COMPREHENSIVE

SURFACE WATER AMBIENT

TOXIC

MONITORING PROGRAM

PROPOSED

FIVE YEAR WORKPLANS

1993 - 1997

LAKES

RIVERS AND STREAMS

MARINE AND ESTUARINE

Department of Environmental Protection

January, 1993

MONITORING PLAN DEVELOPMENT

In An Act to Implement a Comprehensive Ambient Toxics Monitoring Program, Public Law 1991 Chapter 735, the Commissioner of the DEP must include in his report a plan that identifies and prioritizes water bodies to be monitored based on known and suspected sources, that identifies toxic substances to be monitored, and that identifies a monitoring schedule.

Selection of sites, toxic substances monitored and schedules will vary depending on the needs of the overall program in relation to the module. At the same time, continuity is an extremely important characteristic of this program. A balance between continuity and flexibility will be addressed through the development of Five Year Workplans. These plans will provide objectives, goals, milestones, costs, and to the extent possible, identify locations, a sample design and schedule from which the program will operate.

Since circumstances change within any 5 year period, an Annual Workplan will be developed each year which will identify exact locations and other sampling details. The Annual Workplan will reflect information collected in prior years. For example, it may be determined that some waterbodies or contaminants need not be sampled at the same frequency originally envisioned or at all. Others may need to be sampled more frequently. New information, data or issues may be identified by the general public, private, local, state, or federal groups before the plan has been completed. New research findings may identify contaminants or methods that could provide critical or otherwise useful information. There will certainly be factors that could not be anticipated initially that need to be considered on an annual basis. The following process for selection of waterbodies, toxic substances, and a monitoring schedule will be employed when developing both the general five year work plans and the revisions.

Workplans will be developed by the Commissioner using all appropriate information available. The Surface Water Ambient Toxics Monitoring Program technical advisory group, which assisted in preparation of this report, will be asked to review five year plans and annual work plans to ensure that all the requirements of the act are met and to integrate other ongoing efforts to the extent possible.

LAKES MODULE WORK PLAN
1993-1997

SCOPE

In the next five years, 1993-1997, the focus of the lakes module will be fish tissue analysis. Currently there is no such continuing program at the state level. The International Toxics Monitoring Program was a one time survey conducted in 1992-3 which collected fish tissue and snow samples from three lakes in each New England state, New York, and 4 eastern Canadian provinces. Results are expected in spring of 1993. The development of EPA's EMAP program will be reviewed annually to determine its utility in filling information needs for Maine lakes.

Task-Fish Tissue Monitoring

Need-Limited data collected to date indicates that some fish from certain kinds of Maine lakes may exceed the FDA action level for human consumption because of high levels of mercury. Based on research being conducted by the University of Maine, US Fish and Wildlife Service, and Maine Department of Inland Fisheries and Wildlife, there is evidence that Maine bald eagles are experiencing a lower reproductive success than expected. Levels of mercury and other contaminants in fish potentially consumed by the eagles are higher than values associated with effects on reproduction documented in the literature. Maine has very little information regarding contamination of fresh water fish from Maine lakes upon which to make objective scientific conclusions regarding the extent of the problem statewide. There is a need for a comprehensive continuing program to monitor contaminants in fish from Maine lakes all over the state.

Output-During 1993 and 1994 sampling of fish tissue in lakes will be accomplished under a joint project with Region I of EPA under their regional EMAP project (R-EMAP). One hundred twenty lakes will be sampled in 1993 primarily with any remaining sampling necessary conducted in 1994. Sampling will be conducted by the Maine Department of Inland Fisheries and Wildlife biologists for each of the seven regions of the state assisted by EPA and DEP.

Lakes will be selected using the EMAP probability design to ensure extensive geographical coverage of the State. Lakes will be selected from the following population:

1. Lakes that have been surveyed by DIFW
2. Lakes with significant fisheries
3. Lakes of significant importance to wildlife

Lake water chemistry data, fish samples, and sediment samples will be collected from each lake. Limited lake water chemistry data will be collected to assist in comparisons of lake types and in interpretation of fish tissue data. Limited data from sediments will

be collected to provide information on pathways, reservoirs, and also assist in interpretation of data.

Fish species will be selected on the basis of trophic level considerations. Both a top predator and bottom omnivore will be selected from each lake. Since the same species are not present in all lakes, species sampled will vary from lake to lake. A hierarchical order of preference by species importance based on knowledge of distribution and desirability will be used to select species from each lake. The size of fish sampled will be based on legal length limit, desirability and availability to anglers, and likelyhood of capture during sampling.

During 1995-1997 fish tissue monitoring will likely be continued at some level to collect additional information to fill needs identified by the initial program. Since it is impossible to predict the results of that program, it is difficult at this time to determine the scope and necessary resources for those years. The final report of the R-EMAP project, scheduled for completion in early 1995, may contain recommendations regarding future directions in monitoring of this resource which can be implemented at that time.

