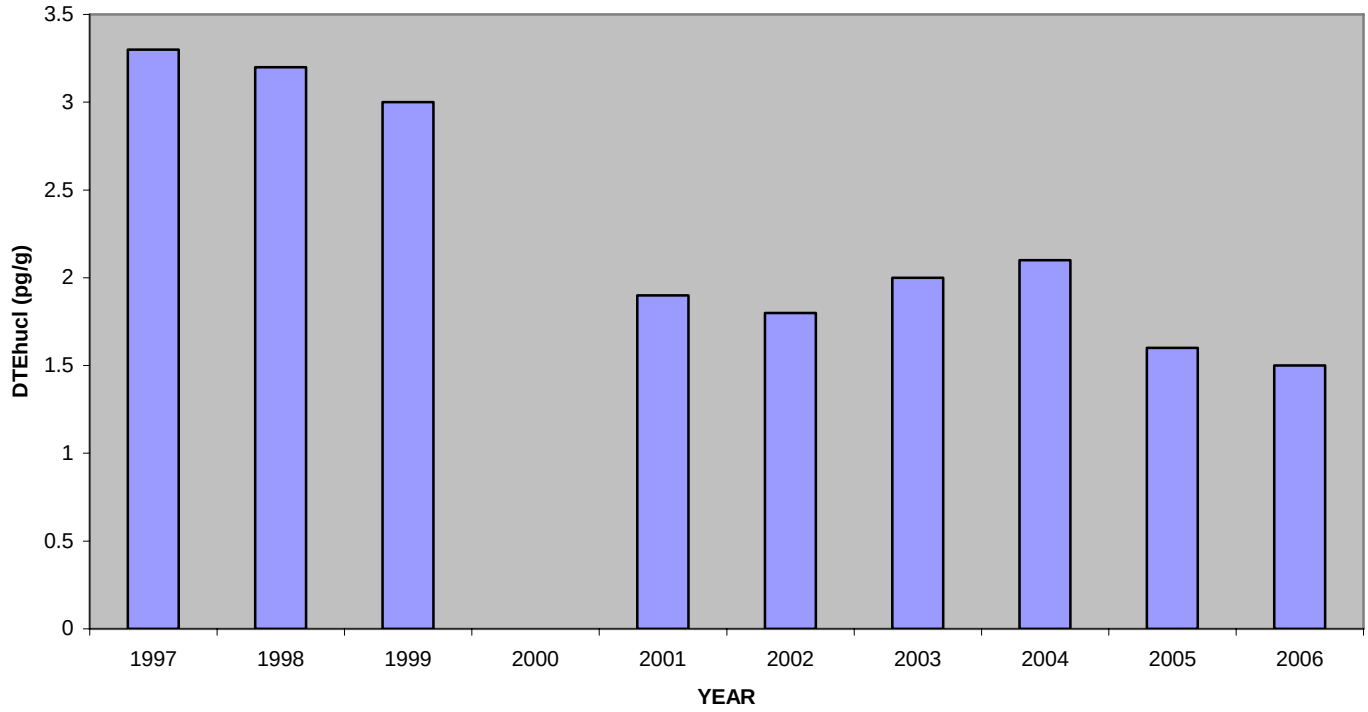


Figure 10. Dioxin concentrations (DTEhucl) in white suckers from the Androscoggin River, Livermore Falls, Maine



Fish sampling in 2003 and 2004 documented that the mill was no longer discharging measurable amounts of dioxins. In a letter dated December 21, 2006 the mill partially demonstrated continued compliance with the 'no discharge' provision of the 1997 Dioxin law by certifying that it has met the performance criteria established by DEP for the bleaching process and defoamer usage (Appendix 7). The bleach plant effluent, analyzed for dioxins in February and March 2006, documented that concentrations of both TCDD and TCDF have been reported below a 10 ppq detection limit in bleach plant effluent since 2002 and below much lower limits since 2004 (Appendix 4). There are no new sludge data since 1996.

Auburn-GIP- (AGI) A total of 5 smallmouth bass were collected in Gulf Island Pond near the deep hole at Seagull Island, approximately 30 miles downstream of Verso Paper (Appendix 5).

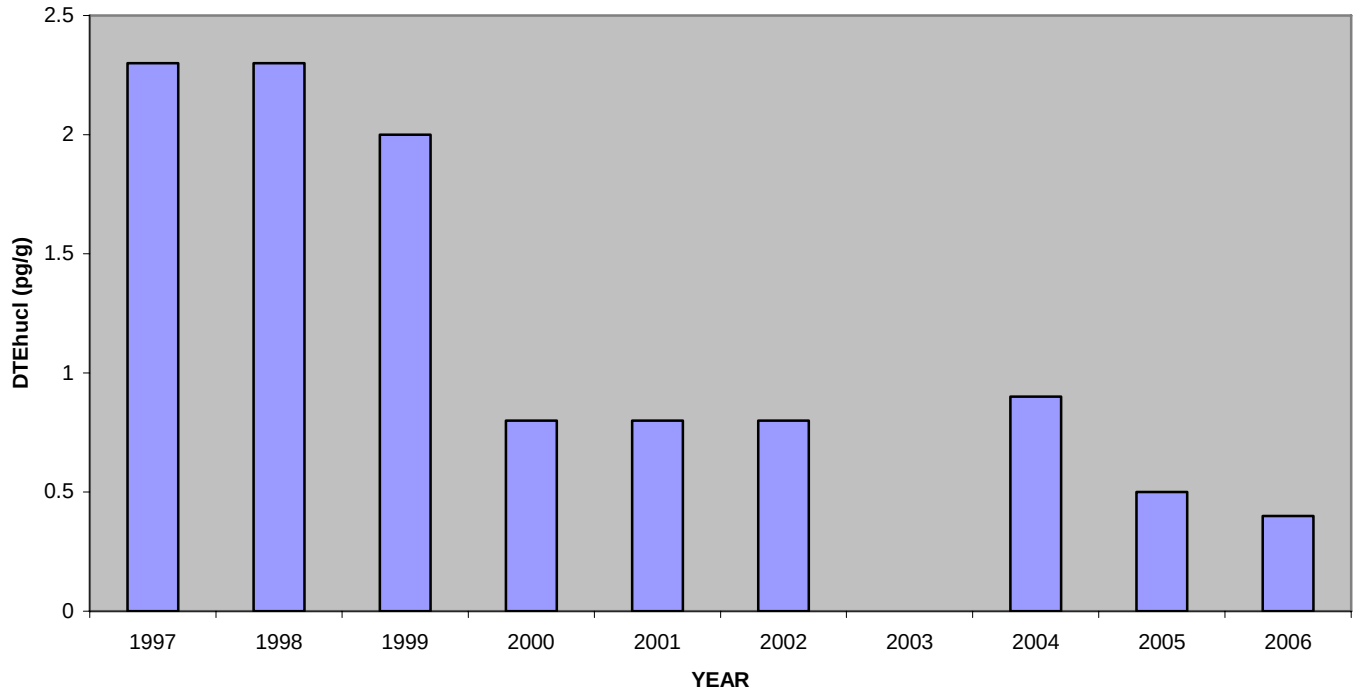
Concentrations of TCDD were similar to those of historical reference stations unimpacted by point source discharges, but DTEh remained slightly elevated at the pFTAL (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in higher levels of total toxic equivalents (TTEh) that are still well below (40%) the FTALr.

