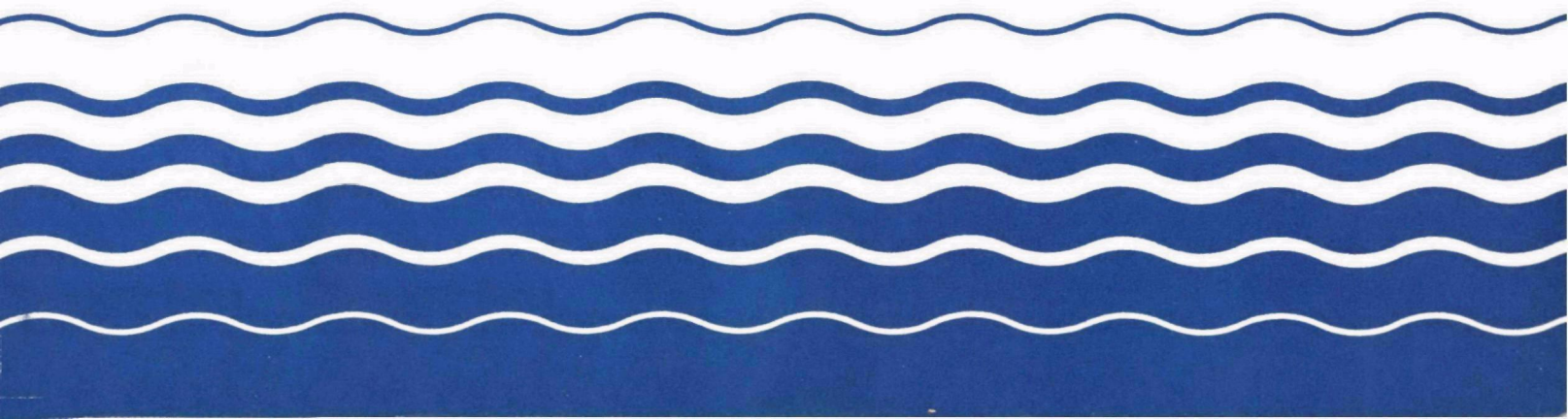


# **Program Survey-- Biological Toxicity Testing in the NPDES Permits Program**



**PROGRAM SURVEY**  
**BIOLOGICAL TOXICITY TESTING IN THE NPDES**  
**PERMITS PROGRAM**

**August 1987**

**Permits Division**  
**Office of Water Enforcement and Permits**  
**U.S. Environmental Protection Agency**  
**Washington, D.C. 20460**

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## INTRODUCTION

In 1986, EPA undertook an informal telephone survey of State and EPA Regional personnel to determine the nature and extent of biological toxicity testing in the NPDES permit program. A program survey summary report containing the information collected in that survey, and bearing the date of July 1986, was reproduced and distributed.

In the 12 months since that study was made, EPA Regions and many States have formalized policies relating to NPDES toxicity testing. There have been concerted efforts in many States to introduce biological testing into a greater number or all of major and many minor permits being considered for reissuance. The use of chronic toxicity effluent testing has increased, and this has led to an increase in toxicity determinations and a requirement on many permittees to conduct toxicity reduction evaluations. Because of these developments in the permit program, it was appropriate to again contact State and EPA Regional personnel to ascertain the present program status. This report summarizes the results of those contacts.

An informal telephone survey of NPDES State and EPA Regional personnel was conducted in mid-1987 to determine the current use of effluent biological testing. To conduct this survey, EPA contracted with WESTEC Services, Inc., Reston, Virginia. Regions and States were asked the number of NPDES permits they administered, the number of permits with a biological toxicity testing requirement, the number of permits with expressed toxicity limits and with requirements for toxicity reduction evaluations. Regional and State programs were discussed, including the use of biological testing such as acute and chronic toxicity testing techniques, instream biotic assessments, water quality trend monitoring at fixed locations, and aquatic organism flesh analyses for bioaccumulative materials, as well as any other use of biological investigative techniques.

EPA has not verified the results of this survey independently. Nor did EPA or the contractor look at individual permits, State regulations, or procedures referenced in the report. The intent of this summary is to give general information on the use of biological testing in Regional and NPDES State toxic control programs.

## RESULTS OF THE SURVEY

Biological testing methods used to characterize environmental effects of toxic pollutants discharges take various forms. Generally, biological methods are segregated into two groups: Effluent testing and receiving water testing. State permit programs use both methods, but permit-required effluent testing is by far the more prevalent.

This survey focused on toxicity tests where organisms are exposed in the static or flow-through environment of undiluted or diluted wastewater for 96 hours or less to simulate acute exposure, or up to 7 or more days to simulate chronic exposure. Various organisms are used in effluent toxicity tests; the EPA published a list of appropriate organisms in Table 1 of "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms" (EPA/600/4-85/013). The EPA publication, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" (EPA/600/4-85/014), provides details for conducting chronic toxicity tests. Various biological methods are appropriate for ambient or receiving water testing, and these provide the capability to identify environmental damage from toxic pollutants to some extent. Methods employed by States include studies and assessments related to macroinvertebrates, fishes, algae, periphyton, protozoa, primary productivity, sediment toxicity tests, fish flesh tainting, fish and mussel flesh analyses for bioaccumulated substances, caged organism toxicity, fish and invertebrate chronic toxicity tests, sediment analyses, and fish avoidance reactions.

The survey showed that:

- o 38 States require industries to conduct toxicity testing (Table 1).
- o 27 States require municipalities to conduct toxicity testing (Table 1).
- o 1,343 industrial permits require toxicity testing (Table 1).
- o 597 municipal permits require toxicity testing (Table 1).
- o The midwestern and western States have the fewest, if any, requirements for biological toxicity testing (Figures 1 and 2).
- o Effluent toxicity limits are in industrial permits in 14 States and are found in 39 percent of the industrial permits that require biological testing (Table 1, Figure 3).

- o Effluent toxicity limits are in municipal permits in 10 States and are found in 78 percent of the municipal permits that require biological testing (Table 1, Figure 3).
- o 16 States have a toxicity testing requirement in industrial permits only (Table 1).
- o 8 States do not require effluent biological testing (Table 1).
- o 19 States project that as new permits are issued, or as existing permits are reissued, all major and significant minor permits will contain biological testing requirements (Table 1).
- o Using major permits as a means of comparison, 15 States require biological toxicity testing in 50 percent or more of their industrial permits. California, Virginia, and West Virginia require biological testing in all of their major industrial permits and some minor permits (Table 1; Figure 1).
- o Using major permits as a means of comparison, 6 States require biological toxicity testing in 50 percent or more of their municipal permits. New Jersey requires biological testing in all of their municipal major permits and some minor permits (Table 1; Figure 2).
- o 10 States have toxicity reduction evaluations programs underway, and 13 additional States are beginning such programs (Table 2).
- o 5 States have (or will have within one year) biological laboratory certification programs (Table 3).
- o 16 States operate mobile biological laboratories for flow-through or chronic biological testing (Table 3).
- o 29 States have capability for conducting definitive acute or chronic toxicity tests (Table 3).
- o 33 States conduct receiving water macroinvertebrate or fish assessments related either to special study pollution investigations or to provide trend monitoring determinations (Table 3).

It is believed that the information herein is more exact than that contained in the 1986 report. Each contact listed in the address of a State or Federal program page was given the opportunity to view and comment on the appropriate draft narrative. Most took the opportunity to refine numbers or narrative connotations. Although the differences between this

and the 1986 report may be subtle in respect to numerical values contained in the report, there is a noticeable difference in future projections by States regarding use of biological toxicity testing in the NPDES programs; nineteen States responded that as new permits are issued, or as existing permits are reissued, all major permits will require biological testing. Six of the responding States now have five or fewer permits with such testing requirements.

TABLE 1. BIOLOGICAL EFFLUENT TESTING IN NPDES PERMITS

	INDUSTRIAL				MUNICIPAL				INDUSTRIAL + MUNICIPAL			
	NO. WITH TESTING 1	2 WITH TESTING 2	NO. WITH LIMITS 3	FUTURE PROJECTIONS 4	NO. WITH TESTING 1	2 WITH TESTING 2	NO. WITH LIMITS 3	FUTURE PROJECTIONS 4	NO. WITH TESTING 1	2 WITH TESTING 2	NO. WITH LIMITS 3	FUTURE PROJECTIONS 4
ALABAMA	50	61	50	+	0	0	0	+	50	20	50	+
ALASKA	3	1	0	0	0	0	0	0	3	1	0	0
ARIZONA	0	0	0	+	0	0	0	+	0	0	0	+
ARKANSAS	40	71	0	+	0	0	0	+	40	71	0	+
CALIFORNIA	184	100	143	0	172	87	183	0	356	100	306	0
COLORADO	1	2	0	+	8	11	0	+	9	0	0	+
CONNECTICUT	62*	73	3	0	0	0	0	0	62	41	3	0
DELAWARE	4	19	0	0	1	7	0	0	5	14	0	0
DISTRICT OF CO.	0	0	0	0	1	100	1	0	1	100	1	0
FLORIDA	40	33	40	+	40	32	40	+	80	33	80	+
GEORGIA	25	42	0	0	1	1	0	0	26	14	0	0
HAWAII	2	22	0	+	1	8	0	+	3	13	0	+
IDaho	2	5	0	0	2	7	0	0	4	0	0	0
ILLINOIS	4	4	0	0	1	1	1	0	5	2	1	0
INDIANA	6	7	0	0	0	0	0	0	6	3	0	0
IOWA	0	0	0	0	0	0	0	0	0	0	0	0
KANSAS	0	0	0	0	0	0	0	0	0	0	0	0
KENTUCKY	13	10	13	+	4	7	4	+	17	9	17	+
LOUISIANA	100	88	0	0	0	0	0	0	100	48	0	0
MAINE	11*	37	1	0	2	3	2	0	13	14	3	0
MARYLAND	25	71	0	+	20	54	0	+	45	50	0	+
MASSACHUSETTS	22	23	17	0	12	12	6	0	34	19	23	0
MICHIGAN	10	9	0	0	0	0	0	0	10	9	0	0
MINNESOTA	1	4	0	+	0	0	0	+	1	1	0	+
MISSISSIPPI	20	50	10	0	0	0	0	0	20	24	10	0
MISSOURI	0	0	0	0	0	0	0	0	0	0	0	0
MONTANA	0	0	0	0	0	0	0	0	0	0	0	0
NEBRASKA	0	0	0	+	0	0	0	+	0	0	0	+
NEVADA	0	0	0	0	1	17	0	0	1	0	0	0
NEW HAMPSHIRE	3	11	0	0	3	8	0	0	6	9	0	0
NEW JERSEY	125	63	100	0	175	100	175	0	300	63	275	0
NEW MEXICO	5	31	0	0	0	0	0	0	5	14	0	0
NEW YORK	9	6	0	0	14	5	0	0	23	5	0	0
NORTH CAROLINA	62*	62	62	+	70*	54	70	+	132	67	132	+
NORTH DAKOTA	0	0	0	+	1	7	0	+	1	5	0	+
OHIO	7	5	0	0	5	3	0	0	12	4	0	0
OKLAHOMA	22	51	0	+	0	0	0	+	22	23	0	+
OREGON	18	78	2	0	0	0	0	0	18	31	2	0
PENNSYLVANIA	0	0	0	0	0	0	0	0	0	0	0	0
RHODE ISLAND	0	35	0	+	14	78	0	+	20	44	0	+
SOUTH CAROLINA	24	30	0	+	5*	4	0	+	29	15	0	+
SOUTH DAKOTA	0	0	0	0	1	3	0	0	1	3	0	0
TENNESSEE	25	29	7	0	4	5	2	0	29	18	0	0
TEXAS	133	53	0	+	0	0	0	+	133	27	0	+
UTAH	6	32	0	+	7	18	0	+	13	22	0	+
VERMONT	0	0	0	0	0	0	0	0	0	0	0	0
VIRGINIA	130	100	0	+	30	45	0	+	160	100	0	+
WASHINGTON	37	82	30	0	0	0	0	0	37	41	30	0
WEST VIRGINIA	70	108	0	0	0	0	0	0	70	74	0	0
WISCONSIN	38*	58	0	0	0	0	0	0	38	24	0	0
WYOMING	0	0	0	+	2	10	0	+	2	4	0	+
TOTALS	1343		478		587		484		1840		942	

\* Includes any requirements via administrative letter.

1 Number with testing may include major and minor permits.

2 Percentage relates to major permits.

3 Permits contain text: limits.

4 When new or existing permits are issued or renewed:

+ = Biological toxicity testing in all major permits

0 = Testing requirements will be placed in selected permits.

0 = No projected growth in testing requirement program.



**TABLE 2. STATE PROGRAMS THAT REQUIRE TOXICITY REDUCTION EVALUATION**

	PROGRAM UNDERWAY	PROGRAM BEGINNING	NONE PRESENTLY
ALABAMA	•		•
ALASKA			•
ARIZONA			
ARKANSAS	•	•	
CALIFORNIA			•
COLORADO			•
CONNECTICUT		•	
DELAWARE		•	
FLORIDA	•	•	
GEORGIA	•		•
HAWAII		•	
IDaho			•
ILLINOIS			•
INDIANA			•
IOWA			•
KANSAS	•		•
KENTUCKY			•
LOUISIANA			•
MAINE		•	
MARYLAND	•		
MASSACHUSETTS		•	•
MICHIGAN	•		•
MINNESOTA			•
MISSISSIPPI			•
MISSOURI			•
MONTANA			•
NEBRASKA			•
NEVADA			•
NEW HAMPSHIRE		•	•
NEW JERSEY			•
NEW MEXICO		•	
NEW YORK	•		•
NORTH CAROLINA		•	•
NORTH DAKOTA			•
OHIO		•	•
OKLAHOMA			•
OREGON	•		•
PENNSYLVANIA			•
RHODE ISLAND		•	•
SOUTH CAROLINA	•		•
SOUTH DAKOTA			•
TENNESSEE			•
TEXAS			•
UTAH			•
VERMONT			•
VIRGINIA	•	•	
WASHINGTON		•	
WEST VIRGINIA		•	
WISCONSIN		•	•
WYOMING			
TOTALS	18	13	27

TABLE 3. BIOLOGICAL TESTING PROGRAMS CONDUCTED BY  
STATE PERSONNEL ANNUALLY

	NO. OF ACUTE TOX. TESTS	NO. OF CHRONIC TOX. TESTS	BIOTIC ASSESSMENT 1	TREND MONITORING 2	MOBILE LABORATORY 3	LABORATORY CERTIFICATION 4
ALABAMA	50	6	20	6	•	0
ALASKA	0	0	0	0	0	0
ARIZONA	0	0	0	0	0	0
ARKANSAS	12	0	26	0	0	0
CALIFORNIA	-	-	-	-	0	•
COLORADO	2	2	3	5	•	0
CONNECTICUT	-	10	10	20	•	0
DELAWARE	25	0	0	0	0	0
DISTRICT OF CO.	0	0	0	0	0	0
FLORIDA	-	-	-	-	•	-
GEORGIA	>50	-	20	25	•	0
HAWAII	0	0	0	0	0	0
IDaho	0	0	0	0	0	0
ILLINOIS	60	0	50	0	•	0
INDIANA	17	0	15	22	•	0
IOWA	0	0	0	0	0	0
KANSAS	44	0	40	00	0	0
KENTUCKY	136	24	22	-	0	0
LOUISIANA	150	112	6	-	0	0
MAINE	30	30	-	50	-	0
MARYLAND	50	-	-	-	0	0
MASSACHUSETTS	100	-	25	0	•	0
MICHIGAN	30	3	60	50	•	0
MINNESOTA	25	12	0	0	•	0
MISSISSIPPI	8	15	0	30	•	0
MISSOURI	0	16	400	0	0	0
MONTANA	6	18	20	28	0	0
NEBRASKA	0	0	0	100	0	0
NEVADA	0	0	0	0	0	0
NEW HAMPSHIRE	120	0	0	0	0	0
NEW JERSEY	0	0	12	-	•	•
NEW MEXICO	0	0	40	-	0	0
NEW YORK	-	50	50	38	•	0
NORTH CAROLINA	100	100	60	100	•	•
NORTH DAKOTA	0	0	0	0	0	0
OHIO	75	10	20	0	0	0
OKLAHOMA	0	0	0	0	0	0
OREGON	120	122	240	24	0	0
PENNSYLVANIA	0	0	240	100	0	0
RHODE ISLAND	0	0	0	10	0	0
SOUTH CAROLINA	-	-	-	-	•	•
SOUTH DAKOTA	0	0	16	20	0	0
TENNESSEE	80	10	100	20	•	0
TEXAS	20	0	20	0	0	0
UTAH	0	0	-	20	0	•
VERMONT	0	0	0	20	0	0
VIRGINIA	22	10	20	175	•	0
WASHINGTON	12	12	-	-	0	0
WEST VIRGINIA	75	0	100	42	0	0
WISCONSIN	0	0	450	50	0	0
WYOMING	0	0	0	0	0	0
TOTALS	1429	562	2095	1034	18	5