PERSONNEL

existing	needed
DEP 0.3 BIO III	1 BIO I (18 mo)
DIFW 0.8 BIO III	1 BIO I (24 mo)
	3 CA (5 mo)
EPA 2.3 wy	

LAKES MODULE BUDGET

FISH TISSUE

	1993	1994	1995	1996	1997
equipment and supplies	34000	956	???	???	???
field work (personnel, travel)	100000	29375	???	???	???
sample handling	4000	579	???	???	???
chemical analysis	106012	106012	???	???	???
data management and report	40000	40000	18918	???	???
contingencies	10000	10000	3792	???	???
TOTAL	294012	186922	22710	???	???
(EPA GRANT)	294012	186922	22710	???	???
TOTAL NEW	0	0	0	???	???

RIVER AND STREAM MODULE WORKPLAN
1993-1997

SCOPE

In the next 5 years, 1993-1997, the focus of toxics monitoring in the Rivers and Streams Module will be divided into two elements, fish tissue monitoring and biomonitoring. There are two current programs which will be included in this effort, the Dioxin Monitoring Program (DMP) and the Biomonitoring Program. Both will be combined with other sampling to ensure a comprehensive program is developed. Fish tissue monitoring will include both intensive and extensive monitoring, while biomonitoring will include only extensive monitoring.

Task-Fish Tissue Monitoring

Need-There are 33 major industrial discharges, 79 major mumicipal discharges, and approximately 600 minor discharges into Maine's surface waters. In addition numerous other activities result in the indirect discharge of toxic pollutants (non-point sources) into the surface waters of the state. Currently there is very little information regarding the nature of these pollutants or of their impact on human or ecological health. Fish tissue monitoring will allow an assessment of the bioaccumulation of the pollutants with this potential.

Output-The DMP will be continued and expanded to include other contaminants, such as other organic and chlorinated organic compounds and heavy metals, potentially present in significant amounts, to be sampled below potential or known point sources of dioxin or other toxic pollutants. The list of contaminants sampled will not necessarily be similar at all sites. There will be a group of contaminants that will be similar for all sites, but other contaminants sampled at a given site will be based on the nature of the expected sources at that site.

Annually intensive monitoring of up to 25 sites below known or suspected point sources of dioxin or other toxic pollutants will be conducted. However, if levels of dioxin continue to decline, as has occurred in the last couple of years and no other significant contaminants are found, the number of stations may be reduced to a smaller number of 'indicator' stations which would be sampled periodically for trends. The frequency of sampling may vary from annual to less frequent sampling at different sites according to the criteria described earlier in this document. Although the Dioxin Monitoring Program is scheduled to end in 1995, it may need to be continued and is included for all years of the five year plan.

In addition to intensive monitoring below known or potential point sources of toxic pollutants, extensive monitoring at up to 25 sites will be conducted each year. These sites will be selected using the river basin approach and other site selection criteria previously listed and will not necessarily be associated with point sources of toxic

pollutants. These sites will change each year such that over the five years, some samples will have been collected in all of the major river basins of the state.

Reference sites will be included and continued throughout the program. No more than 30 sites total (including both intensive and extensive monitoring) will be sampled in any one year. Annual work plans will specify the sites and contaminants to be sampled each year based on the results of the monitoring the previous year.

Both game fish and bottom feeder species of fish will be collected for analysis at each site. Game fish will normally be analyzed as skinless fillets to aid the assessment of risk of the consumption of contaminated fish to human consumers. Bottom feeders will be analyzed, as will game fish occasionally, as whole fish, in order to evaluate the risk of consumption of contaminated fish to wildlife consumers. The targer will be to collect ten fish of each species at each site. At new sites where the presence of contaminants is not known, the fish will be analyzed as two 5-fish composites. At sites with known contamination, the fish may be analyzed as individuals. to describe the variability among individuals to aid the human health risk assessment, or composites if the variability is already known or not of concern.

Task-Biomonitoring

Need-Biomonitoring is necessary to fulfill the requirements of the Water Classification Program 38 MRSA sections 464(6) and 465. More specifically as described in the Surface Water Ambient Toxics Monitoring Program report, biomonitoring is needed as a complement to fish tissue monitoring to assess the impacts of toxic pollution directly to the aquatic community itself.

Output-The current Biomonitoring Program will be continued and expanded to include existing and new sites associated with known and suspected point and nonpoint sources of toxic pollutants. Extensive monitoring of up to 30 sites will be conducted each year, with about 20 located at sites of potential impact and 10 located as reference sites. Sites will be associated with both point and non-point sources of pollution. Some of the sites will be the same as used for monitoring for fish tissue. Sampling using the river basin approach will allow sites to be sampled once every 5 years.