There is a declining trend in TCDD and DTE in bass during the period 1997-2006 (Figure 11). Elevated DTEh concentrations are likely the legacy of the long history of discharges. As this station is a

popular fishing spot, it warrants some continued monitoring for assessment of the Fish Consumption Advisories.

Given that this station is below Verso Paper's discharge with no known intervening discharges of dioxins, then the demonstration of continued compliance with the 1997 Dioxin Law discussed above for the Livermore Falls station applies here as well.

Figure 11. Dioxin concentrations (DTEhucl) in smallmouth bass from the Androscoggin River, Gulf Island Pond, Auburn, Maine.



Androscoggin Lake

Wayne- Androscoggin Lake in Wayne (ALW) and Leeds is a 4000-acre, 38-foot-deep meso-trophic lake with a unique reverse delta at the outlet formed by centuries of periodic backflow from the Androscoggin River via the Dead River into the lake. There is a dam on the Dead River that reduces, but does not prevent, the backflow into the lake, which usually occurs once or twice every year. Significant amounts of dioxin were found in fish from the lake beginning in 1996, but have been somewhat lower since.

In 2006, 10 smallmouth bass and 10 white perch were collected from the lake and analyzed as 2 composites of 5 fish each (Appendix 5). TCDD concentrations were similar to those of historical reference stations unimpacted by point source discharges for both species (Appendix 6). DTEh

concentrations were below the pFTAL in smallmouth bass but exceeded it in white perch (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that exceeded the pFTAL in bass and approached (81%) the FTALr in white perch.

There is a trend for the perioid 1996-2006 of declining concentrations in bass but not in white perch (Figures 12, 13). In 2006 concentrations of TCDD and DTEh in bass were no longer significantly greater than in game fish from all other lakes (n=8) or river reference stations that have been sampled, but concentrations in white perch appear slightly higher (Appendix 6). DTEh in bass were lower than those in bass from AGI, the nearest station on the river sampled in 2006, but concentrations in white perch were similarly elevated. Continued monitoring is needed for this popular fishing lake.

Figure 12 Dioxin concentrations (DTEhucl) in smallmouth bass from Androscoggin Lake, Wayne, Maine

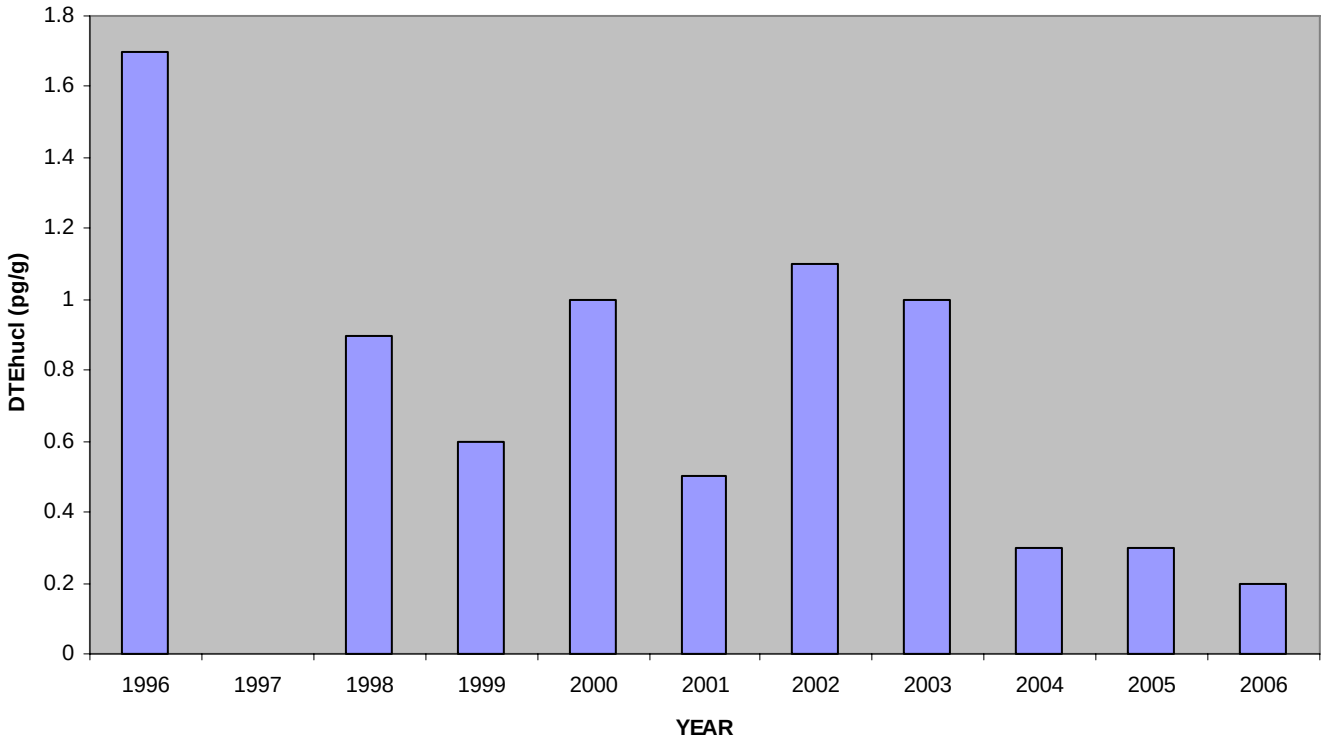
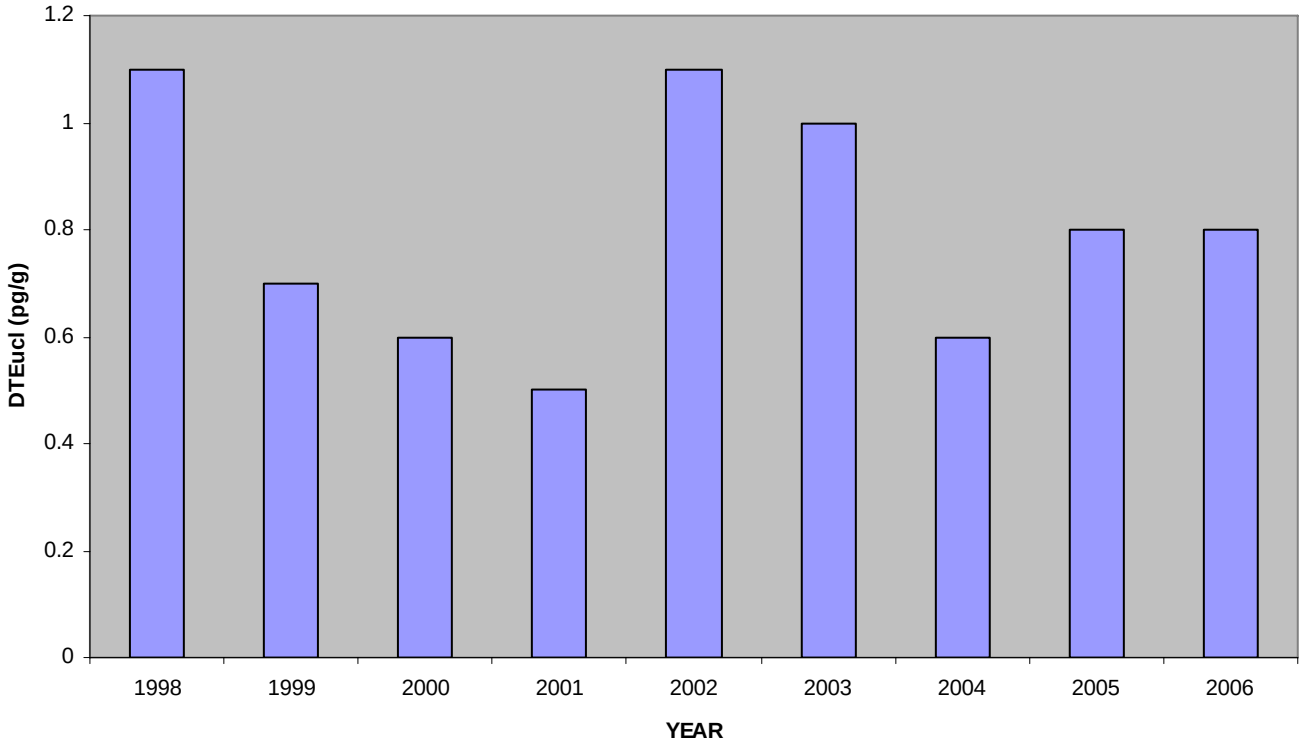