- Information not available

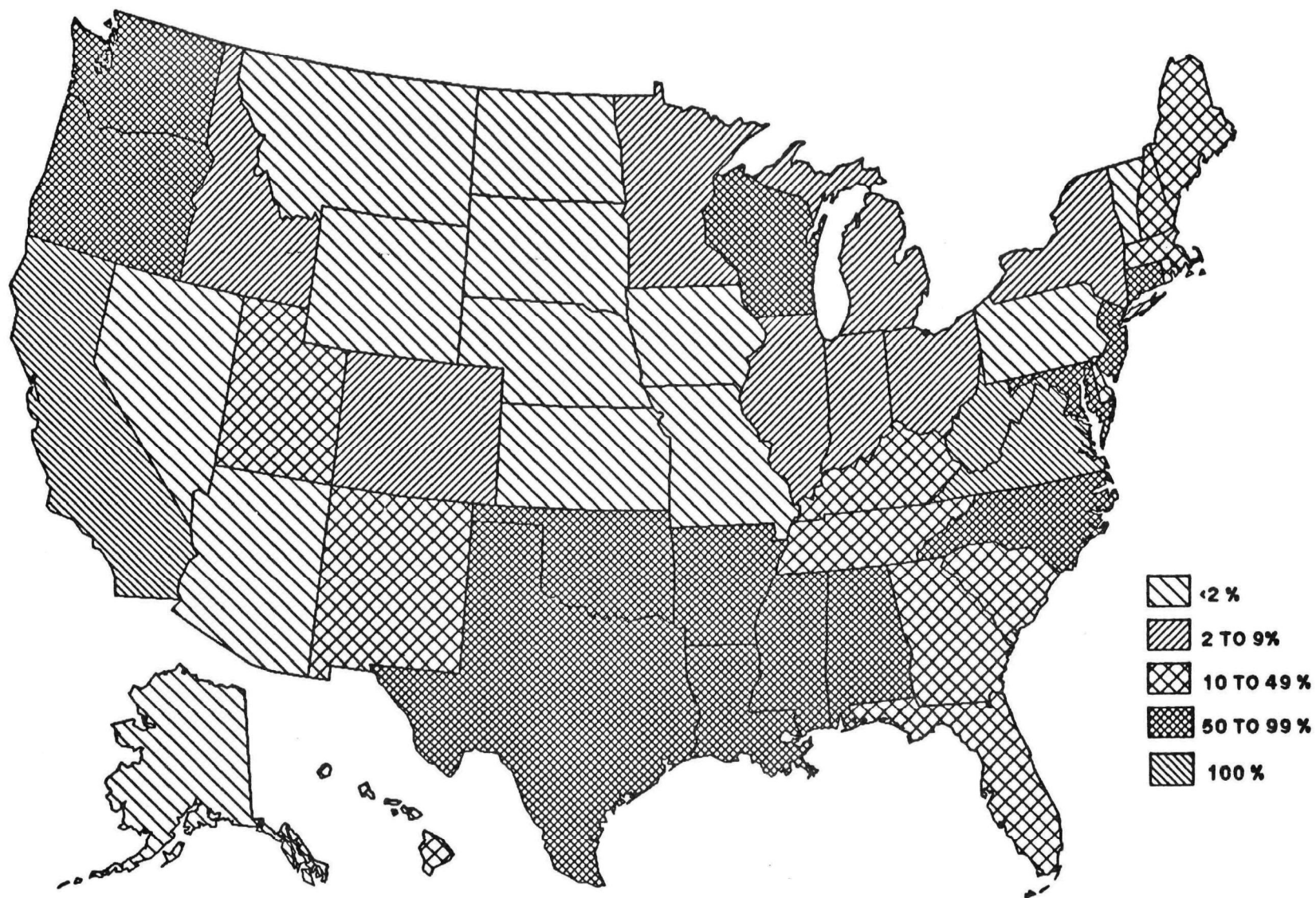
1 Number of locations where macroinvertebrate or fish assessments relate to point source discharges

2 Macroinvertebrate or fish location assessments related to other than point source discharges.

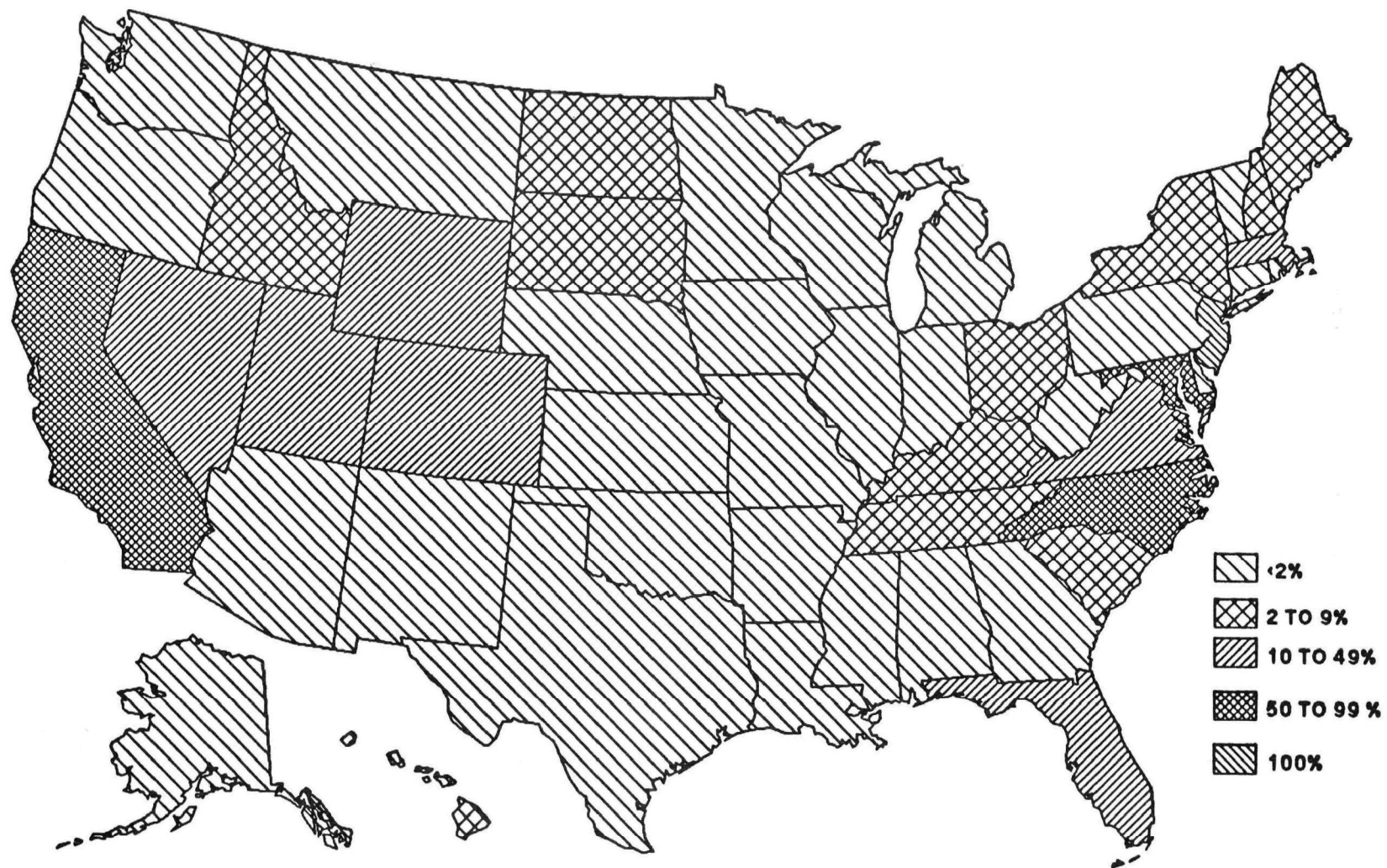
3 State operates a mobile laboratory to service point source discharges.

4 Has or will have in 12 months a biological laboratory certification program.

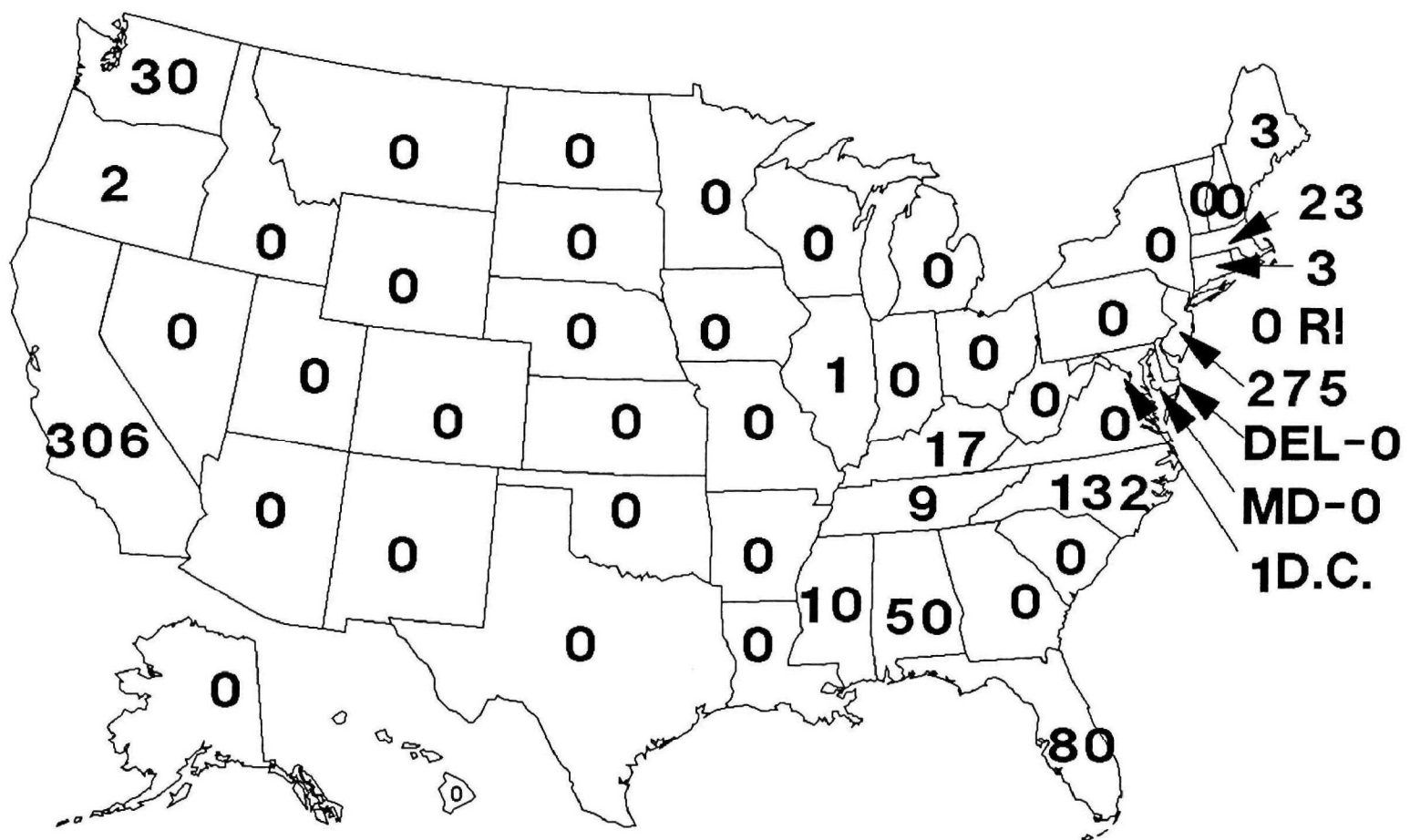
**FIGURE 1. PERCENTAGE OF MAJOR INDUSTRIAL PERMITS WITH TOXICITY TESTING REQUIREMENTS**



**FIGURE 2. PERCENTAGE OF MAJOR MUNICIPAL PERMITS  
WITH TOXICITY TESTING REQUIREMENTS**



**FIGURE 3. NUMBER OF PERMITS WITH TOXICITY LIMITS**



U.S. Environmental Protection Agency, Region I  
John F. Kennedy Federal Building  
Room 2203  
Boston, MA 02203

Mr. Jerry Potamis, Chief  
Industrial Permits Section  
(617) 565-3512

Mr. Clyde Shufelt, Chief  
Municipal Permits Section  
(617) 565-3516

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Biological testing is required for industrial or municipal dischargers scheduled for permit issuance where technology based pollutant limitations diluted by the receiving water (7Q10 for acute toxicity and 30Q2 for chronic toxicity) cannot meet acute or chronic water quality criteria specified in the water quality criteria documents (45 FR 79318, November 29, 1980) or more recently updated drafts of final criteria documents. All municipalities with pretreatment programs are required to perform effluent toxicity testing as permits are reissued. Where permit reissuance is not imminent, Section 308 letters are used to institute toxicity testing. Discharges containing chemicals for which criteria have not been developed are evaluated on a case-by-case basis to determine the likelihood of water use impairment.

Industrial dischargers to fresh water must conduct four acute toxicity tests using a daphnid and the fathead minnow within a 60-day period. Permits containing chemical specific limits based upon biological toxicity testing will include a requirement for periodic chronic or acute toxicity testing. The permittee may accept water quality criteria based, chemical specific permit limits in lieu of biological toxicity testing if such can be met with available treatment technology. Toxicity Reduction Evaluations may be required to bring an effluent into compliance with Water Quality Standards provisions prohibiting discharges of toxic substances in amounts toxic to human health or aquatic life. The Regional policy currently contains no provisions for testing related to human health.

U.S. Environmental Protection Agency, Region II  
26 Federal Plaza  
New York, NY 10278

Ms. Ruth Adelman, Chief  
Permits Management Section  
(212) 264-2911

Mr. Keith Tingberg  
Permits Management Section  
(212) 264-2936

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The Region's toxicity testing policy considers new permit applications and reissuances of prior permits. In addition, toxicity testing is required of permittees, where necessary, via Section 308 letters. The Region determines a "toxicity potential assessment" for a permittee which is an evaluation using:

- o Dilution of effluent by receiving water
- o Instream toxic impacts potential
- o Use classification of receiving water
- o Industrial category and specific processes/products (industrial permits)
- o Percentage of industrial contribution in municipal permits
- o Existence of toxic chemicals

Testing is conducted on a two-tier basis. Tier 1 testing requires 48-hour acute static renewals with an least two species, a vertebrate and an invertebrate, using the fathead minnow and Daphnia magna for freshwater discharges and the silverside (Menidia sp.) and Mysidopsis bahia for discharges to saline waters. At least four tests are to be conducted over a time period representative of all facility processes.

Tier 2 testing "should be directed at obtaining data necessary to refine the impact assessment." This may include chronic toxicity testing or instream toxicity testing. Compliance monitoring of the discharge may be required to ensure that the toxicity of the effluent does not change. Failure to pass toxicity testing (Tier 1) would lead to Tier 2 testing. The issuance of a toxicity permit limit with a monitoring requirement and/or a toxicity reduction evaluation may be required of the permittee pending the results of the Tier 2 testing.

Region II's program objective of requiring toxicity testing or limitations in NPDES permits is "to prevent toxics from being discharged in amounts which are acutely and chronically toxic to aquatic organisms." The policy does not address human health effects, which should be addressed through chemical-specific approaches.

U.S. Environmental Protection Agency, Region III  
841 Chestnut Street  
Philadelphia, PA 19107

Mr. Robert Koroncai  
Environmental Engineer  
Water Quality Control Section, Water Management Div.  
(215) 597-0133

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Region III has developed guidance relating to the biological testing of effluents for toxic pollutants. Such guidance is used in further negotiations with the states related to procedures for toxic wastes and in the review of those NPDES permits subject to regional review. All states within the region have delegated NPDES authority.

The guidance provides for monthly toxicity testing unless it can be demonstrated that an effluent has particular chemical constituents that can be adequately assessed through chemical testing. For effluents with little variability, less frequent testing may be acceptable. Where the wastewater dilution in receiving water is less than 10:1, the 7-day chronic fathead minnow and Ceriodaphnia toxicity tests are required. Where such dilution is greater than above, acute, static or static renewal 96-hour two species toxicity tests may be used. Appropriate saltwater species may be substituted as test organisms in marine waters. The biomonitoring results are compared with instream waste dilution and when potential toxicity is suspected as a result of this comparison, a toxicity reduction evaluation is implemented.

For chemicals specifically identified in permits, a mass balance calculation is made based upon a design flow of 7Q10 for chronic effects and a 1Q10 for acute effects. The results are compared with EPA water quality criteria.

For human health effects, the mean annual flow is used. Health effects risks are based upon most recent EPA water quality criteria and upon the EPA Integrated Risk Information system, which provides computerized health effects risk data for non-carcinogens and, in the future, for carcinogens. For carcinogens, a 10<sup>-6</sup> risk level is recommended.