PERSONNEL

existing

0.2 Bio III
0.5 Bio II
1.0 Bio I

needed

3 conservation aides (4 months each)

RIVERS AND STREAMS
MODULE BUDGET 1993-1997

	1993	1994	1995	1996	1997
BIOMONITORING (30 sites)					
personnel (existing)	69000	72450	76075	79875	83870
needed 1 CA	8000	8400	8820	9260	9725
sorting, taxonomy, travel, etc	20000	21000	22050	23150	24310
subtotal	79000	101850	106945	112285	117905
subtotal new	28000	29400	30870	32410	34035
FISH TISSUE (30 sites)					
personnel (existing)	10000	10500	11025	11575	12150
needed 2 CA	16000	16800	17640	18520	19450
chemical analysis					
metals	72000	75600	79380	83350	87500
dioxin (existing)	168000	168000	168000	168000	168000
other organics	288000	302400	317520	323870	340060
travel	3000	3150	3310	3475	3650
supplies	2000	2100	2205	2315	2430
boat, motor, and trailer	3000				
subtotal	562000	578550	599080	611105	633240
subtotal new	384000	400050	420055	431530	453090
TOTAL	641000	680400	706025	723390	751145
TOTAL NEW	412000	429450	450925	463940	487125

budget estimates increased at 5% per year except for dioxin which is flat funded

MARINE AND ESTUARINE MODULE WORK PROGRAM
1993 to 1997

METHOD DEVELOPMENT

Task 1 - 1993 - Selection and Documentation of Monitoring Methods

Need - The diversity of marine monitoring methods used in Maine precludes comparison of data collected over time or geographic areas. Even within a single agency, there may be as many methods as there are investigators. The result is an accumulation of many unrelated bits of information with no context within which to place them. Use of a standard method will enable proper comparison between sites.

Acceptable methods are critical to development of legally defensible Water Quality Standards. One can not force one municipality or industry to conform to a different set of standards than another's. If methods were generally recognized, they would be more easily used by others not connected with the Marine and Estuarine Module thereby efficiently expanding the common information base.

Output - During 1993, we will prepare a Marine Monitoring Methods Manual which outlines standard methods used by this program for sample collection, data management and analysis. Where possible, protocols comparable to existing programs such as NOAA's Nationwide Status and Trends Program and the Gulf of Maine Council on the Marine Environment will be incorporated.

Task 2 - 1994 - Biological Methods Development

Need - Presence of toxic contaminants in tissue or the environment may be useful when determining trends, but it is of limited value when establishing whether toxic contaminant levels are tied to toxicity or impact. Toxicity is expressed at many biological levels; from subcellular, through cellular, for individuals, species, populations, communities and ecosystems. This area of toxic biological monitoring is just now evolving.

Output 1 - During 1994, an analysis of marine biological effects monitoring tools such as biomarker techniques and community analysis will be reviewed to determine the feasibility of their use. Specifically, items of interest are cost in relation to other techniques, in-state expertise to pursue these techniques, effectiveness and utility of techniques. A report will be prepared to briefly outline findings and identifying an approach to monitoring toxic biological effects in the marine environment.

Output 2 - During 1995 through 1997, the techniques identified in the above report will be applied to Maine marine waters for field testing and development. A report on the findings of this trial will be included in the Five Year Report to the Legislature.

EXTENSIVE MONITORING

Task 1 - 1993 -1997 - Coast wide Environmental Status and Trends Survey

Need - Maine's extraordinary coastline presents a major challenge to environmental resource managers. For the most part it is presumed to be relatively

free of pollution effects, however little information exists to substantiate this. The National Oceanic and Atmospheric Administration's National Status and Trends Program for Marine Environmental Quality is an ongoing (since 1984) program which defines the geographic distribution of contaminants in biological tissues and sediments. Six stations are located in Maine, however, these six are inadequate to characterize the coast of Maine as a whole.

Output - A broad survey will enable us to assess the general quality of Maine's coastal waters as well as establish a baseline record around which future data may be compared. Such a survey will also enable us to prioritize those areas in need of follow up study or intensive surveys. We propose stations in the estuaries of major river basins draining to coastal waters, all NOAA sites, and areas of special interest such as centers of population or clean background areas. Once during a pre-established interval, tissues from blue mussels and a benthic feeder will be sampled from each of the following locations. Other locations will be added. Twelve sites will be sampled each year. After an evaluation of the data from the initial first five years, sites will be selected for continued sampling and their sample intervals evaluated. This task addresses both ecological and human health issues.