Figure 13. Dioxin concentrations (DTEhucl) in white perch from Androscoggin Lake, Wayne, Maine



Kennebec River

Fairfield- (KFF) A total of 3 brown trout and 5 white suckers were collected from the river between the Shawmut Dam and the I-95 bridge, approximately 7-8 miles below SAPPI Somerset's bleached kraft pulp and paper mill in Skowhegan (Appendix 5).

TCDD concentrations in brown trout were slightly elevated above those in historical reference stations unimpacted by point sources (Appendix 6). DTEh were also slightly elevated at just below the pFTAL (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that are stilll well below (34%) the FTALr.

TCDD in white suckers were also slightly elevated above those in historical reference stations unimpacted by point sources (Appendix 6). DTEh exceeded the pFTAL although below (40%) the FTALc (Figure 2, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that further exceed the pFTAL but are below (67%) the FTALr.

There is no declining trend with brown trout, but DTEh from 2005 and 2006 appear lower than those from previous years (Figure 14). Concentrations in 2005 were similar to those of the reference station at Madison and Norridgewock from previous years, but concentrations in 2006 were slightly elevated. There was a significant declining trend for TCDD and DTEh (Figure 15) for suckers for the period 1997-2006.

Fish sampling in 2003 and 2004 documented that the mill was no longer discharging measurable amounts of dioxins. The mill has demonstrated continued compliance with the 'no discharge' provision of the 1997 Dioxin law. In a letter dated March 6, 2006 the mill certified that it has met the performance criteria established by DEP for the bleaching process and defoamer usage (Appendix 7). Sampling bleach plant effluent was conducted in 2006 documented that concentrations of both TCDD and TCDF were below detection at a low sample specific detection level (Appendix 4). Additional periodic monitoring should be continued to confirm low levels in brown trout and rainbow trout, which are fished heavily in this river reach.

Winslow- (KWL) (aka Sidney-KSD- in previous years) A total of 5 brown trout (Appendix 5) were collected below the Lockwood dam in Winslow in an area of the river receiving the discharge from the Kennebec Sanitary Treatment District, which processes effluent from the Huhtamaki paper mill.

Concentrations of TCDD were similar to those at historical reference stations unimpacted by point sources (Appendix 6). DTEh were slightly elevated at just below the pFTAL (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that further exceed the pFTAL but are below (33%) the FTALr.

There are not enough data for trends analysis, but concentrations in 2006 were significantly lower than when last sampled in 2000 and 2001.