U.S. Environmental Protection Agency, Region IV  
345 Courtland Street, NE  
Atlanta, GA 30365

Mr. Marshall Hyatt, Environmental Scientist  
Facilities Performance Branch  
Water Management Division  
(404) 347-3012

With the exception of the State of Florida, all of the states within Region IV have delegated NPDES authority. Region IV administers the NPDES program for the State of Florida. For those states with NPDES authority, Region IV has issued guidance in the form of proposed permit toxicity limits and monitoring requirements. This guidance follows that set forth in EPA's 1985 "Technical Support Document for Water Quality-based Toxics Control," in "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms" (EPA/600/4-85-013), and in "Receiving Waters to Freshwater Organisms" (EPA/600/4-85/014). The biomonitoring guidance is summarized as follows:

When instream waste concentration is greater than or equal to 1 percent at critical low-flow conditions, the permittee shall conduct a 7-day Ceriodaphnia survival and reproduction test and a fathead minnow larval survival and growth test on a 24-hour composite sample on a series of effluent concentrations, including one equivalent to the instream waste concentration, with test solutions renewed daily. Toxicity tests shall be conducted every 2 months for a period of 1 year following initiation of tests and once every 6 months thereafter for the duration of the permit. A permit violation occurs when toxicity is found in the initial test. Generally, a toxicity reduction evaluation will be required only when toxicity is found in a confirmatory test. Test procedures are those recommended in EPA/600/4-85/014.

When the instream waste concentration is less than 1 percent at critical conditions, the permittee shall conduct 48-hour static toxicity tests on three appropriate species including a fish, an invertebrate, and one species selected from EPA 600/4-85/013, Table 1. Tests shall be conducted once every 2 months on 100 percent effluent for a period of 1 year following the initiation of the test and once every 6 months thereafter for the duration of the permit. Four separate grab samples of final effluent shall be collected at evenly spaced intervals over a 24-hour period and used in four separate tests in order to catch any peaks of toxicity and to account for daily variations in effluent quality. Test procedures are those recommended in EPA/600/4-85/013.

U.S. Environmental Protection Agency, Region V  
230 South Dearborn Avenue  
Chicago, IL 60604

Ms. Linda Anderson-Carnahan  
Permits Section  
(312) 886-0136

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All of the states in Region V are delegated with the NPDES program. Under the compliance monitoring program, the region performs a battery of toxicity tests on an average of 80 discharges a year. The battery of tests includes Daphnia pulex and Pimephales promelas acute toxicity tests, a 96-hour algal growth inhibition/stimulation test, and the Ames Assay (conducted with five strains of Salmonella with and without enzyme activation). In some cases the Daphnia and Pimephales acute toxicity tests are replaced by the Ceriodaphnia survival and reproduction test and the Pimephales promelas embryo-larval survival and teratogenicity test. The region also is currently investigating a variety of other toxicity tests including the rat hepatocyte sister chromatid exchange assay, the mammalian mitochondria assay, the Pimephales promelas larval survival and growth test, and the effluent toxicity tests performed by Environment Canada.

Upon receiving regional test results and/or the results of toxicity tests performed by state agencies, the region may send a letter to the state requesting that the permit for the facility tested be reopened and modified or the draft permit sent to the region for review contain certain provisions. Depending on whether significant toxicity was observed or state water quality standards appear to have been violated, the region may request that the permit contain biomonitoring with a trigger to include provisions for a toxicity reduction evaluation and final whole effluent toxicity limits with post-control biomonitoring. When data are lacking, the region may require biomonitoring alone. The region also may use this opportunity to request that chemical specific limits and/or monitoring be contained in the modified/reissued permit, depending on the effluent chemical analyses data available. In cases where a state has failed to protect water quality adequately through the use of toxicity/toxicant limits and monitoring, the region is objecting to the permits.

U.S. Environmental Protection Agency, Region VI  
1445 Ross Avenue  
12th Floor, Suite 1200  
Dallas, TX 75202-2733

Mr. Craig Weeks  
Environmental Engineer  
(214) 655-7180

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Except for Arkansas, none of the states within Region VI currently has NPDES permitting authority. The Region VI toxics policy is designed to support and implement the national policy. The Regional policy is that no source will be allowed to discharge any wastewater which results in the endangerment of a drinking water supply; results in aquatic bioaccumulation which threatens human health; results in instream acute or chronic aquatic toxicity;; or causes a violation of an applicable general or numerical state water quality standard.

In order to accomplish these objectives, the Region will as part of the third round permit issuance procedures ensure that no sources will cause or significantly contribute to an exceedence of EPA's Maximum Contaminant Level requirements for any public drinking water supply; identify and address, with either state or EPA action, sources which may cause or significantly contribute to any exceedence of EPA's water quality criteria for human health protection; address aquatic toxicity by either applying appropriate limitations or toxicity reduction requirements when toxic conditions are known or requiring biological screening for all other facilities having any potential for causing ambient toxicity; and incorporate into permits any applicable specific numerical state water quality standard.

Permits issued to dischargers with a potential for causing ambient toxicity will require that the permittee perform periodic toxicity screening using whole effluent biomonitoring techniques. Permittees typically will be required to monitor on a monthly frequency. As a general rule, discharges which are substantially diluted by the receiving stream will be evaluated using acute methods and low dilution discharges will be evaluated using chronic tests. Discharge samples used by biomonitoring analysis will consist of flow weighted composite samples of all dry weather flows discharged into a receiving stream.

Where ambient toxicity is identified as a problem the Region will proceed with validation, limits, or toxicity reduction evaluation (TRE) requirements as soon as possible.

U.S. Environmental Protection Agency, Region VII  
Water Management Division  
726 Minnesota Avenue  
Kansas City, KS 66101

Mr. Don Toensing, Chief  
Permits Compliance Section  
(913) 236-2817

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Region VII is in the process of drafting regional policy relating to the management of toxic pollutants; the policy is expected to be completed within the next few weeks. Draft policy will be discussed with the applicable states, and it is expected that the ultimate effect will be to increase the degree of toxicity testing in state NPDES programs. Currently the states within the Region have not embraced the concept of effluent toxicity testing.

The Region has tested about 35 facility effluents with daphnid and fathead minnow acute static toxicity tests and expects to continue this program at 30 facilities within the next year. Testing is done via a contract with the University Hygienic Laboratory in Iowa City, Iowa. The Region does not have in-house biological testing capabilities.

The Region continues its Regional Ambient Fish Tissue analyses program at a significant number of locations in each of the states. Principal analyses are for pesticides and some metals. Chlordane and PCBs have occurred at levels higher than those recommended for edible flesh in some areas; the source of such concentrations has not been identified.

U.S. Environmental Protection Agency, Region VIII  
One Denver Place  
999 18th Street, Suite 1300  
Denver, CO 80202-2413

Mr. James Lazorchak  
Water Management Division  
(303) 293-1581

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A regional policy has been distributed that addresses an NPDES whole effluent toxics control program. The policy provides that all major permits must require two-species testing, completion of a toxicity reduction evaluation if toxicity is determined, and an appropriate limitation of whole effluent toxicity after approximately 3 years. The definition of when chronic or acute toxicity is "demonstrated" is left to the permit issuing authority.

The testing protocol requires two species acute tests when receiving water low flow dilution is greater than 100:1, and two species chronic tests when receiving water low flow dilution is less than 100:1. Quarterly testing or monthly testing is governed by the volume of facility discharge; at greater than 20 MGD for a POTW or 10 MGD for an industry, monthly testing is required.

U.S. Environmental Protection Agency, Region IX  
Water Management Division  
215 Fremont Street  
San Francisco, CA 94105

Mr. Phil Woods  
Water Quality Standards Coordinator  
(415) 974-8307

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A regional policy on biological toxicity testing is in the final stages of development. Region IX is pushing toward implementation of the Technical Support Document for Water Quality-Based Toxics Control but, as yet, has not universally translated such concepts into permit language for all permit reissuances. Water quality standards of states within the region generally express the mandate that the survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge as determined, at a minimum, by use of a 96-hour toxicity test.

Many discharges are to the region's marine and tropical waters. Guidance provided in current toxicity testing procedural documents is believed to be less than adequate in recommending methodology and test organism species for such waters.

In early February, 1986, Region IX issued a letter to each of the states in the region that directed them to begin to fully develop the effluent toxicity data base directed for water bodies where aquatic toxicity problems have been documented or are suspected and to readjust permit requirements accordingly.

U.S. Environmental Protection Agency, Region X  
1200 Sixth Avenue  
Seattle, WA 98101

Mr. Roger Mochnick, Chief  
Permits Section - Water Div.  
(206) 442-4817

Ms. Amber Wong  
Permits Section - Water Div.  
(206) 442-1647

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Region X has been requiring biological toxicity testing in all major and new industrial and municipal permits, in municipal permits where pretreatment programs exist, and in minor permits where there is a potential for the discharge of toxic pollutants. The region has permits with toxicity reduction evaluations, which are triggered when toxicity is shown above a site-specific effluent concentration; such concentration is based on dilution necessary to meet water quality criteria. Acute and chronic tests are used in the toxicity testing program. The region has a significant number of permits with whole effluent toxicity limits.

Environment Canada  
Industrial Program Branch  
Oil, Gas and Energy Division  
Ottawa, Ontario, Canada  
K1A 0E7

Mr. R. P. Scroggins  
Project Officer  
(819) 997-1223

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Environment Canada has toxicity testing regulations applicable to new, expanded, or altered plants, but not to existing plants, for the pulp and paper and Canadian meat and poultry industries. The test is with juvenile rainbow trout in a 96-hour static toxicity test. For the former industry, the toxicity limit is an 80 percent survival in 65 percent effluent and 35 percent diluent; for the latter industry a 50 percent organism survival in 100 percent effluent is required. For three other industrial groups, potato processing, metal mining, and petroleum refining, there are pass/fail guidelines related to the 96-hour juvenile rainbow trout toxicity test. Generally, toxicity testing is on a monthly basis.

British Columbia has a general requirement that an effluent must be toxicity-free at end of pipe with requirements specified on a case-by-case basis.

Ontario has developed a Municipal and Industrial Strategy for Abatement, which essentially provides for a dual approach to water pollution abatement: (1) treatment technology with monitoring regulations but not compliance regulations, and (2) water quality toxicity control. Much of the effort, thus far, has been directed toward the treatment technology aspect, with compliance regulations for water quality based toxicity testing potentially 2 to 3 years away.

Canada potentially will use Ceriodaphnia, Daphnia magna, and rainbow trout as test organisms. The fathead minnow is not widely distributed in waterways.



Alabama Department of Environmental Management  
1751 Federal Drive  
Montgomery, AL 36130

John Poole, Chief  
Industrial Branch, Water Div.  
(205) 271-7852

Bob Bretzer, Chief  
Permits and Compliance  
(205) 271-7821

Bill Hollerman  
Biologist  
(205) 271-7936

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Alabama has 82 major and 468 minor industrial permits and 88 major and 171 minor municipal permits. In addition, there are 4 major and 255 minor semipublic and private permitted facilities. Approximately 30 major and 20 minor industrial permits require toxicity testing and have toxicity effluent limits. When permit limits are violated, a toxicity reduction evaluation is mandated. Four of the major permittees are undergoing some phase of a toxicity reduction evaluation currently; none has yet been completed. Although municipalities currently are not required to conduct toxicity tests, it is expected that all major permittees, including municipalities and industries, will be required to institute at least screening toxicity testing as permits are reissued within the ensuing year.

The state operates a mobile biological laboratory but does not have a commercial biological laboratory certification program. There is state capability both for acute and chronic toxicity testing. Test organisms are cultured. It is estimated that acute and chronic toxicity tests using fathead minnows and Daphnia pulex or Ceriodaphnia are completed for 50 facilities per year. The use of chronic toxicity tests by the state is beginning and about six per year are anticipated; approximately two 96-hour flow-through fathead minnow toxicity tests are anticipated per year also.

The state has been examining about 20 instream biotic assessment locations annually. Hester-Dendy substrates and instream handpicking are used in macroinvertebrate studies. Fish tissue analyses for metals, PCBs, and other organic constituents are undertaken at three to six state locations annually.

During the next two years, the state will conduct an evaluation of POTWs that receive industrial effluents. Current total residual chlorine limits are based on U.S. EPA standards, although instream concentrations are now being examined in anticipation of relying on biological testing as an alternative to permit standards.

U.S. Environmental Protection Agency, Region X  
(NPDES authority not delegated)  
1200 Sixth Avenue  
Seattle, WA 98101

Mr. Roger Mochnick, Chief  
Permits Section - Water Div.  
(206) 442-4817

Ms. Amber Wong  
Permits Section - Water Div.  
(206) 442-1647

The State of Alaska has not been delegated NPDES authority. EPA Region X issues 308 major and 817 minor industrial permits and 19 major and 31 minor municipal permits for the state. Three industrial permits require effluent toxicity testing. Toxicity testing requirements for the three industrial permits have been individually tailored to each permittee. One permittee, who discharges to a potentially sensitive area, is required to conduct both effluent and in-situ toxicity tests. The acute effluent toxicity tests (96-hour LC<sub>50</sub>) are to be conducted on three species: a salmonid (coho smolts), an amphipod (*Rhepoxinia*), and an economically important crustacean (juvenile Dungeness crab). The in-situ toxicity tests are to be conducted on four species: two species of filter feeders, and two species of sediment dwellers. These in-situ toxicity tests are basically body-burden analyses, and are to determine bioaccumulation of toxicants, primarily metals, in susceptible species in the area.

Another permittee is required to develop and maintain a continuous flow biomonitoring facility. Salmonids will be kept in an environment where the concentration of pollutants is 10 percent higher than the concentration projected to occur in the receiving water. The facility will serve as a continuous indicator of effluent toxicity, as indicated by symptoms of organism distress or mortality, which will immediately trigger remedial actions such as improving treatment efficiency or prohibiting discharge. Although this is not, in strict terms, a toxicity limit, it does achieve the goal stated in the national policy, which is to eliminate discharge of toxic effluent.

Toxicity testing requirements for the third industrial permittee have been included in a 308 Order. Development of these requirements has followed the latest EPA guidance (TSD and protocols for marine toxicity tests (1987)). The tests include an echinoderm fertilization test, a mussel larval test, and an algal reproduction test (chronic *Champia parvula* test).

There are no biological toxicity limits in the permits.

U.S. Environmental Protection Agency, Region IX  
(NPDES authority not delegated)  
Water Management Division  
215 Fremont Street  
San Francisco, CA 94105

Mr. Phil Woods  
Water Quality Standards Coordinator  
(415) 974-8307

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The State of Arizona has not been delegated authority to issue NPDES permits. EPA Region IX currently administers 23 major and 76 minor industrial permits, and 19 major and 29 minor municipal permits for the state. There are no biological testing requirements in Arizona EPA Region IX permits through 1986. Commencing in FY87, biological testing will be required in major permits.

State water quality standards authorize both biological and chemical techniques to characterize the quality of discharges. The standards provide equal protection to indigenous wildlife and aquatic life in all surface waters whether or not the waters are affected by waste discharge. Through 1987, Arizona has followed a policy of using a pollutant-specific approach by requiring all major and some minor dischargers to monitor for up to 20 toxic pollutants for which numeric criteria have been specified in the state water quality standards. This policy has been applied to all major and some minor dischargers. Testing for additional toxic pollutants and testing by other dischargers is required on a case-by-case basis. Water quality criteria are used to determine potential environmental harm for constituent concentrations found in the monitoring program. Testing of water quality is required when a potential health hazard is suspected or exists or when water quality standards may not be attained.

Except for one approved mixing zone, discharge concentrations are established at the aquatic and wildlife criteria level. Human health protection is provided by statewide numeric standards for nine toxic organics and radiochemicals. Water quality standards for designated effluent dominated waters include protection against enteric viruses and four specific parasites.

Arkansas Department of Pollution Control  
P.O. Box 9583  
Little Rock, AR, 72219

Mr. Roger Payne, Engineer  
NPDES Permits Section  
(501) 562-7444

Mr. John Giese  
Chief Ecologist  
(501) 562-7444

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The State of Arkansas received delegated NPDES authority on November 1, 1986. There are 56 major and 396 minor industrial and 59 major and 234 minor municipal permits in the NPDES program. Forty of the industrial permits require biological toxicity testing. Currently, none of the municipal permits has a biological testing requirement, but as permits are renewed after July 1, 1987, such a requirement will be introduced. The test required is a 48-hour, static acute Daphnia sp. toxicity test, which is to be conducted quarterly for a minimum of two years. Several toxicity tests have shown effluent toxicity, which indicates the importance of the program. Permittees must meet 90 percent or greater survival of test organisms.

Toxicity reduction evaluations are required when toxicity is demonstrated. Enforcement actions are instituted depending upon the extent and number of violations and upon major or minor permit status.

A few municipal permits have residual chlorine limits, which are based upon the EPA water quality criteria recommendation for residual chlorine. All waters of the state are classified as potential drinking water sources. At some future date, the state expects to issue NPDES permits based upon drinking water maximum contaminant levels applicable to finished drinking water.

The state does not have a biological laboratory certification program nor does it operate a mobile biological laboratory. The state undertakes receiving water macroinvertebrate, and sometimes fish, assessments at 16 to 18 paired stations annually. Fish flesh bioaccumulation analyses for some metals, pesticides, and PCBs are performed from 12 to 20 locations in principally a problem-oriented program. In conjunction with permit compliance inspections, static 48-hour Daphnia sp. toxicity tests are done for 6 to 12 facilities annually. The chronic Ceriodaphnia toxicity test has not yet been instituted into the monitoring program.