Long Term Status and Trend Waterbodies	**Prime Characteristic**	**Interval**
Piscataqua River estuary	Major Basin-SC	2
Wells National Estuarine Research Reserve	Reference-SB	2
Kennebunk Estuary	Urban-SC	4
Goosefare Brook Estuary	Non-Attainment-SC	4
Saco River Estuary	Urban/Industrial-SC	2
Presumpscot River Estuary	Major Basin-SC	2
Royal River Estuary	Major Basin-SC	4
Kennebec / Androscoggin Estuary	Major Basin-SB	2
Sheepscot Estuary	Major Basin/Reference-SB	2
St. George Estuary	Major Basin/Reference-SB	4
Penobscot Estuary	Major Basin-SC	2
Union Estuary	Major Basin-SB	4
Narraguagus Estuary	Major Basin-SB	4
St. Croix Estuary	Major Basin-SC	2
Damariscotta Estuary	Major Basin/Reference-SB	4
Muscongus Bay	Reference-SB	4
Rockland Harbor -	Industrial-SC	2
Belfast Harbor	Industrial-SB	4
Blue Hill/ Cape Rosier	Non-Attainment-SB	4
Southwest Harbor	Intense Recreational-SB	4
Casco Bay	Industrial Mix	2
Sears Island	Oil Facility	4
Pickering Island	NOAA S&T	simult.
Deer Isle	NOAA S&T	simult.
Frenchman's Bay	NOAA S&T	simult.
Machias Bay	Reference	4

Task 2 - 1993 - 1997 - Human Health Risk Assessment

Need - Data on toxic contamination collected by this program will undoubtedly elicit concerns by the public regarding human health risks. The need to place data generated by this monitoring program in proper and informed perspective is important to the success of the entire program. To date, information on levels of toxic contaminants in human food species is virtually absent. Public reaction and market effects are left up to speculation. Because environmental trend monitoring techniques using tissues are generally aimed at targeting organs where contaminants are concentrated, these same techniques are not always appropriate tools for assessing human health risks.

Output - We propose to sample select food species in geographic areas targeted as anomalous through environmental monitoring to determine levels of toxic contaminants in edible tissues. This will require a multi year collection period to include reference sites as well as contaminated sites.

INTENSIVE MONITORING

Task 1 - 1993-1997 - NPDES / Water Quality Certification Monitoring

Need - Waste discharge permits are renewed every 5 years. To date, renewals have been issued without a thorough understanding of the impact of the discharge on receiving waters. In fact, attainment of classification is rarely documented. Such information is needed if Maine is to accomplish the goals of the Clean Water Act and Classification Program.

Output - As the state is divided into 5 hydrologic licensing units, monitoring for classification attainment will be conducted during the year prior to relicensing.

Task 2 - 1993 - 1996 - Assessment of Extent of Local Pollution

Need - While the extensive survey is useful in characterizing Maine's coast as a whole, the intensive survey is used to describe specific areas or systems along the Maine coast. It is best used where contamination is known to be of concern or strongly suspected to be of concern. To date the Program has looked at Casco Bay, Piscataqua River Estuary, Boothbay Harbor, and Machias Bay. Penobscot Bay was surveyed by Johnson and Larsen in 1984 (Johnson, 1985). Other high value coastal systems need to be studied.

Contamination data thus far suggest that patterns which may be useful in predicting (and thereby avoiding) future contamination. Monitoring structured to test this hypothesis could make a significant contribution to environmental management if such a predicitve model were made available.

Output - From 1993 to 1996, we will design a stratified monitoring plan to address the question of whether or not small embayments with certain morphometric and hydrodynamic characteristic are vulnerable to contaminant accumulation.

Task 3 - 1996 -1997 - Effects of Dredge Disposal Areas on Marine Life

Need - As a result of the NOAA data report on Casco Bay and reports by fishermen, there is some reasonable suspicion that the dredge disposal area(s) may be contributing to fish health problems. Specifically, a higher than usual incidence of lesions and fin erosion have been reported in the vicinity of the Bigelow Dump Site. Off New York, at the 106 Mile Site, fish health is a major problem. In the least, the reports relating to Casco Bay must be verified.

Output - Five samples of ten fish and ten molluscs will be collected in the vicinity of two Casco Bay disposal sites and two areas thought to be unaffected by disposal. Samples will be subjected to pathological and chemical analysis of heavy metals, PCBs, and PAHs.

Total new money to support the above Five Year Workplan is summarized below.

	1993	1994	1995	1996	1997
LAKES	$0	$0	??	??	??
RIVERS AND STREAMS	$412,000	$429,450	$450,925	$463,940	$487,125
MARINE	$135,960	$202,960	$227,960	$197,460	$197,460
DATA MANAGEMENT	$10,000	$6,500	$6,500	$3,000	$3,000
TOTAL NEW FUNDS	**$557,960**	**$638,910**	**$685,385**	**$664,400**	**$687,585**