Figure 14. Dioxin concentrations (DTEhucl) in brown trout from the Kennebec River at Fairfield, Maine

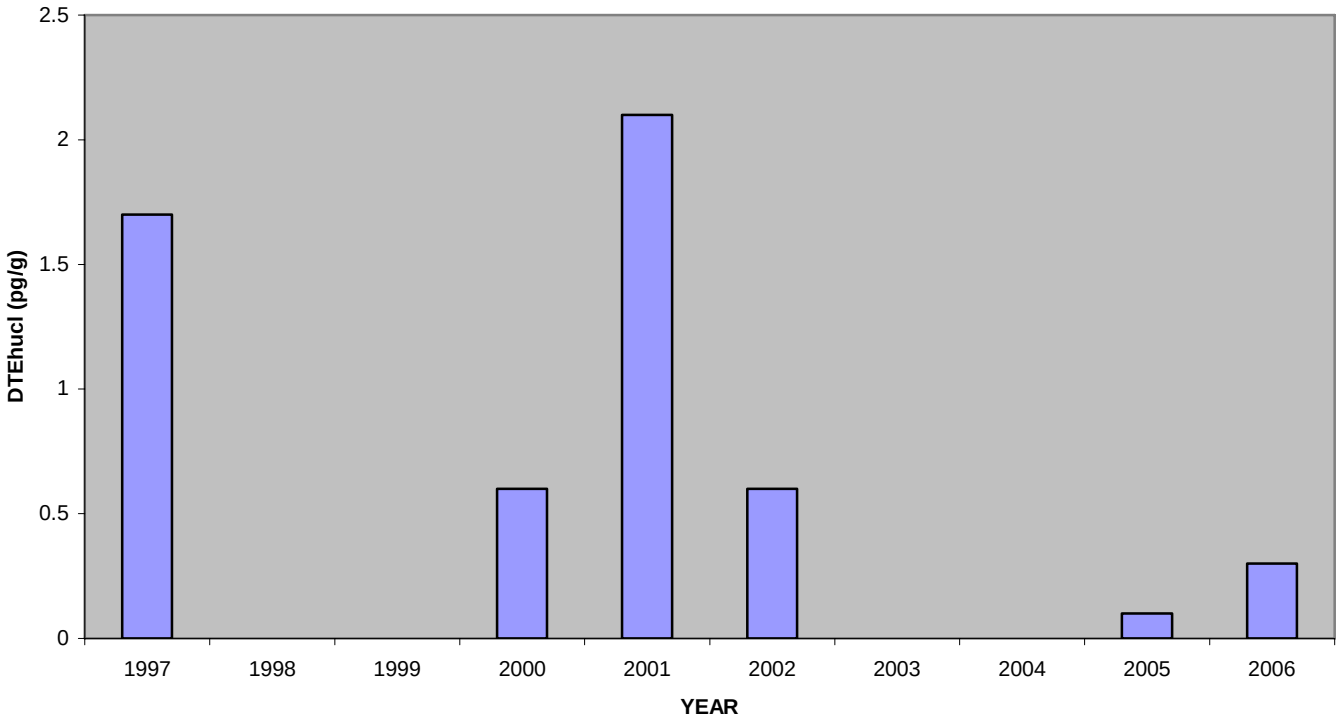
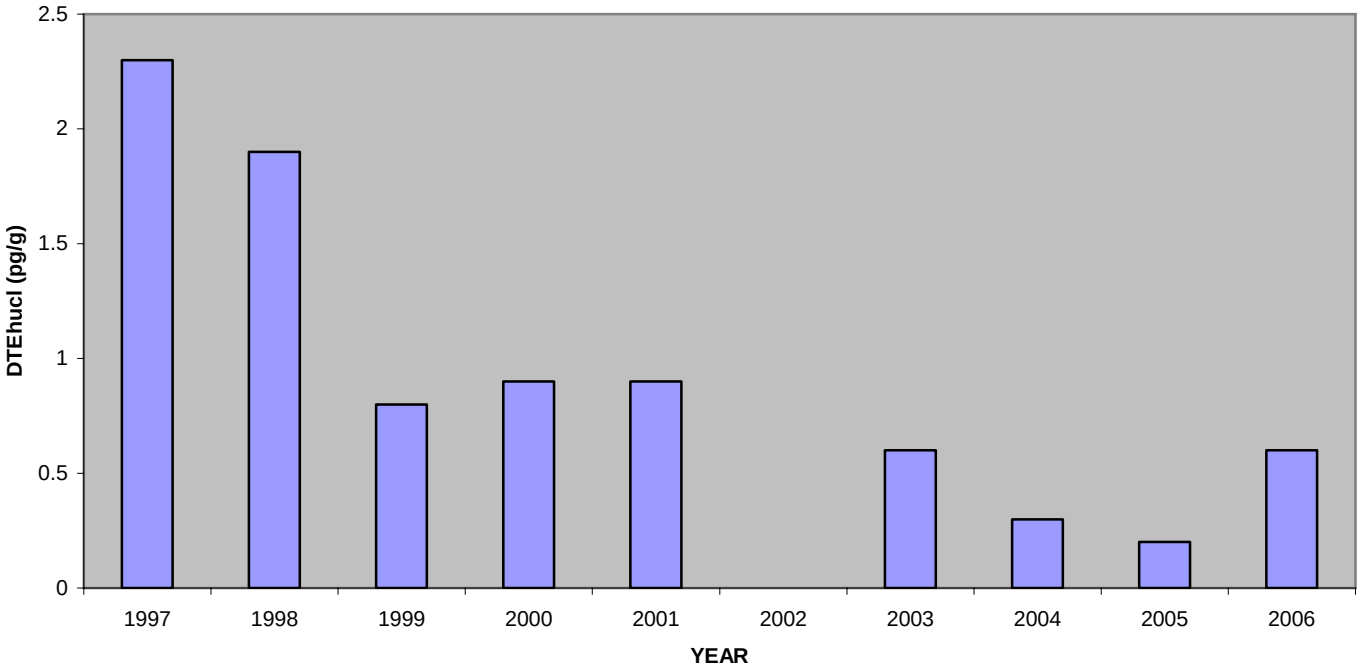


Figure 15. Dioxin concentrations (DTEhucl) in white suckers from the Kennebec River in Fairfield, Maine



Gardiner- (KGD) As part of the SWAT monitoring program 5 smallmouth bass (Appendix 5) were collected from the river at Gardiner, approximately 6 miles below the discharge of the former (Statler, Tree-Free, American Paper) recycled paper mill in Augusta. Concentrations of TCDD and DTEh (Figure 1) were similar to those of historical reference stations unimpacted by point source discharges and below the pFTAL. Both were also significantly lower than those about 3 miles upstream at Augusta/Hallowell from 1997-99 (Appendix 6). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that exceeded the pFTAL but was well below (25%) the FTALr. Elevated concentrations of total PCBs in fish from the Kennebec River below Augusta has been previously well documented. Consequently, MCDC has issued a Fish Consumption Advisory recommending no consumption of freshwater fish from this river reach (Appendix 1).