California Water Resources  
Control Board  
901 P Street  
Sacramento, CA 95833

Christopher Foe, RWQCB-5  
3443 Routier Rd.  
Sacramento, CA 95827  
(916) 361-5714

Mr. John Norton, Chief  
Water Quality Standards  
and Policy Unit  
(916) 322-0211

Margaret Drumm, RWQCB-6  
P.O. Box 9428  
South Lake Tahoe, CA 95731  
(916) 544-3481

John Hannum, RWQCB-1  
1440 Guerneville Rd.  
Santa Rosa, CA 95401  
(707) 576-2220

Curt Shifrer, RWQCB-6  
15371 Bonanza Rd.  
Victorville, CA 92392  
(619) 241-6583

Susan Anderson, RWQCB-2  
1111 Jackson St.  
Oakland, CA 94607  
(415) 464-1346

Will Ponder, RWQCB-7  
73271 Highway 111, #21  
Palm Desert, CA 92260  
(619) 346-7491

Jay Cano, RWQCB-3  
1102-A Laurel Ln.  
San Luis Obispo, CA 93401  
(805) 549-3147

M. Adackapara, RWQCB-8  
6809 Indiana Av., #200  
Riverside, CA 92506  
(714) 782-4130

John Lewis, RWQCB-4  
107 S. Broadway, #1027  
Los Angeles, CA 90012  
(213) 620-5415

C. Tamaki, RWQCB-9  
9771 Clairemont Mesa Blvd-B  
San Diego, CA 92124  
(619) 265-5114

The State of California administers an NPDES program through nine Regional Water Quality Boards. The state issues 250 major discharge permits; a total of 356 permits, generally all major permits and some minor permits, require effluent toxicity testing. There are 306 permits, 86 percent of the number requiring testing, that have biological toxicity limits. Many of these permittees discharge to the ocean or to San Francisco Bay, and these discharge areas have a high degree of toxicity control.

RWQCB	TOTAL NPDES PERMITS				PERMITS WITH BIO.		PERMITS WITH BIO.	
	MAJOR		MINOR		TESTING		TOXICITY LIMITS	
	INDUSTRIAL		MAJOR	MINOR	INDUSTRIAL	MUNICIPAL	INDUSTRIAL	MUNICIPAL
1	5	40	10	15	19	16	9	13
2	18	133	42	16	30	60	30	60
3	6	79	17	10	35	26	35	26
4	25	276	22	5	27	34	27	34
5	15	139	39	37	22	20	22	20
6	1	13	3	0	7	3	7	2
7	0	16	10	9	14	6	0	0
8 4	120	10	6		26	5	1	0
9	9	40	14	6	12	8	12	8
SUB-TOTAL	83	856	167	104	184	172	143	163
TOTAL	939		271		356		306	

Generally, the toxicity test required is a 96-hour static test using rainbow or steel-head trout, fathead minnow, golden shiner, or three-spine stickleback as test organisms. The frequency of required testing may be weekly, monthly, quarterly, or annually. Region 3 is considering requiring a continuous instream toxicity test with rainbow trout for some permits, and some permits require a 96-hour flow-through test (Region 2). Generally, a 50 percent survival of test organisms is required, but in some regions a 90 percent survival in effluent is the rule. Allowance is given for a potential 10 percent mortality in control tests.

The frequency of testing depends upon the industry involved: pulp and paper mills test weekly (Region 1); cooling towers on power plants, quarterly (Region 7); geothermal facilities, annually (Region 6). Current testing procedures generally follow the 1976 California laboratory procedures publication (California Fish and Game, "Guidelines for Performing Acute Toxicity Fish Bioassays in Municipal and Industrial Waste Waters." Chronic toxicity testing has not begun (Region 3), or is just getting underway (Regions 2, 5, and 8). EPA has conducted chronic toxicity tests at nearly 20 facilities for Region 4; Region 5 is seeking an EPA grant to complete acute and chronic toxicity testing at 18 facilities. Some commercial laboratories in California are not yet experienced with chronic toxicity testing procedures as specified by EPA, and appropriate test organisms for marine waters remains an issue.

Regions 2 and 5 are collaborating on an extensive program of effluent, ambient, and urban runoff testing using EPA methods. This program is aimed at reducing toxicity in the San Francisco Bay delta, and a Total Maximum Daily Load/Waste Load Allocation permit approach for this complex system will be developed as a result of this study.

Toxicity Reduction Evaluations have not yet been implemented (Regions 3 and 4), implemented in one major discharger but not yet completed (Regions 5 and 8), implemented in pulp and paper mills (Region 1), or in three to four refineries (Region 2); some success but not abundant success has been apparent. Except for deep ocean discharges and a few inland discharges in the Imperial Valley, chlorination is practiced at municipal facilities; chlorine limits are as specified in the California Ocean Plan and other standards. The California Fish and Game Department and the various Regional Boards also have made local determinations regarding chlorine toxicity. For example, dechlorination with sulfur dioxide to no detectable chlorine is the rule in Regions 1 and 2.

California water quality standards provide that the survival of aquatic life in surface waters subject to a waste discharge shall not be less than that for the same water body in areas unaffected by the waste discharge. The California Fish and Game Department is assisting the State Board with protocols and some toxicity tests. The University of California at Davis has a contract to assist with the Region 5 program of effluent and other toxicity testing. Toxicity tests are not performed generally by personnel of the regional boards. Extensive biological investigative activities are associated with ocean discharges. Field biological activity associated with inland surface waters is beginning throughout the state (Region 5 has an especially active program). Toxic substances are monitored in fish tissues for all major rivers, and there is an extensive mussel watch program for all ocean waters.

A laboratory certification program for biological testing is planned and will begin within a year.

Connecticut Department of Environmental Protection  
122 Washington Street  
Hartford, CT 06115

Lee Dunbar  
Senior Environmental Analyst  
(203) 566-7049

Mike Harter, Asst. Director  
Permits and Enforcement  
(203) 566-3245

The State of Connecticut administers 85 major and about 600 minor NPDES industrial permits and 67 major and 19 minor municipal permits. Fifty industrial facilities conduct toxicity testing, generally through administrative letter; only 10 or 12 permits require it. Two or three of the permits contain toxicity limits. Municipalities are not now required to perform toxicity tests. Permits require a fish and an invertebrate to be used as test organisms and most employ the acute 96-hour and 48-hour toxicity tests using fathead minnows and Daphnia, respectively.

New regulations are projected for early 1988 which will require all permittees whose effluent is known to contain toxics to perform acute toxicity testing. Biological toxicity limits also will be imposed. New regulations also will require toxicity monitoring for municipal discharges. If toxicity limits are not exceeded, testing will be continued on a quarterly basis; however, if toxicity limits are exceeded, the testing frequency doubles and the facility in violation must present a plan for toxicity reduction. Already, Connecticut has seen some remarkable reductions by a few permittees in the form of reduced in-plant wastewater flows and treatment system upgrades.

The state conducts chronic 7-day Ceriodaphnia and 7-day fathead minnow toxicity tests for instream monitoring purposes, and fish and macroinvertebrates are surveyed in problem-oriented areas. Two to five surveys are conducted annually. Intensive biological monitoring of macroinvertebrate communities is done at 10 to 20 sites during the fall, and 40 to 50 sites are used for monthly ambient chemical testing. There is no state biological laboratory certification program. A mobile biological laboratory is operated by the state for the purpose of on-site toxicity testing.

Recently, more stringent maximum residual chlorine limits have been included in permits for industrial and municipal facilities. Municipal facilities are evaluated on a dilution basis, and over 50 percent of these facilities will need to revamp their systems in order to comply.

Connecticut's present policy prohibits the discharge of effluents into any drinking water resource. This embodies not only those water resources presently used, but also any water resource that may be tapped in the future.

CO Department of Health  
Water Quality Control Division  
4210 E. 11th Avenue  
Denver, CO 80220

Mr. Bob Shukle  
Unit Chief

Ind. Permits & Enf. Unit  
(303) 331-4758

Mr. David Akers  
Unit Chief

Domestic Permits Unit  
(303) 331-8333

Mr. Bob McConnel  
Researcher IV

(303) 331-4578

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The Colorado NPDES program has approximately 48 major and 400 minor industrial permits and 71 major and 370 minor municipal permits. Toxicity testing is required for 1 industrial facility and for 8 municipal facilities. No biological toxicity limits are required. Water quality based toxic chemical limits are included in 50 to 60 percent of the industrial permits and all of the municipal permits.

Testing procedures involve effluent 48-hour acute static toxicity tests performed quarterly with fathead minnows and Ceriodaphnia except for the largest facility, which is required to test monthly. A new state policy is under development which would require toxicity testing with toxicity limits on permits up for renewal.

The state has conducted 96-hour acute flow-through toxicity tests using fathead minnows, channel catfish, and trout as needed for standard setting purposes. Fish tissue is analyzed in one study area with two or three sites annually. Annually, through cooperative effort, the U.S. EPA undertakes upstream and downstream ambient toxicity testing using the chronic 7-day Ceriodaphnia test on a waterway of environmental concern. Colorado has a mobile biological laboratory. No biological laboratory certification program exists at this time.

All permits with maximum total residual chlorine limits are based either on an instream limit or on a standard state limit. Toxicity testing is done before chlorination, whereas maximum contaminant levels for drinking water apply to the treated water at the water treatment plant.



Department of Natural Resources and Environmental Control  
P.O. Box 1401  
Dover, DE 19903

Mr. Richard W. Greene  
Environmental Engineer  
(302) 736-5732

Mr. Paul Janiga  
Environmental Engineer  
(302) 736-5725

The State of Delaware administers a permit program consisting of 21 major and 39 minor industrial and 15 major and 25 minor municipal NPDES permits. Four industrial permits and one municipal permit require aquatic toxicity testing. In general, permit conditions specify that a facility conduct three consecutive 24-hour whole effluent toxicity tests using a receiving water resident fish species. The frequency at which the three tests are conducted varies among NPDES facilities (quarterly is typical). If the average mortality of the three tests ever is greater than 20 percent, the permittee must conduct a 96-hour definitive toxicity test to generate an effluent LC50. If the effluent 96-hour LC50 is less than 50 percent, the facility then is required to conduct a toxicity reduction evaluation. Currently, NPDES permits do not have biological Toxicity Unit limits. The state believes that more experience is required before such limits are imposed.

Delaware presently is embarking on a toxicity evaluation project for all dischargers. The first and present phase of this program is to collect effluents and perform screening static acute toxicity tests involving *Ceriodaphnia* sp. and fathead minnow as test organisms. The second phase of the program will involve only those facilities whose effluents were found acutely toxic in phase one. Phase two will more completely characterize an effluent's toxicity and will involve chemical specific analyses and definitive toxicity tests. Limited resources may result in only partial completion of phase two elements. All testing for this program is being conducted by the state. Presently, Delaware has no biological laboratory certification requirements.

Delaware maintains a water quality monitoring network of approximately 200 fixed stations. Toxic metals are analyzed regularly in priority basins, and at least annually in all basins. Fish and macroinvertebrate biosurveys are conducted at eight of the stations. Fish, shellfish, and/or sediments are screened for bioaccumulative and toxic substances on an annual basis.

Currently, a consultant has been retained to evaluate the chlorine issue within the state. Maximum chlorine limits are included in some municipal permits. Following the consultant's report, a chlorine policy likely will be developed.

DISTRICT OF COLUMBIA

U.S. Environmental Protection Agency, Region III  
(NPDES authority not delegated)  
841 Chestnut Street  
Philadelphia, PA 19107

Mr. Robert Koroncai  
Environmental Engineer  
(215) 597-0133

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The District of Columbia does not have delegated authority for the NPDES program. The District of Columbia Blue Plains Municipal Treatment Plant permit requires monthly chronic 7-day Ceriodaphnia and fathead minnow toxicity tests for the first two months, after which the more sensitive of the two tests is to be continued monthly. Daily 24-hour composite effluent samples for seven consecutive days are to be taken and used for test and renewal solutions in a dilution series of 100, 50, 25, 12.5, and 7 percent effluent plus a control. If chronic toxicity is demonstrated at the 50 percent effluent dilution, a toxicity reduction evaluation may be required.

U.S. Environmental Protection Agency, Region IV  
(NPDES authority not delegated)  
345 Courtland Street, N.E.  
Atlanta, GA 30365

Mr. Marshall Hyatt, Environmental Scientist  
Facilities Performance Branch  
Water Management Division  
(404) 347-3012

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EPA, Region IV, administers the NPDES permit program for the State of Florida. There are about 122 major and 670 minor industrial, 125 major and 74 minor municipal, and 3 major and 42 minor federal facility permits within the state. About 40 industrial and 40 municipal permits currently require biological toxicity testing, and these permits have effluent toxicity testing limits.

In a May 5, 1986, EPA memorandum on Whole Effluent Toxicity Testing Policy for Florida it was stated that whole waste toxicity limits and biomonitoring requirements will be required in reissued domestic and municipal Florida NPDES permits for all major facilities and for all minor facilities with design flows greater than or equal to 0.5 MGD. Toxicity limits and biomonitoring requirements will be included in other minor facilities where information, including previous toxicity tests, indicates a potential toxic effluent. Whole waste toxicity limits and biomonitoring requirements will be required in all industrial permits which fail a screening procedure used by Region IV to review Form 2C application data and previous toxicity data.

When the instream waste concentration is greater than or equal to 1 percent at critical low flow conditions, the permittee shall conduct a 7-day Ceriodaphnia survival and reproduction test and a 7-day fathead minnow larval survival and growth test on a 24-hour composite sample on a series of effluent concentrations including one equivalent to the instream waste concentration, with test solutions renewed daily. Toxicity tests shall be conducted every 2 months for a period of 1 year following initiation of the test and once every 6 months thereafter for the duration of the permit. A permit violation occurs when the no observed effect level is less than or equal to that effluent concentration which is equivalent to the instream waste concentration in both the initial and a confirmatory toxicity test.

When the instream waste concentration is less than 1 percent at critical conditions, the permittee shall conduct 48-hour static toxicity tests on three appropriate species including a fish, an invertebrate, and one species selected from EPA 600/4-85/013, Table 1. Tests shall be conducted on 100 percent effluent once every 2 months for a period of 1 year and once every 6 months thereafter for the duration of the permit. Four separate grab samples of final effluent shall be collected at evenly spaced intervals over a 24-hour period and used in four separate tests in order to catch any peaks of toxicity and to account for daily variations in effluent quality. A permit violation occurs when a lethal concentration greater than 50 percent is found in any one of the grab samples within any testing period.

Georgia Department of Natural Resources  
Environmental Protection Agency  
205 Butler Street, S.E.  
Floyd Towers East  
Atlanta, GA 30334

Mr. Jack Dozier, Chief  
Water Protection Branch  
(404) 656-4708

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The State of Georgia administers an NPDES program with 60 major and 500 minor industrial and 120 major and 350 minor municipal permits. Twenty-five industrial permittees and one municipal permittee are required to complete 48-hour acute static toxicity tests using daphnids and fathead minnows as test organisms. If the screening test is failed, a permittee must complete a 96-hour flow-through test using fathead minnows. If this test is failed, a toxicity reduction evaluation is required. The state is implementing a biomonitoring program and when toxicity is found through this program, the discharger will be required to conduct biomonitoring tests.

The biomonitoring program in Georgia includes onsite flow-through testing and static testing onsite and at a base facility. A base facility in Atlanta for use in toxicity testing and aquatic biomonitoring is under construction. The state expects to do a large number of static toxicity tests, using Daphnia pulex and fathead minnows, and to complete approximately one 96-hour flow-through toxicity test per month. They will screen effluents to determine possible acute toxicity before sending the mobile laboratory on-site for a flow-through test. The state believes, in general, that there is a need to address acute toxicity problems before attacking the chronic toxicity issue. Chronic toxicity will be addressed on a case-by-case basis.

The state annually samples 100 locations with chemical analyses and 26 for macro-invertebrates for trend water quality monitoring. Of the 100, 6 locations are sampled for fish. At 20 locations, fish flesh and sediments are examined for heavy metals and selected organic compounds, and at 13 estuarine locations, shellfish are examined for the same constituents. Biological impact studies related to point sources are made at 15 to 20 locations annually, where macro-invertebrates and water chemistry are examined.

Hawaii Department of Health  
P.O. Box 3378  
Honolulu, HI 96801

Mr. Dennis Lau, Chief  
Environmental Permits Branch  
(808) 548-6410

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The state administers an NPDES program that includes 19 major and 55 minor industrial permits and 11 major and 8 minor municipal permits. Two industrial permits and one municipal permit require acute 96-hour static toxicity tests using fish as the test organism. Most discharges are to the marine environment, and the appropriate aquatic species and type of toxicity test remain uncertain. In addition, the state prohibits importation of some standard species. However, research is in progress to develop standard test methods with local species.

EPA, Region IX has recommended use of standard freshwater species where a freshwater discharge is involved. The state is committed to the inclusion of biomonitoring requirements in permits for all major discharges. To date, toxic discharges have not been identified; hence, there have not been toxicity reduction evaluations. Permittees with a biological testing requirement have completed comprehensive investigations of receiving water environments, including coral, benthic organism assessments, and fish. The state submits the results of such assessments to the University of Hawaii for assessment, interpretation, and recommendations. The state has the capability for very limited biological investigations.

There are no standards for specific toxic pollutants in Hawaii's water quality standards, with the exception of ammonia in marine waters.

U.S. Environmental Protection Agency, Region X  
(NPDES authority not delegated)  
1200 Sixth Avenue  
Seattle, WA 98101

Mr. Roger Mochnick, Chief  
Permits Section - Water Div.  
(206) 442-4817

Ms. Amber Wong  
Permits Section - Water Div.  
(206) 442-1647

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The State of Idaho has not received authority to administer an NPDES permit program. EPA Region X issues 42 major and 273 minor industrial permits and 28 major and 94 minor municipal permits for the state. Two industrial and two municipal permits require chronic toxicity testing, or both chronic and acute testing, either with one or three test organism species. An additional 2 industrial permits and 1 municipal permit are expected to contain biomonitoring requirements when draft reviews have been completed. None of the permits has toxicity effluent limits in the form of TUs (toxic units); however, if the permittee exhibits toxicity at or below a specified effluent concentration level, the permittee is required to conduct a toxicity reduction evaluation. The toxicity testing program is in its infancy, and most of the testing is accomplished with in-house capability by the permittees.

Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, IL 62706

Mr. Tim Kluge, Manager  
Industrial Wastewater Permit Unit  
(217) 782-1696

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Illinois has 100 major and approximately 1,800 minor industrial permits and 180 major and 600 minor municipal permits in the NPDES program. Toxicity testing is required in four industrial permits and one municipal permit. Biological toxicity limits are contained in the one municipal permit although they are presently under appeal. Approximately 20 permits are scheduled to be modified during the next year to include toxicity testing requirements. Additionally, most expiring industrial permittees will be required to submit toxicity testing results as part of their renewal application.

Toxicity testing permit requirements include acute 96-hour static toxicity tests with fathead minnows and algae, 48-hour static tests with *Daphnia*, and, for those permittees discharging into small streams, chronic 7-day toxicity tests with fathead minnows and *Ceriodaphnia*. Human health screening also is required; dischargers are given the option of performing Ames testing or extensive chemical analysis combined with a toxicological review. Testing is performed quarterly.

Once a year, 73 stream and 18 lake locations are sampled by the state for fish flesh tainting caused by pesticides and PCBs. Biological surveys of aquatic macroinvertebrates are conducted at approximately 50 sites annually. There are 50 to 60 acute 96-hour static and flow-through toxicity tests that are performed on one sample per facility. Every 6 weeks, 205 stations are monitored for trends in chemical parameters.

Currently, Illinois operates two mobile biological laboratories in conjunction with a fixed central laboratory. No state-sponsored biological laboratory certification program exists at this time.

Daily maximum limits, based on best professional judgment, for total residual chlorine are contained in 1,400 to 1,500 permits; all testing is done on dechlorinated samples.

Indiana Department of Environmental Management  
Office of Water Management  
105 South Meridian Street  
Indianapolis, IN 46225

Mr. Joseph Krieger  
NPDES Permit Supervisor  
  
(317) 232-8706

Mr. John Winters, Chief  
Water Quality Surveillance and  
Standards Branch  
(317) 243-5028

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There are 90 major and 675 minor industrial and 101 major and 350 minor municipal permits in the state NPDES program. Six of the industrial permits require biological toxicity testing, but none has a toxicity limit currently. The test generally required is an acute static 48-hour daphnid toxicity test, but in some permits, the 7-day chronic Ceriodaphnia and embryo-larval fathead minnow toxicity tests are required. No municipal permits currently require biological toxicity testing.

The state conducts about 17 static, 48-hour Daphnia magna acute screening tests on major industries and municipalities annually. The state currently is developing the capability to conduct the chronic Ceriodaphnia toxicity test. This capability will be greatly enhanced with the completion of a new biological laboratory facility, now under construction. Culturing facilities will be available within the laboratory for daphnia and for fathead minnows.

Through use of the Hester-Dendy artificial substrate tool, benthic macroinvertebrates are examined, along with fish, at 22 core monitoring stations and at about 5 discharge-oriented locations biannually. Macroinvertebrates only are also assessed at 15 habitat and use evaluation stream locations. Fish tissues are analyzed for PCBs, metals, and selected pesticides at 50 locations plus an undetermined number of "hot spot" or special attention areas.

The state owns a mobile toxicity testing laboratory, but currently it is not in use. There is no biological laboratory certification program.



Iowa Department of Natural Resources  
Henry A. Wallace Building  
900 East Grand  
Des Moines, IA 50319

Steve Williams  
Environmental Spec.  
(515) 281-8884

Ralph Turkle  
Environmental Engineer  
(515) 281-7025

Monica Whuk  
Environmental Spec.  
(515) 281-8879

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The State of Iowa issues 21 major and 592 minor industrial permits and 63 major and 642 minor municipal permits in the NPDES program. Presently, there are no biological toxicity testing requirements. Water quality based toxic chemical limitations are included in permits where needed.

Iowa performs ambient water quality trend monitoring at 15 sites on a monthly basis and 11 sites on a quarterly schedule. The Region VII EPA office scans for toxics in fish flesh at 14 stations and performs static 24-hour acute toxicity tests on 10 to 12 industrial or municipal facilities suspected of releasing toxics in their effluent.

Water quality standards for total residual chlorine were established in 1985; however, few permits contain such limits. The state is incorporating total residual chlorine limits in permits as they are reissued.

Guam/Commonwealth of Northern Mariana Islands  
Trust Territory of Pacific Islands/American Samoa  
U.S. Environmental Protection Agency, Region IX  
Water Management Division  
215 Fremont Street  
San Francisco, CA 94105

Mr. Phil Woods  
Water Quality Standards Coordinator  
(415) 974-8307

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The Islands of the Pacific do not have delegated NPDES authority. EPA Region IX administers the permit program that includes a combined 8 major and 24 minor industrial permits for all islands and 8 major and 9 minor municipal permits.

All entities have water quality standards which provide that the survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge. Provision is made for the implementation of this policy statement through a 96-hour static renewal toxicity test as a minimum. Generally, the implementation of the toxicity testing requirement has not occurred. NPDES permits provide for the chemical analysis of various numbers of specific wastewater constituents.

Biomonitoring has been implemented using coral toxicity testing programs in Guam and, recently, with a few acute toxicity tests using fish as test organisms. As in other tropical areas, there is a general lack of technical guidance on suitable toxicity test organisms and techniques for tropical waters.

Kansas Department of Health and Environment  
Forbes Field  
Topeka, KS 66620

Dr. Joe Arruda  
Water Quality Biologist  
(913) 296-5572

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Kansas has 14 major and 234 minor industrial and 42 major and 441 minor municipal permits in its NPDES program. There is no biological testing associated with the permit program.

The state has a priority list of approximately 25 industries and 29 municipalities whose effluents are screened for toxicity, using 24-hour Daphnia pulex and fathead minnow toxicity tests. No chronic testing currently is done by the state, but the culturing of Ceriodaphnia is being undertaken to implement such purpose.

In related activities, the state conducts macroinvertebrate assessments at 52 to 75 locations annually and periphytic assessments occasionally in special studies. Macroinvertebrates sampled via the kick method are examined annually at about 52 water quality trend monitoring locations. The state participates in the Regional Ambient Fish Tissue analyses program, where whole fish collected by the state at 20 locations are analyzed for pollutants by the EPA Region VII annually. The Kansas state laboratory conducts edible portion fish tissue analyses for follow-up studies on rivers and lakes where human health impacts are known or suspected.

Kentucky Dept. of Natural Resources and Environmental Protection  
18 Reilly Road  
Ft. Boone Plaza  
Frankfort, KY 40601

Dr. Albert Westermann, Aquatic Toxicologist  
Program Director of Toxicity  
Strategy Program  
(502) 564-3410

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Kentucky currently has 128 major and 300 minor industrial NPDES permits; when including the intermittent discharges of the coal industry, these numbers are boosted to 216 major and approximately 1,500 minor permits. There are 57 major and about 200 minor municipal NPDES permits. All permits have water quality based toxic chemical limits, and 13 industrial and 4 municipal permits have both toxicity testing and biological toxicity limits. Beginning on July 9, 1987, all major industrial and municipal permits, and all minor municipal permits which include pretreatment programs, will require biomonitoring when being reissued.

All major facilities that discharge into a 7Q10 low flow stream, and have an effluent volume of 1 percent or greater than the receiving stream, will be required to perform chronic 7-day Ceriodaphnia and 9-day embryo-larval fathead minnow toxicity tests every other month for the first year and semi-annually thereafter. Any facility with an effluent less than 1 percent of the available dilution must conduct quarterly 96-hour fathead minnow and 48-hour daphnid acute static renewal toxicity tests. It must also be demonstrated that there are no chronic toxicity effects occurring instream. If toxicity limits are exceeded, a toxicity reduction evaluation is required. All new permits contain language mandating effluent toxicity reductions, but only those violating permit limitations have been given an absolute time limit. Five facilities presently fall under the latter category.

Kentucky does not operate a mobile biological laboratory for the purpose of conducting on-site toxicity tests. There is no state biological testing laboratory certification program at present, but the state reserves the right to reject a laboratory's results if state and federal guidelines for conducting toxicity tests are not observed.

In 1986, the state completed 136 acute and 24 chronic toxicity tests on facility effluents using fathead minnows and daphnids. Intensive surveys of fishes and macroinvertebrates were conducted at 22 stations, including flesh bioaccumulation scans for 40 various pollutants.

Residual chlorine limits currently are based on EPA water quality criteria, although a move is being made to raise the limit based on research conducted by the state and the Athens, Georgia, laboratories. The maximum contaminant levels for drinking water apply at the consumer's tap.

LOUISIANA

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LA Dept. of Environmental Quality  
P.O. Box 44091  
Baton Rouge, LA 70804

LA Dept. of Environmental Quality  
Office of Water Resources  
11720 Airline Highway  
Baton Rouge, LA 70817

Dr. Dick Gregg  
Environmental Program Specialist  
(504) 342-6363

Ms. Teri Jackson  
(504) 922-0547

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The State of Louisiana has not received NPDES permit delegation; the program is administered by EPA Region VI. There are 145 major and 881 minor industrial and 75 major and 343 minor municipal NPDES permits. About 100 of the industrial permittees are required to conduct toxicity testing; there are no toxicity effluent limits. The 48-hour static Daphnia spp. acute toxicity test is required. Currently there are no biological testing requirements in municipal permits.

The state, in addition, maintains its own discharge permit system. As a result, a discharger must obtain an NPDES permit from EPA Region VI, as well as a state permit to discharge. There is coordination between the two regulatory systems, and testing requirements are similar when they apply to both systems.

The state administers a permit system with 50 major and 300 minor industrial and 50 major and 900 minor municipal permits. About 30 of the industrial permits require toxicity screening using the 48-hour static Daphnia spp. test. There are no effluent toxicity limits and there are no testing requirements on municipalities. If greater than 80 percent mortality exists in 100 percent effluent, the permittee must perform a 96-hour static renewal toxicity test using fathead minnows. If this test is failed, there must be a determination of the cause and an identification of appropriate corrective action. In the testing program to date, none has failed the 96-hour test. In addition to the 30 industrial permits that require effluent toxicity testing, 6 permittees are required to do receiving water biotic assessments upstream and downstream from the discharge using macroinvertebrates and fish in the stream quality assessment.

The state has operated a new toxicity testing laboratory for about the past year. There is capability for the 7-day Ceriodaphnia and the 8-day egg-embryo-larval fathead minnow chronic tests. During the past year, approximately 12 chronic fathead minnow, 100 chronic Ceriodaphnia, and approximately 150, 48-hour acute Daphnia pulex tests were performed. The chronic tests principally have been on ambient waters, whereas the acute screening tests principally have been on facility effluents. The short-term goal is to develop similar capability with marine organisms. Most of the activity thus far has centered around intensive stream surveys, one of which involved 13 chronic toxicity tests per month. The acute tests are performed primarily during compliance sampling efforts. There is no commercial laboratory certification program.

ME Department of Environmental Protection  
State House Station 17  
Augusta, ME 04333

Mr. Norm Marcotte  
Licensing and Enforcement Section  
(207) 289-3355

Mr. Barry Mower  
Environmental Evaluation and Lake Studies  
(207) 289-7776

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NPDES authority has not been delegated to the State of Maine; the program is administered by EPA Region I. There are 64 major and 46 minor municipal and 30 major and 322 minor industrial permits within the program. Fifteen of the municipalities have approved pretreatment programs and these will be required to perform biological effluent testing either via specific permit language or Section 308 letters.

At the present time, two municipalities and one industry have biological testing requirements and toxicity limits. In addition, toxicity testing language has been drafted for three additional permits; one industrial and two municipal licenses require effluent toxicity testing but do not have specific toxicity limitations. Approximately 10 industrial permittees have performed toxicity tests via administrative request.

When a toxicity problem becomes apparent through instream invertebrate examination or state-conducted toxicity tests, a permit applicant may be asked to undertake an effluent testing program. The type of tests required are the 7-day chronic Ceriodaphnia toxicity test and a 14-day brook trout growth study in conjunction with an acute daphnid test. Monitoring frequency varies according to circumstances surrounding the discharge, but generally the requirement is for a monthly acute test and a quarterly chronic test. Fathead minnows are not used in the state testing program because it is believed that Ceriodaphnia results in a more sensitive and representative test.

The state evaluates stream conditions through rock substrate baskets at 30 to 50 waterway locations per year. Three replicate samplers are used at each location. In the past, such locations have been selected to identify environmental problems associated with facility effluents; in the future, the program will evolve to address non-point source areas. In addition to the macroinvertebrate study described above, acute and chronic Ceriodaphnia effluent toxicity tests have been performed at 15 locations. Facilities due for permit renewal are priority candidates for such testing.

Department of the Environment  
201 West Preston Street  
Baltimore, MD 21201

Mr. John Veil  
Chief, Industrial Point Source Div.  
(301) 225-5678

Mr. Arcadio Sincero  
Chief, Municipal Permits Div.  
(301) 333-1069

Maryland administers a permit program with 52 major and 520 minor industrial permits and 37 major and 311 minor municipal permits. Twenty-five industrial permits currently require toxicity testing; 37 municipal permits eventually will require such testing. None has a biological toxicity permit limit. Existing permits generally require a one-time 96-hour static renewal toxicity test with a locally important fish and invertebrate. As permits have been reissued during the past year, they have required a 7-day chronic toxicity test with Ceriodaphnia and fathead minnows once per quarter for at least the first year of the permit. For estuarine waters, mysid shrimp and sheepshead minnows become the test organisms. Acute tests with a locally important fish and invertebrate are required once, concurrent with the chronic testing.

The toxicity reduction evaluation program is just getting underway. When acute toxicity is confirmed with a repeat toxicity test, a toxicity reduction evaluation is imposed. Toxicity reduction evaluation has not been implemented for municipalities; one has been required in an industrial permit, and two additional such evaluations are pending. Currently, there are no results from the evaluation.

The state began operating a State Biomonitoring Laboratory in March 1987, under a 3-year contract with the Johns Hopkins University. The initial goal is to conduct an acute static daphnid and fathead minnow toxicity test on a facility's effluent at a rate of at least one facility per week. Later, chronic testing will be conducted. This will serve as a comparison to the results of permittee testing through commercial laboratories. There is no biological laboratory certification program, and currently there is no activity in this regard. The state does not operate a mobile biological laboratory.

Currently, the priority pollutants are not a part of water quality standards. Drinking water maximum contaminant levels are applicable to designated domestic water supply intake areas only.

In related biologic activities, an assessment of benthic macroinvertebrates to Chesapeake Bay tributaries continues. Biotic assessment of benthic macroinvertebrates has been on-going for a network of trend monitoring locations throughout the state. Receiving stream biotic assessments are not made a permit condition.

MA Division of Water Pollution Control

One Winter Street  
Boston, MA 02108

Technical Services Branch  
Westboro, MA 01581

Mr. Glen Gilmore, Chief  
Surface Water Permits Section  
(617) 292-5656

Mr. Arthur Johnson  
Biomonitoring Program Manager  
(617) 366-9181

NPDES authority has not been delegated to the Commonwealth of Massachusetts; the program is administered by EPA, Region I. Permits are issued jointly by the state and EPA. There are 99 major and approximately 25 minor municipal and 94 major and approximately 350 minor industrial permits within the program. Thirty-four of the municipalities have approved pretreatment programs, and these will be required to institute biological toxicity testing either through permit or Section 308 letter; most municipal permittees are required to undertake toxicity testing because of chlorination.

Presently, about 22 industrial permittees and 12 municipal permittees are required to conduct toxicity testing; 17 industrial and 6 municipal permits contain toxicity limits. The type of toxicity test generally required is a 48-hour static daphnid and fathead minnow or appropriate marine species toxicity test. For two or three of the larger marine dischargers, a three species, chronic toxicity test is required and chronic toxicity limits have been imposed. Frequency of testing is monthly for these larger facilities but less frequent for other facilities.

About two industrial toxicity reduction evaluations are in progress as a result of toxicity testing; none has yet been completed.