Penobscot River

East Branch at Grindstone- (PBG) The East Branch of the Penobscot River at Grindstone has no point source discharges and was used as a reference station for the Lincoln Paper and Tissue mill from 1995-1998. Due to concerns about discharges from the Millinockett mills into the West Branch that might be ascribed to the Lincoln mill, dioxin concentrations in fish from the Woodville station on the main stem below the confluence of the East and West branches was compared to those from the Grindstone station in 1997 and 1998. With a finding of no significant difference in dioxin concentrations between the two stations, the Woodville station has been used as the reference for Lincoln since 1999. In some recent years, concentrations of DTEh in white suckers from the Woodville station were elevated above historical levels and above those from Grindstone. Consequently, in 2006, as part of the SWAT program, both stations were resampled.

In 2006 5 white suckers (Appendix 5) from Grindstone were captured and analyzed for dioxins, furans and coplanar PCBs. Concentrations of TCDD and DTEh were below the pFTAL (Figure 2, Appendix 2) and similar to historical levels (Appendix 6).

Woodville (Mattaceunk Impoundment)- (PBW) As part of the SWAT monitoring program, 5 white suckers (Appendix 5) were collected from the river at Woodville, downstream of Katahdin Paper's pulp and paper mills in Millinocket and East Millinockett to compare to those from Grindstone, as described above. Fish collected at this station from 1997-2001 had similarly low concentrations of dioxin as the historical reference station at Grindstone on the East Branch, uninfluenced by any mill. Therefore, this station had served as a reference station for the Penobscot River and the upstream station for Lincoln Paper and Tissue above/below (A/B) test. Finding DTEh in suckers in 2002, 2003, and 2005 elevated above historical levels at Woodville and Grindstone, both stations were resampled in 2006.

In 2006 5 white suckers were collected from the Woodville impoundment. Concentrations of TCDD and DTEh were below the pFTAL (Figure 2, Appendix 2) and similar to those from Grindstone and to those at Woodville prior to 2002 (Appendix 6). The elevated levels seen in recent years were not measured in 2006. The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that exceeds the pFTAL and is significantly higher than that at Grindstone, however.

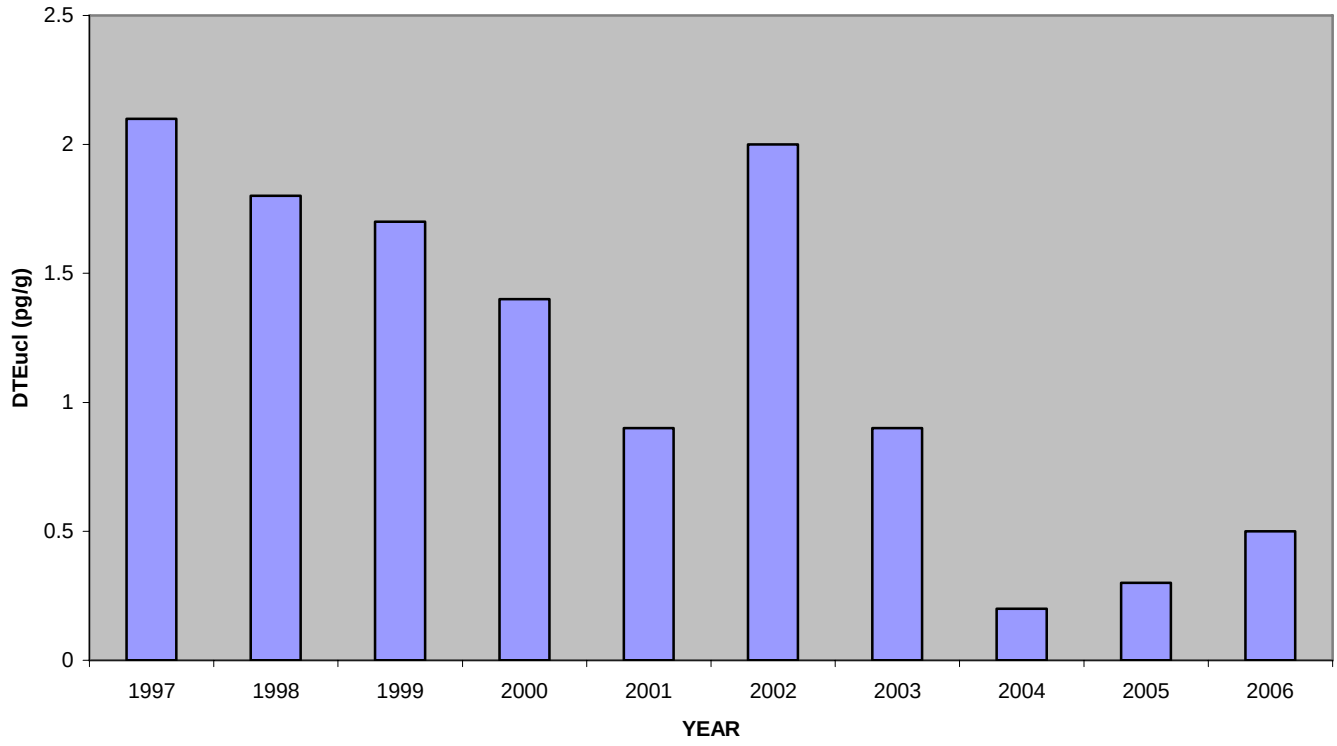
Given the varied results since 2002 and changes at the mills in Millinockett during this time, monitoring should be continued in 2007.

South Lincoln- (PBL) A total of 5 white suckers (Appendix 5) were collected from the river near the boat ramp in South Lincoln, approximately 4 miles downstream of Lincoln Paper and Tissue Company's bleached kraft mill in Lincoln

Concentrations of TCDD and DTEh were significantly elevated above those at Grindstone and Woodville, sampled in the SWAT monitoring program (Appendix 2). Concentrations of DTEh were also above the pFTAL although well below (36%) the FTALc (Figure 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that are still well below (63%) the FTALr.

There were declining trends in TCDD and DTE for the period 1997-2006, although levels increased significantly in 2006 (Figure 16).

Figure 16. Dioxin concentrations (DTEhucl) in white suckers from the Penobscot River at S Lincoln, Maine



The mill passed the A/B test in 2003 and 2005, and must demonstrate continuing compliance annually. Reduced discharge of dioxin from the mill has been documented by decreased concentrations of TCDD and TCDF in sludge (Appendix 3) and in effluent (Appendix 4) since a change in the mill's bleaching process from chlorine based bleaching to primarily oxygen based bleaching in 1999. These results are consistent with the declining trend seen in fish, and the finding of no measurable discharge by 2005. The results of the 2006 fish testing are conflicting. This warrants a close review of the discharge from the mill and repeat testing both above and below in 2007.

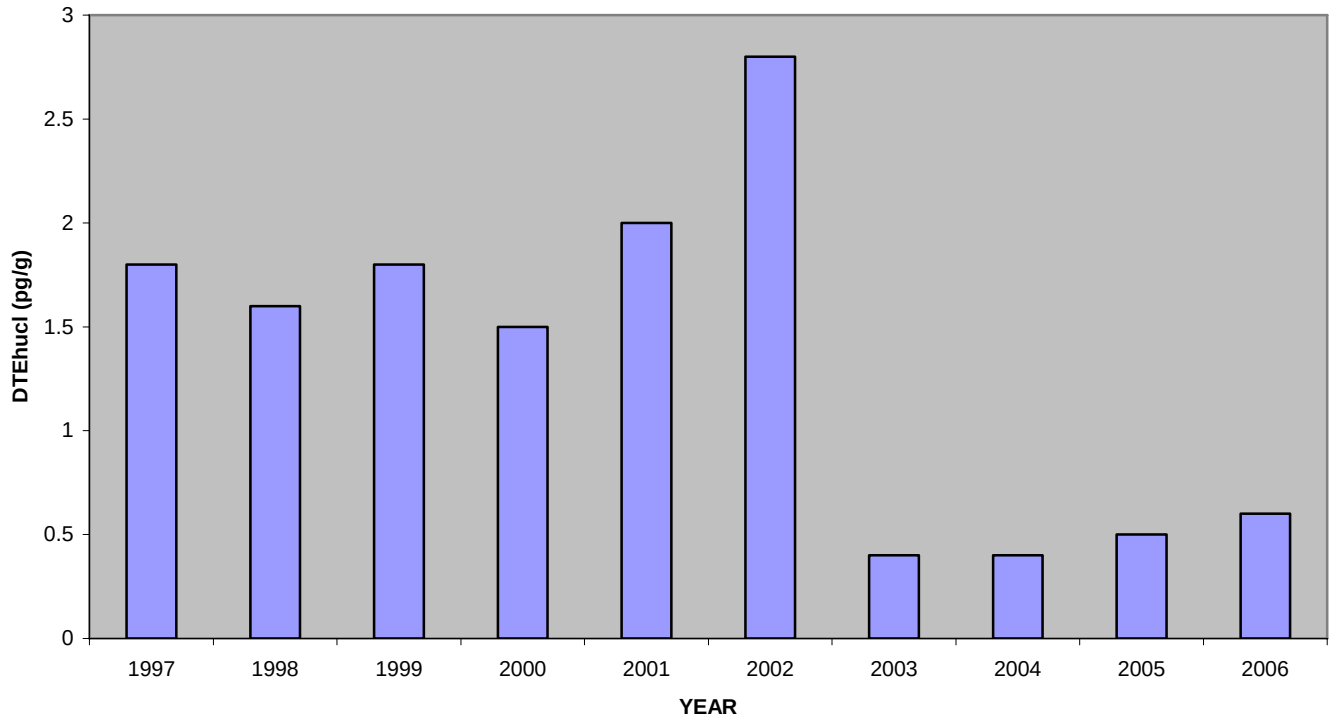
Veazie- (PBV) A total of 5 white suckers (Appendix 6) were collected from the Veazie Impoundment about 7-8 miles below the former Fort James' bleached kraft mill in Old Town (Appendix 5). This mill closed in March 2006. It was purchased by Red Shield in November 2006 and currently is operated as a biomass boiler producing power for the grid.

Concentrations of TCDD were similar to those at background stations unimpacted by point source discharges (Appendix 6). DTEh, however, were elevated and exceeded the pFTAL although below (43%) the FTALc (Figure 2), Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in an increase in total toxic equivalents (TTEh) that are still below (78%) the FTALr.

There was a declining trend for TCDD for the period 1997-2006, but none for DTEh (Figure 17). This is a bit surprising since TCDD and TCDF bleach plant effluent concentrations at the Georgia Pacific mill have continued to decline since early 1998 and remain below suitably low detection levels (Appendix 4). Nevertheless, concentrations are significantly lower since 2003 compared to previous years.

The 2003 and 2004 A/B tests had documented that there was no longer a measurable discharge of dioxin from the mill. Continued compliance in 2006 was documented by non-detected concentrations in bleach plant effluent (Appendix 4). Additional periodic monitoring and certification of bleach plant operation will be necessary to confirm continued reduced concentrations under new owners and operations if the facility will be operated as a pulp and or paper mill, which may occur.

Figure 17. Dioxin concentrations (DTEhucl) in white suckers from the Penobscot River at Veazie, Maine



Presumpscot River

The Presumpscot River has not been sampled since 2002, when the A/B fish test found no significant difference in dioxin concentrations above and below SD Warrens' paper mill for the second year. The pulp mill had closed in 1999, and the paper mill continued with purchased pulp. In 2006, at the request of MCDC, fish were sampled again as part of the SWAT monitoring program.

Windham -(PWD) A total of 5 smallmouth bass (Appendix 5) were collected from the Dundee Impoundment in the river in Windham, upstream of the mill. Concentrations of TCDD and DTEh were similar to those from historical reference stations unimpacted by point source discharges (Appendix 6). This was not always the case for some unknown reason. This "reference" station had no point source discharges above it, but often had higher concentrations than all other reference stations with no point sources. The addition of dioxin-like (coplanar) PCBs to DTEh resulted in an increase in total toxic equivalents (TTEh) that approached only the pFTAL. There are not enough recent data for meaningful trends analysis.

Westbrook- (PWB) A total of 5 smallmouth bass (Appendix 5) were collected from the river below SD Warren's paper mill in Westbrook. Concentrations of TCDD and DTEh were similar to those from Windham (Appendix 2, Figure 1). The addition of dioxin-like (coplanar) PCBs to DTEh resulted in an increase in total toxic equivalents (TTEh) that exceeded the pFTAL. There was no trend in either TCDD or DTEh.