The state does not have a biological laboratory certification program. The state purchased a new mobile laboratory which is equipped for acute and chronic toxicity testing; the laboratory will begin operation this year. The laboratory will be used in compliance monitoring and as a means of spot checking effluents where tests have been made by a commercial biological laboratory. The state also uses a commercial bacteriological assay for effluent screening; approximately 100 such effluent screens are made annually. Ideally, the state hopes to use the bacteriological screening test in conjunction with the daphnid and fathead minnow toxicity tests. With the new laboratory the fathead larval growth and survival test and the chronic Ceriodaphnia toxicity test will become viable monitoring tools. Up to the present time, Region I EPA has supplied the principal competency for toxicity testing within the state.

The state conducts macroinvertebrate assessments at approximately 25 locations annually. Use is made of the rapid 5-minute "kick sampling" technique with analyses of the first 100 organism subsample. About half of these locations are associated with special studies and about half with particular facility discharges.

Fish flesh analyses are made for 10 to 50 locations annually for pesticides, heavy metals, and PCBs. Human health aspects are managed through chemical analyses, with results compared to health criteria and published risk assessments. Work is being done with bacteriological indicators in an effort to link those bacteria with potential sources of pollution.



Michigan Department of Natural Resources  
Surface Water Quality Division  
P.O. Box 30028  
Lansing, MI 48909

Mr. William E. McCracken, Chief  
Permits Section  
(517) 335-4114

Mr. Jim Grant, Supervisor  
Water Quality Appraisal Unit  
(517) 335-4193

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Michigan has 117 major and about 810 minor industrial permits and 98 major and approximately 540 minor municipal permits in the NPDES program. Less than 10 permits require toxicity testing and there are no permits containing biological toxicity limits. Testing is end-of-pipe and involves 96-hour acute toxicity tests with fathead minnows. State water quality standards implement chemical specific limits, which are included in over 50 percent of the industrial permits and over 90 percent of the municipal permits. All permits are evaluated for toxicity concerns, and those with unacceptable effluent are required to undertake a toxicity reduction evaluation.

Annually, the State of Michigan conducts approximately 30 site investigations and 10 intensive biological surveys of fish and macroinvertebrates to evaluate water quality conditions in areas of environmental concern. Fish are collected from 40 sites per year for flesh analyses for metals, pesticides including PCBs, and other parameters on a case specific basis. Five caged fish studies will be done this year, and 40 to 50 stations have been established for monthly monitoring of chemical specific parameters. Three chronic and 30 static acute 48-hour toxicity tests will be performed at the state laboratory, and 5 on-site acute 96-hour flow-through toxicity tests will be conducted by the mobile biological laboratory. There is no certification program for commercial biological testing laboratories.

An estimated 25 percent of all permits contain maximum residual chlorine limits which are based on state water quality standards. According to state policy, maximum contaminant levels for drinking water apply instream at the point of intake.

Minnesota Pollution Control Agency  
1935 W. County Road B2  
Roseville, MN 55113

Mr. Doug Hall, Supervisor  
Permit Unit

(612) 297-1832

Mr. Marvin Hora, Head  
Toxic Abatement and Lake Evaluation Unit  
Division of Water Quality  
(612) 296-7215

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The Minnesota NPDES program includes 28 major and about 500 minor industrial permits and 50 major and approximately 600 minor municipal permits. Currently, toxicity testing is required in one major industrial permit; however, testing will be required in all major permits when reissued. Testing will involve either the 24-hour static acute fathead minnow or 96-hour flow-through toxicity tests using whole effluent and serial dilutions. Biological toxicity limits have not been imposed.

Minnesota collects approximately 1,000 to 1,500 fish from 50 to 75 sites for the bioaccumulation analyses of mercury, PCBs, and dioxin. This year the state will conduct approximately 12 chronic toxicity tests using Ceriodaphnia and embryo-larval fathead minnows. Twenty-four-hour and 48-hour static acute toxicity tests using fathead minnows and Daphnia magna will be performed at 25 facilities this year. The mobile biological laboratory will do on-site acute 96-hour flow-through toxicity testing. There is no biological laboratory certification program.

Residual chlorine limits are included in many permits, and all new municipal treatment facility permits have a dechlorination requirement. At this time only the pre-chlorinated wastewater is tested for toxicity.

Mississippi Department of Natural Resources  
Bureau of Pollution Control  
P.O. Box 10385  
Jackson, MS 39209

Mr. Jerry Cain, Chief  
Industrial Wastewater Control Section  
(601) 961-5073

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The permit program in Mississippi consists of approximately 40 major and 493 minor industrial and 45 major and 255 minor municipal permits. About 20 of the industrial permits have requirements for biological toxicity testing; none of the municipal permits requires such testing. Of the 20 permits requiring testing, approximately 10 have toxicity effluent limits. In the future, all permits with a testing requirement will have toxicity limits. In the future, also, there will be an increase of about 50 percent in the number of permits requiring biomonitoring.

All of the industrial permits undergo a screening process whereby mass balance dilution calculations for specific chemical constituents are compared with water quality criteria. Where toxicity could be a potential problem, biological toxicity testing is implemented. All pretreatment permits for indirect dischargers are issued at the state level; thus, the state believes that, through a chemical specific assessment, it will be able to control potential toxic components of municipal dischargers.

All of the 20 industrial permits with testing requirements include chronic 7-day toxicity tests using *Ceriodaphnia* and fathead minnows. Tests are required quarterly for the first year and every six months thereafter. When a test is failed, a confirmatory test is required. When the confirmatory test is failed, a toxicity reduction evaluation is required. Three or four industries currently are in the early stages of toxicity reduction evaluation; three additionally are in the middle stages and have identified the cause of toxicity. No toxicity reduction evaluation has been completed currently. The state is developing a state-wide strategy for the control of toxic pollutants.

There is no biological laboratory certification program. The state will have an operational mobile biological laboratory for chronic toxicity testing by December, 1987. It is anticipated that 15 chronic toxicity tests and potentially 7 or 8 acute toxicity tests will be completed on an annual basis. Ambient monitoring of fish flesh for metals and chlorinated hydrocarbons are completed annually at 30 locations. There are 15 state trend monitoring locations where macroinvertebrates and periphyton are examined and 30 locations where fish populations are assessed.

Missouri Department of Natural Resources  
Water Pollution Control Division  
P.O. Box 176  
Jefferson City, MO 65102

Mr. John Ford  
Water Quality Specialist  
(314) 751-7626

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The State of Missouri administers a permit program with 70 major and 2,100 minor non-municipal permits and 70 major and 750 minor municipal permits. None of the permits in the NPDES program has a requirement for biological toxicity testing; the program can be characterized as being virtually chemical specific. Five or six of the permittees have, in the past, been required to perform an instream biotic assessment of receiving waters with macroinvertebrates, with the focus on one location upstream from a source and one or two locations downstream. Generally, an initial macroinvertebrate study is all that has been required of permittees. A few permittees are performing toxicity tests routinely that are not required under permit conditions.

The state is in the initial phase of a chronic toxicity testing program related to effluents. Through a contract with the U.S. Fish and Wildlife Services's Columbia National Fish Research Laboratory, Columbia, MO, state and laboratory personnel are conducting chronic Ceriodaphnia and fathead minnow toxicity tests on 16 municipal effluents over a 2-year period. Twelve of the municipal effluents have been examined. When this contractual program has been completed, the state's testing program will be shifted to the state laboratory at Jefferson City where the state will continue to check four to six effluents annually. This is essentially a compliance monitoring program. The state anticipates requiring toxicity testing and possibly attaching toxicity limits in applicable permits if toxicity is discovered in the effluents.

The state does not operate a mobile laboratory. There is no state laboratory certification program for biological testing laboratories, nor is there a trend monitoring program where biological techniques are employed. The state collects fish annually at 22 locations for the Regional Ambient Fish Tissue analyses program where EPA Region VII analyzes whole fish for pollutants. The Missouri Department of Conservation analyzes fish flesh for chlordane, PCBs, and other pesticides in an extensive fish sampling program as well.

The state completes qualitative benthological investigations using macroinvertebrates in receiving water streams in the vicinity of 200 facilities annually. These specific locations change annually as the state's investigative universe of about 1,000 facilities is completed in a 5-year period. In addition, more intensive instream biotic assessments are completed in four to six stream reaches annually.

Montana State Department of Health and  
Environmental Sciences  
Cogswell Building, Room A-206  
Helena, MT 59620

Mr. Loren Bahls, Supervisor  
Water Quality Management Section  
(406) 444-2406

Mr. Fred Shewman, Supervisor  
Wastewater Discharge Permit Section  
(406) 444-2406

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There are 19 major and 166 minor industrial and 26 major and 79 minor municipal permits in Montana's NPDES program. There is no requirement for effluent toxicity testing. There are two industrial permits that require receiving water biomonitoring.

The state has developed the capability to perform the 7-day chronic Ceriodaphnia toxicity test and has performed such at six locations. Screening toxicity tests have been done on 10 effluents using a 7-day static renewal Ceriodaphnia test. At an additional five locations, the EPA regional laboratory recently conducted trout, fathead minnow, and 7-day chronic Ceriodaphnia testing.

The state conducts six to eight instream biotic assessments annually, many of which are associated with upgraded sewage treatment plants. Algae, primary productivity, chlorophyll a, and macroinvertebrates are examined. Trend water quality monitoring is undertaken at 30 locations where macroinvertebrates and algae are included in the examination. The state recently completed chronic Ceriodaphnia on ambient upstream and downstream waters receiving runoff water from a copper and silver mine spill slope.

There are no commercial laboratories within the state known to have toxicity testing capability. There is no biological testing laboratory certification program. Facilities are not available for the state to conduct fathead minnow toxicity tests.

Nebraska Department of Environmental Control  
Water Quality Division  
P.O. Box 94877  
Lincoln, NE 68509

Mr. Steve Walker  
Environmental Scientist  
(402) 471-2186

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The NPDES program for the State of Nebraska includes 26 major and 201 minor industrial and 44 major and 299 minor municipal permits. There are no requirements for biological testing in the permits, and the program is operated on a pollutant-specific basis. The state expects to introduce biological toxicity testing into major permits as they are reissued.

The EPA currently is testing about six facilities annually for the state, using static renewal acute toxicity tests on effluents with daphnids and fathead minnows as test organisms. If toxicity is found through toxicity testing, the state will seek appropriate action by the permittee to rectify the problem. Currently, there are no toxicity reduction evaluations in progress.

The state participates in the Regional Ambient Fish Tissue analyses program, where fish are collected at 20 locations and whole fish are analyzed by EPA Region VII for 130 toxic contaminants. As part of the ongoing 205(j) water quality management program, the state examines 3 of the 13 river basins, or approximately 100 stream locations, per year for macroinvertebrates and fish.

Nevada Division of Environmental Protection  
201 South Fall Street  
Carson City, NV 89710

Mr. Wendell McCurry  
Water Quality Office  
(702) 885-4670

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The State of Nevada has 5 major and 20 minor industrial NPDES permits and 6 major and 15 minor municipal permits. The one permit with biological testing is a municipality with advanced waste treatment. The requirement is for quarterly 96-hour static renewal toxicity tests using trout as the test organism. Although not a condition of the permit, the municipality maintains a tank stocked with trout through which the treated effluent passes prior to discharge to receiving waters. In addition, the permit requires periphyton and macroinvertebrate assessments at several locations in the receiving water. Three other municipalities potentially will be required to undertake biomonitoring.

The state currently does not have capability to undertake toxicity testing related to the permit program. EPA has conducted biomonitoring at two of the major dischargers in the state and found significant chronic toxicity.

NH Department of Environmental Services  
Water Supply and Pollution Control Division  
Permit Compliance Section  
6 Hazen Drive  
Concord, NH 03301

Mr. Lynn Woodard  
(603) 271-2457

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New Hampshire does not have NPDES delegated authority. The NPDES program is managed by EPA Region I. There are 40 major and 75 minor municipal permits and 27 major and 75 minor industrial permits within the system. About 3 municipal and 3 industrial permits now require toxicity testing. The type of test involved is an acute static toxicity test with at least two species including a daphnid and fathead minnow. The future thrust is to examine 20 percent of the facilities each year and include biological toxicity testing where appropriate. All of the major municipalities with pretreatment programs will be included in the biological toxicity testing program in the near future.

Many of the permits have water quality based limits for toxic pollutants. State water quality standards prohibit the discharge of toxic pollutants in amounts that may cause toxicity in the receiving water. Calculated pollutant levels instream resulting from the maximum plant discharge and 7Q10 low flow receiving water conditions are compared with instream acute water quality criteria. Similar calculated levels resulting from average plant discharge and 30Q2 low flow receiving water conditions are compared against chronic criteria. Such comparisons determine whether technology-based limitations (BATs) or criteria-based chemical-specific limits would be required in a reissued permit. An instream toxicity test by a permittee may be used to provide grounds for reconsideration of initial permit values.

The state has a program of conducting acute Daphnia pulex toxicity tests on 40 facility effluents per year. Concurrent with the effluent test, a similar toxicity test is performed for the receiving water upstream and downstream from the discharge where physical stream conditions are appropriate for such activity. The state does not conduct other types of biological effluent or receiving water testing. A mobile biological laboratory is not operated, nor is there a biological laboratory certification program.

The toxicity reduction evaluation concept is used where it is necessary to identify a source of toxicity. Residual chlorine limits are in municipal permits, except that many of the older plants do not have such limits. Such limits are based upon EPA water quality criteria. Drinking water maximum contaminant levels are applicable statewide and are factored into the design of any municipal pretreatment program.



New Jersey Department of Environmental Protection  
P.O. Box CN 029  
Trenton, NJ 08625

Ed Post, Section Chief  
Industrial Permits  
Bureau of Indst. Waste Mgt.  
(609) 292-0407

Alfred Korndorfer  
Supervising Env. Spec.  
Div. of Water Resources  
(609) 292-0427

Dr. Bonnie Zimmer  
Env. Scientist  
Div. of Water Resources  
(609) 984-4429

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New Jersey issues 200 major and 780 minor industrial permits and 160 major and 310 minor municipal permits. Of the above, 125 industrial and about 175 municipal permits require biological toxicity testing; other municipalities will be required to test when permits are reissued. About 100 issued industrial permits and all of the municipal issued permits contain toxicity limits. The remaining have a monitoring requirement only. Permits require acute static renewal fathead minnow toxicity tests in fresh water or mysid shrimp or sheepshead minnow tests in sea water. A few of the permits on complex industrial wastewaters require chronic testing using the 7-day fathead minnow test or a 21-day daphnid test principally as a monitoring tool; there are no toxicity limits on the chronic tests. Multiple species testing is being introduced into some permit requirements. Testing generally is conducted on a quarterly basis but some complex wastewaters are tested monthly. When four consecutive tests show no toxicity, a permittee can petition for testing frequency modification.

Toxicity Reduction Evaluations based upon toxicity testing are beginning to be written into municipal permits. Following a history of monitoring for 18 months, there is a sufficient record of effluent toxicity to place such a program in perspective. Six or eight such evaluations are in a development stage. In industrial permits, the tendency has been to provide permit limits and schedules to achieve such by using formal toxicity reduction procedures.

Neither chronic toxicity testing procedures nor the Ames test procedure have been placed in the State Regulations Governing Laboratory Certification and Standards of Performance. The Ames test has been placed in a few permits where there is a potential for mutagenicity. In the policy discussion and development stages have been such issues as toxicity testing for indirect dischargers, using the fry stage of fathead and sheepshead minnows as test organisms, and using the transparent Medaka fish egg test for toxicity.

Residual chlorine limits are in 65 percent of the municipal permits and will be going into all such permits during reissuance. Toxicity tests are performed on end-of-pipe dechlorinated wastewater except when dechlorination devices are being installed.

The state operates a biological laboratory certification program with on-site inspection and an annual recertification requirement; about 20 laboratories maintain certification. A mobile laboratory is operated for facility on-site acute toxicity testing using fathead minnows and bluegills. A chronic toxicity testing program has not yet been implemented. The new state fixed laboratory still is in the construction phase. Four or five intensive receiving water surveys with ten or twelve sampling locations in each are performed annually where macroinvertebrates, fish, periphyton, and sediments are examined.

New Mexico Health and Environmental Department  
Environmental Improvement Division  
P.O. Box 968  
Santa Fe, NM 87504-0968

Mr. Glen Saums, Prog. Mgr.  
Surface Water Section  
(505) 827-2795

Mr. Dave Tague  
Surveillance & Standards Section  
(505) 827-2822

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NPDES authority has not been delegated to New Mexico. The state has 16 major and 134 minor industrial and 21 major and 25 minor municipal permits in the NPDES program. Five of the major industrial permits require acute static toxicity testing using a daphnid. None of the permits has a toxicity effluent limit. As the regional toxics control strategy becomes implemented, a greater emphasis on biological toxicity testing in permits is expected. The state performs about 12 water quality stream studies, with an estimated 40 specific locations for quantitative and qualitative macroinvertebrate examination, annually. No state toxicity tests are performed and there is no fish tissue examination.

The state has a stringent residual chlorine limit that requires chlorination to attain a level of 500 fecal coliform organisms per 100 ml. One of the municipalities maintains dechlorination equipment.

New York State Department of  
Environmental Conservation  
Division of Water  
50 Wolf Road  
Albany, NY 12233

Mr. Ed Kuzia  
(518) 457-8819

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The State of New York administers an NPDES program with approximately 160 major and 860 minor industrial permits and 265 major and 300 minor municipal permits. The program principally is chemical specific; 9 industrial permits and 14 municipal permits require toxicity testing. No permit contains a toxicity effluent limit. The testing program requires a minimum of quarterly acute static renewal toxicity tests using fathead minnows and daphnids. There are, on the other hand, about 200 specific chemicals in the permit program.

Toxicity reduction evaluations are in their program infancy and, where implemented, would be on a very site specific basis. There is a mechanism in the permit guidance document for requiring such evaluations in the event of 50 percent failure of the initial screening tests during one year; presently, permits do not contain specific evaluation language. No facility thus far has failed acute toxicity testing. Thus, there has not been a need for further action.

The state does not have a biological laboratory certification program. A mobile toxicity testing laboratory is operated, but it is not used extensively. The 7-day chronic Ceriodaphnia test is used on 50 ambient receiving water locations annually. Macroinvertebrates are assessed at 38 trend monitoring sites and at 50 locations associated with special survey sites annually. Fish flesh is analyzed from 100 locations annually for organochlorine pesticides, PCBs, and some metals, principally mercury.

The state is reviewing its chlorine criteria. Permits containing chlorine effluent limits based upon the old criteria for which there are no documented adverse effects on the receiving stream will continue with those limits. New facilities will be required to comply with limits based on the new criteria.

Water quality standards provide for four ambient water classifications. Drinking water maximum contaminant levels apply only to Class A waters, protection against bioaccumulation of specific contaminants to all waters, fish propagation protection to A, B, and C waters, and fish survival to D waters.

North Carolina Dept. of Natural Resources and Community Development  
Division of Environmental Management  
P.O. Box 27687  
Raleigh, NC 27611

Steve Tedder, Head  
Tech. Services Branch  
(919) 733-5083

Dale Overcash, Leader  
NPDES Group  
(919) 733-5083

Ken Eagleston  
Biological Services Unit  
(919) 733-5083

North Carolina administers an NPDES program with 100 major and 2,730 minor industrial permits and 130 major and 240 minor municipal permits. Biological toxicity testing is required in 30 permits and through an additional 102 administrative letters for a total involvement of 132 permittees. Toxicity testing requirements and limitations currently are placed in all major industrial and municipal permits either upon reissuance or as a new permit. Additionally, all minor discharges with complex wastewaters receive similar toxicity limitations. When the wastewater flow exceeds 1 percent of the receiving water 7Q10 flow, the 7-day chronic Ceriodaphnia test is required. Where wastewater flows are less, an acute static toxicity test either with Ceriodaphnia or Daphnia pulex may be substituted. In the future, toxicity testing will apply to all major industrial and municipal dischargers and to all minor dischargers with complex. The state tests toxicity on more than 200 effluent samples per year. When toxicity is found through a state toxicity test, a toxicity reduction evaluation is imposed on the facility. A number of municipalities, in particular, have completed such evaluations. Success is measured by the ability to pass a chronic toxicity test on an effluent sample diluted to the percentage waste present in the receiving stream during 7Q10 conditions.

Regulations now are being developed for a biological laboratory certification program; it is expected that the program will be implemented within a year. The program is expected to require completion of performance evaluation samples by participating laboratories.

The state program involves completing acute and 7-day chronic Ceriodaphnia toxicity tests on approximately 100 facilities per year. Macroinvertebrates are examined at 100 trend monitoring locations and at an additional 60 special study locations annually. A mobile laboratory is operated, and one flow-through toxicity test per month is completed. A basin-wide study involving fish flesh analyses for pesticides and metals is conducted at 30 to 50 locations annually. The complete set of test locations is 150 sites. Phytoplankton is examined at six locations from two lakes monthly selected from a monitoring network of 40 lakes; the assessment relates generally to eutrophication.

There are no chlorine standards, and samples for toxicity tests are taken end-of-pipe.

North Dakota Department of Health  
Water Supply and Pollution Control  
1200 Missouri Avenue  
Bismarck, ND 58501

Ms. Sheila McClenathan  
Environmental Scientist  
(701) 224-2354

Mr. Daniel Stewart  
Biologist  
(701) 224-2354

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North Dakota has 7 major and 70 minor industrial and 15 major and 300 minor municipal permits in its NPDES program. The program is managed in a chemical specific manner; one major municipal permit contains a toxicity testing requirement. Beginning in Fiscal Year 1988, the state anticipates including a requirement for either acute or chronic effluent testing in major reissued permits.

The EPA Laboratory, Denver, Colorado, has provided technical assistance in performing one or two acute and chronic toxicity tests on effluents as a demonstration project. The state is in the process of developing its toxicity testing capability. A portion of an existing state laboratory will be devoted to this activity, and capability exists for conducting both acute and chronic tests with Ceriodaphnia and fathead minnows. Fish flesh analyses for pesticides, PCBs, and metals are completed from fish captured from approximately 10 locations.

Ohio Environmental Protection Agency  
P.O. Box 1049  
Columbus, OH 43266-1049

Robert Phelps, Chief  
Industrial Wastewater Sect.  
(614) 481-2001

Lester Fischer, Supervisor  
Monitoring Branch  
(614) 481-2001

Charles Webster  
Water Quality Lab.  
(614) 294-5841

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The State of Ohio administers an NPDES permit program with approximately 140 major and 1,350 minor industrial and 156 major and 900 minor municipal permits. Five of the municipal permits and two of the industrial permits now contain a requirement for biological testing. Effort is being made currently to include such testing in 10 to 15 industrial permits. The forecast is that biological testing will be included in permit language where needed. When reissued permits require testing, monthly acute fathead minnow and daphnid toxicity tests or quarterly chronic 7-day Ceriodaphnia or fathead minnow tests are designated.

Toxicity reduction evaluation has not yet been written into a permit. However, in one or two cases, such evaluations are taking place. After toxicity has been identified either through state or permittee testing, the biomonitoring requirement may be increased. Following a repeated indication of toxicity, a toxicity reduction evaluation may be indicated.

The state has a stringent chlorine limit, and dechlorination often is required as a result. Drinking water maximum contaminant levels are applicable to public water supply reaches designated in water quality standards.

The state has been doing acute static 48-hour Ceriodaphnia and 96-hour fathead minnow toxicity tests three times per year on 18 to 20 effluents. This effort, when completed, will involve about 75 toxicity tests. An evaluation of the results of this study will determine state action to place additional toxicity testing and toxicity limits into appropriate permits; it may determine action on toxicity reduction evaluations. The state completes 7-day Ceriodaphnia and fathead minnow chronic toxicity tests on an "as needed" basis and anticipates a workload of 7 to 10 such toxicity tests per year. The state does not operate a mobile toxicity testing laboratory, and there is no biological laboratory certification program.

The receiving waters of the 18 to 20 effluent locations are also being examined for macroinvertebrates using Hester-Dendy multiple plate samplers. Electro-fishing or seining techniques to sample fish populations at the above locations are undertaken three times annually. Fish tissue and sediments are analyzed through contract support.

Oklahoma Water Resources Board  
1000 N.E. 10th Street  
Oklahoma City, OK 73152

Dr. Ron Jarman, Chief  
Water Quality Division  
(405) 271-2541

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Oklahoma has not been delegated NPDES authority. There are approximately 36 major and 360 minor industrial and 59 major and 740 minor municipal permits in the NPDES program. Twenty-two of the industrial permits now require an acute 48-hour toxicity test using a daphnid as the test organism. Presently, biological testing is not required of municipal permittees. The biological toxicity testing program has been in effect for major industrial permit reissuances for the past 2 years.

With the implementation of the EPA, Region VI policy on the discharge of toxic pollutants, reissued permits will contain biological toxicity testing language that will require either acute or chronic toxicity effluent testing. The type of test will depend generally upon the dilution that the waste receives. The state is committed to a biological toxicity testing program.

Oklahoma has a state permit system in addition to the EPA NPDES program. Although the language in the two permits virtually is the same, a particular discharge must be permitted by two separate permits.

The state is in the process of developing a biological testing program. Acute, 96-hour toxicity tests using the most sensitive indigenous fish have been used for toxicity testing on ambient water, but state capability currently does not exist for conducting effluent toxicity tests using EPA-recommended techniques.

Oregon Department of Environmental Quality  
Water Quality Division  
P.O. Box 1760  
Portland, OR 97207

Kent Ashbaker, Manager  
Industrial Waste Section  
(503) 229-5325

Mary Halliburton, Manager  
Sewage Disposal Section  
(503) 229-6099

Richard Hafele, Supervisor  
Biomonitoring Section  
Laboratory Division  
(503) 229-5983

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There are approximately 23 major and 551 minor industrial and 35 major and 198 minor municipal permits in the Oregon NPDES program. Eighteen industrial permittees are required to complete toxicity testing, generally one acute and one chronic toxicity test annually, using Ceriodaphnia and fathead minnows. Two of the metals facilities permits have toxicity effluent limits, and two permits require an instream biotic assessment. No biological testing of municipal permittees now is required. The state, however, is screening major discharges for toxicity through toxicity testing.

The state expects to increase biological toxicity testing in industrial permits and to implement a testing program for municipal permits for those facilities where toxicity in effluents may be of potential concern. The mechanism to require a toxicity reduction evaluation exists but has not been made a part of permit language. Toxicity (chronic and acute) screening tests conducted by the DEQ Laboratory on four municipal majors have not documented any problems to date.

The state does not operate a mobile biological laboratory and there is no certification of biological testing laboratories. Approximately 122 acute and chronic toxicity tests using the 21-day Daphnia magna or 7-day Ceriodaphnia and fathead minnow chronic tests are completed on facility discharges annually. In addition, macroinvertebrate assessments are completed upstream and downstream from these facility discharges. About eight per year of the 14-day chronic algal assay using Selenastrum are completed annually. It is estimated that 12 to 24 receiving water studies where macroinvertebrates and periphyton are assessed are completed annually. Caged salmonid fishes or caged invertebrates placed upstream and downstream from a potential pollution source are used in one or two studies per year.



Pennsylvania Department of Environmental Resources  
P.O. Box 2063  
Harrisburg, PA 17120

Mr. James Ulanoski, Chief  
Standards Unit, Bureau of Water Quality Management  
(717) 787-9637

Pennsylvania has approximately 170 major and 1,050 minor industrial permits and 225 major and 2,080 minor municipal permits in its NPDES program. The program has been oriented specifically toward chemical specific effluent testing. Chemical specific limits are made a part of a permit based upon an industry's declaration in the NPDES application of constituents probably occurring in the discharge and those constituents expected to be in the wastewater as a result of EPA and other studies. The more stringent of technology based limits or water quality based limits are used to arrive at a permit limit. An industry may appeal imposed limits to the Department's Environmental Hearing Board and, if unsuccessful, through the courts. Biological toxicity testing is not now required in Pennsylvania permits.

Toxicity reduction evaluations are invoked when monitoring indicates that chemical limits are being violated. Several of these have been accomplished, and they encourage improved in-plant management and wastewater control techniques.

During the past year, EPA Wheeling, WV, laboratory assisted the state by conducting chronic 7-day Ceriodaphnia and fathead minnow toxicity tests on 20 facility wastewater effluents. In addition, the state conducts 35 comprehensive stream use attainability biotic assessments and approximately 200 less comprehensive "upstream and downstream" biotic assessments for specific facilities annually. Fish and/or macroinvertebrates are examined in these studies. Fish flesh analyses are performed at 25 to 30 selected locations to determine pollutant bioaccumulations. There are 280 trend monitoring locations where monthly or quarterly chemical analyses are made; many of these require examination of biological communities.

The state does not believe that there is a statewide problem with chlorine toxicity; thus, maximum chlorine limits generally are not made a part of municipal permits. Where chlorine toxicity is known or suspected to be adversely impacting designated stream uses, chlorine is controlled through a "Strategy for Addressing Environmental Concerns over Discharges of Total Residual Chlorine." In some cases, this may require permit limits for total residual chlorine. Drinking water maximum contaminant levels are applicable statewide. Where human water quality criteria for carcinogens are more stringent at the 106 exposure level than are the maximum contaminant levels, those criteria are used to protect the statewide potable water supply use.

U.S. Environmental Protection Agency, Region II  
(NPDES authority not delegated)  
26 Federal Plaza  
New York, NY 10278

Mr. Keith Tingberg  
Permits Management Section  
(212) 264-2936

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Puerto Rico does not have delegated authority to issue NPDES permits. The island's permitting program is managed by Region II. Puerto Rico has 89 major and 146 minor industrial and 36 major and 93 minor municipal permits in its NPDES program. There have been 11 industrial permits issued by the Region that have required biomonitoring. Testing requirements are four 48-hour acute toxicity tests that are conducted at a quarterly frequency. Based upon a review of results, chronic toxicity testing, inclusion of permit toxicity limits, or a Toxicity Reduction Evaluation may be required. Through the Region, Puerto Rico is considering requiring biomonitoring at municipal facilities with significant industrial inflow.

Rhode Island Division of Water Resources  
83 Park Street  
Providence, RI 02903

Ms. Carlene B. Newman  
Senior Sanitary Engineer  
(401) 277-3961

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With 17 major and 81 minor industrial permits and 18 major and 11 minor municipal permits, State of Rhode Island permits require effluent toxicity testing on 6 industrial and 14 municipal discharges. There are no permit-specified toxicity effluent limits, but the use of such limits is under consideration. Toxicity testing will be required in at least all major permits. The specified effluent test is a 48-hour daphnid and a 96-hour fathead minnow static toxicity test. Tests are performed on whole effluent, and the testing frequency generally is every 6 months. The state views this initial program as a toxicity screening endeavor, with testing requirements designated on a case-by-case basis but including those specific industries with known or suspected toxic substances in effluent.

There is no toxicity testing laboratory certification program, and currently there are no laboratories in Rhode Island equipped for aquatic biological testing.

The state conducts trend stream monitoring at approximately 10 locations using artificial substrates and macroinvertebrates as criteria of water quality. Shellfish meats are routinely examined for contaminants also, but this human health test is not permit associated.

Municipalities have chlorine discharge limits, and such residual concentrations are sufficiently elevated to ensure meeting a fecal coliform standard of 200 per 100 ml. Dechlorination is not a requirement, although one facility operates the equipment. With municipalities, samples for toxicity testing are taken pre- and post-chlorination.

South Carolina Dept. of Health and Environmental Control  
2600 Bull Street  
Columbia, SC 29201

Mr. Russ Sherer, Director  
Division of Water Quality Assessment and Enforcement  
(803) 734-5300

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South Carolina administers an NPDES program with an estimated 80 major and 200 minor industrial permits and 115 major and 300 minor municipal permits. Fifty-three of the industrial permits require biomonitoring activities; 24 of these require effluent toxicity testing, with some requiring instream biotic assessment in addition, and 29 require instream biotic assessment only. No municipality currently has a permit toxicity testing requirement; however, about five municipalities are required to perform toxicity tests through administrative order. The toxicity tests now required by permit generally are 96-hour flow-through tests using bluegill sunfish; some permits require 48-hour daphnid tests or the use of mysid shrimp on whole effluents.

As permits are reissued, all major municipal permittees and minor permittees with significant industrial contribution will be required to conduct chronic 7-day Ceriodaphnia effluent toxicity tests. It is expected that 20 such municipal permits will be reissued this year. The requirements for industrial permittee testing, likewise, will orient toward the chronic Ceriodaphnia toxicity test in the future, with a decrease in instream assessment requirements. With this shift in testing emphasis, the mobile biological laboratory operated by the state gradually is being phased out, and the state will be doing 7-day chronic Ceriodaphnia toxicity tests on facilities with effluents being transported to the central Columbia laboratory.

The frequency of chronic testing will be monthly for some period of time. When toxicity is demonstrated, a toxicity reduction evaluation will be triggered to identify the source of toxicity. Toxicity reduction evaluations are just being implemented for municipalities; a number of industries have been required to identify and correct the source of toxicity since 1976. Heretofore, formal toxicity reduction evaluations have not been a part of permit language.

Bioaccumulation/bioconcentration aspects are considered in two permits that require tissue testing for certain metals and in a statewide fish flesh monitoring program conducted annually by the state. Other tests required in one permit each include fish flesh tainting, fish avoidance, and caged organism assessment. Potential human health impacts from discharges are considered upon issuance of all permits using state water quality and drinking water standards to establish effluent limits as well as guidance provided by EPA Water Quality Criteria documents.

A maximum chlorine limit following EPA criteria is in all applicable NPDES permits being reissued. All new facilities have dechlorination systems installed. Prechlorination and final effluents are evaluated with static acute toxicity tests. Chronic toxicity tests are conducted at end-of-pipe. All waters of the state are designated for drinking water supplies following appropriate treatment, as well as for fishing and the survival and propagation of a balanced indigenous aquatic community of flora and fauna.

South Carolina maintains a biological laboratory certification program with a recertification requirement on a 3-year cycle. About 20 biological testing laboratories are on the certified list.