Salmon Falls River

There is currently a fish consumption advisory on the Salmon Falls River below Berwick due to a combination of dioxins and PCBs. Up through 2002, fish samples have been collected from the Salmon Falls River about 2 miles below the discharge from the Berwick Sewer District's municipal wastewater treatment plant in Berwick, whose discharge ranged from 65-70% effluent from Prime Tanning Company in the past to ~40% currently. Sampling was scheduled for 2003 and 2004 but fish were not captured. DEP's long standing policy has been that where there is a single discharger of dioxin in a river, fish sampling is the best way to determine the status of any discharge. Where there is more than one source, sampling of sludge may be used to determine discharge status. Prime Tanning Company notified DEP that there was an additional source historically in Somersworth NH. Consequently, after discussion with the New Hampshire Department of Environmental Services, testing of both Berwick and Somersworth, NH wastewater treatment plant sludge was substituted for fish testing on a quarterly basis. The results of the first 4 quarters' sampling show that concentrations from both are relatively low but similar to those from the Town of Hartland (with the discharge from Irving Tanning) below which are significantly elevated concentrations in fish (Appendix 3). Samples will be collected in the next 4 quarters as well.

In 2006 at the request of MCDC as part of DEP's SWAT monitoring program, fish were also collected above and below the Berwick discharge for analyses for dioxins and PCBs.

Spaulding Pond- SFP A total of 5 largemouth bass (Appendix 5) were collected from Spaulding Pond in Lebanon, upstream of the Berwick discharge. There are no known significant point source discharges above this station. Concentrations of TCDD and DTEh were similar to those previously reported at another reference station upstream at Acton) (Appendix 6). DTEh were below the pFTAL (Figure 1). The addition of dioxin-like (coplanar) PCBs to DTEh resulted in an increase in total toxic equivalents (TTEh) that exceeded the pFTAL but was well below (54%) the FTALr There are not enough recent data for meaningful trends analysis.

South Berwick- A total of 5 largemouth bass (Appendix 5) were collected from the Rollinsford Impoundment about 2 miles below the discharge from the Berwick Sewer District's municipal wastewater treatment plant in Berwick, whose discharge is dominated by effluent from Prime Tanning Company. Concentrations of TCDD and DTEh were similar to those at Acton (Appendix 6, Figure 1). DTEh were below the pFTAL (Figure 1). Concentrations were also significantly lower than in previous years (Appendix 6), which is consistent with low levels found in the sludge (Appendix 4). The addition of dioxin-like (coplanar) PCBs to DTEh resulted in an increase in total toxic equivalents (TTEh) that exceeded the pFTAL but was well below (29%) the FTALr. There was no trend in either TCDD or DTEh.

Sebasticook River

Historical discharges of dioxin have been documented on both the East and West Branches of the Sebasticook River. In 2006, at the request of MCDC as part of DEP's SWAT monitoring program, fish were sampled from the East Branch and main stem. Sampling of the West Branch continued under the Dioxin Monitoring Program.

East Branch at Newport- (SEN) A total of 5 largemouth bass (Appendix 5) were collected from the river just above the County Road Bridge, a popular fishing spot at the inlet to Sebasticook Lake. This station is approximately 2 miles below the Corinna Sewer District discharge, 80% of which was from the Eastland Woolen Mill. This facility treated the waste from the Eastland Woolen Mill in Corinna until 1996, when the mill ceased operation. Since then groundwater and river sediments have been found to be contaminated with a number of pollutants from the mill including dioxin. The site was placed on the National Priorities List of Superfund sites in 1999, and extensive remediation included removal of contaminated soil and the buildings in the 'downtown area' and relocation of a portion of the riverbed. In addition, the Corinna discharge was removed from the river, going to land treatment in 2005.

Concentrations of TCDD in 2006 were similar to those of historical reference stations unimpacted by point source discharges and lower than previous levels (Appendix 6). DTEh, however, were elevated above the pFTAL (Appendix 2, Figure 1). The addition of dioxin-like (coplanar) PCBs to DTEh resulted in an increase in total toxic equivalents (TTEh) that approached (88%) the pFTALr.

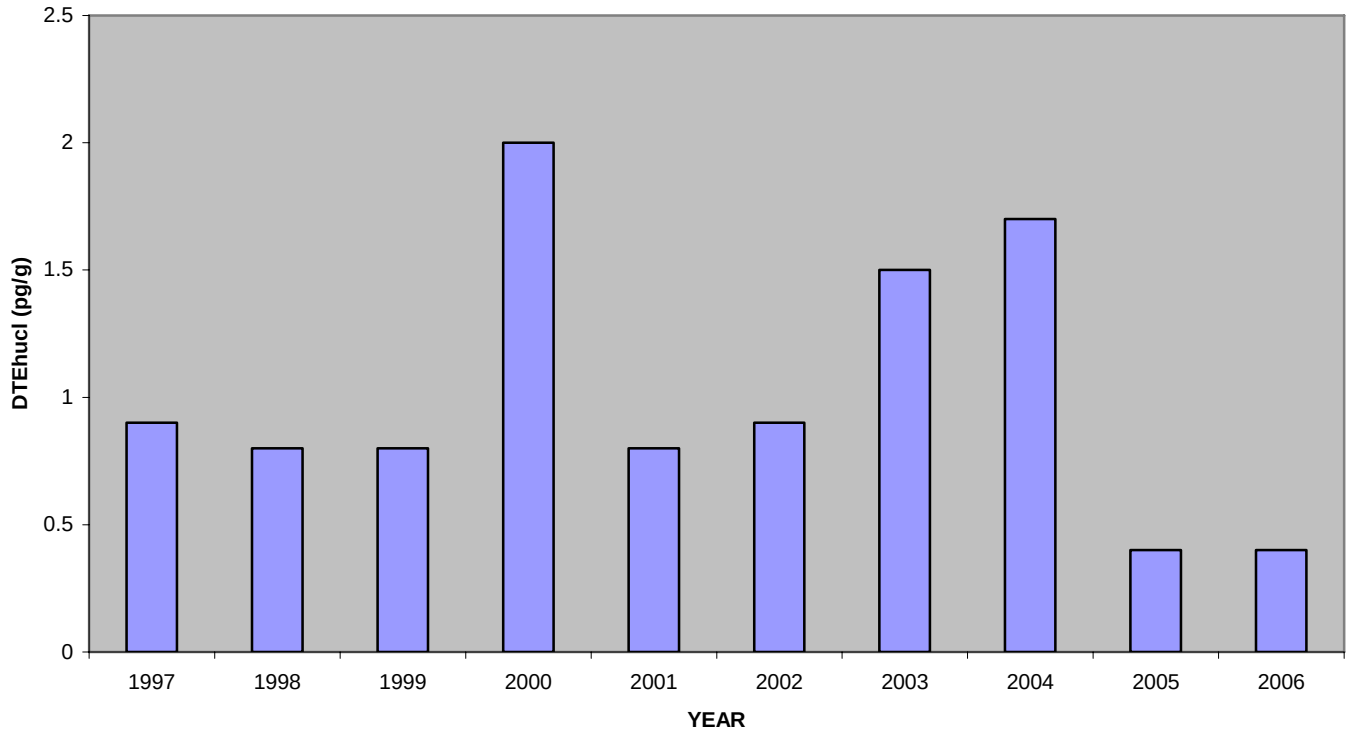
Although there are not enough recent data for meaningful trends analysis, in 2006 DTEh were somewhat lower than previous levels (Appendix 6) likely documenting the effects of remediation.