South Dakota Dept. of Water and Natural Resources  
Office of Water Quality  
Joe Foss Building  
Pierre, SD 57501

Mr. Dennis Rounds  
Natural Resources Engineer  
(605) 773-3351

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South Dakota has 4 major and 56 minor industrial and 29 major and 283 minor municipal permits in the NPDES program. NPDES authority has not been delegated, and the permit program is administered by EPA, Region VIII. One municipal permit with combined industrial and domestic wastes has a requirement for a static and flow-through salmonid toxicity test. There are no biological testing requirements for industrial permittees. Additional permittees will be required to conduct effluent toxicity tests as permits are reissued; acute or chronic tests will be required.

The state may become more involved with toxicity testing activities but will keep most of the toxicity testing responsibility with the permittees. There are no commercial biological testing laboratories within the state and there is no laboratory certification program. Currently, the state has no facility within which to conduct toxicity tests.

The state conducts 12 to 16 macroinvertebrate and fish biotic stream assessments annually. Fish flesh from two or three locations, usually in the Black Hills area, is analyzed for pesticides, metals, and selected organic contaminants annually. In addition, trend water quality monitoring including macroinvertebrates and fish is performed annually at about 20 sampling locations. Site specific receiving water assessments at major facilities with macroinvertebrates and fish are in the planning stage.

Tennessee Division of Water Pollution Control  
150 Ninth Avenue, North  
Nashville, TN 37219-5404

Mr. Rich Sinclair, Manager  
NPDES Permit Program  
(615) 741-7883

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Tennessee issues 86 major and 960 minor non-municipal permits, plus an estimated 400 mining permits, and 75 major and 166 minor municipal permits. Twenty-five industrial permits require effluent toxicity testing; seven of these have toxicity limits. Four municipal permits currently require toxicity testing; two of these have toxicity limits. It is projected that in the future toxicity testing requirements will be placed in all permits where toxicity may be suspected by authorities. All major permitted discharges are screened via fathead minnow and Ceriodaphnia toxicity tests, and many are subjected to chronic testing techniques with these two organisms as well.

Many permits contain language that mandates a toxicity reduction evaluation when there is a showing of toxicity through the testing process. At least one such toxicity reduction evaluation has changed a stream reach from one devoid of game fish to one from which trout now are caught. In this case, the cause of the former toxicity was found in a raw product used in the manufacturing process.

The state does not have a biological laboratory certification program. A mobile biological laboratory is operated, principally to conduct flow-through 96-hour toxicity tests. With the increase in chronic testing, however, the numbers of flow-through tests gradually are being diminished.

Approximately 100 facility discharges are checked annually through state toxicity testing. Ninety of these industrial and municipal discharges are tested via fathead minnow and Ceriodaphnia acute tests. Ten are tested using the same organisms in chronic 7-day toxicity tests. The state cultures its own organisms for toxicity testing.

Instream assessments of macroinvertebrate and fish communities are completed in 20 to 30 studies per year, which translates into 100 or more locations per year. Macroinvertebrates, likewise, are examined at 20 trend monitoring sites annually, and fish are analyzed for toxic substances in the flesh at 5 of these.

There is a chlorine standard of 19 ug/l as a daily maximum for municipal discharges. This is established on a mass balance basis, with a violation occurring at the reliable detection level of 100 ug/l. As a result of this standard, many of the municipalities have installed dechlorination equipment.

Texas Water Commission  
P.O. Box 13087  
Capital Station  
Austin, TX 78711

Mr. Robert Silvus, Chief  
Industrial Wastewater Permits  
(512) 463-8200

Mr. Jack Davis  
Water Quality Standards Unit  
(512) 463-8475

NPDES permitting authority has not been delegated to the State of Texas. There are approximately 250 major and 1,570 minor industrial and 241 major and 836 minor municipal permits in the NPDES program, which is managed by EPA, Region VI. Biological toxicity testing is being required in 133 of the industrial permits, and the test is an acute static 48-hour daphnid toxicity test. There are no such testing requirements in municipal permits currently.

In the future, the biological testing program espoused in the EPA Region VI policy will affect all major dischargers as permits are reissued. Acute or chronic toxicity testing on effluents covered by major permits will be required, and the type will depend upon the amount of dilution afforded the effluent.

Texas had an existing discharge permitting program when the NPDES program was initiated. The state has continued that program and, by agreement, prepares draft NPDES permits for issuance by the EPA concurrent with preparation of permits under the state system. In the state system, there are 12 or fewer effluent situations where toxicity tests are required. The state requires submittal of toxicity test results obtained as a result of an NPDES permit requirement. A permittee must obtain both an NPDES and a state permit for a point source discharge.

The state currently does not conduct toxicity testing and does not operate a mobile toxicity testing laboratory. There is no biological laboratory certification program.

A contract laboratory is employed to conduct toxicity testing on facility discharges and on ambient receiving waters. The 48-hour acute daphnid or mysid shrimp toxicity test is used for effluent testing, and the 7-day Ceriodaphnia chronic test is used for ambient water toxicity testing. In addition, a 7-day mysid test is used for ambient waters with salinities greater than 5 parts per thousand. Currently, about 5 intensive field surveys involving 25 ambient water locations and 20 facility discharges are programmed annually. In addition, the state conducts instream macroinvertebrate and fish assessments on 5 to 10 water reaches annually.

Utah Dept. of Health, Water Pollution Control  
4108 State Office Building  
P.O. Box 45500  
Salt Lake City, UT 84145

Mr. Fred Pehrson, Chief  
Permits and Compliance Section  
(801) 538-6146

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Utah was delegated NPDES authority on July 7, 1987. The NPDES program encompasses 19 major and 150 minor industrial and 39 major and 43 minor municipal permits. Fourteen of the municipal permittees have pretreatment programs, and these are targeted for a toxicity testing requirement; some of these already have toxicity testing requirements, but not all. Six of the industrial permits require biological toxicity testing. As any major permit is reissued, biological toxicity testing is being incorporated into permit language. The type of test currently is confined to the acute static renewal daphnid and fathead minnow toxicity test. Currently, toxicity reduction evaluations have not become a part of the permitting process.

The state does not have toxicity testing capabilities. There is a state biological laboratory certification program, and compliance monitoring data are accepted only from a laboratory certified by the state. There are 10 to 20 special studies annually to determine beneficial use assessments and to identify water quality impairment. Macroinvertebrate and fish examinations are a part of these studies. No fish flesh analysis is done.

Drinking water maximum contaminant levels are applicable to designated public water use reaches as identified in water quality standards. Municipalities have a residual chlorine concentration that is based upon the criterion in water quality standards which, in turn, is based upon EPA water quality criteria.



Vermont Agency of Natural Resources  
Department of Environmental Conservation  
103 South Main Street - 10 North  
Waterbury, VT 05676

Mr. Douglas Burnham, Supervisor  
Special Studies & Surveillance  
(802) 244-5638

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The State of Vermont has 8 major and 72 minor industrial and 31 major and 28 minor municipal permits in its NPDES program. There is no requirement for biological toxicity testing in the permit program. There is a plan, however, to establish a toxicity testing program in the next 12 to 18 months. A burden would be placed on the state to demonstrate toxicity prior to a requirement for testing being imposed on a permittee.

The state believes that there are 6 to 12 discharges with potential toxicity impact on the receiving waters. Currently, potential toxicity is controlled through a chemical specific program in which environmental effects literature for those substances known to be discharged is used to estimate potential environmental harm.

Although the state is not conducting toxicity tests currently, their strategy is to be responsible for the initial acute screening of effluents for toxicity. The screening test would include both a 48-hour Daphnia pulex and a 7-day chronic Ceriodaphnia toxicity test. When potential toxicity is determined in the screening process, the industry would be responsible for conducting 7-day chronic Ceriodaphnia and larval fathead minnow toxicity tests. With the testing program, the state would establish toxicity effluent limits; if such were violated, a toxicity reduction evaluation would be triggered.

A new laboratory building with a toxicity testing unit is in the planning stage. When completed, this laboratory will enhance the state's testing capabilities. There is one commercial biological testing laboratory within the state; there is no laboratory certification program.

In associated biological investigative activities, the state has an ambient stream monitoring program with 30 locations where macroinvertebrates are sampled through use of the Surber Sampler. There are six locations where fish populations are examined to monitor long-term effects of stream acidification on head-water fish populations.

In a new program initiative, indirect discharge permittees will be required to monitor macroinvertebrates via rock basket substrates upstream and downstream from each discharge, with five to eight baskets per location. This program will provide instream assessment of discharge effects. A program of fish contaminant monitoring was initiated in 1986. Fish samples will be collected at approximately five sites per year. Edible portions will be analyzed primarily for heavy metals and PCBs.

Virginia Water Control Board  
2107 North Hamilton Street  
Richmond, VA 23230

Mr. Richard Ayers  
Water Resources Ecology Supervisor  
(804) 257-6418

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Virginia has 66 major and 741 minor industrial permits and 67 major municipal permits in its NPDES permit program. Within these, biological toxicity testing is required in 130 industrial permits and 30 municipal permits, the latter having treatment capacities over 5 MGD or pretreatment programs. None of the permits contains biological toxicity limits or water quality based toxic chemical limits.

The basic toxicity testing policy includes semiannual 96-hour acute, static or static renewal effluent tests using a daphnid and fathead minnow or the appropriate saltwater species. In some cases, the frequency may be increased, and chronic toxicity tests may be required. In the lower James River, chronic toxicity tests involving both Ceriodaphnia and the 7-day fathead minnow test, or the appropriate saltwater species, are requirements in 20 permits. Twenty-three permittees are required to complete macroinvertebrate receiving water assessments; such assessments generally are associated with those streams whose physical characteristics provide good assessment potential. It is expected that instream assessments will be increasingly required as a means to test the effectiveness of the pollution control program.

When an effluent is demonstrated to be toxic, additional testing or a toxicity reduction evaluation is required. There are ongoing toxicity reduction evaluations with 11 industrial and 4 municipal permittees. None has been completed, but the cause of the toxicity has been isolated in five cases. One facility has a toxicity reduction plan as a specific permit requirement; others were triggered by a generic permit clause and resulted from demonstrated toxicity. Program success is measured by a demonstration of no toxicity through continued effluent or instream assessment testing.

There is no state biological testing laboratory certification program. The state approves a test plan submitted by the permittee, however, and this plan identifies the laboratory that will perform the tests. The state operates a mobile biological laboratory that provides on-site static and chronic toxicity testing and a base of operations for macroinvertebrate receiving stream assessment at the same time.

Annually, the state goal is 20 receiving water assessments through macroinvertebrate community studies. Fish flesh bioaccumulation analyses for metals and some organics are performed for 40 routine locations and for up to 6 caged organism locations downstream from specific sources. The goal for state-conducted toxicity testing is 10 facilities on site per year for both acute and chronic tests using Ceriodaphnia and fathead minnow or appropriate saltwater species plus 12 facilities per year in the fixed laboratory for acute toxicity testing only. Trend monitoring locations include 175 for macroinvertebrates and 40 for fish.

Appropriate permits contain residual chlorine limits based upon EPA water quality criteria. Toxicity tests are on effluents and may include dechlorinated effluents where appropriate. Designated ambient water supply areas include 5 miles upstream from a raw water intake. The state currently is debating whether to extend the drinking water criteria statewide. There is presumed to be no removal of a drinking water maximum contaminant level during water supply treatment.

U.S. VIRGIN ISLANDS

Department of Planning and Natural Resources  
179 Altona and Welgunst  
Charlotte Amalie, St. Thomas,  
Virgin Islands 00801

Ms. Marcia Taylor  
NPDES Program Supervisor  
(809) 774-3320

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The Virgin Islands have 5 major and 30 minor industrial and 2 major and 9 minor municipal permits in the NPDES program. There are no permits with biomonitoring requirements.

Washington Department of Ecology  
Mail Stop PV-11  
Olympia, WA 98504

Mr. Stan Springer, Supervisor  
Enforcement and Program Coordination Section  
(206) 459-6042

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Washington has 45 major and 475 minor industrial permits and 45 major and 235 minor municipal permits in its NPDES program. Approximately 37 of the industrial permits require biological toxicity testing, and of these, about 30 have toxicity limits. Biological testing will be required in one municipal permit in the near future. The toxicity test generally is a 96-hour toxicity test using salmonids. The toxicity limits specify 80 percent survival of test organisms in 65 percent effluent using the receiving water as dilution water. Upon failing the test, corrective actions include a determination of the cause of the toxicity.

With the exception of four federal facility permits that require chronic tests using Ceriodaphnia and Selenastrum, chronic toxicity testing has not been placed in NPDES permits; however, the state is beginning a program of acute and chronic testing using Ceriodaphnia. An additional development period is necessary to become comfortable with the Ceriodaphnia test. About 12 facility biomonitoring studies are planned annually with acute and chronic toxicity tests. The state does not operate a mobile toxicity testing laboratory, and there is no certification program for biological testing laboratories. Washington is not using the fathead minnow as a test organism; it is not found in the state's waters.

The Puget Sound study and management plan has received special emphasis in the state water quality program. All major dischargers to Puget sound will be monitored with particular attention to sediments, particulate fraction of effluents, acute and chronic effects, instream biotic effects, and water quality.

WV Division of Water Resources  
1201 Greenbriar Street  
Charleston, WV 25311

Mr. Jerry Ray, Head  
Permits Branch  
(304) 348-0375

Mr. Don Kain, Head  
Monitoring Branch  
(304) 755-9141

The NPDES program encompasses 62 major and approximately 700 minor industrial facilities and 33 major and approximately 240 minor municipal facilities, with an additional 2,200 minor sewage discharges. About 70 of the industrial permits require effluent toxicity testing on an annual, semiannual, or more frequent basis. No biomonitoring requirements have been imposed upon municipal effluents. However, some permits for POTWs with pretreatment programs contain biomonitoring requirements for industrial users. Some of the industrial permits require instream macroinvertebrate assessment. The standard permit language requires a 48-hour static LC50 test on fathead minnows and Daphnia pulex. Should the toxicity test results indicate toxicity, further biomonitoring requirements or a toxicity reduction plan may be required.

The state conducts fathead minnow and daphnid acute toxicity tests on 50 to 75 facility discharges annually. These tests are made during the time of major facility inspection. Trend monitoring activities encompass macroinvertebrate assessments in comprehensive studies on a 42-station network. In addition, macroinvertebrate communities are examined in 15 to 20 special study type investigations, which have 4 to 5 sampling locations per study.

The state does not operate a mobile biological laboratory. Currently, there is no biological laboratory certification program; however, such a certification program is in the planning stage.

Wisconsin Department of Natural Resources  
P.O. Box 7921  
Madison, WI 53707

Mr. Carl Blabaum, Director  
Bureau of Wastewater  
(608) 266-3910

The State of Wisconsin has 62 major and 731 minor industrial and 88 major and 507 minor municipal permits in its NPDES program. As a part of the 1987 permit application process, 36 pulp and paper mills were required to submit results of 7-day chronic *Ceriodaphnia* and fathead minnow toxicity tests on effluents. These facilities also were required to perform acute toxicity tests for the 1979 permit issuances. The further use of biomonitoring for these and other industrial facilities is currently being evaluated.

The state expects to require toxicity testing of some municipalities in the future. The use of toxicity reduction evaluations is just beginning to be addressed. Testing for metals and the priority pollutants is required in permits of municipalities with treatment plants exceeding 5 MGD design capacity.

In the late 1970s, the state operated a mobile acute toxicity testing laboratory. This trailer is not currently in use, since little end-of-pipe toxicity was found. There is no certification program for commercial biological laboratories. The majority of the pulp and paper mill toxicity testing is being performed by the Institute of Paper Chemistry located at Appleton, WI. There is no state toxicity testing capability, but it is expected that the capability for chronic toxicity testing will be developed within the next 12 to 18 months.

The state has performed a study on the applicability of the Ames test to water pollution control testing. The mouse test for toxic algae also is being investigated further. There is an extensive macroinvertebrate sampling program involving 450 samples, but the thrust of this program is toward nonpoint source pollution. There are 40 to 50 trend monitoring locations where macroinvertebrates, zooplankton, phytoplankton, and chlorophyll are examined.

Wisconsin has an extensive fish and wildlife tissue examination program where approximately 500 flesh samples are examined for PCBs, 45 for chlordane and dieldrin, 10 for toxaphene, and 1,200 for total mercury. Some of the samples are examined for more than one of the above mentioned constituents or for other constituents, such as dioxins and furans, as circumstances require.

Wyoming Department of Environmental Quality  
Water Quality Division  
Herschler Building, 4th Floor West  
Cheyenne, WY 82002

Mr. John Wagner  
Technical Supervisor  
(307) 777-7781

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Wyoming administers a permit program consisting of 30 major and 770 minor industrial and 20 major and 80 minor municipal NPDES permits. Of these, two municipalities are required to complete acute 48-hour daphnid toxicity tests on a quarterly schedule. There is no toxicity testing required of industry, but industrial activities generally are confined to resource extraction such as coal mining and oil production, and complex industrial wastewaters are rare. As industrial and municipal permits are reissued, all major permits and selected minor permits will have a toxicity testing requirement.

Toxicity tests are not performed by the state Water Quality Division, and very little water pollution related biological assessment of any kind is undertaken by the agency. There is no biological laboratory certification program. EPA's Duluth, MN, mobile laboratory will conduct acute and chronic tests on 10 to 12 facility discharges this fall. The Wyoming Game and Fish Department has completed fish sampling as a technical support service to the Water Quality Division upon request.