West Branch at Palmyra (SWP) A total of 5 largemouth bass were collected from the river near the US Route 2 bridge about 3-4 miles below the discharge from the Town of Hartland, whose effluent is about 85% effluent from Irving Tanning Company (Appendix 5).

TCDD concentrations were elevated slightly above those of historical reference stations unimpacted by point source discharges (Appendix 6). Concentrations of DTEh were also elevated and right at the pFTAL (Figure 1, Appendix 2). The addition of dioxin-like (coplanar) PCBs to DTEh results in total toxic equivalents (TTEh) that exceed the pFTAL but are well below (32%) the FTALr. Concentrations are still higher than those from the upstream reference station in previous years or from other reference stations in Maine.

There is no declining trend due to the wide variation among the years, but concentrations in 2006 were also much lower than in previous years (Figure 18). These results document a current or historical local source of dioxin to this reach of the river, most likely the Irving Tanning discharge. Although the only effluent sample result reported (1996) showed no detectable amount of dioxin in effluent (Appendix 4), low solubility and high bioconcentration of dioxin make effluent data less meaningful than sludge data. Sludge data from 1989 show measurable levels of TCDF (Appendix 3), but more recent data in 2000 show concentrations below reasonably low detection levels. If these recent data are representative of reduced discharges, concentrations in fish should decrease in time, the length of which will be determined by how much residual dioxin remains in the system. Because the West Branch is heavily fished, continued monitoring is warranted.

Figure 18. Dioxin concentrations (DTEhucl) in largemouth bass from the West Branch Sebasticook River at Palmyra, Maine



Burnham- (SEB) A total of 5 smallmouth bass (Appendix 5) were collected from the main stem of the Sebasticook River below the confluence of the East Branch and West Branch (Appendix 5) at the request of the MCDC as part of Maine's Surface Water Ambient Toxics (SWAT) monitoring program. This reach, then, receives water from upstream sources from SEN and SWP.

Concentrations of TCDD were slightly elevated above those at historical reference stations unimpacted by point source discharges (Appendix 6). Concentrations of DTEh were also elevated at the pFTAL (Figure 1, Appendix 2). There results are not surprising given the existence of sources upstream on each branch of the river. The addition of dioxin-like (coplanar) PCBs to DTEh results in total toxic equivalents (TTEh) that further exceed the pFTAL but are well below (37%) the FTALr.

There are not enough data for trends analysis, but concentrations were similar to those from 2005 and slightly lower than those in 2004.

APPENDIX 1.

FISH CONSUMPTION ADVISORIES

APPENDIX 2A.

SPECIES AND STATION CODES

SPECIES CODES

BNT	brown trout
EEL	eel
LMB	largemouth bass
RBT	rainbow trout
SMB	smallmouth bass
WHP	white perch
WHS	white sucker

STATION CODES

AGL	Androscoggin R at Gilead above NewPage
ARP	Androscoggin R at Rumford Point above NewPage
ARF	Androscoggin R below Rumford below NewPage
ARY	Androscoggin R at Riley above Verso Paper
ALV	Androscoggin R at Livermore Falls below International Paper
AGI	Androscoggin R at Gulf Island Pond, Auburn below International Paper
ALS	Androscoggin R at Lisbon Falls below International Paper
ALW	Androscoggin Lake at Wayne below International Paper
KRM	Kennebec R at Madison above SAPPI Somerset, Skowhegan
KNW	Kennebec R at Norridgewock above SAPPI Somerset, Skowhegan
KHY	Kennebec R at Hinckley, above SAPPI Somerset Skowhegan
KFF	Kennebec R at Shawmut, Fairfield below SAPPI Somerset, Skowhegan
KRS	Kennebec R at Sidney below SAPPI-Somerset & KSTD in Waterville
PBW	Penobscot R at Woodville above Lincoln Paper & Tissue
PBM	Penobscot R at Winn above Lincoln Pulp and Paper in Lincoln
PBL	Penobscot R at S Lincoln below Lincoln Pulp and Paper in Lincoln
PBC	Penobscot R at Costigan, Milford above Georgia Pacific in Old Town
PBV	Penobscot R at Veazie below Georgia Pacific in Old Town
PBO	Penobscot R at Orrington below Georgia Pacific in Old Town
PWD	Presumpscot R at Windham above SAPPI Westbrook
PWB	Presumpscot R at Westbrook below SAPPI Westbrook
SFS	Salmon Falls R at S. Berwick below Berwick POTW and Prime Tanning
SEN	E Br Sebasticook at Newport below Corinna and former Eastland Woolen mill
SED	E Br Sebasticook at Detroit below Corinna and former Eastland Woolen mill
SWP	W Br Sebasticook at Palmyra below Hartland POTW and Irving Tanning

APPENDIX 2.

DIOXIN AND FURAN CONCENTRATIONS IN 2004 FISH AND SHELLFISH SAMPLES

APPENDIX 3.

TCDD & TCDF IN SLUDGE FROM MAINE WASTEWATER TREATMENT PLANTS

APPENDIX 4.

TCDD & TCDF IN WASTEWATER FROM MAINE PULP AND PAPER MILLS

APPENDIX 5.

LENGTHS AND WEIGHTS FOR 2006 FISH SAMPLES

APPENDIX 6.

SUMMARY OF DIOXINS AND FURANS IN FISH AND SHELLFISH SAMPLES, 1984-2006

APPENDIX 7

CERTIFICATIONS OF BLEACH PLANT OPERATION